Towards a HOLISTIC UNDERSTANDING of SOCIETY: BRIDGING Social Sciences, Statistics and Computational Sciences

DSSR 2025 PESCARA 19TH-21ST FEBRUARY

BOOK OF ABSTRACTS

DATA SCIENCE & SOCIAL RESEARCH (DSSR 2025)

Edited by: Tonio Di Battista, Yuri Calleo, Alex Cucco

DSSR 2025 - Towards a holistic understanding of society: bridging Social Sciences, Statistics and Computational Sciences

BOOK OF ABSTRACTS

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Mid-Adriatic Hypercity, culture and creativity

Cecilia Serafini

Summary of Background Data
Analyzing various projects carried out in Europe, it is very interesting to dwell on the MESOC, elaborated by the Econcult team, of the Research Center for the Economy of Culture in Valencia through which they arrived at the declination of three types of cities: heritage, smart city and creative city [1]. Starting from these three definitions, to develop a HYPERCITY model it is necessary to dilute the concept of heritage according to which the city is only a repository of cultural heritage and in which the ability to generate value depends only on tourism and to aim for smart and highly creative cities in which interconnections, efficient mobility and governance based on developed technologies improve living conditions and where the culture, innovation and creativity of those who live in the urban context are engines of innovation and development [2,3].
Objectives
Starting from the project of a highly cosmopolitan, globalized and high-tech Adriatic Region, we will focus here on the importance of creating a smart city centered on culture. With a view to reducing inequalities, dealing with health and well being, and increasing gender equality as dictated by the goals of the 2030 Agenda, it is of paramount importance to outline a model of the city of the future that makes creativity and culture its central elements.
Methods
The goal would be to create a research center that would connect all the current realities in the Mid Adriatic territory, identify best practices and elaborate a model through the use of participatory observation and qualitative research that is strongly High tech, but also High touch directed to the creation of deeper relationships in the perspective of Gemeutlichkeit.
Results
The involvement of citizens who are more aware of the riches of the territory and more discerning in their demand for expressive and social experiences, the increase of professions related to the culture and creativity sector, a greater use of digitization and collaborations between institutions and private experts in the field of technology and AI. The latter connection would make it possible to work on both the creation of added value given by culture and creativity and to make places more safe and accessible.
Discussion/Conclusions
A mid-Adriatic hypercity would, therefore, become an engine of development in terms of smartness and socioeconomic development, cosmopolitan-demographic complexity, and a variety of lifestyles.

References

1. Rausell-Köster, P., Ghirardi, S., Sanjuán, J. Et al. Cultural experiences in the framework of 'cultural cities': measuring the socioeconomic impact of culture in urban performance. City Territ Archit 9, 40 (2022). https://doi.org/10.1186/s40410-022-00189-8
2. Pitasi, A., L'ipercittá facile e complessa: un fenomeno globale in un laboratorio adriatico: https://youtu.be/x-Xs06w-0oo?si=cgthl2zqT-seEhw6.
3. https://www.mesoc-project.eu/city-pilots/valencia.

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Nuova Pescara as a Hyper-City: Challenges and Issues of a Merger Project

Massimo Angrilli, Valentina Ciuffreda, Ilaria Matta, Alessia Brisdelli

Summary of Background Data
The merger of the municipalities of Pescara, Montesilvano, and Spoltore within the Ionian-Adriatic macro-region, scheduled to be implemented by January 1, 2027, takes place in a historical moment characterized by increasingly complex urban challenges. These challenges include global phenomena such as demographic concentration in cities, resource depletion, climate change, and the urgent need to shift toward more sustainable development models. Addressing these issues requires a radical rethinking of how cities are conceived and planned.
Objectives
This paper examines the formation of Nuova Pescara as an opportunity to tackle these challenges in an integrated and innovative manner. It proposes a departure from traditional urban development models, which often prioritize horizontal expansion at odds with crucial goals such as soil sealing limitation, climate adaptation, and ecological and energy transitions. Instead, the paper advocates for models centered on urban regeneration, increased density, diversification, complexity, and the enhancement of natural and cultural resources.
Methods
The concept of the "hyper-city," as outlined by Andrea Pitasi, serves as a key interpretative framework for this analysis. A hyper-city is characterized by the porosity of administrative and state boundaries, a cosmopolitan demographic, socio-economic development as a strategic objective, and a high level of interconnectivity and digitalization. The paper analyzes the merger project through this conceptual lens, focusing on the redefinition of the prefix "hyper." Often misinterpreted as a city striving to be "above the norm", the term is re-envisioned as a "city-beyond", signifying the transcendence of administrative boundaries to create inter-municipal synergies in service management and a rethinking of development traditionally confined to horizontal growth.
In the case of Pescara, this "city-beyond" concept extends to overcoming coastal limitations, exploring how the merger can strengthen the new city's strategic role as a connective node between inland areas and the Ionian-Adriatic basin. This approach has significant implications for economic development and environmental sustainability.
Results
This paper will adopt a critical stance, aiming not only to reconstruct the ongoing debate surrounding the Nuova Pescara merger but also to evaluate alternative scenarios. The analysis will explore two potential scenario: rejecting the merger hypothesis entirely or advancing toward a broader aggregation of municipalities within the metropolitan area. By juxtaposing these alternatives, the study will highlight the limitations and opportunities inherent in each scenario. The rejection of the merger could risk perpetuating administrative fragmentation and inefficiencies, while a larger-scale metropolitan aggregation might amplify synergies, enhance regional connectivity, and more effectively address challenges such as climate adaptation and socio-economic inequality. This dual evaluation is intended to enrich the discourse by providing a nuanced understanding of the potential trajectories and their implications for urban governance and sustainability in the Ionian-Adriatic macro-region.

References

1. Angrilli, M.: La ciudad Adriatica. Paisajes costeros. In Turismo. Paisaje. Futuro. Hacia una transicion turstica en Canarias indice (pp. 254-259). Dirección General de Ordenación y Promoción Turística. Consejería de Turismo, Industria y Comercio. Gobierno de Canarias (2023).
2. Barbieri, G.: Hyperadriatica. OP2, opere pubbliche e città adriatica indirizzi per la qualificazione dei progetti urbani e territoriali, Venezia, Ascoli, Pescara. List-ActarTrento-Barcellona (2009).
3. Munoz, F.: Urbanalización: Paisajes comunes, lugares globales. Gustavo Gili, Barcelona, (2008).

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The 21st Century Urban Landscape: The Gender Perspective Approach.

Adele Bianco

Summary of Background Data
The design, governance and evolution of urban spaces have a significant impact on the quality of life of women, men, individuals and less considered social groups, shaping different experiences for these groups and thereby impacting their quality of life [1] [2].
Objectives
The consideration of women's and other marginalised groups' perspectives and needs is a pivotal issue. This ensures the sustainability of our urban landscapes, catering to the needs of their inhabitants while also considering the intentions of urban planners [3].
The paper focuses on two aspects that have been identified as having a significant impact on the lives of women. The first aspect is the matter of economic opportunities. Generally, urban areas offer women greater opportunities to access work, education and professional networks. The second aspect concerns access to services and infrastructure dedicated to health, both for oneself and for family members. This issue is directly linked to a responsibility that falls largely on women, significantly influencing their quality of life.
Methods
Key indicators of the quality of urban design and management include safety throughout the day, mobility, ease access to essential services and infrastructure related to health and care, as well as the availability of housing and economic resources such as employment.
Results
Analysing urban spaces through a gender lens enables us to comprehend how such environments reflect or do not reflect gender dynamics.
Two persistent issues emerge: first, the persistent pay disparity between men and women, with women continuing to receive lower incomes even in urban areas; second, the prevalence of informal economic activity, in which many women work without adequate protection.
Discussion/Conclusions
The consideration of the needs of women, disadvantaged social groups or those with specific requirements is therefore paramount in order to render the urban environment accessible and liveable for all. This commitment to inclusivity and sustainability represents a pivotal challenge for city administrations, who can utilise targeted policies to enhance the liveability and inclusivity of urban spaces.

References

1. Beebeejaun, Y.: Gender, urban space, and the right to everyday life. Journal of Urban Affairs, 39(3), 323–334. (2016). https://doi.org/10.1080/07352166.2016.1255526
2. Simonton, D. (Ed.): The Routledge History Handbook of Gender and the Urban Experience, Routledge, London. (2017)
3. Terraza, H., Orlando, M.B., Lakovits, C., Lopes, J. V., Kalashyan, A. Handbook for Gender-Inclusive Urban Planning and Design. World Bank, Washington, DC. (2020) http://hdl.handle.net/10986/33197

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Invited Session - INV *2 Social Data Science, Artificial Intellingence, and Social Change - Mara Maretti*

Organized by Mara Maretti
Chair Mara Maretti

1. *Innovative Approaches to Sustainable Tourism: Integrating Scenario Workshops and Participatory Scenario Planning* (Guido Capanna Piscé, Luca Giraldi, Luca Olivari)
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Innovative Approaches to Sustainable Tourism: Integrating Scenario Workshops and Participatory Scenario Planning

Guido Capanna Piscè, Luca Giraldi, Luca Olivari

Summary of Background Data
Destination management organizations are increasingly considered key players in coordinating tourism initiatives that balance economic growth with sustainability and inclusion [1]. However, the traditional top-down approaches often fall short of fully incorporating the diverse priorities of local stakeholders. Enter the Scenario Workshop methodology, particularly when adapted and combined with Participatory Scenario Planning (PSP). This approach offers a framework that encourages multi-stakeholder engagement, fostering dialogue and consensus-building. It's shown promise in tackling complex challenges within tourism governance. How? By promoting discussions that lead to actionable outcomes, aligning with the sector's evolving demands for innovation [3], accessibility [2], and environmental sustainability.
Objectives
In this research, we're taking a critical look at how well the Scenario Workshop method works for developing Destination Management Organizations (DMOs). We're also exploring its potential as a participatory tool that could lead to more inclusive, forward-thinking tourism governance [1]. Our study offers a practical view of structured participatory approaches to managing destinations, showing how these methods can help align various stakeholders' priorities with broader strategic goals in tourism.
Methods
Our research employs a modified version of the Scenario Workshop methodology, which has its roots in the European Awareness Scenario Workshop (EASW) framework. We've deliberately simplified and streamlined this approach to work within our time and resource constraints. We've also incorporated elements from the Participatory Scenario Planning (PSP) methodology to bolster its effectiveness and relevance. This tailored approach allows us to gather valuable insights whilst maintaining efficiency. By combining these methodologies, we're able to leverage the strengths of both, creating a robust framework that suits our specific research needs.
Results
Our workshops revealed an interesting alignment between local stakeholders' priorities and key themes in current tourism research. These themes notably centre on sustainability, accessibility, and innovation. It's clear that the concerns of those on the ground mirror the academic discourse, suggesting a promising convergence of practical and theoretical perspectives in the field.
Discussion/Conclusions
Our findings highlight the benefits of blending Scenario Workshop methods with Participatory Scenario Planning (PSP) approaches. This combination can yield concrete, practical outcomes whilst aligning stakeholder interests with strategic tourism objectives. The research demonstrates that the Scenario Workshop methodology serves as a powerful tool to foster the growth of Destination Management Organisations (DMOs) that are firmly grounded in community values and sustainability principles. Moreover, it underscores the vital need for adequate resources and technical know-how to successfully implement digital and sustainable [3] initiatives in the tourism industry.

References

1. Yang, Y., Wani, G. A., Nagaraj, V., Haseeb, M., Sultan, S., Hossain, M. E., ... & Shah, S. M. R. (2023). Progress in sustainable tourism research: an analysis of the comprehensive literature and future research directions. Sustainability, 15(3), 2755
2. Scheyvens, R., & Biddulph, R. (2018). Inclusive tourism development. Tourism Geographies, 20(4), 589-60
3. El Archi, Y., Benbba, B., Kabil, M., & Dávid, L. D. (2023). Digital Technologies for Sustainable Tourism Destinations: State of the Art and Research Agenda. Administrative Sciences, 13(8), 184

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Science Communication about COVID-19: Politicization and Depoliticization of Science in the Italian Case

Alessandra De Luca, Mara Maretti [1]

Summary of Background Data
The study is framed within Science and Technology Studies and focuses on a dataset of online newspaper articles about Covid-19, collected from newspaper websites and Facebook between 1st March 2020 and 31st December 2022. This timeframe enables an examination of the role of scientific knowledge in two distinct phases: the early pandemic and the later phase, characterized by the politicization of science through government measures in Italy.
Objectives
To explore the politicization and depoliticization of science during the COVID-19 pandemic, as conceptualized by Bolsen and Druckman (1), Bolsen and Palm (2), and Hart et al. (3).
Methods
Articles in the dataset were preliminarily classified according to their respective newspapers' political orientations. Using text analysis and semantic network analysis, the study examined how narratives around Covid-19 were constructed and how science was politicized or depoliticized through journalistic storytelling.
Results
Text analysis revealed differing narratives shaped by political orientations, highlighting shifts in the representation of scientific knowledge. Semantic network analysis further displayed the evolving framing of science during the pandemic.
Discussion/Conclusions
The findings highlight the crucial role of media in shaping public perceptions of science, emphasizing the interconnections between political contexts and journalistic narratives during a global health crisis.

References

1. Bolsen, T., Druckman, J.N. (2015). Counteracting the Politicization of Science. Journal of Communication, 65(5): 745–769.
2. Bolsen, T., Palm, R. (2022). Chapter Five - Politicization and COVID-19 vaccine resistance in the U.S. Progress in Molecular Biology and Translational Science, Academic Press, 188(1): 81-100.
3. Hart, P.S., Chinn, S., Soroka, S. (2020). Politicization and Polarization in COVID-19 News Coverage. Science Communication, 42(5): 679-697.

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Mara Maretti - University Gabriele d'Annunzio

The role of data in ecoliteracy: an EcoAI for sustainability.

Gianfranco Rubino

Summary
The escalating global environmental challenges demand innovative approaches to ecological education that integrate traditional pedagogical methods. This research shows the relevance of using data into ma comprehensive framework for an Ecological Artificial Intelligence (*EcoAI*) system designed to revolutionize ecoliteracy education through data-driven, adaptive, and personalized learning strategies.

Background Data
The chiasm created by artificial intelligence (AI) and machine learning (ML) is soon recognized as a powerful tool that has revolutionized ecological research globally since the 1990s [1]. Traditional environmental education methods have been criticized for their inability to change students' attitudes and behaviours regarding sustainability [2]. The correlation of AI, big data, and other digital technologies has the potential to significantly raise the levels of traditional education systems [3], leading to significant changes. Scientists can now extract meaningful patterns from data, identify unexpected variable interactions and nonlinearities [4] and make predictions with unprecedented precision, such as for habitat suitability or species distribution. In education, these transformative capabilities support the need for a deeper understanding of ecological systems.

Methods
The proposed *EcoAI* framework comprises five interconnected dimensions that synergistically address the complex challenges of environmental education:

1. **Contextual Data Integration:** The framework's foundation lies in its ability to aggregate and synthesize multidimensional environmental data from diverse sources. By integrating real-time environmental monitoring, the *EcoAI*, this approach transforms abstract environmental concepts into tangible, context-specific learning experiences that resonate with individual learners' local ecological environments.
2. **Personalized Learning Trajectories:** Central to the *EcoAI* framework is an adaptive learning algorithm that customizes educational content based on individual learner profile, addressing the critical limitation of one-size-fits-all environmental education, increasing engagement and knowledge retention through tailored content delivery.
3. **Interactive Scenario Modelling:** The framework incorporates predictive modelling capabilities that enable learners to explore complex environmental scenarios through advanced visualization technologies and interactive simulations, such as:

- Explore potential ecological outcomes of individual and collective actions
- Understand systemic interconnections within ecological systems
- Develop critical thinking skills about environmental challenges
- Visualize long-term implications of sustainability choices

4. **Behavioural Transformation Mechanisms:** Beyond knowledge transmission, the *EcoAI* framework integrates evidence-based behavioural change strategies. By providing real-time feedback, comparative analytics, and personalized sustainability recommendations, the system motivates learners to translate ecological understanding into concrete environmental actions.

- **Ethical and Inclusive Design:** Committed to ethical AI development, like mitigate algorithmic bias, ensure data privacy and security, provide accessible interfaces for diverse user groups and respect cultural variations in environmental understanding.

References

1. Lek, S., & Guégan, J. F.: Artificial neural networks as a tool in ecological modelling, an introduction. Ecological Modelling, 120, 65–73. https://doi.org/10.1016/S0304-3800(99)00092-7 (1999).
2. Chen, L., Chen, P., & Lin, Z.: Artificial intelligence in education: A review, Ieee Access, 8, 75264-75278. (2020).
3. Gowda, R.S., Suma, V.: A comparative analysis of traditional education system vs. e-Learning, In: 2017 International Conference on Innovative Mechanisms for Industry Applications (ICIMIA). IEEE, pp. 567–571. (2017).
4. Ryo, M., & Rillig, M. C.: Statistically reinforced machine learning for nonlinear patterns and variable interactions, Ecosphere, 8, e01976. https://doi.org/10.1002/ecs2.1976 (2017).

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Invited Session - INV *3*
Identifying and Counteracting Online Misogyny in Cyberspace (ICOMIC Project) - Annalina Sarra

Organized by Annalina Sarra
Chair Annalina Sarra

1. *Leveraging Human Expertise for Better Understanding andAddressing Online Misogyny* (Emiliano del Gobbo, Alex Cucco, Lara Fontanella, Elisa Ignazzi, Sara Fontanella)
2. *Mapping the Italian Manosphere: Language, Self-Representation, and Network Analysis of Misogynistic Communities* (Elisa Ignazzi, Mara Maretti, Lara Fontanella)
3. *Foresight and strategies to address online misogyny: Insights from a Delphi scenario analysis* (Simone Di Zio, Lara Fontanella, Alice Tontodimamma)
4. *Beyond Misogyny Detection: Investigating Bias and Embracing Perspectivism* (Giulia Rizzi, Elisabetta Fersini)

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Leveraging Human Expertise for Better Understanding and Addressing Online Misogyny

Emiliano del Gobbo, Alex Cucco, Lara Fontanella, Elisa Ignazzi and Sara Fontanella

Summary of Background Data
Women are disproportionately targeted by online abusive content, with sexualized aggression being the most prevalent form of hostility directed at them [1]. These abuses are rooted in misogyny, broadly defined as a cultural mindset that perpetuates hatred toward females based solely on their gender. The identification of misogynistic content is critical as it reinforces harmful stereotypes, discrimination, and normalizes gender-based violence. Addressing such content helps create safer online environments and protects users' well-being and rights.
Objectives
This study aims to enhance the accuracy and interpretability of misogyny detection in online platforms by leveraging explanation-guided learning (EGL). It explores the role of human annotation in improving detection models by providing contextual insights into misogynistic language [2].
Methods
A dataset of 13,500 comments sourced from Twitter, Instagram, and Facebook was used. Each comment was annotated by a pair of annotators, one male and one female per pair, across three evaluation rounds. Annotators identified specific text spans constituting misogynistic content, which served as the basis for training machine learning models. These annotations provided contextual information to improve both the performance and transparency of detection systems
Results
Models trained using explanation-guided learning and human annotations demonstrated improved accuracy in identifying misogynistic content. Additionally, the interpretability of these models was integrated in the learning procedure, allowing for clearer explanations of the rationale behind predictions. The use of human-annotated spans provided a rich context that aligned with ethical requirements for automated content moderation systems.
Discussion/Conclusions
Integrating human annotations into machine learning frameworks can improve both the effectiveness and transparency of misogyny detection algorithms. Explanation-guided learning ensures that these systems remain accountable, ethical, and capable of handling the nature of misogynistic content. This study highlights the value of incorporating human expertise in AI-driven content moderation, emphasising the need for more inclusive and human centric detection algorithm.

Acknowledgement: This research was undertaken as part of the ICOMIC (Identifying and Counteracting Online Misogyny in Cyberspace) Project funded by EU Next Generation, MUR-Fondo Promozione e Sviluppo-DM 737/2021

References

1. Amnesty International Italia. Barometro dell'odio: Sessismo da tastiera, 2020. URL https://www.amnesty.it/barometro-dellodio-sessismo-da-tastiera/.
2. Gao, Y., Gu, S., Jiang J., Hong, S., Yu, D., Zhao, L. Going beyond XAI: A systematic survey for explanation-guided learning. ACM Computing Surveys, 56(7):1–39, 2024.

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Mapping the Italian Manosphere: Language, Self-Representation, and Network Analysis of Misogynistic Communities.

Elisa Ignazzi, Mara Maretti, Lara Fontanella.

Summary of Background Data
The Italian manosphere comprises online communities united by misogynistic and antifeminist ideologies, with key groups such as Men's Rights Activists (MRAs), Men Going Their Own Way (MGTOW), Incels, and Pickup Artists (PUAs) [1]. These groups emphasize male identity, perceived societal injustices, and resistance to feminism, frequently framing men as victims of a changing social landscape. We created two datasets, the first one collecting Facebook pages belonging or related to one of the groups of the manosphere, while for the second one we collected 695 posts from four different blogs and forums, focusing on the "self-presentation" section.
Objectives
This study aims to analyze the language and the instances of each community, highlighting their similarities and their differences, how do they talk about others, especially women, and how do they represent themselves and the men in their communities. Furthermore, we were interested in the network of Facebook pages related to the manosphere in Italy and their connections to international pages.
Methods
The study utilizes qualitative methods, such as digital ethnography to reconstruct the pages' network, and statistical analysis, including a keyness analysis of the language used in forums and online platforms associated with the Italian manosphere, that allows for an exploration of recurring themes and keywords related to gender dynamics, masculinity, and societal opposition.
Results
The analysis identifies a clear division between the different factions of the manosphere, each presenting distinct narratives. MRAs focus on legal reforms and the protection of men's rights, particularly within the realms of family law and reproductive rights. MGTOW members reject traditional romantic relationships, emphasizing autonomy and detachment. Incels portray themselves as victims of societal and romantic exclusion, while PUAs focus on mastering seduction techniques to gain validation. The study also reveals that these groups foster a digital "community of practice," sharing knowledge, language, and ideological reinforcement, which strengthens their collective identity.
Conclusions
The Italian manosphere is characterized as a network of online communities that operate as both social movements and virtual communities of practice (VCoPs). It functions as a space for ideological exchange, reinforcing beliefs about masculinity in crisis and antifeminism. Despite differences in focus, all groups within the manosphere share a common goal of challenging feminism and reasserting traditional gender roles.

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References

1. Ignazzi, E., Maretti, M., & Fontanella, L. (2025). The Italian Manosphere: Composition, Structure, and Functions of a Digital Network. Social Inclusion, 13, Article 9341. https://doi.org/10.17645/si.9341

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Foresight and strategies to address online misogyny: Insights from a Delphi scenario analysis

Simone Di Zio, Lara Fontanella and Alice Tontodimamma

Summary of Background Data
The proliferation of online misogynistic speech has surged with the widespread use of social media, posing significant challenges for individuals and society. This phenomenon is fueled by the behavior of "prosumers," who simultaneously produce and consume content [1]. Despite efforts to counteract this issue, current strategies often prove inadequate, necessitating a more structured and forward-looking approach.
Objectives
The study aims to evaluate long-term strategies to effectively counteract and prevent the spread of online misogynistic hate speech using a Delphi-based future scenario approach. The goal is to provide recommendations for policies that are effective, feasible, and sustainable.
Methods
A Delphi method combined with future scenarios was employed [2,3]. Experts were selected using bibliometric techniques. The Delphi process involved two consultation rounds to evaluate current and future countermeasures, as well as key drivers of change. Data were analyzed using fuzzy clustering, with results visualized through ternary plots. Additionally, generative artificial intelligence tools were utilized to create narrative scenarios and identify policy actions.
Results
Educational strategies and the integration of artificial intelligence emerged as the most promising approaches to counter online misogyny. Future actions deemed most plausible include mandatory media literacy education in schools and the use of AI to identify and counter hate speech in real time. However, uncertainties persist regarding the legal and technological feasibility of some measures. The results delineate three distinct scenarios: a desirable one, a business-as-usual intermediate, and an undesirable scenario.
Discussion/Conclusions
The study highlights the need for a holistic approach combining regulatory, educational, and technological actions to counter online misogynistic speech. The Delphi method proved effective in generating insightful scenarios and preliminary policies, although limited expert participation remains a challenge. In conclusion, this work offers valuable tools to inform strategic decisions in promoting a more inclusive digital environment.

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References

1. Bruns, A.: Produsage: Towards a Broader Framework for User-Led Content Creation, in Proceedings of 6th ACM SIGCHI Conference on Creativity and Cognition 2007. Association for Computing Machinery, United States of America, pp. 99--105 (2007).
2. Di Zio, S., Bolzan, M., Marozzi, M.: Classification of Delphi outputs through robust ranking and fuzzy clustering for Delphi-based scenarios. Technol. Forecast. Soc. Change 173, 121140 (2021).
3. Rikkonen, P., Tapio, P.: Future prospects of alternative agro-based bioenergy use in Finland—Constructing scenarios with quantitative and qualitative Delphi data. Technol. Forecast. Soc. Change 76(7), 978--990 (2009).

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Beyond Misogyny Detection: Investigating Bias and Embracing Perspectivism

Giulia Rizzi and Elisabetta Fersini

Summary of Background Data
Misogyny, a pervasive form of hate against women, is spreading rapidly online. Addressing this issue requires a multimodal approach, as hateful content frequently extends beyond textual expressions. The task is also hindered by challenges related to *bias* and *perspectivism*, which compromise the efficacy and fairness of detection systems. Bias is frequently associated with a skewed distribution of specific elements in the datasets that will be used for training hate speech detection models [1]. Perspectivism, instead, frequently emerges due to the subjective interpretation of what constitutes hate speech, which is influenced by cultural, linguistic, and contextual factors [2]. In order to address the above-mentioned issues, the Multimedia Automatic Misogyny Identification (MAMI) dataset [3], which is a widely adopted benchmark that offers valuable insights into the nuances of misogynistic content, has been used.
Objectives
This study aims to tackle the challenges of misogyny identification in multimodal content through three key contributions:

- Evaluate unimodal and multimodal approaches to determine the most effective source of information for detecting misogynistic memes and identify persistent meme archetypes that still represent an open challenge.
- Develop and apply a bias estimation and mitigation technique to address unfair predictions caused by dataset imbalances.
- Propose an approach to identify disagreement-related elements in multimodal content, serving as a proxy to identify samples that might be perceived differently by the annotators.

Methods
Four unimodal and three multimodal approaches are assessed for their ability to detect misogyny in memes. A novel bias estimation technique is proposed to identify potentially biased elements in memes, followed by a mitigation strategy using Bayesian Optimization to adjust predictions. Additionally, a probabilistic approach is employed to detect content elements likely to evoke disagreement among annotators.
Results
The investigation revealed that multimodal approaches outperformed unimodal ones, although certain meme archetypes remain challenging to classify. The proposed strategies are not only able to correctly discover candidate biased elements, but they are also effective to correctly drift the predictions for a large number of cases. The probabilistic approach to disagreement detection demonstrated strong performance, requiring fewer parameters while effectively identifying subjective content elements.
Discussion/Conclusions
This work highlights the importance of multimodal strategies for misogyny detection in online content, emphasizing the need to address both bias and perspectivism. The proposed contributions advance the field of misogyny detection by providing effective methodologies to tackle key challenges, with promising implications for broader applications in multimodal content analysis.

References

1. Caton, S., Haas, C.: Fairness in machine learning: A survey. ACM Comput. Surv. **56**(7), pp. 1–38 (2024). ACM New York, NY
2. Frenda, S., Abercrombie, G., Basile, V., Pedrani, A., Panizzon, R., Cignarella, A.T., Marco, C., Bernardi, D.: Perspectivist approaches to natural language processing: a survey. Lang. Resour. Eval. pp. 1–28 (2024). Springer
3. Fersini, E., Gasparini, F., Rizzi, G., Saibene, A., Chulvi, B., Rosso, P., Lees, A., Sorensen, J.: SemEval-2022 Task 5: Multimedia automatic misogyny identification. In: Proceedings of the 16th International Workshop on Semantic Evaluation (SemEval-2022), pp. 533–549 (2022)

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Invited Session - INV *4 Advanced Clustering and Multilevel Analysis Techniques for Complex Data - Stefano Antonio Gattone*

Organized by Stefano Antonio Gattone
Chair Stefano Antonio Gattone

1. *Clustering methods for Compound Extremes based on the Wasserstein distance* (Regina Castrovilli, Fabrizio Durante, Daniela Gallo, Gianfausto Salvadori)
2. *Integrating fuzzy clustering and dimensionality reduction for enhanced analysis of large datasets on high-dimensional social phenomena* (Mariaelena Bottazzi Schenone, Maurizio Vichi)
3. *Local fit measures in multilevel cross-classified latent class models* (Nicola Piras, Silvia Columbu, Jeroen K. Vermunt)

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Clustering methods for Compound Extremes based on the Wasserstein distance.

Regina Castrovilli, Fabrizio Durante, Daniela Gallo, and Gianfausto Salvadori

Summary of Background Data
Statistical modeling of climate extremes, such as heatwaves, droughts, and floods, is of critical importance for mitigating their potentially severe impacts on society. Among these, Compound Events - the simultaneous occurrence of multiple, potentially interdependent hazards - are particularly consequential, often resulting in impacts that surpass those of univariate extremes.
Objectives
A key area of research in statistical climatology is regionalization, which involves identifying sub-regions that exhibit similar behavior in the variables of interest. Regionalization is essential since it enhances our understanding of the spatial variability and impacts of climate phenomena. Our aim is to provide a regionalization of complex spatial climatological datasets, when compound extremes are considered.
Methods
We design a clustering algorithm that captures the similarity of multivariate extremal phenomena, observed across different locations. Within the framework of the block-maxima methodology, we employ two main dissimilarity measures: (a) one based on the univariate distribution of extremes and (b) another on the copula associated with these maxima. Both measures leverage the Wasserstein distance, which offers a robust means of comparing distributions and usually gives more intuitive clustering results, as demonstrated in previous studies
Results
By using data related to daily maxima temperature levels (in Celsius) and minima relative humidity in 22 municipalities located in Apulia region (Southern Italy), we show improved estimation of climate-related metrics at specific locations by leveraging statistically similar regions.
Conclusions
Traditional univariate approaches that assess hazards independently can significantly underestimate the true aggregate risk in such scenarios. The use of the Wasserstein distance offers a robust means of comparing distributions in univariate and multivariate setting. Moreover, it provides more intuitive clustering results, as also demonstrated in previous studies.

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Integrating fuzzy clustering and dimensionality reduction for enhanced analysis of large datasets on high-dimensional social phenomena

Mariaelena Bottazzi Schenone and Maurizio Vichi

Summary of Background Data
A novel and versatile methodology that combines fuzzy clustering and dimensionality reduction to address the complexities of analyzing high-dimensional social phenomena, offering significant contributions to social science research, has been studied and here proposed. This methodology is particularly suited for analyzing global socioeconomic phenomena, such as disparities in public health, education, income, and quality of life.
Objectives and Methods
By summarizing variables' contribution into a small number of latent components, we enhance both clustering precision and interpretability of the results. Additionally, the fuzzy approach of assigning membership degrees to clusters that vary in the unit interval allows for a more comprehensive understanding of units that may not fit neatly into a single class.
This approach overcomes several limitations of traditional clustering methods, such as the inability to manage large datasets in order to identify both overlapping memberships and the identification of latent dimensions simultaneously. This dual capability enables the model to uncover nuanced patterns in complex datasets, where units can exhibit partial similarities across multiple dimensions, reflecting the multidimensionality of real-world social and economic systems.
Results
The methodology can be applied to group countries based on latent socioeconomic dimensions such as health, education, and economic equity, while simultaneously quantifying the uncertainty of these assignments. Additionally, it is possible to consider a single dimension for variables' reduction and thus construct reliable composite indicators (CI), such as a quality-of-life indicator for cities. Together with the CI, the method returns a ranking of units into equivalence classes. Unlike traditional ranking systems that assign a distinct rank to each unit, this approach assigns the same equivalence class to units with minimal differences in their CI scores, ensuring a more meaningful and interpretable ranking system.
Discussion/Conclusions
By bridging advanced computational methodologies with the core needs of social science research, the proposed approach facilitates evidence-based policymaking and the exploration of complex social systems. Its capacity to synthesize large datasets with high-dimensional features into actionable insights makes it a useful tool for addressing contemporary challenges in sustainable development, social inequalities, public health, and urban planning.

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Local fit measures in multilevel cross-classified latent class models.

Nicola Piras, Silvia Columbu and Jeroen K. Vermunt

Summary of Background Data
Latent class (LC) analysis is generally used to classify respondents into unobserved, unknown groups based on their responses to observed variables. This approach usually refers to categorical variables but can be extended to other types. Various extensions of the standard LC model have been introduced to handle complex data structures, such as in the case of hierarchical nesting of observations at different levels, for example, children nested within schools ([1]). However, sometimes the nesting consists of multiple higher levels which are not hierarchically linked, but instead cross-classified (CC), for example, children could be considered nested within both schools and neighborhoods. In such situations, two sets of higher-level mixture components, with associated latent variables, one for each of the two cross-classified levels, must be introduced (see [2]).
Objectives
Standard formulations of latent class models assume conditional independence between the indicator items, and in the multilevel variants it is also assumed an extra conditional independence between observations within groups. Adherence to these assumptions and the corresponding correct estimation of parameters is central to evaluate how well an estimated model fits to the data. For this reason, local fit measures can be defined to verify whether these key assumptions hold in specific parts of the model.
Methods
For the original LC model, a local fit statistic for evaluating whether conditional independence holds for each pair of items is the Bivariate residual (BVR) ([3]). It uses a Pearson goodness-of fit statistic type of formula, involving the comparison between predicted and observed frequencies in two-way tables. Moreover, similar measures called BVR-group and BVR-pair were proposed for evaluating the adherence to the assumption of conditional independence of observations within groups. These local fit measures show where misfit occurs and suggest model changes for improvement of the model definition.
Discussion/Conclusions
We generalize these BVR-type measures to the case of CC multilevel LC models. We illustrate an application of this method to classify degree programmes (level-1 units), universities (first level-2 CC) and fields of study (second level-2 CC) according to perceived quality of Italian graduates. Data comes from the 2017 italian Almalaurea survey.

References

1. Vermunt, J. K.: Multilevel latent class models. Sociological Methodology, 33:213–239 (2003).
2. Columbu, S., Piras, N., Vermunt, J. K.: Multilevel Cross-Classified Latent Class Models. CLADAG Book of Abstracts and Short Papers, ISBN: 9788891935632, 390–393 (2023).
3. Nagelkerke, E., Oberski, D. L., Vermunt, J. K.: Goodness-of-fit of multilevel latent class models for categorical data. Sociological Methodology, 46:252–282, Taylor & Francis (2016).

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Invited Session - INV *5 Scientific Knowledge Analysis in Health - Massimo Aria and Maria Spano*

Organized by Massimo Aria and Maria Spano
Chair Massimo Aria

1. *From Scientific Production to Practical Insights: Turning Health Research into Decision-Making Tools* (Massimo Aria, Carlo Alabiso, Corrado Cuccurullo, Luca D'Aniello, Maria Spano)
2. *C.A.R.E. plot: An Innovative Tool to Assist Italian Triage System* (Corrado Crocetta, Maria Gabriella Grassia, Camilla Massa, Rocco Mazza, Simone Paesano, Francesca Paola Pastena, Dario Sacco)
3. *Mapping Hard-to-Reach Populations: a Data-Driven Approach to Digital Healthcare Accessibility in Italy carried out as part of the Project Digital Health Solutions in Community Medicine project (DHEAL-COM)* (Fabio Corbisiero,Pasquale Cortese, Carmine Urciuoli)

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From Scientific Production to Practical Insights: Turning Health Research into Decision-Making Tools

Massimo Aria, Carlo Alabiso, Corrado Cuccurullo, Luca D'Aniello and Maria Spano

Summary of Background Data
Academic Health Science Centres (AHSCs) share a triple strategic mission: training healthcare professionals to address disease burden effectively using advanced health technologies, pioneering innovative treatments and digital solutions to enhance the EU health sector's sustainability and global competitiveness and delivering high-quality, data-driven, people-centered healthcare [1]. However, balancing these three objectives is highly complex, often leading to challenges such as strategic ambiguity and organizational tensions. Despite the recognized importance of this tripartite mission, the interplay between its components remains underexplored [2]. While some studies focus on how teaching impacts patient care, the influence of research on clinical practice remains largely uninvestigated, considering the diverse scientific outputs generated by AHCs, including publications, clinical trials, patents, grants, and social impact [3]. Today, bibliometrics and scientometrics offer robust methodologies to measure research outputs.
Objectives
Our study aims to develop a structured framework to build a comprehensive database containing bibliometric and scientometric metadata on the scientific production of Italian public AHSCs from 2000 to the present. The framework leverages OpenAlex, a database covering over 230 million records.
Methods
We will identify publications linked to each AHSC by searching their full institutional affiliations, retrieving the main scientific information about documents published by authors affiliated with these centers, and unique metadata offered by OpenAlex. Additionally, metadata will be enriched using PubMed/MEDLINE, which incorporates Medical Subject Headings (MeSH), a controlled biomedical vocabulary that facilitates precision indexing and searching. Since OpenAlex lacks metadata on grants, clinical trials, altmetrics, and patents, these data will be supplemented using Dimensions, which offers a broader research context, enabling a comprehensive view of AHSCs' scientific impact.
Results
By integrating these diverse data sources, our contribution presents a novel framework for retrieving and consolidating critical information about Italian AHSCs.
Discussion/Conclusions
The framework offers valuable insights into its strategic mission, highlighting implications for healthcare, education, and innovation.

References

1. French, C.E., Ferlie, E., Fulop, N.J.: AThe international spread of Academic Health Science Centres: a scoping review and the case of policy transfer to England. Health Policy (2014) doi: 10.1016/j.healthpol.2014.07.005
2. Cuccurullo, C., Aria, M., Spano, M., D'Aniello, L.: Leading Change in Academic Health Science Centers. Zaccaria, (2023)
3. D'Aniello, L., Spano, M., Cuccurullo, C., Aria, M.: Academic Health Centers' configurations, scientific productivity, and impact: Insights from the Italian setting. Health Policy (2022) doi: 10.1016/j.healthpol.2022.09.007

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C.A.R.E. plot: An Innovative Tool to Assist Italian Triage System

Crocetta Corrado, Grassia Maria Gabriella, Massa Camilla, Mazza Rocco, Paesano Simone, Pastena Francesca Paola, Sacco Dario

Summary of Background Data
Patient wait times in emergency department (ED) settings and the accuracy of triage codes are critical factors influencing the quality of patient care and satisfaction. Research indicates that approximately 50% of triage evaluations in EDs may be inaccurate, with improper identification of high-urgency patients compromising safety and misclassification of low-urgency cases impacting ED throughput and wait times. Shorter wait times are associated with improved patient outcomes, emphasizing the need for timely and accurate triage assessments. Current methodologies often fail to systematically address the relationship between triage inaccuracies and prolonged wait times.
Objectives
The study aims to develop and implement a standardized methodological strategy for the Emergency-Urgency (EMUR flow) information system to identify diagnostic uncertainties and errors in triage code assignment. By doing so, the research seeks to reduce waiting times and improve the congruence between triage codes and diagnostic outcomes.
Methods
A pilot study was conducted employing the construction of specific indicators and the development of a graphical tool called the Codes Assessment Relevant Errors (C.A.R.E.) plot. The approach analyzed congruence between diagnoses associated with different triage codes, variations in triage categorizations between admission and discharge, and waiting times. The C.A.R.E. plot served as a visual instrument to identify and quantify discrepancies in triage assessments and their associated outcomes.
Results
The proposed methodology enabled the identification of systematic uncertainties and errors in triage code assignments that contribute to prolonged waiting times in ED settings. The C.A.R.E. plot effectively highlighted cases of diagnostic and triage incongruence, revealing critical mismatches between triage classifications and diagnoses. This strategy provides actionable insights for improving the accuracy of triage assessments, optimizing ED operations, and ultimately enhancing patient care and outcomes.

References

1. Chen, S. S., Chen, J. C., Ng, C. J., Chen, P. L., Lee, P. H., & Chang, W. Y. Factors that influence the accuracy of triage nurses' judgement in emergency departments. Emergency Medicine Journal, 27(6), 451-455 (2010)
2. Fernandes, M., Vieira, S. M., Leite, F., Palos, C., Finkelstein, S., & Sousa, J. M.: Clinical decision support systems for triage in the emergency department using intelligent systems: a review. Artificial Intelligence in Medicine, 102, 101762, (2020)

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Mapping Hard-to-Reach Populations: a Data-Driven Approach to Digital Healthcare Accessibility in Italy Carried out as Part of the Project Digital Health Solutions in Community Medicine Project (DHEAL-COM)

Fabio Corbisiero, Pasquale Cortese, and Carmine Urciuoli

Hard-to-reach (HtR) populations encompass socially and geographically marginalized groups that experience systemic barriers to accessing healthcare services and participating in research. These groups include individuals with disabilities, elderly people in rural areas, ethnic minorities, migrants, and the homeless according to [1]. The barriers faced by HtR populations are diverse and often intersectional, arising from economic constraints, geographical isolation, linguistic challenges, and cultural stigmas. In Italy, for instance, migrants and Roma communities often encounter additional obstacles due to administrative hurdles and discriminatory practices according to [2]. Addressing these issues requires innovative, context-specific methodologies, such as digital health solutions that offer telemedicine services and digital literacy programs to bridge existing gaps. This study aims to systematically map HtR populations to support targeted policy interventions aimed at healthcare equity. This research aims to construct a synthetic index that identifies Italian municipalities with high concentrations of HtR populations, using socio-demographic, healthcare, and technological variables. The objective is to support data-driven healthcare interventions targeting underserved areas. Data were collected from [3], and other institutional databases. Principal Component Analysis (PCA) was employed to construct individual indices reflecting economic vulnerability, healthcare scarcity, digital infrastructure gaps, and social stigma. The normalized indices were aggregated into a composite HtR index. The dataset includes 7,896 Italian municipalities, with missing data imputed using regional averages. Software R was used to visualize results. The synthetic HtR index revealed clusters of vulnerable populations in rural and economically disadvantaged areas. These municipalities exhibited low internet coverage, scarce telemedicine services, and higher socio-economic deprivation. PCA demonstrated that socio-economic and infrastructural dimensions accounted for a significant proportion of the variance. The final thematic maps highlight the geographic distribution of healthcare exclusion zones. The findings highlight the urgent need for intersectional policies to address the compounded barriers to digital healthcare access faced by marginalized communities in Italy. The results indicate that socio-economic vulnerability, infrastructural gaps, and social stigma interact to create significant healthcare disparities, particularly in rural and economically disadvantaged regions. Implementing telemedicine and digital literacy initiatives tailored to local needs can significantly reduce these disparities, improving healthcare equity. Moreover, GIS-based mapping provides policymakers with an effective tool for visualizing exclusion zones and prioritizing interventions. Future research should focus on evaluating the long-term impact of these interventions, refining the indices to capture evolving healthcare challenges, and enhancing the inclusivity of digital healthcare systems through user-centered solutions and participatory approaches.

References

1. Bonevski, B., Randell, M., Paul, C., Chapman, K., Twyman, L., Bryant, J., ... & Hughes, C. (2014). Reaching the hard-to-reach: A systematic review of strategies for improving health and medical research with socially disadvantaged groups. BMC Medical Research Methodology, 14(1), 42. https://doi.org/10.1186/1471-2288-14-42
2. Ceccarelli, G., d'Ettorre, G., Bernardi, S., Pinacchio, C., Fiorentino, F., Fattorini, L., ... & Vullo, V. (2018). Human rights violations of migrants in Italy: A challenge for health care systems. Journal of Immigrant and Minority Health, 20(2), 218-225. https://doi.org/10.1007/s10903-017-0563-2
3. Istituto Nazionale di Statistica (ISTAT). (2011). 8,000 Census ISTAT. Retrieved from https://ottomilacensus.istat.it/download-dati/

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Invited Session - INV *6 Social Data Science, Artificial Intellingence, and Social Change - Mara Maretti*

Organized by Mara Maretti
Chair Elisa Ignazzi

1. *Analyizing hidden affordances in visual generative models: a digital sociology research protocol* (Guido Anselmi, Claudia Cantale)
2. *Artificial Intelligence Revolution and Humanity: Challenges, Opportunities and Expert Insights* (Davide Pedone, Elisa Ignazzi)
3. *Homophily and Insularity Dynamics in an Echo Chambers: Computational Models for the Study of the Conspiracy Subculture in Facebook* (Vanessa Russo, Giulia Andrighetto, Mara Maretti, Eugenia Polizzi, Federico Cecconi)

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Analyzing ‘hidden affordances’ in visual generative models: a digital sociology research protocol.

Guido Anselmi and Claudia Cantale[1]

Summary of Background Data
In this contribution we analyze a dataset of 700 images generated by DALL-E, as we are interested in investigating imaginary and social biases around two set of entities: the human body and GAFAM companies. 500 images each depict one of the key components of GAFAM and 200 depict each male or female beautiful individuals.
Objectives
Affordances [1] in digital sociology are one of the key tools for observing how digital platforms operate. Observing digital affordances in generative models can be quite difficult due to their opaque nature, computational techniques can be deployed to reveal hidden affordances. With this contribution we want to elaborate a protocol to enhance and update the traditional way of doing ‘digital methods’ by employing computational text analysis on prompt enhancement, automatically generated by DALL-E APIs. We assume that Prompt enhancement is a) a key affordance in ensuring a consistent image style b) can be leveraged to describe how visual generative modes ‘nudge’ image creation.
Methods
Firstly we adopt minimal prompting, namely for each of our entities we use a) the company name as a prompt (with the exception of Apple), b) ‘a beautiful man [or woman]’. Secondly, we conceptualize prompt enhancement as a key affordance for image generation in visual generative models. For each generation we store the enhanced prompt as a text string. Thirdly, we measure word frequency for each case and across cases by using an array of explorative tools such as TF-IDF or topic modeling. We also employ qualitative visual analysis.
Results
The GAFAM dataset allows us to explore the imaginary of tech industry and the depiction of power and bleeding edge technology, however due to the lack of comparable works this is purely methodological and exploratory. The ‘gender’ dataset allows us to assess biases in image generation: in general biases as realized by align with available depictions of the topic in literature [2], as visual generative models build upon pre exiting stereotypes.
Discussion/Conclusions
Further methodological work is needed to assess the impact of generative and visual generative models on the digital imaginary, both in the case of the tech sector and in the case of gendered bodies. Transmodel comparison is needed to assess specific biases ‘baked in’ different models as well as longitudinal comparison, assessing the impact of different ‘generations’ of models.

References

1. Rogers, R. Digital methods. MIT press (2013).
2. Sun, L., Wei, M., Sun, Y., Suh, Y. J., Shen, L., & Yang, S. Smiling women pitching down: auditing representational and presentational gender biases in image-generative AI. Journal of Computer-Mediated Communication, 29(1). (2024)

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Artificial Intelligence Revolution and Humanity: Challenges, Opportunities and Expert Insights

Davide Pedone, Elisa Ignazzi

Objectives
This study seeks to conduct an in-depth exploration of the phenomenon of artificial intelligence, aiming to identify and delineate, through the insights of domain experts, the challenges and opportunities that emerging technological systems pose to contemporary society. Given the rapid transformations AI is driving across diverse spheres of daily life, from employment to education, it becomes crucial to examine how these technologies shape everyday interactions and social dynamics..
Methods
To investigate the phenomenon, a qualitative methodology was adopted, specifically employing semi-structured interviews [1], which facilitated an in-depth examination of the themes that emerged. Four overarching topics were identified: the definition of artificial intelligence and its current state, AI's impact on daily life, debates and critical issues, and prospects for the future. This thematic framework was then presented to a panel of experts. The sampling strategy employed was purposive, or theoretical sampling [1], grounded in the principles of computational social science [2]. The participants included sociologists, legal scholars, statisticians, and industry professionals.

The collected interviews were analyzed using QualCoder software, which enabled the systematic coding and examination of transcriptions. Additionally, RStudio was utilized to conduct a text-mining analysis, highlighting the most frequently occurring terms in the interviews.
Results
The interview analysis identified twenty-five analytical codes. Participants predominantly concentrated on themes such as the "future"—a core topic within the interview framework—alongside "challenges," "fear of new technology," "learning," "legislation," and "anthropomorphization." The textual analysis underscored a notable juxtaposition between two key terms: "artificial" and "people".
Conclusions
The interviews emphasized several critical considerations that warrant immediate and future attention to realign the trajectory of the artificial intelligence revolution toward a more ethical and human-centric paradigm. Achieving these objectives requires an educational process designed to help individuals comprehend the intrinsic mechanisms of these systems, fostering an understanding of AI as complementary support tools rather than substitutes. Such an approach will enable the effective and responsible utilization of the immense potential offered by artificial intelligence.

References

1. Corbetta, P., (2014). Metodologie e tecniche della ricerca sociale. Bologna, il Mulino.
2. Conte, R., et all., (2012). Manifesto of computational social science. The European Physical Journal Special Topics, 214(1), 325–346.

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Homophily and Insularity Dynamics in an Echo Chambers: Computational Models for the Study of the Conspiracy Subculture in Facebook

Vanessa Russo, Giulia Andrighetto, Mara Maretti, Eugenia Polizzi, Federico Cecconi

Summary of Background Data
Social media platforms, particularly Facebook, host specialized networks that disseminate information from unofficial sources. These networks, structured around pages and groups, amplify specific content through algorithmic mechanisms, fostering its circulation within bubbles. Critical dynamics such as political orientation and emotional triggers, including fear or hate, play a pivotal role in sustaining these bubbles. While previous studies on echo chambers and information bubbles have primarily focused on the agents driving information virality and the structural dynamics of these systems, less attention has been given to thematic and emotional factors that help maintain these bubbles by acting as a social adhesive.
Objectives
The aim of this research is twofold. First, it seeks to analyse the characteristics of a conspiracy-oriented echo chamber on Facebook by examining the actors involved, the network topology, and the cultural elements that sustain its activity and interactivity. Second, it aims to develop a computational agent-based model (ABM) based on these findings to describe the chamber's formation, evolution, and potential dissolution [1].
Methods
The research methodology integrates both qualitative and quantitative approaches, organized into two phases: descriptive and experimental. In the descriptive phase, an echo chamber is selected and analysed through social network analysis, ethnographic content analysis, and text mining to explore its digital landscape. The experimental phase investigates the variation in network structure in relation to certain article properties. This is achieved by constructing an agent-based model that combines insights from the descriptive phase with an analysis of the system's structural dynamics
Results
The research identifies two main trends within the echo chamber. The first trend is the compactness of the bubble, which is maintained through social homophily, as actors interact primarily with like-minded individuals, reinforcing cohesion within the network. The second trend is insularity, characterized by a lack of interaction with external actors, resulting in the isolation of the bubble from external viewpoints.
Discussion/Conclusions
This study reveals the pivotal role of emotional and thematic elements in sustaining conspiracy-oriented echo chambers on Facebook. These factors foster group cohesion by evoking ambivalent emotional responses, highlighting the interplay between structural and cultural dynamics. The findings advocate for designing information policies that leverage these insights, offering more effective, context-sensitive interventions. The development of a computational agent-based model provides a robust tool for further exploration of these systems, with significant implications for research and practical applications in information management.

References

1. Russo, V., Andrighetto, G., Maretti, M. *et al*. Homophily and Insularity Dynamics in an Echo Chambers: Computational Models for the Study of the Conspiracy Subculture in Facebook. *Soc Indic Res* (2024). https://doi.org/10.1007/s11205-024-03461-1

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Invited Session - INV *7 Data sciences for socio-territorial indicators - Agostino Stavolo and Maria Gabriella Grassia*

Organized by Agostino Stavolo and Maria Gabriella Grassia
Chair Agostino Stavolo

1. *Official Statistics and Machine Learning: Spatial Analysis from Remote Sensing Images* (Fabrizio De Fausti, Marco Di Zio, Orietta Luzi, Stefano Mugnoli)
2. *Clusterwise regression for missing data imputation: application to Italian green companies indicators* (Gianmarco Borrata, Antonio Balzanella, Raffaele Mattera, Rosanna Verde)
3. *Exploring the relationship between tourism and urban deprivation: a longitudinal study on Matera* (Rosanna Cataldo, Marina Marino, Rocco Mazza, Agostino Stavolo)

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Official Statistics and Machine Learning: Spatial Analysis from Remote Sensing Images

Fabrizio De Fausti, Marco Di Zio, Orietta Luzi, Stefano Mugnoli

The territory and its geographical characteristics represent elements fundamental for the understanding of reality that surrounds us. Remote sensing images, supported by machine learning techniques, may provide important and peculiar information that can be difficultly gathered with the usual data sources such as survey and administrative data. It is a timely and granular information, and provides detailed characteristics of the places where we live. On this streamline, National Statistical Institutes (NSIs) are increasing their interest and efforts for their use into the statistical production process. Projects at national and European [1] level are in due course, some applications include classification of land cover, production of agricultural plots, and quantification of urban green areas. As far as the latter project is concerned, Istat has been working for producing an experimental statistic on the quantification of urban green through orthophotos. To this aim, an adaptive and automatic algorithm elaborating the normalised vegetation index (NDVI) is proposed [2]. In this application, orthophotos were preferred to satellite images because of their higher resolution, up to 20 cm, that is essential in an urban area.
The use of remote sensing data in the scientific community is certainly not new, but their introduction for the production of official statistics is not immediate. One of the most important problems is the quality evaluation of statistics produced with this data. Nevertheless, NSIs have an opportunity to develop new information product that a real important value added. In fact, NSIs have and are able to manage a lot of information concerning the society and their multivariate aspects, thus the integration of those data with remote sensing images has an enormous potentiality for improving the knowledge of society. To make a concrete example, the quantification of urban green areas is certainly an important information per se, but it is surely more informative to link this information to the people living in the areas, to their social profiles, to health statistics, how much it is accessible and how much it can affect their lives. This is in fact at the basis of relevant European initiatives for supporting towns and cities in restoring nature and biodiversity, as illustrated in [3].

References

1. Essnet research project One-Stop-Shop for Artificial Intelligence and Machine Learning for Official Statistics (AIML4OS): WP7: AI/ML on earth observation data, satellite imagery. https://cros.ec.europa.eu/book-page/aiml4os-wp7-aiml-earth-observation-data-satellite-imagery-0
2. Mugnoli, S., Sabbi, A., De Fausti, F., Lancioni, G., & Sisti, F. (2024). Quantification of urban green areas: An innovative remote sensing approach for Official Statistics. Proceedings of the 2nd workshop on methodologies for official statistics 6 /7 Rome, Italy. https://www.istat.it/produzioneeditoriale/ 2nd-workshop-on-methodologies-for-official-statistics/
3. European Commission Urban Green Platform https://environment.ec.europa.eu/topics/urbanenvironment/ urban-nature-platform_en

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Clusterwise regression for missing data imputation: application to Italian green companies indicators

Gianmarco Borrata, Antonio Balzanella, Raffaele Mattera and Rosanna Verde

The development of indicators to monitor green companies and understand the characteristics that determine their green status is a critical step toward promoting sustainable practices and informing policy decisions. In this study, we focus on the evaluation of green companies in Italy, leveraging a unique dataset of over one thousand firms that applied for funding through the "Investimenti Sostenibili 4.0" program. This dataset provides valuable insights into the factors influencing access to green funding; however, it also contains missing data, which must be appropriately imputed to ensure robust data analysis.

In this paper, we propose the use of clusterwise regression [2] for missing data imputation. This method offers significant advantages over classical imputation approaches by leveraging the inherent cluster structure of the data [1]. Specifically, clusterwise regression imputes missing values by applying functions such as the mean or other statistical estimates within clusters to which the unit with missing data belongs to. This approach ensures that the imputation process accounts for heterogeneity across clusters, leading to more accurate and context-sensitive results. We evaluate the effectiveness of clusterwise regression in imputing missing data and use the imputed dataset to investigate the characteristics that explain access to green funding in Italy.

We find that when applying clusterwise regression with 10%, 20%, and 30% of missing values, the RMSE values are 5.79, 7.75, and 7.32, while the corresponding MAE values are 4.66, 5.38, and 5.27. In contrast, using a simple imputation procedure without clustering yields RMSE values of 5.88, 7.78, and 7.47, and MAE values of 4.87, 5.43, and 5.37. These comparisons suggest that clusterwise regression provides better performance across different levels of missing data, highlighting the advantages of leveraging cluster-specific information in the imputation process. Given the obtained results, we construct indicators that provide a comprehensive view of green company distribution across the Italian provinces.

The results underline the potential of clusterwise regression as a robust tool for data imputation, enabling more reliable analyses and the development of meaningful green business indicators.

References

[1] Karmitsa, N., Taheri, S., Bagirov, A., & Mäkinen, P. (2020). Missing value imputation via clusterwise linear regression. IEEE Transactions on Knowledge and Data Engineering, 34(4), 1889-1901.

[2] Park, Y. W., Jiang, Y., Klabjan, D., & Williams, L. (2017). Algorithms for generalized clusterwise linear regression. INFORMS Journal on Computing, 29(2), 301-317.

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Exploring the relationship between tourism and urban deprivation: a longitudinal study on Matera

Rosanna Cataldo, Marina Marino, Rocco Mazza and Agostino Stavolo.[1]

Summary of Background Data
Tourism has a considerable impact on poverty, the degree of relative deprivation and processes of social exclusion in a society. For decades, it has been recognized as a tool for development and poverty alleviation [2]. Existing tourism research on poverty has predominantly focused on income-based analyses, often overlooking the multidimensional nature of poverty and the perspectives of those directly affected. For decades, tourism has been recognized as a tool for development and poverty alleviation [1].
Objectives
This study explores the relationship between tourism and urban deprivation, focusing on the case of Matera and the impacts of tourism on the historic centre. The analysis spans from Matera's candidacy as the European Capital of Culture to 2022, incorporating two key reference points: 2014, the year of its designation, and 2019, the year of the cultural events [3]. The examination of Matera is grounded in socioeconomic and demographic indicators, as well as tourism metrics, both provided by the National Institute of Statistics.
Methods
In this work, the main tourism indicators and the material deprivation index are analysed. A longitudinal analysis was carried out with the aim of measuring if and how tourism has changed the city in terms of deprivation and urban development.
Discussion/Conclusions
Starting from the analysis of the deprivation index known in literature and tourism, the aim is to build a system of composite indicators to represent territorial heterogeneity in order to provide a cognitive contribution to support the design of differentiated interventions, using a higher order PLS-PM model.

References

1. Frenzel, F.: Slumming it: The tourist valorization of urban poverty. Bloomsbury Publishing. (2016)
2. Holden, A.: Tourism, poverty and development. London: Routledge (2013).
3. Mavrin, I.: European capital of culture and sustainable tourism: challenges, trends and perspectives. Tourism: An International Interdisciplinary Journal, 72(1), 20-34 (2024).

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Invited Session - INV *8 Resilience as a mental view on future - Luigi Fabbris*

Organized by Luigi Fabbris
Chair Luigi Fabbris

1. *"What doesn't kill you makes you stronger" : A new scale to measure resilience as both recovering and strengthening people's ability* (Clelia Cascella, Luigi Fabbris)
2. *The COVID-19 experience as a turning point for youth's behaviours* (Luigi Bollani, Angela Maria D'Uggento, Luigi Fabbris)
3. *Resilience, trust in science, and future outlooks: Perspectives of Italian youth in the post-pandemic era* (Luigi Bollani, Simone Di Zio, Luigi Fabbris)
4. *Social priorities and future perspectives of Italian young adults engaged in volunteering activities* (Angela Maria D'Uggento, Luigi Fabbris, Mariangela Zenga)

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“What doesn't kill you makes you stronger”: A new scale to measure resilience as both recovering and strengthening people’s ability.

Clelia Cascella[1], Luigi Fabbris[2]

Summary of Background Data
The human condition has always been marked by major shocks and dramatic events, including wars and pandemics, and it is reasonable to assume that this will continue to be the case in the future. These inevitable challenges will continue to influence humans’ life in the future. Consequently, it can be argued that resilience - defined as a resource that can counteract the risk of decline caused by a stressor or a series of stressful events - is essential for adapting, recovering and thriving in the face of adversity, thus enhancing protection against adverse or aversive life circumstances. Because resilience allows for more effective navigation of life’s difficulties, it can be considered necessary for individual well-being, with the result that individuals could emerge even stronger from negative experiences such as the Covid-19 pandemic.
Objectives
Adequate measurement of resilience is both necessary and urgent. In this paper, we validated a new extended scale to measure resilience among Italian young adults (18-34) in the aftermath of Covid-19 pandemic.
Methods
In this study, we deployed the Rasch model to analyse data from a second survey (RECALL2) of 400 young adults, conducted in Italy between June 2024 and January 2025 and aimed at investigating the post-pandemic vitality of Italian young adults. It focuses on three themes: resilience (using some items from the Connor-Davidson Resilience Scale) [1], trust in science (adapted from the RECALL1 project) [2], and future outlooks (using items from the Beck Hopelessness Scale) [3].
Results
The results of the proposed analysis allow us to explore the contribution of each of the items administered to the measurement of resilience in young adults, and in particular how each of them improves the precision of the measurement compared to other existing resilience scales. In addition, our results shed new light on the characteristics of the most (and least) resilient individuals in our sample, helping us to profile individuals at risk of reaching critically low levels of resilience.
Discussion/Conclusions
Our proposed work contributes to existing knowledge by validating a scale of resilience that is ready for use in future research. Scale validity and its measurement invariance were discussed in-depth, as well as the statistical properties of our proposed scale. Finally, discussing how the model assumed in analysing the data along with the psychometric functionality of each administered item helped us to better conceptualize (and understand) the phenomenon under investigation.

References

1. Connor, K.M., Davidson, R.T.: Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC), Depression and Anxiety, 18: 76–82 (2003).
2. Bollani L., Fabbris, L.: Trust in health science and organizations in Italy during the COVID-19 pandemic (submitted) (2024).
3. Beck, A.T., Weissman, A., Lester, D., Trexler, L,: The measurement of pessimism: The Hopelessness Scale. Journal of Consulting and Clinical Psychology, 42(6): 861–865 (1974).

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The COVID-19 experience as a turning point for youth's behaviours.

Luigi Bollani, Angela Maria D'Uggento, Luigi Fabbris

Summary of Background Data
The COVID-19 pandemic was a social shock that caused unexpected reactions among people, especially younger ones. Empirical studies have shown that young people around the world have changed their perception of the future, developed new behaviours as they became aware of their frailty and may have defined new life goals for themselves [1, 2].
Objectives
The study aims to evaluate if and how much people have changed their habits as a consequence of a relevant experience such as the COVID-19 pandemic. More than 400 Italian young adults were interviewed during 2024 through a CAWI survey. The study assessed, in particular, the daily behaviours and certain life choices such as the propensity to settle down, work, travel, have fun, volunteer and do domestic chores.
Methods
A univariate analysis of the collected data showed that many young people started with new attitudes and behaviours after the pandemic. A multivariate analysis was performed to elicit the most relevant relationships between the youth's behaviours, on the one hand, and their social and psychological characteristics, on the other.
Results
The results of the data analysis highlighted that, indeed, the COVID-19 experience either started or accelerated the young adults' propensity to change their future targets. Although it is unclear whether this propensity persists in the long run, we ascertained that the pandemic was a turning point in youngsters' lives. We found that a group of youngsters improved their ability to shape their future, while others, particularly the younger of the young adults, were so threatened by the severity of this health and social experience to develop psychic ailments and depressive symptoms that might limit their life targets and behaviours.
Discussion/Conclusions
The pandemic was a social shock that affected the lives of young people far beyond the health consequences. They were particularly affected by lockdowns, distance learning, remote working, and social distancing rules. Indeed, the health consequences of the virus epidemic were so irrelevant that the survivors of the infection – e.g. the large majority of those infected – felt stronger than those who had not experienced an infection [2]. Furthermore, two close wars began immediately after the pandemic. This suggests the need for a holistic study of the consequences of social and natural crises, as people are not only affected by the recent crisis, but also by the cumulative effects of a series of crises.

References

1. D'Uggento, A. M., Fabbris, L.: Future orientation and psychological and social capital of Italian young adults. In: *Book of Short Papers of the Conference of the Association for Applied Statistics*, The Department of Statistical Sciences of Sapienza University of Rome, 18-20 September 2024 *(in press).*
2. D'Ovidio, F.D., D'Uggento, A.M., Di Zio, S., Fabbris, L.: Coping strategies and perception of the after-pandemic future of Italians. In L. Fabbris, S. Mignani, G. Tassinari (eds). *Statistics, Technology and Data Science for Economic and Social Development. Book of short papers of the ASA Bologna Conference, Statistica Applicata – Italian Journal of Applied Statistics*, 35(3), 207-212 (2023).

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Resilience, trust in science, and future outlooks: Perspectives of Italian youth in the post-pandemic era.

Luigi Bollani, Simone Di Zio, Luigi Fabbris

Summary of Background Data
At the dawn of the post-pandemic era, it is essential to reflect on the key factors that both enabled the Italian society to navigate the COVID-19 crisis and hindered its response. Such reflection is particularly crucial to remain prepared for potential future challenges of similar magnitude. A group of Italian universities started a project, named RECALL (Research on the Effects of COVID-19 on All Lifestyles and Social Links), to study the effect of the pandemic in Italy. This study analyses the data collected in a second survey (RECALL2) on a sample of Italian population.
Objectives
The study aims to measure the relations between young Italians' resilience, their trust in science and future outlooks.
Methods
The study is based on an empirical survey conducted in Italy between June 2024 and January 2025, involving a sample of 400 young adults aged 18 to 34. It focuses on three main themes explored through the RECALL2 questionnaire: resilience, assessed using a subset of items from the 25-item Connor-Davidson Resilience Scale [1]; trust in science, measured with a battery of questions partially adapted from those tested during the RECALL project [2]; and future outlooks, examined within the framework of future time perspective (FTP) using selected items from the 20-item Beck Hopelessness Scale [3]. These three themes were conceptualized as latent factors and estimated through factor analysis. A multivariate analysis was then conducted to explore the interrelationships among these constructs, incorporating side variables and control variables.
Results
The analysis revealed a positive relationship between resilience and trust in science. Resilience was also associated with proactivity and, more broadly, future time perspective. Side variables, such as severe depression, proved significant, alongside control variables like gender and age.
Discussion/Conclusions
The interplay among the three dimensions under study offers a comprehensive perspective: resilience as a reflection on the past, trust in science as engagement with the present, and FTP as a projection towards the future. These findings contribute to understanding the factors influencing individual and societal responses in post-crisis contexts.

References

1. Connor, K.M., Davidson, R.T.: Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC), Depression and Anxiety, 18: 76–82 (2003).
2. Bollani L., Fabbris, L.: Trust in health science and organizations in Italy during the COVID-19 pandemic (submitted, 2024).
3. Beck, A.T., Weissman, A., Lester, D., Trexler, L,: The measurement of pessimism: The Hopelessness Scale. Journal of Consulting and Clinical Psychology, 42(6): 861–865 (1974).

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Social priorities and future perspectives of Italian young adults engaged in volunteering activities.

Angela Maria D'Uggento, Luigi Fabbris, Mariangela Zenga

Summary of Background Data
This paper aims to explore the transformative role of associationism and volunteering as catalysts for promoting solidarity among young adults and a factor for building a more inclusive and resilient society. From June to December 2023, about 500 Italian participants were interviewed using a web-based survey. A subgroup of 307 respondents aged 18-34, usually referred to as young adults, was interviewed. The data allowed us to shed light on the distinctive characteristics of young volunteers and the underlying motivations that inspire their commitment to the principles of solidarity, mutual aid and collective improvement.
Objectives
The aim of this study is to understand the characteristics of people who are actively involved in volunteer organizations compared to those who have never participated in such activities and to gain insight into the factors that differentiate the two groups.
Methods
We conducted an exploratory analysis to identify the best predictors to investigate the most important relationships using multivariate statistical methods.
Results
The analysis emphasizes the central role of volunteering as a form of social capital [1]: Volunteering fosters personal development, strengthens interpersonal relationships and cultivates a strong sense of civic responsibility. Through volunteer activities, young adults build robust social networks that help them navigate uncertainties and fears about the future by transforming individual action into a collective force capable of overcoming societal challenges.
Discussion/Conclusions
This study highlights the importance of voluntary organizations as dynamic incubators of social capital where individuals can develop the skills, relationships and shared values necessary to promote social cohesion and systemic positive change [2]. Today's society has been profoundly impacted by unexpected global events (the COVID-19 pandemic, wars and the catastrophic effects of climate change). These crises have underscored the urgent need to rethink the relationship between individuals and their communities to improve collective wellbeing. While these challenges pose significant threats, they also present opportunities to drive innovation, promote collective action and develop long-term strategies and collaborative efforts centered on a shared vision for a better future.
By promoting association opportunities, policy makers and organizations can empower young people to play a central role in shaping a future characterized by sustainability, inclusivity and collective prosperity. These findings make the case for targeted initiatives and strategies that strengthen the role of social networks as a cornerstone of societal progress and pave the way for a more cohesive and forward-looking world.

References

1. D'Uggento, A. M., Fabbris, L.: Future orientation and psychological and social capital of Italian young adults. In: *Book of Short Papers of the Conference of the Association for Applied Statistics*, The Department of Statistical Sciences of Sapienza University of Rome, 18-20 September 2024 *(in press).*
2. Comper, C.: Visioni del futuro nelle organizzazioni di volontariato tra futuri desiderati e futuri possibili. In: Italian Institute for the Future, Napoli (eds.) Napoli, (2002).www.instituteforthefuture.it.

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Invited Session - INV *9 Data Integration in Social research: Leveraging New and Traditional Sources for a Complex Future - Fabio Crescenzi and Alessandra Righi*

Organized by Fabio Crescenzi and Alessandra Righi
Chair Fabio Crescenzi

1. *Relevance and quality of survey data for the training set supporting population census counting* (Antonio Laureti Palma, Gerardo Gallo)
2. *Evolution of 2021 enumeration areas* (Alberto Sabbi, Stefano Mugnoli, Fabio Lipizzi, Giovanni Lombardo)
3. *Tracking Social Change in Italy: The Italian Online Probability Panel of the FOSSR project* (Luciana Taddei, Michele Santurro, Mario Paolucci)
4. *Assessment study of AIS data for their use in the Maritime Transport Statistics* (Marco Di Zio, Angela Pappagallo, Norina Salamone, Luca Valentino)

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Relevance and quality of survey data for the training set supporting population census counting

Antonio Laureti Palma and Gerardo Gallo

In official statistics production, administrative data are crucial for coping with budget constraints and less willingness on the part of respondents to participate in surveys. Administrative data have undoubted advantages, such as: being inexpensive; having a census-like approach to collection and can be viewed as the backbone for the population census. [1, 2].
Since 2020, in Italy, ISTAT has produced population and housing census count estimates by relying on the administrative sources organized as "Signs of Life" (SoL) in an ad hoc integrated database. This involves data processing of more than forty administrative archives, each of them containing basic information on individual SoL covering several years. To support the census process, since 2018 ISTAT has also been conducting a yearly sample survey by collecting the main characteristics of Italian resident population.
In Italy, there is a Population Registry, based mainly on the Municipality Registry Offices, which is typically affected by under- and over-coverage of individuals. These mismatches can be relevant and their corrections, or error minimization, is one of the main target of the permanent census process.
The goal of this study is to use SoL to implement a supervised ML-based classification strategy to distinguish between the usual and not usual resident population in Italy in order to evaluate the over- and under-coverage counts in the Population Register. In contrast to the broad applications of ML in various scientific and statistical fields, the use of ML algorithms for population counting in census statistics is a relatively new field of application and only a few case studies are available in the scientific literature [3].
In our approach, we first pre-processing all data to build an effective feature frame and then, using the census sample survey, we then set up a representative training set for a supervised classification strategy based on a Support Vector Machine (SVM) model. One of the critical issues addressed was the problem of imbalanced classification, i.e. the rare incidence of not usual resident versus usual resident population. This classification problem has been dealt with a cost-sensitive approach using the SVM-RBF model.
The ML classification results were compared with the information in the Population Register, highlighting the actual over- and under-counting of the usual resident population. The work also focused on the critical role of the quality of the training set for the use of machine learning in a complex information scenario such as a population census.

References

1. UNECE, "Guidelines for Assessing the Quality of Administrative Sources for Use in Censuses", United Nations, New York, 2021.
2. Bernardini A, Brown J, Chipperfield J, Bycroft C, Chieppa A, Cibella N, Dunnet G, Hawkes MF, Hleihel A, Law EC, Ward D. Evolution of the person census and the estimation of population counts in New Zealand, United Kingdom, Italy and Israel. Statistical Journal of the IAOS. 2022 Jan 1;38(4):1221-37.
3. Calian V, Zuppardo M, Hardarson O. Machine learning estimation of the resident population. Statistical Journal of the IAOS. 2023 Nov;39(4):947-60.

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Evolution of 2021 enumeration areas

Alberto Sabbi, Stefano Mugnoli, Fabio Lipizzi, Giovanni Lombardo

Summary of Background Data
The 2021 Enumeration Areas (EAs 2021), recently released by Istat, represents a turning point in spatial statistical analysis by aiming to provide qualitatively more accurate information [1,2]
Methods
The evolutionary path started with the idea of considering EAs not only for the purely instrumental purposes of census operations, but also to meet the need to favor 'homogeneous characteristics in demographic, socio-economic, urban planning, environmental and similar terms'.
This evolutionary path reached a stage of mapping spatial characteristics regarding land use, the presence of major infrastructure (such as airport areas, port areas, etc.), services and more. This type of work made it possible to identify the statistical units of different surveys in the EAs 2021[3].
On the other hand the change in census strategy has also substantially altered the function assigned to EAs 2021. In fact, in the past these were mainly used to collect data concerning these survey units. In this new edition in addition to disseminating data at the territorial level of the population, EAs 2021, can become a tool for disseminating various statistical surveys. This new perspective makes it possible, to create and analyse the territory in a different way, for example with different indicators such as those related to accessibility.
Results
In this paper, some results that emerged will be illustrated and compared with previous versions of the EAs In addition, applications of the new EAs 2021 as a tool of official statistical production will be briefly illustrated.

References

1. Laaribi A., Peters L.: GIS and the 2020 Census: Modernizing Official Statistics. Redlands. California: EsriPress (2019).
2. Lipizzi F. And Mugnoli S.: Profili e Dinamiche delle Località abitate in Italia. In Istat (eds). Forme, livelli e dinamiche dell'urbanizzazione in Italia. Istat, pp 39-58. (2017)
3. UNITED NATIONS: Handbook on the Management of Population and Housing Censuses. Series F No. 83. New York: United Nations. (2021)

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Tracking Social Change in Italy: The Italian Online Probability Panel of the FOSSR project

Luciana Taddei, Michele Santurro, and Mario Paolucci[1]

Population-based longitudinal studies form the backbone of empirical research. As "largescale instruments", they allow the scientific community to test theories and make new observations, while also constituting the basis for evidence-based policy advice [1]. Italian social science research has historically been hindered by fragmented research infrastructure and a critical lack of longitudinal data, due to structural barriers in the research funding system, with profound consequences for understanding and addressing social change.

Based on a probability sample of approximately 10,000 individuals aged 18-74, drawn from the national population register, the Italian Online Probability Panel (IOPP) seeks to overcome these challenges by introducing high-quality longitudinal survey data to monitor social transformations. IOPP integrates innovative methodologies to ensure comprehensive representation, including offline participants via postal questionnaires. Recruitment will commence in early 2025, with data collection spanning five annual waves.

IOPP is uniquely positioned at the intersection of traditional and new data sources, reflecting a broader agenda of integrating diverse data types in social research. The panel's surveys will feature a core questionnaire exploring enduring themes – family and housing, education, work, income, inequality, vulnerability, and political attitudes – while rotating modules developed via open calls will allow dynamic exploration of emerging societal issues. By adhering to state-of-the-art standards in probability sampling, question testing, translation for international comparability, coding, response rate optimization, and incentive design [2], IOPP ensures quality and comparability.

IOPP is part of the Fostering Open Science in Social Science Research (FOSSR) project, which addresses Italy's infrastructural challenges by establishing an innovative Research Data Infrastructure (RDI) connected with leading RDIs such as CESSDA ERIC and SHARE ERIC, as well as international surveys like GUIDE and GGS, included in the ESFRI Roadmap 2021. Emphasizing Open Science and FAIR principles (Findable, Accessible, Interoperable, Reusable) [3], FOSSR not only enhances data management and analysis but also integrates IOPP within global research frameworks.

By leveraging traditional survey methodologies alongside advanced tools for data integration, IOPP represents a transformative step in equipping Italian social science to navigate the complexities of a rapidly evolving societal landscape. It highlights the potential of harmonizing diverse data sources to enrich the understanding of social change and embed Italy more deeply within the global ecosystem of social science research.

References

1. Breuer, C., Gramatté, A.-M., Schulz, A.: The relevance of population-based longitudinal studies for science and social policies. German National Academy of Sciences Leopoldina, Halle (2016)
2. Nicolaas, G., Calderwood, L., Lynn, P., Roberts, C.: Web Surveys for the General Population: How, why and when?. National Centre for Research Methods (2014). https://eprints.ncrm.ac.uk/id/eprint/3309/3/GenPopWeb.pdf. Cited 15 Jan 2025
3. Mons, B., Data Stewardship for Open Science. Implementing FAIR Principles. CRC Press, Boca Raton (2018)

[1] CNR-IRPPS, National Research Council - Institute for Research on Population and Social Policies

Assessment study of AIS data for their use in the Maritime Transport Statistics.

Marco Di Zio, Angela Pappagallo, Norina Salamone e Luca Valentino[1]

Automatic Identification System (AIS) is an automatic tracking system used from ships for safety reasons. AIS generate a non-traditional data source rich of information about maritime transport. Signals about geo-localization, speed and other information on navigation status are provided. National Statistical Institutes are investigating the use of these data to improve quality and timeliness of maritime transport statistics [1]. The Istat survey is census and the missing trips are integrated with administrative sources from Italian General Command of Port Authorities. Maritime traffic is a difficult phenomenon to measure due to complexity and volatility of ship movements. There is no a priori list of events and sometimes it happens that even the integration of the two sources does not ensure complete coverage of the phenomenon. The availability of an independent third source such as AIS would help to solve these problems.
AIS data must be transformed to be used for our statistical purposes, essentially transforming a list of signals of presence in the sea, into a list of ships' routes. A route is characterised from the transport unit (the vessel), the port of departure and the port of arrival. Istat has developed procedures to this aim, see [2] for details. Once data are transformed, analysis about errors need to be carried out to make AIS data really available for our statistical purposes. For this step, analysis based on the comparison of AIS data with the official data is performed. At this stage of the analysis, still on going, some discrepancies suggest that AIS have some gaps. In particular, we noted that important differences are concentrated on some classes of ships and ports, while on the others the numbers are very similar. This comparative analysis made us discover also some errors in our data. Our preliminary conclusions are that the AIS data source confirms its potential especially when considered not as an alternative source, but as a source of information to be integrated with the others. It can be used at least as a control data source for resolving errors, and for improving coverage. Further analysis are in due course to deepen the knowledge of AIS data with the aim of an integration into the production process of the official maritime transport statistics.

References

1. Wielen, N. V. D., McGurk, J., & Barrett, L. (2024). Optimising port arrival statistics: Enhancing timeliness through Automatic Identification System (AIS) data. Statistical Journal of the IAOS, 40(2), 421-434.
2. Arosio, F.M., Di Zio, M., Martino, A., Massacci, G., Ortame, F., Pappagallo, A., Pugliese, F., Salamone, N., Sisti, F., Talice, S., Valentino, L. (2024). Statistical use of Automatic Identification System (AIS) data. 3rd Workshop on Methodologies for Official Statistics, Istat, Rome, 4-5 December 2024. https://www.istat.it/en/event/workshop-on-methodologies-for-official-statistics/

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Invited Session - INV *10 Complex Environmental Processes and Modeling of Compound Events (PRIN PNRR 2022 SLIDE) - Luigi Ippoliti*

Organized by Luigi Ippoliti
Chair Luigi Ippoliti

1. *Modeling Rainfall Induced Slides* (Carlo Zaccardi, Luigi Ippoliti, Pasquale Valentini, Giovanna Vessia)
2. *Semi-Supervised Learning for Time Series Clustering Using Copulas* (Alessia Benevento, Fabrizio Durante, Roberta Pappadá)
3. *Statistical analysis on a river network: insights from graphical models* (Nicola Pronello, Rosaria Ignaccolo, Sara Castiglia, Vito Frontuto, Natalia Golini, Luigi Ippoliti)
4. *Bayesian Inference for Discrete Spatio-Temporal Gaussian Hidden Markov Models* (Daniele Tancini, Riccardo Rastelli, Francesco Bartolucci)

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Modeling Rainfall Induced Slides

Carlo Zaccardi, Luigi Ippoliti, Pasquale Valentini, and Giovanna Vessia

Summary of Background Data
Landslides are among the most impactful natural hazards worldwide and threaten populations and local economies [1, 2]. Therefore, estimating landslide *susceptibility* (i.e., the likelihood that an event occurs in an area) is crucial for the implementation of effective risk reduction strategies and early warning systems.
The study domain corresponds to the provinces of Teramo, Pescara and Chieti, which make up the Peri-Adriatic area of the Abruzzo region. Landslide data is collected from several sources, and is combined with information about morphological and lithological features of the study area. The spatial unit of analysis is known as slope unit, i.e. a subdivision of the terrain with homogeneous characteristics [1, 2].
Objectives
The spatial susceptibility of the study region to rainfall-induced down-hill movements is assessed. The ultimate goal is to produce maps that allow for a susceptibility zonation to be used by local authorities for management and planning purposes.
Methods
The number of zeros (i.e., units with no landslide records) in the data seems larger than expected under a Poisson distribution. This problem is known as *zero inflation*, and it may be due to the fact that some events may not have been recorded.
Therefore, under the Bayesian paradigm, a zero-inflated Poisson model is proposed. Prior distributions for the parameters in the model are chosen following existing literature (see, e.g., [3]).
Results
The susceptibility is estimated as the probability of having at least one landslide. Elevated coastline areas, as well as spatial units close to river basins, show high susceptibility values.
Furthermore, zero-inflated models have the ability to distinguish between two kinds of zeros [3]. A value of zero may occur either in the absence of landslides or due to under-reporting. The probability that an observed zero is due to the absence of landslides seems higher in the inland territories than coastal areas.
Conclusions
A zero-inflated Poisson model is proposed to estimate landslide susceptibility in the Abruzzo region. The proposed model should be preferred over a traditional Poisson regression model since the data show zero inflation and hence over-dispersion.
Acknowledgments
We acknowledge financial support for projects funded by the European Union - NextGenerationEU - Complex Environmental Data and Modeling (CoEnv) - 2022E3RY23 - CUP D53D23011080006, and Stochastic Modeling of Compound Events (SLIDE) - P2022KZJTZ - CUP D53D23018920001.

References

1. Lombardo, L., Opitz, T., Ardizzone, F., Guzzetti, F., Huser, R.: Space-time landslide predictive modelling. Earth-science reviews **209**, 103318 (2020).
2. Reichenbach, P., Rossi, M., Malamud, B. D., Mihir, M., Guzzetti, F.: A review of statistically-based landslide susceptibility models. Earth-science reviews **180**, 60–91 (2018).
3. Fernandes, M. V., Schmidt, A. M., Migon, H. S.: Modelling zero-inflated spatio-temporal processes. Statistical Modelling **9(1)**, 3–25 (2009).

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Semi-Supervised Learning for Time Series Clustering Using Copulas

Alessia Benevento and Fabrizio Durante and Roberta Pappadà

Summary of Background Data
Time-series data, consisting of one or more variables that vary over time, is extensively recorded and analyzed across numerous fields, including science, engineering, medicine, economics, and finance. Clustering is a widely used data mining technique for classifying temporal datasets into related groups when prior knowledge about group structures is insufficient. While clustering is typically performed in unsupervised learning settings to uncover hidden patterns, incorporating additional background information, such as pairwise positive or negative relationships among the time series, introduces constraints on the clustering process. In such scenarios, the problem transitions to semi-supervised learning, where these relationships influence clustering outcomes. Semi-supervised clustering methods have been recently introduced in the literature in the context of copulas, starting with [2]. These algorithms integrate in the clustering process the constraints related to (non-temporal) proximity among time series, which may be derived from spatial information or other covariates.
Objectives
The primary objective is to develop a novel semi-supervised learning framework for clustering time series that accounts for spatial constraints and complex dependence structures within a copula framework.
Methods
The proposed framework leverages copula-based measures to model temporal dependences and tail behaviors in time-series data. Spatial proximities are incorporated into the clustering process through semi-supervised methods inspired by methodologies introduced in [1].
Results
The semi-supervised clustering framework effectively identifies clusters among time-series data while considering spatial constraints. The results demonstrate the framework's ability to capture complex dependence structures, including tail behaviors, and its applicability in real-world scenarios such as environmental monitoring.
Discussion/Conclusions
This study highlights the utility of copula-based semi-supervised clustering methods in addressing challenges posed by spatial constraints and complex dependence structures in time-series data. The novel framework offers a flexible and robust approach to clustering, balancing temporal and spatial relationships, and providing practical insights for applications in various fields, particularly environmental monitoring. The findings emphasize the framework's potential to improve the interpretability and utility of clustering results in applied contexts.

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References

1. Benevento, A., Durante, F., and Pappadà, R. *Tail-dependence clustering of time series with spatial constraints* , Environ. and Ecol. Stat. (2024): 1-17
2. Disegna, M., D'Urso, P., and Durante, F. *Copula-based fuzzy clustering of spatial time series* , Spat. Stat. (2017), 21:209–225

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Statistical analysis on a river network: insights from graphical models

Nicola Pronello, Rosaria Ignaccolo, Sara Castiglia, Vito Frontuto, Natalia Golini, Luigi Ippoliti

Objectives
Environmental issues, including pollution in riverine systems, are inherently complex, involving multivariate processes that evolve across time and space. Graphical models, grounded in graph theory, offer a powerful probabilistic framework for visualizing and analyzing intricate relationships between variables. These models represent variables as nodes and their dependencies as edges, providing an intuitive and mathematical tool for uncovering spatio-temporal patterns and interactions. This study investigates the application of graphical models to analyze pollutant relationships within a river network.
Methods
Pollutant interactions in fluvial networks present unique challenges due to their spatial correlation. By representing the spatial domain as an undirected network, where each vertex corresponds to a branch of the river and edges reflect the adjacency of geographic river segments, we establish an effective and convenient framework for capturing spatial dependency. In this setting, this research explores kernel regularization on graphs [1], as a nonparametric tool for estimating and representing these connections. Specifically, this is achieved by defining a nonparametric covariance estimator that enables the smooth reconstruction of covariance relationships among pollutants along the network (see, e.g., [2] for a similar approach).
Results
A case study involving pollutant and chemical data from the Piemonte region in north-western Italy illustrates the potential of this approach. Graphical models estimated in this domain reveal interactions among several chemicals and pollutants, capturing key contributors and their spatial patterns.
Conclusions
By leveraging methodologies to represent networks and summarizing complex interdependencies, this research contributes to developing tools for enhanced understanding of riverine pollution. Integrating statistical modeling with graph theory holds promise for advancing environmental science and supporting evidence-based decision-making in addressing pressing ecological challenges.

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References

1. Smola, A.J., Kondor, R.: Kernels and Regularization on Graphs. In: Schölkopf, B., Warmuth, M.K. (eds.) Learning Theory and Kernel Machines. pp. 144–158. Springer, Berlin, Heidelberg (2003).
2. Yin, J., Geng, Z., Li, R., Wang, H.: Nonparametric covariance model. Statistica Sinica **20(1)**, 469-479 (2010)

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Bayesian Inference for Discrete Spatio-Temporal Gaussian Hidden Markov Models

Daniele Tancini, Riccardo Rastelli and Francesco Bartolucci

Summary of Background Data
Data with spatial and temporal dimensions are nowadays used in many fields, and require advanced statistical models to be analyzed. Spatio-temporal hidden Markov models (STHMMs) are often proposed for these types of data structures.
Objectives
STHMMs are difficult to estimate because their latent joint distributions are usable only in trivial cases. These latent distributions are usually substituted with pseudo-distributions [1], targeting the Markov chain Monte Carlo (MCMC) with the pseudo-posterior distribution. This approach can impact the estimation accuracy, particularly when there is a strong dependence among the latent variables. The objective of this work is to show how inference can be carried out targeting the MCMC with respect to the true posterior distribution.
Methods
An approximate exchange (AE) algorithm [2] is used for the estimation of Gaussian STHMMs. This algorithm overcomes the need to calculate the entire distribution, targeting the MCMC with respect to the true posterior distribution. Differently from the exchange algorithm, the approximate version does not rely on perfect auxiliary samples as it approximates the distribution by sampling from a Gibbs sampler. A theoretical justification for the validity of this approach is provided in [3], proving that when the MCMC kernel for the exchange algorithm is uniformly ergodic, the invariant distribution of the corresponding AE algorithm becomes closer to the target as the number of iterations increases. Due to the computational cost of the AE algorithm, we develop a new initialization approach for the auxiliary variable, which improves the convergence when a limited number of iterations is used for the Gibbs sampler. Additionally, by augmenting the posterior distribution with the latent variables, we derive the full conditional distributions for the parameters of the response variables enabling a more efficient sampling.
Results
A comparison is conducted between the pseudo-posterior approach and the proposed algorithm. Specifically, we evaluate their performance across a variety of scenarios, considering both regular and non-regular spatial structures, varying numbers of latent classes, and different time occasions. The results show more accurate estimates provided by the proposed algorithm in comparison to the pseudo-posterior approach.
Discussion/Conclusions
In this work we considered the problem of Bayesian estimation of Gaussian STHMMs. We provided an alternative solution, based on the approximate exchange MCMC, for the estimation of this type of models which does not need a pseudo-posterior approach.

References

1. Besag, J.: Spatial interaction and the statistical analysis of lattice systems. Journal of the Royal Statistical Society, Series B **36**, 192–225 (1974)
2. Friel, N. and Pettitt, A. N.: Classification using distance nearest neighbours. Statistics and Computing **21**, 431–437 (2011)
3. Everitt, R. G.: Bayesian parameter estimation for latent Markov random fields and social networks. Journal of Computational and Graphical Statistics **21**, 940–960 (2012)

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Invited Session - INV *11 Research on Information and Computational Economics (RICE) - Edgardo Bucciarelli*

Organized by Edgardo Bucciarelli
Chair Edgardo Bucciarelli

1. *Subjective Probability and Prospect Theory: An Algorithmic Approach Towards a Unified Theory* (Raffaele Dell'Aversana, Edgardo Bucciarelli)
2. *How does the Evolution of European Sustainability Regulation Affect Corporate Financial Performance? Modelling, Simulation, and Game Development* (Edgardo Bucciarelli, Alessia Regnicoli, Aurora Ascatigno)
3. *A Quantum Approach to Conjunction Fallacy and Category Assignment: Experimental Evidence* (Edgardo Bucciarelli, Casimiro M. Insardi, Aurora Ascatigno)

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Subjective Probability and Prospect Theory: An Algorithmic Approach Towards a Unified Theory

Raffaele Dell'Aversana and Edgardo Bucciarelli

Summary of Background Data
This paper explores the potential for a unified theory bridging Bruno de Finetti's subjective probability [1] and Kahneman and Tversky's prospect theory [2].
Objectives
This paper aims to integrate the subjective nature of probability with the behavioural insights of prospect theory to create a more realistic and comprehensive decision-making model. It builds upon the Wish algorithm [3] previously developed as a practical application of de Finetti's decision theory. While de Finetti's framework emphasises the maximisation of mathematical earnings expectation based on personal probability assessments, prospect theory introduces behavioural factors that demonstrably influence human decision-making under risk and uncertainty, such as loss aversion and the non-linear weighting of probabilities.
Methods
The paper employs a theoretical framework combining factors from both de Finetti's decision theory [1] and Kahneman and Tversky's prospect theory [2]. It proposes an evolution of the Wish algorithm [3] to explore how subjective probability assessments can be effectively integrated with behavioural insights, focusing on how these factors influence decision-making processes under risks and uncertainty.
Results
The findings suggest that a holistic approach, which combines the mathematical rigour of subjective probability with the psychological underpinnings of behavioural insights, can lead to improved predictive abilities and more effective decision support systems.
Discussion/Conclusions
This paper not only contributes to the theoretical discourse but also aims at practical applications in research fields such as social sciences and cognitive sciences, thereby providing a pathway for future research and application, especially as regards the identification of a unified decision theory.

References

1. de Finetti, B. (1965). La probabilità: guida nel pensare e nell'agire. [Probability: A guide to think and act, En. trad.]. Quaderni dell'Istituto Universitario di Scienze Sociali, Trento (1965).
2. Kahneman, D., & Tversky, A. (1979). Prospect theory: an analysis of decision under risk, Econometrica, 47, 263-991.
3. Bucciarelli, E., Mattoscio, N., & Erasmo, V. (2018). Understanding Bruno de Finetti's Decision Theory: A Basic Algorithm to Support Decision-Making Behaviour. In: Bucciarelli, E., Chen, S.H., Corchado, J.M. (eds) Decision Economics: In the Tradition of Herbert A. Simon's Heritage. Advances in Intelligent Systems and Computing, Vol. 618. Springer, Cham (Switz).

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How does the Evolution of European Sustainability Regulation Affect Corporate Financial Performance? Modelling, Simulation, and Game Development.

Edgardo Bucciarelli, Alessia Regnicoli and Aurora Ascatigno

Summary of Background Data
Sustainability research has explored various factors influencing companies' decision-making regarding their sustainability commitments and the resulting financial outcomes, viewed through different theoretical lenses. Stakeholder Theory [1] suggests that sustainability initiatives can enhance a company's reputation and its market share, ultimately leading to improved financial performance [2]. These initiatives can result in both direct and indirect financial benefits. Although there is substantial evidence supporting the financial benefits of sustainability, recent research has shifted its focus from "whether" sustainability pays off to "when" and "under what conditions" it is most beneficial [3].

Objectives
In the paper, we aim to explore how European sustainability regulations influence companies' sustainability commitments. While much of the existing literature focuses on micro-level perspectives, companies make sustainability decisions within a broader macroeconomic context. We seek to understand how strategic interactions between companies may influence their sustainability initiatives and the related behavioural outcomes, particularly how financial performance is impacted by adherence to EU sustainability regulations.

Methods
We propose a game-theoretical model using the Public Goods Game framework to develop six hypotheses based on a time-consuming process related to the evolution of European sustainability regulations. Finally, we apply the framework above and simulation techniques in game development, analysing six scenarios.

Results
The simulation results reveal several advantages of incorporating European sustainability regulations into companies' business strategies. Nevertheless, we identify worst-case scenarios in real systems, such as the notorious free-riding dynamics.

Discussion/Conclusions
Considering the advantages of the game design recommendations, the Public Goods Game framework positively contributes to developing game simulations into sustainable business model archetypes.

References

1. Donaldson, T., & Preston, L. E.: The stakeholder theory of the corporation: Concepts, evidence, and implications. Academy of management Review, 20(1), pp.65-91 (1995).
2. Hall, J., & Wagner, M.: Integrating sustainability into firms' processes: Performance effects and the moderating role of business models and innovation. Business Strategy and the Environment, 21(3), pp.183-196 (2012).
3. Grewatsch, S., & Kleindienst, I.: When does it pay to be good? Moderators and mediators in the corporate sustainability–corporate financial performance relationship: A critical review. Journal of Business Ethics, 145, pp. 383-416 (2017).

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A Quantum Approach to Conjunction Fallacy and Category Assignment: Experimental Evidence

Edgardo Bucciarelli, Casimiro M. Insardi, and Aurora Ascatigno

Summary of Background Data
In 1990, Shafir et al. [1] analysed experimental data derived from a Conjunction Fallacy experiment. The Conjunction Fallacy is a cognitive bias that occurs when individuals inaccurately evaluate the probability of a profile belonging to two combined categories as being higher than the probability of it belonging to a single category. This phenomenon illustrates the intricate nature of human judgment and decision-making. In 2022, Kovalenko and Sornette [2] proposed a model based on the hypothesis that the decision-maker cognitively considers a superimposed alternative profile to support the decision-making in assessing the aforementioned probability estimates. This alternative profile interferes quantum-mechanically with the given profile. The model in [2] was fitted to data from a previous experiment in [1], conducting theoretical analyses that strongly supported the model and its core hypotheses.
Objectives
This work aims to extend the research in [2] by analysing values—i.e., variables and parameters—related to the above model after experimentally obtaining them.
Methods
A lab-in-the-field experiment was conducted to obtain the values as mentioned earlier. The experimental design involved two treatments: H (word writing) and L (reframing). Each experimental subject was randomly assigned the H or L treatment. In both cases, each subject evaluated fourteen profiles. After presenting a profile, subjects were demanded to estimate its representativeness regarding the joint and the component categories. After the treatment, the experimental task was repeated once, adding the assessment of a geometric angle that we hypothesise to be an observable manifestation of a cognitive correlate. This correlate is a value within the model in [2] and results from a superimposed alternative profile. Additionally, we analysed all the data collected experimentally.
Results
We identified promising emerging consistencies. The data gathered before treatment administration align reasonably with those reported by [1], suggesting a reliable connection worth further exploration. After the treatments, data exhibited larger values than before. The experimental representativeness values are higher where we expected them to be higher. No commitment was requested regarding the subsequent estimates in the treatments. This finding suggests that additional profiles present within subjects' cognitive framework may modify the estimates of profile representativeness, thereby facilitating decision-making. A moderate correlation was observed between the angles we calculated by applying the model in [2], considering the representativeness, the probabilities in [1], and the elicited angles.
Discussion/Conclusions
The model proposed by [2] is relatively plausible, and its parameters can be obtained and assessed through experimentation. The moderate correlation between the angles represents a scientific novelty that should be investigated further. Subsequent experimental sessions will focus on estimating the probabilities under identical experimental conditions and treatments.

References

1. Shafir, E., Smith, E.E., & Osherson, D.N. (1990). Typycality and reasoning fallacies. Memory& Cognition, 18(3), 229-239.
2. Kovalenko, T., & Sornette, D. (2022). The conjunction fallacy in quantum decision theory. I: Credible Asset Allocation, Optimal Transport Methods, and Related Topics. Springer (Cham, Switzerland).

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Invited Session - INV *12* *Exploring Futures: Approaches, Methodologies, and Visualizations for Scenario Development - Mara Di Berardo and Yuri Calleo*

Organized by Mara Di Berardo and Yuri Calleo
Chair Mara Di Berardo

1. *The revenge of Laplace's Demon: On the revival of determinism in futures thinking, and its fallacies* (Roberto Paura, Carolina Facioni)
2. *Discovering Collectible Design: A Delphi Method Approach* (Laura Benedan, Federica Codignola, Carlotta Galeone, Paolo Mariani)
3. *Rethinking Futures Studies: Probability and Futures Studies as a Natural Synergy* (Rocco Santoro)
4. *Enhancing Delphi outputs exploring visual communication modalities for future scenarios representation* (Yuri Calleo, Andrea Barbato, Davide Barbato, Mara Di Berardo, Manuela Scioni, Marco Marozzi, Simone Di Zio, Mario Bolzan)

Back to start

The revenge of Laplace's Demon: On the revival of determinism in futures thinking, and its fallacies

Roberto Paura[1] and Carolina Facioni[2]

Objectives
The age of machine learning and big data has revived the old dream of a deterministic prediction of the future. If human beings today are unable to discover the laws that rule social dynamics, perhaps intelligent machines will be able to do so, discerning among immense masses of data the patterns that explain human action. This belief resonates with a new revival in determinism within various sciences, such as the theories concerning the illusion of free will in neuroscience, or super-determinism in quantum mechanics [1]. But that this dream is nothing more than an illusion was demonstrated as early as the 20th century by the founding fathers and mothers of Futures Studies, who, by taking distance from classical futurology, understood how the future is not only epistemologically, but ontologically different from the past [2]. Why, then, do we fall back once again into Laplace's delusion, into the belief that by owning all the necessary data, the future will be revealed? The proposed article aims to provide an answer to this question.
Discussion/Conclusions
Behind this belief lies not only a new form of positivism, but also a wide range of unproven assumptions about the identity between social and natural phenomena, and the reduction of the human being to pure, calculable and predictable information. An illusion that can turn into a threat to the very freedom of human action. In this sense, the theorization of the economist and mathematician Bruno de Finetti can help the scientific community to reconcile an idea of data-driven research with the study of possible futures, as theorized by de Jouvenel. Bruno de Finetti developed "subjectivist" probability theory in the early 1930s [3]. Aimed to of eliminating any residue of metaphysicality from the idea of probability, the core topic of de Finetti's theory was the concept of exchangeability. Exchangeability is the moment in which each individual gives up on renegotiating their opinion on the probability that an event/phenomenon will occur, reaching a balance with that of others. Which is exactly the result of many methods practised in Futures Studies, first Delphi method. Reconciling statistics with the study of futures, at the same time abandoning any idea of objectivity, but at the same time using the opinion of experts, reliable data, in short, everything that can be defined as "scientific work" in the strict sense is, at the same time itself, the objective and methodological challenge of Futures Studies.

References

1. Sapolsky, R.M. Determined: A Science of Life Without Free Will. Penguin, London (2023).
2. De Jouvenel, B.: The Art of the Conjecture. Basic Books, New York (1967)
3. De Finetti, B.: Probabilismo. Saggio critico sulla teoria delle probabilità e sul valore della scienza. Libreria Editrice Francesco Perrella S.A. Napoli-Città di Castello (1931)

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Discovering Collectible Design: A Delphi Method Approach.

Laura Benedan, Federica Codignola, Carlotta Galeone, Paolo Mariani

Summary of Background Data
The term 'collectible design' is used to describe functional design objects that also hold symbolic value, making them highly sought after due to their particular assets such as rarity, uniqueness, or authenticity. These items are traded in both the art and commercial markets, with auction prices increasing and an expansion in the number of specialist trading platforms suggesting a growing demand. Collectible design may be considered a hybrid market and product category, which includes historical and contemporary design commodities. The functional and symbolic qualities of these items are valued by collectors for a multitude of reasons, including emotional and social identification.

Objectives
The present study aimed to gain a deeper understanding of the world of collectible design. This involved exploring the underlying principles that drive its appeal and market value, as well as analysing its evolving trends.

Methods
A literature review was conducted to explore the body of knowledge surrounding collectible design, focusing on its aesthetic, functional, symbolic, and market-driven attributes. Subsequently, three semi-structured qualitative interviews were conducted with experts in the fields of collecting, interior decoration, and the art market. This initial phase identified key themes and areas of uncertainty, indicating the necessity for a structured methodology to further examine collectible design. Accordingly, the Delphi approach was deemed an appropriate methodology for the systematic gathering of expert opinions and the achievement of consensus on critical aspects of collectible design. In the initial phase, a questionnaire was constructed based on the insights derived from the literature review and qualitative interviews. The questionnaire was distributed to a panel of experts, comprising designers, collectors, art and design professionals and academics, in order to elicit their perspectives. In the second phase, a shorter questionnaire was constructed, focusing on issues where consensus had not been reached in the initial round.

Results
Consensus was reached among experts on the term "collectible design", with a majority (91%) agreeing that it denotes a tangible entity. Furthermore, five images of collectible design were presented to experts, and for each item, participants identified key terms. The analysis revealed that the items were perceived as ‘distinctive’, often emphasising their originality or rarity. Additionally, functionality and craftsmanship were highlighted as important factors.

Discussion/Conclusions
The present study offers a comprehensive examination of collectible design, integrating theoretical knowledge with practical insights from industry experts. The use of the Delphi method yielded insights into current practices and future trends.

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Rethinking Futures Studies: Probability and Futures Studies as a Natural Synergy

Rocco Santoro

Summary of Background Data
The presentation explores the integration of statistical and computational approaches into Futures Studies to provide a robust frame-work for forecasting. By leveraging Bayesian reasoning, Kolmogorov complexity, and Solomonoff's universal probability, the study proposes methods for dynamically updating probabilities and classifying future scenarios. The Helmholtz machine, a computational model employing hierarchical learning and latent structures, is introduced to recognize and generate data for future predictions. Human decision-making is framed as a key factor in shaping futures, with a dialectical approach that balances rational analysis and psychocognitive states. The role of imagination is emphasized as a bridge between conscious and unconscious processes, forming the dataset for advanced neural network models Markovian processes into a temporal structure where the latent classes represented unobservable events in future scenarios. The aim shows how probability, underpinned by statistical and computational tools, can support both the imagination and construction of potential futures while providing scientifically validated methods for assessing the future visions.
Objectives
The application of a statistical-probabilistic framework for envisioning the future, aimed at constructing an intelligible cognitive pathway capable of imagining the future through statistical, mathematical, and probabilistic tools. Imagination is conceived as a decision-making process.
Methods
The framework integrates probabilistic and computational methods, leveraging Kolmogorov complexity, Solomonoff's metric, and Markovian processes, emphasizing decision-making as a dynamic interplay of aspirations, data, and reasoning. It treats the future as unobservable, modeled cognitively, with foundational elements like Bayes' theorem and active inference.
Results
The application, developed in Python, will envisage the future of a war, identified 4 distinct states of nature: inaction, compromise, retaliation, and war. For each state, risk levels were defined within a normalized range of 0.1 to 0.9, assigning progressively increasing values in an arithmetic progression such that war consistently represents the highest risk. The data matrix generated from Poisson, Gamma, and Normal distributions has provided results, visualized across multiple temporal stages, demonstrating the adaptability of this innovative methodology The dynamic has been computed for 102 months. Each 12 months a histogram resumed the probability of the 4 states.
Discussion/Conclusions
The model combines subjective imagination with statistical and computational tools to explore potential futures, guided by diverse data profiles. While innovative, it faces limitations: lack of prediction benchmarks, non-Markovian assumptions, computational constraints, dataset dependency, subjective imagination, departure from traditional data-driven methods, and bias against multidisciplinary approaches. Despite these challenges, the approach embraces uncertainty and imagination as vital components of future modeling. Overcoming these issues requires advancing computational techniques and fostering interdisciplinary integration to enhance robustness and applicability.

References

1. Kuhn, T. S. *The Structure of Scientific Revolutions*. University of Chicago Press, 1962. Chicago. (Traduzione italiana: Kuhn, T. S. (1969). La struttura delle rivoluzioni scientifiche. Torino: Einaudi. ISBN: 9788806199005).
2. Laplace, PS. Essai philosophique sur les probabilités, (1814). Texte de la 5°edition, Christian Bourgois, Paris 1986.
3. Solomonoff, R. *A Preliminary Report on a General Theory of Inductive Inference.* Report V-131, Zator Co., Cambridge, Ma. Feb 4, 1960, revision, Nov., 1960.

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Enhancing Delphi outputs exploring visual communication modalities for future scenarios representation

Yuri Calleo, Andrea Barbato, Davide Barbato, Mara Di Berardo, Manuela Scioni, Marco Marozzi, Simone Di Zio and Mario Bolzan

Summary of Background Data
The study builds on the "Domani in Famiglia" project, which explored future family scenarios in Northeast Italy over the past five years. The current research extends this by testing innovative visual communication methods for Delphi-based research [1]. The aim is to enable experts to evaluate future scenarios using enhanced visualization tools, ensuring accessibility and efficacy.
Objectives
The primary objective is to develop and evaluate diverse methods for visually representing ten-year future family scenarios. These include text, comic strips, photographs, and videos. The research seeks to assess the effectiveness of these formats in conveying complex scenarios, emphasizing clarity, coherence, and engagement.
Methods
An experimental design was employed with 4 scenarios × 3 visualization modalities × 4 evaluation criteria. Scenarios were assigned randomly based on participants' birth months. Evaluation metrics were informed by established scenario quality criteria, including consistency, plausibility, comprehensibility, and aesthetic simplicity. Data collection utilized a computerized online questionnaire on Limesurvey.
Results
The first phase focused on operationalizing visualization methods and integrating AI tools, such as Generative Adversarial Networks (GANs) [2], for image and video generation. Key findings highlight the role of narrative integration, visual details, and the balance between textual and emotional elements in enhancing scenario comprehension. A participant sample size of 40 per scenario was deemed reasonably sufficient to ensure stable and reliable estimates of preference scores, given the observed variability of the scores. Preliminary results suggest that visual and multimedia approaches outperform text-only formats in user engagement and clarity.
Discussion/Conclusions
The study demonstrates that advanced visual methods, supported by AI, can significantly improve the communication of complex future scenarios. While challenges such as balancing comprehensibility and detail remain, the integration of multimedia storytelling offers a promising path for scenario-based research. The findings emphasize the importance of tailoring visual elements to enhance scenario plausibility and coherence, thereby fostering more effective decision-making processes in Delphi-based studies. This ongoing research is poised to provide practical recommendations for utilizing visual communication in foresight exercises, with implications for both academic and applied settings. Future work will explore broader participant engagement and refine evaluation metrics.

References

1. Di Zio, S., Calleo, Y., Bolzan, M. Delphi-based visual scenarios: an innovative use of generative adversarial networks. Futures, 154, 103280 (2023)
2. Frolov, S., Hinz, T., Raue, F., Hees, J., Dengel, A. Adversarial text-to-image synthesis: A review. Neural Networks, 144, 187-209 (2021)

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Invited Session - INV *13 Advanced models for financial data and risk assessment - Francesca Fortuna*

Organized by Francesca Fortuna
ChairFrancesca Fortuna

1. *Identifying patterns in time series using Weighted Clustering in the Time-Frequency Domain* (Antonio Balzanella, Francesca Fortuna, Alessia Naccarato)
2. *LHP approximation for green/brown loans credit portfolios* (Alessandro Ramponi, Sergio Scarlatti)
3. *Centrality as a predictor of financial crises: Analyzing BIS data with panel logit regression* (Roy Cerqueti, Antonio Iovanella, Raffaele Mattera, Saverio Storani)

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Identifying patterns in time series using Weighted Clustering in the Time-Frequency Domain.

Antonio Balzanella, Francesca Fortuna and Alessia Naccarato

Summary of Background Data
Financial time series often exhibit complex characteristics, such as non-stationarity, time-varying volatility, and regime changes, which present significant challenges for their analysis. This study focuses on real-world data provided by *Gestore dei Mercati Energetici S.p.A. (GME)*, the organization responsible for monitoring the Italian electricity market (https://gme.mercatoelettrico.org/en-us/). The dataset contains hourly records of the Purchase Price for End Customers (PUN) spanning the period from 2016 to 2023.
Objectives
The primary goal of this research is to develop a method capable of capturing essential features of financial time series by identifying representative patterns from both temporal and frequency domains. This approach aims to reduce the high dimensionality inherent in such data.
Methods
The proposed methodology represents a financial time series as a collection of non-overlapping time segments, with each segment described by a matrix of wavelet coefficients. To analyze this representation, we introduce a novel weighted K-means clustering algorithm[1]. This algorithm optimizes a newly defined within-cluster heterogeneity function, which measures the similarity between time series segments and cluster centroids using weighted distances. These weights assign varying importance to each time-frequency component and are determined as part of the optimization process rather than being provided as input.

The proposed method offers three key advantages: 1) It enables the aggregation of time series segments into clusters while balancing the contributions of individual wavelet decomposition components to overall variability; 2) The derived weights highlight the most significant time-frequency components in the clustering process; 3) By employing cluster-specific weights, the method facilitates the analysis of datasets where the relevance of time-frequency components varies across clusters.
Results
The proposed algorithm was tested on real-world data to demonstrate its practical utility in clustering and summarizing large datasets of time series. We evaluated the algorithm's performance by examining its convergence to a stable value of the objective function, the compactness of the resulting clusters (measured in terms of wavelet-based deviance), and the weights assigned to each time-frequency component.
Discussion/Conclusions
By integrating temporal and frequency domain analysis into the clustering process, the proposed method provides a robust framework for uncovering the intrinsic structure of financial time series. This approach has the potential to enhance forecasting and risk management strategies in the financial sector.

References

1. Balzanella, A., Fortuna, F., Naccarato, A: Detecting patterns in financial data through weighted time-frequency domain clustering. Qual Quant (2024), doi: https://doi.org/10.1007/s11135-024-02000-x.

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LHP approximation for green/brown loans credit portfolios

Alessandro Ramponi and Sergio Scarlatti

Summary of Background Data
In recent years, efforts to address climate change and promote the creation of an environmentally sustainable economy have intensified. This commitment has spurred the emergence of financial instruments designed to support activities commonly referred to as "green". Financial institutions, as well as non-financial corporations or local governments, engage in lending activities by introducing various sustainable debt instruments to fund challenging low-carbon transition objectives and assisting companies in securing debt capital for sustainability initiatives. These include financing rooftop solar power, wind farms, environmentally friendly farming practices, water conservation, the leasing of hybrid and electric vehicles, and initiatives aimed at enhancing the energy efficiency of industrial, commercial and residential properties. *Green* and *sustainability-linked* loans (SLLs), which emerged as the leading sources of sustainable debt, constitute our source of information.
Objectives
The analysis of credit portfolios containing such debt instruments is becoming increasingly important. In this respect, one of the key challenges in such a framework is to identify the sources of default at the portfolio level while ensuring computational tractability. The evaluation of portfolio VaR, and consequently the Economic Capital, and the pricing of structured financial instruments like ABS or MBS even in the framework of "green securization", see [1], is one of the primary objective of this research.
Methods
One prevalent approach to model portfolio credit risk involves employing the LHP (Large Homogeneous Portfolio) approximation within the one-factor Merton-type framework, commonly referred to as the ASRF (Asymptotic Single Risk Factor) model, due to Vasicek [3]. This methodology serves as the foundation for credit risk management, allowing the (approximate) computation of the quantiles of large portfolios.
Results
In this research, we consider the classical Vasicek one-factor Gaussian model under more general distributional assumptions for the systematic risk factors. We specifically examine how the quantiles of the loss portfolio are affected by i) mixing distributions characterized by skewed and heavy-tail properties (see [2]) and ii) a multivariate specification of the systematic risk factor.
Discussion/Conclusions
Within our model framework, we can examine various scenarios, by appropriately specifying/fitting the model parameters, to assess the impact of incorporating green and sustainability-linked loans into large credit portfolios.

References

1. Agliardi R. (2021), Green securitisation, *Journal of Sustainable Finance & Investment*, DOI: 10.1080/20430795.2021.1874214.
2. Azzalini A. (2005), The multivariate skew-normal distribution and related multivariate families (with discussion), *Scandinavian Jounal of Statistics* 32,159-188.
3. Vasicek O., (1991), Limiting loan loss probability distribution KMV Corporation.

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Centrality as a predictor of financial crises: Analyzing BIS data with panel logit regression

Roy Cerqueti, Antonio Iovanella, Raffaele Mattera, and Savcerio Storani

Summary of Background Data
The analysis of interbank networks plays a pivotal role in understanding the spread of financial contagion and systemic risks within the global economy. Research has shown that the interconnectedness of financial institutions can either mitigate or exacerbate the likelihood of financial crises. Some studies argue that higher connectivity strengthens the financial system's resilience by distributing risks, while others suggest it increases fragility by amplifying the propagation of negative shocks. The Bank for International Settlements (BIS) database provides a comprehensive source for studying the evolution of interbank links among countries, which can be used to track systemic risk over time.
Objectives
The objective of this study is to explore whether centrality measures within interbank networks can serve as early warning signals for financial crises. By examining quarterly BIS data from 2000 to 2023, we aim to determine if centrality metrics, such as degree centrality, betweenness, and eigenvector centrality, correlate with the onset of financial crises in different countries. Additionally, we seek to assess the influence of country-specific effects on these relationships and their potential as predictive tools.
Methods
We construct quarterly networks based on the BIS data and calculate centrality measures for each country in every period. A panel logit regression is then performed, with financial crises (coded as 0 for no crisis and 1 for crisis) as the dependent variable. Centrality measures, along with country effects, are included as independent variables to assess their role in predicting crisis events over time..
Results
Our results suggest that certain centrality measures, particularly betweenness and eigenvector centrality, significantly correlate with the likelihood of financial crises. Countries with higher centrality values are found to be more vulnerable to crises, and these measures demonstrate a clear pattern of prediction in the months leading up to crisis events.
Discussion/Conclusions
The findings support the hypothesis that centrality measures can function as early warning indicators for financial crises. Our study underscores the importance of network analysis in monitoring financial stability, highlighting the potential of using centrality metrics to predict and prevent systemic shocks. Further research should explore the dynamic changes in network structure and their role in evolving crisis prediction models.

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Invited Session - INV *14* *Measuring and Modelling Violence Against Women: Innovative Strategies for Data Analysis - Fiorenza Deriu and Cristina Mollica*

Organized by Fiorenza Deriu and Cristina Mollica
Chair Fiorenza Deriu

1. *Hidden Violence: A Spatial Pogit Model for Estimating Underreported Cases of Violence Against Women* (Greta Panunzi, Silvia Polettini, Serena Arima)
2. *Violence against women: how to overcome the underreporting and using Big Data to frame the phenomenon* (Claudia Villante, Maria Giuseppina Muratore)
3. *Stereotypes feeding intimate violence: what has changed over time. The Italian experience* (Isabella Corazziari, Maria Giuseppina Muratore, Lucilla Scarnicchia, Claudia Villante)

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Hidden Violence: A Spatial Pogit Model for Estimating Underreported Cases of Violence Against Women

Greta Panunzi, Silvia Polettini and Serena Arima

Summary of Background Data
Violence against women remains a pervasive and persistent issue. However, there is a significant lack of comprehensive and up-to-date data on this widespread yet frequently underreported problem. While specialized surveys are the most reliable means of estimating the prevalence and characteristics of gender-based violence, the absence of recent survey data poses a considerable challenge. In such situations, police records can provide valuable information but are often limited by significant underreporting.
Objectives
To address this data gap, we propose a model that integrates administrative data with socio-demographic indicators [2]. In the absence of recent survey data, our study focuses on estimating the prevalence of gender-based violence across provinces in Italy.
Methods
We employ a Poisson regression framework that accounts for under-reporting using the Pogit model [4,1]. This approach explicitly incorporates the reporting process, helping to mitigate potential biases inherent in administrative data. For computational efficiency, we utilized INLA [3] within a Bayesian framework to fit the model.
Discussion/Conclusions
This methodology represents a significant step forward in the study of gender-based violence, offering deeper insights into the complex dynamics of this issue in Italy. By combining data from multiple sources and leveraging advanced statistical techniques, our approach provides policymakers and stakeholders with more accurate and actionable information. These findings aim to support the development of targeted, effective interventions and policies to combat violence against women, ultimately contributing to a safer and more equitable society.

References

1. Chen J, Song JJ, Stamey JD. A Bayesian hierarchical spatial model to correct for misreporting in count data: application to state-level COVID-19 data in the United States. *Int J Environ Res Public Health*. 2022;19(6):3327.
2. Flood M, Pease B. Factors influencing attitudes to violence against women. *Trauma Violence Abuse*. 2009;10(2):125-142. doi:10.1177/1524838009334131.
3. Rue H, Martino S, Chopin N. Approximate Bayesian inference for latent Gaussian models by using integrated nested Laplace approximations. *J R Stat Soc Series B Stat Methodol*. 2009;71(2):319-392.
4. Oliver Stoner, Theo Economou, and Gabriela Drummond Marques da Silva. "A Hierarchical Framework for Correcting Under-Reporting in Count Data". In: *J Am Stat Assoc* 114.528 (2019), pp. 1481– 1492. DOI: 10.1080/01621459.2019.1573732.

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Violence against women: how to overcome the underreporting and using Big Data to frame the phenomenon

Claudia Villante, Maria Giuseppina Muratore

Summary of Background Data
Violence against women is underreported phenomenon and its social and cultural narrative strongly affects this issues. Different and complex are the reasons behind the underreporting and only the survey sample could give a good estimation of the prevalence. In addiction to this survey (the Women Safety Survey), which is currently underway, ISTAT has started to adopt new and different sources of data looking at new approaches and methodologies to enrich the integrated datawarehouse system, created and implemented in cooperation with the Department of Equal Opportunity of the Presidency of the Council of Ministries.
Objectives
The objectives of the paper are to describe the adopted new methodologies and the results of these approaches which complement the traditional sources of data (administrative statistics, surveys, registers).
Methods
Different are the methodologies adopted to address the new data needs to frame the phenomenon: the paper will describe the approach of citizen-generated data (United Nations' Copenhagen Framework) and how to use new sources of data to better understand this complex topic.
Results
The paper will also provide first results of the new methodologies adopted by ISTAT using citizen-generated data and big data.
Discussion/Conclusions
How to integrate these different data sources and how to improve the knowledge on violence against women.

References

1. Liu, B. Sentiment Analysis and Opinion Mining. Morgan & Claypool Publishers. https://doi.org/10.2200/S00416ED1V01Y201204HLT016 (2012).
2. Van den Brakel J, Söhler E., Daas P. & Buelens B., Social media as a data source for official statistics; the Dutch Consumer Confidence Index. Statistics Canada, December 21 (2017).
3. Yongyi Min, Haoyi Chen & Francesca Perucci, Data on SDGs are riddled with gaps. Citizens can help, Nature 633, 279-281 (2024) doi: https://doi.org/10.1038/d41586-024-02920-6

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Stereotypes feeding intimate violence: what has changed over time. The Italian experience

I Corazziari[1], MG Muratore[2], L Scarnicchia[3], C Villante[4]

Summary of Background Data
Common people lives surrounded by the culture of their specific community that can be steeped in stereotypes regarding sensitive dimensions of daily life. Stereotypes can affect people behaviours if not adequately recognised and emptied of power. Istat realised two waves of the survey *Gender stereotypes and the social image of violence*, in 2018 and 2023. Common indicators from the two surveys regard opinions about gender roles in households' economic and domestic management, the level of acceptability of violence (slaps and control) in intimate relationships at least in selected situations, attitudes towards survivors of sexual violence, and possible suggestions in terms of reliable aids against violence.

Objectives
The present work aims at evaluate changes in the social image of violence and stereotypes regarding intimate partner relationships. The selected indicators, aggregated at regional levels, describe such dimensions and will be analysed to check evidence about changes over time.

Methods
Due to the availability of only two points over time, a descriptive multivariate analysis will be performed using the fourth model of the Factorial Dynamic Analysis developed in 70s' by Coppi and Zannella [1], improved by Corazziari in 90s' and recently [2]. The fourth model analyses the variability of the multidimensional data, according a strategy similar to index numbers, where one-time data matrix is the reference where to plot the other occasions.

Results
Stereotypes about gender roles in households' economic and domestic management, acceptance of violent behaviours in the intimate relationship are less common in 2023 with respect to 2018. Notwithstanding a severe stigmatization of the sexual violence victim remains among women in 2023. It is more common to believe and recognise professional aids to stop violent behaviours for victims.

Discussion/Conclusions
According to Istat data about Violence against women (VAW) [3], sexual, physical and psychological violence decreased between 2006 and 2014 (the last wave of the VAW survey is on the field by now). Women seem to be more aware and able to recognise, skip and/or stop violent relationships. An improved scenario in terms of a more clear social image of violence and decreasing of some common stereotypes, accompanies such empowerment of women. Notwithstanding improvements looks not enough and still slow, at least looking at feminicide data: decreasing from 2002 to 2023 both in absolute value and for 100.000 women, more than 100 women by year are killed as women and more than half are killed within the family by partners or relatives.

References

1. Coppi, R. and Zannella, F. 'L'analisi fattoriale di una serie temporale multipla relativa allo stesso insieme di unità statistiche', Atti della XXIX Riunione della SIS (1979).
2. Maggino F., Facioni C., Corazziari I. Measuring Uncertainties: a Theoretical Approach, ISSN online 1757-1189; ISSN print 1757-1170, DOI: 10.1504/IJCEE.2019.097797, International Journal of Computational Economics and Econometrics, Inderscience Enterprises Ltd, vol. 9(1/2), pages 5-28. (2019).
3. https://www.istat.it/en/statistical-themes/focus/violence-against-women/survey-results/

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Invited Session - INV *15 Student mobility and inequalities in higher education - Margherita Silan and Elisa Cisotto*

Organized by Margherita Silan and Elisa Cisotto
Chair Margherita Silan

1. *Gender gap/disparities in academic collaboration network* (Francesco Santelli, Amin Gino Fabbruzzi Barbagli, Alessia Forciniti, Ilaria Marotta)
2. *Gender differences in enrolment choices in Italy: a focus on Sicilian inner-areas* (Marina Chiaramonte, Andrea Priulla, Massimo Attanasio)
3. *Social Inequality and Student Mobility from Southern to Northern Italy. An Analysis of the Interplay between Social Origin, Academic Achievement and Track at Upper Secondary Education* (Andrea Priulla, Eleonora Miaci, Nazareno Panichella)

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Gender Gap/Disparities in Academic Collaboration Network

Francesco Santelli, Amin Gino Fabbrucci Barbagli, Alessia Forciniti, Ilaria Marotta

Summary of Background Data
Gender inequality in STEM disciplines, including statistics, remains a critical issue, reflecting broader societal and institutional dynamics. From a sociological perspective, career choices and educational paths are often shaped by gender stereotypes, societal expectations, and role models, both within the family and academic environments. Despite ongoing efforts to promote gender equality, structural biases still limit women's career advancement in many fields.
Objectives
This study explores the gender gap in academic career progression within the field of statistics, across Italian university institutions, identifying the gender of each co-author through manual and algorithmic processes, focusing on Italy's scientific publications landscape from 2012 to 2022.
Methods
The analysis is based on a comprehensive dataset of co-authorship networks from Scopus. Several factors were controlled for, including institutional affiliation, academic discipline, publication output, and number of collaborations. Network analysis methods were applied to measure centrality and the strength of academic collaborations for both men and women. Network models were used to assess the likelihood of career advancement (e.g., from assistant to associate professor) while controlling for the aforementioned factors. We further employed temporal analysis to observe trends over time, investigating whether gender disparities in promotions persisted or narrowed as female representation improved. Finally, comparisons were drawn to determine whether differences in professional recognition and career trajectory were attributable to structural network positions or intrinsic biases in the system.
Results
The results underline, to some extent, a gender discrepancy in career advancements, with men more likely to receive promotions than women, even when controlling for equivalent academic performance and network engagement. These findings suggest that systemic biases could still play a major role in limiting the career progression of women in academia.
Discussion/Conclusions
Our findings highlight the persistent challenges faced by women in achieving parity in academic career advancement within statistics, a peculiar branch of the STEM fields. Addressing these disparities requires a multifaceted approach, including policy interventions, mentorship programs, but also systemic cultural changes within academic institutions to foster an environment that supports and promotes gender equality.

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Gender differences in enrolment choices in Italy: a focus on Sicilian inner-areas

Marina Chiaramonte[1], Andrea Priulla[2], Massimo Attanasio[3]

Summary of Background Data
Existing literature on university enrolment choices in Italy highlight significant disparities based on various factors, including socioeconomic status (SES) [1], high school type [2], and territorial disparities [3]. While existing literature has explored the relationships between SES, high school type, gender, and geographic location independently (or in two- or three-way interactions), this is the first study to examine the interplay of geographical factors and gender, controlling for SES and high school type, in influencing university enrolment.
Objectives
This study aims to evaluate gender differences in the enrolment choices of Sicilian high school graduates, considering various social backgrounds and areas of origin. Specifically, it explores how distance from educational services (i.e. universities), along with other factors may influence students' university decisions.
Methods
Using a linkage of data from two Italian administrative sources (2021/22 a.y.), we apply a multinomial model to study the interplay between gender, SES, and area of origin in the transition from high school to university.
Results
The results show that males and females make different university enrolment choices based on their area of origin, especially among students from less privileged social backgrounds. Female students, high-SES students, and graduates of humanistic or scientific high schools are more likely to enrol in university, with distance from the university being less influential overall. However, the gender gap in university enrolment decreases among students from urban hubs, suggesting that distance negatively impacts males more. High SES positively influences the likelihood of enrolling in university outside one's home region. Graduates of humanistic or scientific high schools are more likely to enrol out-of-region, while graduates of technical high schools other licei show a larger gender gap with females more likely to relocate. This gender gap becomes more significant as the distance from the nearest university in Sicily increases and among students with higher SES.
Discussion/Conclusions
This research contributes to the literature by suggesting that the impact of gender and distance is weaker for graduates of humanistic/scientific high schools but remains significant for those from technical and other licei. The persistent influence of SES further emphasises its role in shaping access to higher education. These findings suggest that policy interventions should target the reduction of geographic and socioeconomic barriers, particularly for males from rural areas and those attending technical or other licei, who face additional challenges in accessing university education.

References

1. Contini, D., Scagni, A.: Social-origin inequalities in educational careers in Italy. In: Jackson, M. (ed.) Determined to Succeed, pp. 149–227. Stanford University Press (2013)
2. Cappellari, L.: High school types, academic performance, and early labour market outcomes. Academic Performance and Early Labour Market Outcomes (March 2004)
3. Camarero, L., Oliva, J.: Thinking in rural gap: mobility and social inequalities. Palgrave Communications. 5(1), 1–7 (2019)

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Social Inequality and Student Mobility from Southern to Northern Italy. An Analysis of the Interplay between Social Origin, Academic Achievement and Track at Upper Secondary Education.

Andrea Priulla[1], Eleonora Miaci[2], Nazareno Panichella[3]

Summary of Background Data
North-South disparities in economic development in Italy also manifest in unequal educational opportunities. Southern regions, which already face high dropout rates, experience considerable student outflows at the university level [1]. Previous research shows that mobility from South to North is more frequent among students from higher social classes [2] and those with strong academic performance in high school [3]. However, how these two factors interact remains unclear.
Objectives
Drawing on longitudinal microdata from two Italian administrative sources, this study examines the interplay of social class, high school achievement, and upper secondary track choice on the post-secondary choices of southern Italian graduates. Specifically, it focuses on two pathways: enrolling in a Southern university versus not enrolling; and enrolling in a Central or Northern university versus not enrolling.
Methods
We fit five mixed-effects binomial logistic models, where the outcome is the choice to move to central-northern regions or enrolling in southern universities.
In the first step, we assessed the effect of social origin on student mobility, controlling for other covariates. Next, we included the interaction between social origin and prior academic performance. We then introduced upper secondary track to test whether the interaction effect differs by track. Finally, we fitted two gender-stratified models to explore whether these patterns differ between males and females.
Results
Our findings underscore the importance of an intersectional perspective in studying educational outcomes. University mobility appears to be a "boosting advantage" predominantly benefitting students who attended humanistic or scientific licei, performed well in mathematics, and had more highly educated parents.
Discussion/Conclusions
This work enriches the literature on inequalities in higher education by providing insights into the interplay of social background, high school track, and academic ability on the mobility choices of students from southern Italy, an aspect largely neglected in the literature due to a lack of available data.

References

1. Attanasio, M., & Enea, M. (2019). La mobilità degli studenti universitari nell'ultimo decennio in Italia. UNIVERSALE PAPERBACKS IL MULINO, 43-58.
2. Ballarino, G., Colombo, S., Panichella, N., & Piolatto, M. (2022). Human capital dynamics: the geographical mobility of high-school graduates towards university in Italy. Regional Studies, 56(6), 921-939.
3. Tosi, F., Impicciatore, R., & Rettaroli, R. (2019). Individual skills and student mobility in Italy: A regional perspective. Regional Studies, 53(8), 1099-1111.

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Invited Session - INV *16 Causal inference approaches to study health and wellbeing - Giovanna Boccuzzo and Bruno Arpino*

Organized by Giovanna Boccuzzo and Bruno Arpino
Chair Giovanna Boccuzzo

1. *The Effect of Remote Contact Patterns During the COVID-19 Lockdown on Older Peoples' Loneliness: A Doubly Robust Approach to Propensity Score Weighting with Gradient Boosted Regression* (Gaetano Tedesco, Bruno Arpino)
2. *The Unseen Burden: Examining the Health Effects of Informal Caregiving in Italy* (Elisa Cisotto, Margherita Silan, Alessandra De Rose, Giulia Cavrini)
3. *Integrating Structural Equation Modelling and Causal Discovery in Epidemiology* (Claudia Franceschini, Giovanna Boccuzzo, Valerie Tikhonoff)

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The Effect of Remote Contact Patterns During the COVID-19 Lockdown on Older Peoples' Loneliness: A Doubly Robust Approach to Propensity Score Weighting with Gradient Boosted Regression

Gaetano Tedesco and Bruno Arpino

Given its adverse impacts on health, longevity, and well-being, loneliness represents a significant public health concern. Characterized as the perceived deficit between the actual and desired quality or quantity of social relationships, loneliness is prevalent among older adults and the feeling is known to increase during aging. Previous research has linked loneliness with a risk for mortality comparable with other well established risk factors like obesity or substance abuse [3], as well as cardiovascular conditions and heart disease [1]. The COVID-19 pandemic drastically reduced in-person interactions, increasing feelings of loneliness among people. However, the increase in remote interactions may helped to counteract the repercussions of diminished face-to-face social engagement.

This study explores the causal relationship between modified remote contact patterns and perceived loneliness among older Italian adults. Data were taken from the Intergen-COVID online survey which aim was to assess people's social relationship and mental health during the lockdown restrictions. Exploring the influence of non-physical contacts in alleviating perceived loneliness, we defined a multi-treatment analysis exploring mixed pattern of individuals who increased non-physical interactions with some contacts while decreasing or maintaining unchanged levels with others.

While previous research have examined the effects of non-physical interactions, this work represents, to the best of our knowledge, the first application of a *doubly robust* (DR) method combining a *machine learning* based approach to propensity score weighting [2] and *G-computation* for estimating the Average Treatment Effect on the Treated (ATT). We implemented *gradient boosted regression* for propensity score weights estimation, effectively balancing key pre-treatment characteristics, and a series of weighted *cumulative link* models for the perceived loneliness, accounting for distinct sets of covariates. The causal effect of interest was estimated using the g-formula proposed by Robins.

Our findings suggest that enhanced non-physical contact significantly alleviates the perception of loneliness feeling during the COVID-19 lockdown across all examined frameworks. The analysis revealed that an increase in non-physical contacts brought, on average, a reduction in the probability of experiencing *severe* loneliness by approximately 4 percentage points with respect to decreasing or maintaining unchanged such contacts. Comparing the only increase pattern with the mixed contact pattern we found a reduction of 4-5 p.p. in the probability of feeling lonely "often". These effects were consistent and statistically significant across all models tested, highlighting the potential of remote interactions in reducing the adverse effects of physical social isolation.

Key words: COVID-19 lockdown, Older people, Propensity score, Boosted regression, Causal effect.

References

1. Cacioppo, J.T., Hawkley, L.C., Crawford, L.E., Ernst, J.M., Burleson, M.H., Kowalewski, R.B., Malarkey, W.B., Van Cauter, E., Berntson, G.G.: Loneliness and Health: Potential Mechanisms. Psychosomatic Medicine **64**, 407–417 (2002)
2. McCaffrey, D.F., Griffin, B.A., Almirall, D., Slaughter, M.E., Ramchand, R., Burgette, L.F.: A tutorial on propensity score estimation for multiple treatments using generalized boosted models. Statistics in Medicine **32**(19), 3388–3414 (2013)
3. Holt-Lunstad, J., Smith, T.B., Baker, M., Harris, T., Stephenson, D.: Loneliness and Social Isolation as Risk Factors for Mortality: A Meta-Analytic Review. Perspectives on Psychological Science **10**(2), 227–237 (2015)

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The Unseen Burden: Examining the Health Effects of Informal Caregiving in Italy

Elisa Cisotto, Margherita Silan, Alessandra De Rose, Giulia Cavrini

Summary of Background Data
As life expectancy increases, caregiving responsibilities for aging parents and parents-in-law often fall on adult children, particularly in countries like Italy with strong family ties and limited public care facilities. Research highlights the negative impact of caregiving on health and well-being [1], particularly for women and those providing intensive or co-residential care [2,3]. Italy's aging population and reliance on family-based care offer a unique context to explore the causal relationship between caregiving and self-reported health (SRH).

Objectives
1. Assess the prevalence of informal caregiving for aging parents/parents-in-law in Italy.
2. Examine the link between caregiving and caregivers' SRH.
3. Investigate the role of gender, employment status, and caregiving intensity in shaping this relation, applying methods to infer causality.

Methods
We analysed data from the 2016 Families, Social Subjects, and Life Cycle Survey (FSS), a nationally representative survey conducted by the Italian National Institute of Statistics. The analytical sample included 9,575 respondents aged 35-64 with at least one living parent or parent-in-law. Caregiving data were categorized into in-home and out-of-home care activities based on specific survey questions. Logistic regression models estimated the relationship between caregiving and SRH, with caregiving status, intensity (<20 hours/week vs. ≥20 hours/week), and gender as key predictors. Propensity Score Matching (PSM) was also implemented to infer causal relationships.

Results
Descriptive findings show that 13.6% of respondents are caregivers, with 33.4% providing high-intensity care and 24.6% co-residing with the care recipient. High-intensity caregiving significantly reduces the likelihood of reporting good or very good SRH, particularly among women. Low-intensity caregiving, however, has a more pronounced negative association with men's SRH. Employment status further modifies these associations, with employed caregivers showing greater vulnerability to compromised well-being

Discussion/Conclusions
Unpaid caregiving, particularly when intensive, is adversely associated with caregivers' SRH, with notable gender differences. Women bear a greater health burden in high-intensity caregiving, while low-intensity caregiving is associated with men's health disproportionately.

References

1. Bom, J., Bakx, P., Schu, F.: The impact of informal caregiving for older adults on caregiver health: A systematic review. Gerontologist (2019)
2. Labbas, E., Stanfors, M.: Gender differences in caregiving intensity, coresidence, and well-being: Evidence from Europe. Eur. J. Popul. (2023)
3. Kalmijn, M., Saraceno, C.: Intergenerational support: Responsiveness to parental needs in different cultural contexts. Eur. Soc. (2008)

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Integrating Structural Equation Modelling and Causal Discovery in Epidemiology

Claudia Franceschini, Giovanna Boccuzzo and Valerie Tikhonoff

Summary of Background Data
A core objective across many scientific areas is to identify the underlying causal relationships and leverage them effectively. In epidemiology, arterial hypertension and uricemia represent significant cardiovascular risk factors, but their relationship with cardiovascular events, a leading global health concern, remains unclear. Causal relationships can traditionally be observed and quantified through well-designed interventions and causal inference techniques; however, in many situations such procedures are challenging or infeasible [1]. Observational data represents a significant opportunity to enhance understanding and inform decision policy-making by exploring causal patterns through machine learning algorithms and statistical properties – a process referred to as causal discovery [2]. However, fully realizing the potential of causal discovery techniques requires integrating domain-specific knowledge to contextualize findings.
Objectives
This research aims to integrate SEM [3] and causal discovery techniques to study causal relationships in observational epidemiological context. In particular, it seeks to analyse the role of arterial hypertension with uricemia and cardiovascular events developing robust frameworks for investigating these causal relationships. Moreover, it seeks to evaluate different measurements of hypertension using the dichotomous clinical variable "hypertensive" and the continuous variables of diastolic and systolic blood pressure (DBP, SBP) separately.
Methods
A large clinical database is utilized, employing gaussian SEM for hypothesis-driven analysis and the gaussian causal discovery PC algorithm to empirically identify and validate causal relationships. This integrated approach allows for a comprehensive evaluation of the inferred causal relationships by comparing different SEM model specifications' fit with data-driven explorative insights.
Results
The SEM models identified hypertension as a mediator between uricemia and cardiovascular events, and the clinical definition of hypertension resulted in the best model fit. Causal discovery confirmed uricemia as a key explanatory variable and hypertension as a mediator between uricemia and cardiovascular events; analyses of DBP and SBP revealed challenges in establishing clear causal relationships. The integration of SEM and causal discovery methods resulted in improved robustness of causal findings in the observational context.
Discussion/Conclusions
This research highlights the potential of integrating SEM and causal discovery techniques in epidemiology with observational data, offering robust insights into the causal links between uricemia, arterial hypertension, and cardiovascular events. The findings also emphasize the importance of choosing the appropriate definitions of hypertension, and call for further investigation into its relationships. This study exemplifies how computational approaches, statistics and domain expertise can provide perspectives that support evidence-based policy and innovation in areas such as epidemiology and public health.

References

1. Pearl, J.: Causality: Models, reasoning, and inference (2nd ed.). Cambridge University Press. (2009)
2. Spirtes, P., Glymour, C., & Scheines, R.: Causation, prediction, and search. MIT Press.(1993)
3. Bollen, K. A.: Structural equations with latent variables. Wiley. (1989)

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Invited Session - INV *17 Methods and Models for Educational Data - Maria Prosperina Vitale and Isabella Sulis*

Organized by Maria Prosperina Vitale and Isabella Sulis
Chair Maria Prosperina Vitali

1. *Assessing the gender peer effect and gender stereotypes in university enrolment in Italy* (Valentina Tocchioni, Samuele Milone, Gabriele Lombardi)
2. *Evaluating the Impact of Teacher Practices on High School Students' Performance: Evidence from the INVALSI Survey* (Nunzia Brancaccio, Iacopo Moreschini, Isabella Sulis, Maria Prosperina Vitale)
3. *The Building Blocks of Peer Effect in Educational Choices* (Angela Pacca, Giuseppe Giordano)

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Assessing the gender peer effect and gender stereotypes in university enrolment in Italy

Valentina Tocchioni, Samuele Milone, Gabriele Lombardi

Summary of Background Data
University enrolment decisions are influenced by a complex interplay of social, cultural, and individual factors. Among these, the role of peer presence and gender stereotypes emerges as particularly salient in shaping educational trajectories, especially in a country like Italy, a context characterized by regional variations in social norms and cultural attitudes.
Objectives
This work intends to assess the impact of same-sex peers, different-sex peers and gender stereotypes in university enrolment in Italy. Our twofold objective is: (a) to understand if and how the presence of peers and same-gender peers influence university enrolment decisions; (b) to evaluate to what extent gender stereotypes impact university enrolment choices. We expect that in regions where gender stereotypes are more pronounced, university enrolment decisions are more likely to reflect traditional academic pathways (e.g., most females enrolling in care-related disciplines). Conversely, in regions with less pronounced and more equitable gender stereotypes, enrolment decisions are expected to align with less traditional and more gender-balanced academic pathways (e.g., a higher female representation in STEM fields).
Methods
Using the integration between two administrative data sources, the INVALSI database and the Anagrafe Nazionale Studenti (ANS) database, our final dataset comprises a total of 391,094 students of grade 13 who graduated in school year 2018/2019, of which 198,184 are females (50.7%). Among those, university enrollees in the academic year 2019-2020 are 212,374 (54.3% of all students considered). For answering our research objectives, we create school-level indicators, which consider the gender composition of students enrolled on a specific course in a university, and we compute some regional-level indicators of gender stereotypes using the data stemming from the Istat Survey on gender stereotypes. Then, we estimate multilevel logistic models for the enrolment to university, in which we include our main explanatory variables, such as gender, high school's field of study and the above-mentioned indicators, and several control variables (like socio-economic status, migration background, math and Italian grades, school type—public or private—and school location by macro-region).
Results
Preliminary estimates of school-level indicators reveal that the concentration of students enrolling in the same course increases the likelihood of high-school students enrolling on university.
Conclusions
Further analyses will be crucial to understanding if gender, field of study, and local gender stereotypes influence enrolment patterns. This work aims to explore the role of same-sex peers, different-sex peers, and stereotypes in shaping university enrolment in Italy.

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Evaluating the Impact of Teacher Practices on High School Students' Performance: Evidence from the INVALSI Survey

Nunzia Brancaccio, Iacopo Moreschini, Isabella Sulis, Maria Prosperina Vitale

Summary of Background Data
The INVALSI sample data from the 2021-2022 student cohort are used jointly to the classroom-level data gathered by teachers' questionnaires. Covariates include students' and teachers' sociodemographic characteristics, high school information and educational practices. Specifically, gender, migratory background, and socioeconomic status are considered at the student level, along with the school curriculum. For teachers, the frequency of IT device use, non-conventional teaching and assessment practices are included. Moreover, information on the use of distance learning methods—relevant due to intermittent closures during the COVID-19 pandemic—are encompassed as control variables, together with information on teachers' characteristics, such as gender, age, and career longevity.
Objectives
Recent studies have increasingly explored the impact of specific teaching practices on student achievement, particularly in mathematics and science proficiency [1,2]. The present contribution aims at evaluating the effect of teaching practices on high school students' performance focusing on INVALSI Mathematics and Reading tests in grade 13.
Methods
Logistic and Multilevel logistic models [3] are used to analyze how teachers' characteristics and practices affect student achievements at upper secondary school. The outcome variable takes is the result of the classification of students in low and high achievers defined by considering students reaching at most the second level and the fifth level of the INVALSI proficiency classification, respectively.
Results
Descriptive statistics on low and high achievers reflect different abilities among school tracks. Lyceums present fewer low achievers, particularly in Mathematics for Scientific lyceums. Technical and Vocational schools report over 50% of low achievers and under 3% of high achievers, except for Mathematics in Technical schools, where high achievers slightly exceed 10%.
First findings from multilevel logistic regression models show as teaching practices vary in their impact on student achievements. Positive effects, in terms of decreasing of the probability of underperforming and increasing the probability of overperforming, are recorded for those classes that often undertake peer activities, laboratory works or regularly present their work to classmates. Other practices, like flipped classrooms, show negative effects increasing the probability to underperform in Reading tests. The use of ICT, both in teaching practice and as testing and assessment tools, has a negative effect on the probability of being a high achiever in both Reading and Mathematics. Finally, students in classes where teaching was mainly done remotely are more likely to be low achievers in reading than their classmates who attended lessons in person.

References

1. Hann, T.: Investigating the impact of teacher practices and noncognitive factors on mathematics achievement, Research in education, 108 (1), 22-45 (2020)
2. Bara, G., & Xhomara, N.: The effect of student-centered teaching and problem-based learning on academic achievement in science. Journal of Turkish Science Education, 17(2), 180-198 (2020)
3. Goldstein, H.: Multilevel Statistical Models. Wiley Series in Probability and Statistics. Wiley & Sons, 4 edition (2011)

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The Building Blocks of Peer Effect in Educational Choices

Angela Pacca and Giuseppe Giordano

Background
In students' educational choices, the peer group exerts a significant influence**.** The peer effect has been debated since the Coleman report (1966) [1], which was one of the first studies to suggest the existence of an effect between school performance and social interactions among peers. One of the most important findings from the study was that the school environment played a significant role in the creation of educational inequalities. The peer effect has been studied considering numerous factors, mainly related to academic performance, but also including personal background, environment, individual characteristics and perception of reality. However, the peer effect has been studied little in relation to educational choices in terms of tertiary education [2][3].
Objectives
The aim of this paper is to carry out a literature review analyzing the main studies and contributions related to the effect of peers on educational choices.
Methods
We select and explore the scientific literature on peer effect on educational context, by using a bibliometric approach. An attempt is made to bring out a comprehensive and multidimensional scheme of analysis that can contribute to a deeper understanding of the role of peer interaction among students analyzing the main factors affecting educational choices also considering socio-demographic aspects and relational data. Social Network analysis and text mining techniques will be used to highlight the macro dimensions emerging from the scientific debate.
Results
The bibliometric approach allows us to consider the students peer effect in the context of broader processes. The review explores the theoretical and practical contributions of the literature identifying the scientific methodologies used in the main studies in order to gain an in-depth understanding of how the peer effect develops and its long-term implications. Historical trajectories, trending topics and dynamic thematic maps allow to depict the whole framework of the phenomenon.
Conclusions
This contribution allows to highlight how the dynamics of interaction impact directly or indirectly on the educational choices. Different fundamental macro-dimensions will be identified for understanding the peer effect on educational choices. These dimensions are crucial for analyzing how influences within peer groups in educational contexts are activated and interact with other factors in individuals' lives, especially during periods of transition when crucial decisions for the future should be made.

References

1. Coleman, J.S., Campbell, E.Q., Hobson, C.J., McPartland, J., Mood, A.M., Weinfeld, F.D., York, R.L.: Equality of Educational Opportunity. U.S. Department of Health, Education, and Welfare, Office of Education, Washington, DC (1966)

2. Porcu, M., Sulis, I., Usala, C.: Estimating the peers effect on students' university choices. In: Book of Short Papers. IES 2022 Innovation & Society 5.0: Statistical and Economic Methodologies for Quality Assessment, pp. 134-139 (2022)

3. Usala, C., Porcu, M., Sulis, I.: The high school effect on students' mobility choices. Statistical Methods & Applications, pp. 1-3 (2023)

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Invited Session - INV *18 Data science and AI for healthcare services - Rocco Mazza and Marina Marino*

Organized by Rocco Mazza and Marina Marino
Chair Rocco Mazza

1. *Digitalizing clinical records to identify typological profiles and disease progression in Alzheimer's patients* (Agostino Stavolo, Mauro Cataldi, Daniela Femminella)
2. *Best Practices for Clinical Applications (BPCA) in Inguinal Hernia Management* (Maria Gabriella Grassia, Camilla Massa, Salvatore Massa, Rocco Mazza, Simone Paesano)
3. *New Tools for Evaluating Intra-Operative Flows: Preliminary Analyses* (Salvatore Lamagna, Federica D'Agostino, Valentina Di Palma)

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Digitalizing clinical records to identify typological profiles and disease progression in Alzheimer's patients

Stavolo Agostino, Cataldi Mauro, Femminella Daniela

Summary of Background Data
The rapid evolution of digital health technologies (DHTs) has introduced significant challenges in assessing their value, necessitating adaptations to traditional value assessment frameworks. These technologies often diverge from conventional healthcare interventions, requiring innovative methodological approaches to capture their unique attributes, such as dynamic user interaction, data-driven insights, and real-time adaptability. Despite advancements, gaps remain in addressing the complexity and scalability of DHTs, highlighting the need for multidisciplinary frameworks that integrate clinical, economic, and user-centered perspectives.
Objectives
We aim to digitalize 195 anonymized medical records from the Federico II University Hospital, UOC Geriatrics and Adult Cystic Fibrosis, and identify recurring patterns in family histories, physiological data, and Alzheimer's test results. Specifically we use the Addenbrooke's Cognitive Examination Revised (ACE-R). It is a cognitive screening tool designed to identify mild cognitive impairment, a condition that poses a high risk for Alzheimer's disease and other types of dementia [1], [2]. The objective is to create typological profiles of Alzheimer's patients based on their first visit and track disease progression over time.
Methods
An exploratory approach was used to digitize and analyse clinical records, focusing on family histories, physiological anamneses, and Alzheimer's test outcomes. Pattern analysis techniques were employed to uncover latent patterns describing the conditions of Alzheimer's patients treated at the centre and to analyse their progression over time based on clinical records from follow-up visits..
Results
The analysis identified recurring patterns linking family and physiological histories with Alzheimer's test results, enabling the classification of patients into distinct typological profiles. These profiles highlight variations in disease onset and progression from the initial visit. The digitalization process also facilitated the efficient organization and analysis of complex datasets.
Discussion/Conclusions
The study demonstrates the feasibility and utility of digitizing clinical records to identify meaningful patterns in Alzheimer's patients. The derived typological profiles provide a foundation for understanding disease heterogeneity and progression from the first visit. These insights have implications for personalized care planning and early intervention strategies.

References

1. Pigliautile, M., Chiesi, F., Rossetti, S., Conestabile della Staffa, M., Ricci, M., Federici, S., Mecocci, P.: Normative data for the ACE-R in an Italian population sample. *Neurological Sciences, 36*, 2185-2190 (2015).
2. Siciliano, M., Raimo, S., Tufano, D., Basile, G., Grossi, D., Santangelo, F., Santangelo, G.: The Addenbrooke's Cognitive Examination Revised (ACE-R) and its sub-scores: normative values in an Italian population sample. *Neurological Sciences, 37*, 385-392 (2016).

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Best Practices for Clinical Applications (BPCA) in Inguinal Hernia Management

Maria Gabriella Grassia, Camilla Massa, Salvatore Massa, Rocco Mazza, Simone Paesano

Summary of Background Data
Inguinal hernia is a widely studied condition, with a large body of scientific literature available. However, the variability of academic discourse and the complexity of terminological associations create barriers to identifying key patterns that could support the development of Best Practices for Clinical Applications (BPCA). The text mining approach to the analysis of scientific publications has gained importance in understanding academic discourse and its implications for clinical practice.
Objectives
The main objective of the study is determined which are the discriminating elements of the choice of one clinical practice rather than another. Using explorative statistical approaches, the analysis investigates whether it is possible that associations of terms, identify the presence of recurrent patterns in choosing one clinical practice over another. This approach reveals key insights into the dynamics of academic discourse on inguinal hernia. The study aims to support the definition of Best Practices for Clinical Applications (BPCA) by synthesizing evidence from the literature to improve clinical decision making.
Methods
Full-text articles were retrieved via API from PubMed Central using a structured query targeting articles on inguinal hernia published between 2015 and 2024. Statistical modeling approaches are used to evaluate the probability distributions governing term associations.
Results
Expected results will indicate that some term associations are related to the adoption of specific practices. Patterns identified in the literature highlight key factors that may influence decision making in clinical settings.
Discussion/Conclusions
Variability in academic discourse reflects broader challenges in the standardization of clinical practices. Statistical analysis of term associations provides a novel approach to uncovering insights that could guide clinicians and policymakers in harmonizing care protocols. On the other hand, the integration of these findings into clinical frameworks requires further validation through interdisciplinary collaboration and stakeholder involvement. The text mining based analysis of scientific literature offers a promising method for identifying patterns that can inform Best Practices for Clinical Applications (BPCAs). This approach has the potential to improve clinical decision making by ensuring evidence-based, patient-centered care in the management of inguinal hernia.

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New Tools for Evaluating Intra-Operative Flows: Preliminary Analyses

Salvatore Lamagna, Federica D'Agostino, Valentina Di Palma, Salvatore Massa

Summary of Background Data
The study of surgical flows represents one of the most significant aspects of the healthcare sector, this enables us to understand the performance of healthcare services, identifying critical issues, and understand its causes. This process not only ensures greater effectiveness of healthcare services but also facilitates the work of doctors and collaborators through better organization and more precise data collection.
These improvements can be facilitated using software dedicated to flow analysis, which optimizes the efforts of all involved. As Giovanni Gorgoni [1] emphasized, technological innovation can initially generate fears, but the advantages it brings far outweigh the risks and resistance to change from doctors. Similarly, Luigi Tilli [2], highlights how technological support can significantly improve the planning of scheduled surgical pathways.
Objectives
The goal of this study was to create a tool to systematize data and provide a clear view of the surgical situation to evaluate department performance and identify any issue related to surgery rooms.
Methods
To achieve this goal, survey was made, which led to the construction of a database of the first kind. The data collected was analyzed by constructing frequency distributions, following the guidelines outlined in the regional directive "Guidelines for Managing the Pathway of Scheduled Surgical Patients" by the Campania Region. Subsequently, specific indicators were developed using the Python programming language to monitor operating room activities, creating a useful tool to support doctors in their decision-making.
Results
The results obtained provided a series of useful insights, including:

- Surgical time, i.e., the average time required to complete an operation.
- Turnover time, i.e., the interval between the exit of one patient and the entry of the next.
- Cancellation rate, i.e., the ratio between the total number of scheduled surgeries and those actually cancelled.

Discussion
In conclusion, these tools and methodologies are essential for improving working conditions in the operating room and raising the level of reliability and performance to higher standards.
While aware that this represents only the beginning of a complex transformation and that numerous uncertainties remain, it is undeniable that technological innovation constitutes a strategic element to focus on for the future of healthcare.

References

1. Giovanni Gorgoni, in:" L'IA in sala operatoria: sicurezza potenziata, ma con quali rischi?" (2024)
2. Luigi Tilli, in "Gestione del percorso chirurgico" (2020).
3. Regione Campania, "Indicazioni per l'organizzazione e la governance del percorso del paziente chirurgico programmato *in applicazione dell'Accordo Stato Regioni Rep. Atti n. 100/CSR del 9 luglio 2020 "Linee di indirizzo per il governo del percorso del paziente chirurgico programmato" (2020)*

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Invited Session - INV *19*
Functional data analysis - Tonio Di Battista

Organized by Tonio Di Battista
Chair Tonio Di Battista

1. *Clustering curves in functional subspaces* (Roberto Rocci, Stefano Antonio Gattone)
2. *Functional and classical approaches to predict carbon emissions from electricity generation: a comparative study* (Pierdomenico Duttilo, Francesco Lisi)
3. *Penalized Model-Based Clustering for Complex Functional Data: Applications in Spatial Clustering* (Nicola Pronello, Rosaria Ignaccolo, Natalia Golini, Luigi Ippoliti, Sara Fontanella)

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Clustering curves in functional subspaces

Roberto Rocci and Antonio Stefano Gattone

Summary of Background Data
Nowadays, in a wide range of application domains, the data atoms of interest are represented by functions or curves [1]. In recent years, there has been a considerable amount of literature on the subject with the aim of extending classical multivariate techniques to functional data.
Objectives
This work investigates the clustering and dimension reduction of functional data and develops a model-based approach to performs these tasks simultaneously.
Methods
A new model-based method is proposed to perform clustering and dimension reduction of functional data simultaneously. The idea is to assume that the observed functional data is distributed as a finite mixture of Gaussian processes. Differences among the components, in terms of means and covariances, can be represented in a functional subspace of reduced dimension. Inference is drawn conditionally at the points where the curves are evaluated [2] following a penalised maximum likelihood approach. The penalty is introduced in order to take into account the functional nature of the data. This allows us to obtain smooth estimates of the centroids. An EM-type algorithm to compute the estimates is presented. The calibration of the penalty is performed during the iterations of the algorithm following the idea of Gattone and Rocci [3].
Results
The effectiveness of the proposal is shown by applications to real and simulated data.
Discussion/Conclusions
In this work a novel method which performs clustering and dimension reduction of functional data is presented. Dimension reduction and clustering are combined in a single model, which assumes that the centroids live in a subspace of reduced dimension. Such an approach, provides a powerful alternative to the well-known tandem analysis which first applies data dimension reduction, and then performs clustering. In fact, the latter may not be optimal since the reduced space of functions identified in the first step may not contain the features relevant for clustering.

References

1. Ramsay J. and Silvermann B.: Functional Data Analysis. Springer-Verlag, New-York (2005)
2. James G. and Sugar C.: Clustering for sparsely sampled functional data. Journal of the American Statistical Association,**98**(462):397-–408 (2003)
3. Gattone S.A. and Rocci R.: Clustering curves on a reduced subspace. Journal of Computational and Graphical Statistics, **21**:361—379 (2012)

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Functional and classical approaches to predict carbon emissions from electricity generation: a comparative study

Pierdomenico Duttilo and Francesco Lisi

Summary of Background Data
Electricity generation is one of the main contributors to global carbon emissions, which underscores the need for accurate short-term forecasting to support mitigation strategies, emission-based scheduling and electricity storage management [1, 2, 3, 4].
Objectives
This work aims to compare functional and classical methods to forecast short-term carbon emissions from electricity generation.
Methods
Three model categories were evaluated: parametric functional models, including seasonal functional autoregressive (S)FAR and functional autoregressive with exogenous variables (FARX) models [5, 6]; non-parametric models and possibly nonlinear models, such as generalised additive models (GAM); linear parametric models, like the seasonal autoregressive integrated moving average (SARIMA) model, which can include exogenous variables (SARIMAX). The models were applied to hourly carbon emission data from the northern Italian electricity market [7], covering the period 2020–2022, with forecasts made for 2023. Forecast accuracy was assessed using the root mean square error (RMSE) for each hour of the day.
Results
The results indicate that functional models, particularly FAR(1) and FARX(1), outperform other methods during early morning and late evening hours. However, GAM demonstrate superior accuracy during midday and evening hours. The SARIMA models performed the worst in all time intervals.
Discussion/Conclusions
Functional methods provide a robust framework to predict carbon emissions due to their ability to model continuous temporal dynamics. Findings underscore the importance of selecting appropriate forecasting methods based on time-of-day variations.

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References

1. Leerbeck, K., Bacher, P., Junker, R.G., Goranovic, G., Corradi, O., Ebrahimy, R., Tveit, A., Madsen, H.: Short-term forecasting of CO2 emission intensity in power grids by machine learning. Appl. Energy **277**, 115527 (2020).
2. Bokde, N.D., Tranberg, B., Andresen, G.B.: Short-term CO2 emissions forecasting based on decomposition approaches and its impact on electricity market scheduling. Appl. Energy **281**, 116061 (2021).
3. Wang, Y., Qiu, J., Tao, Y.: Optimal power scheduling using data-driven carbon emission flow modelling for carbon intensity control. IEEE Trans. Power Syst. **37**(4), (2022).
4. Jin, Y., Sharifi, A., Li, Z., Chen, S., Zeng, S., Zhao, S.: Carbon emission prediction models: A review. Sci. Total Environ. **927**, 172319 (2024).
5. Damon, J., Guillas, S.: The inclusion of exogenous variables in functional autoregressive ozone forecasting. Environmetrics **13**(7), 759–774 (2002).
6. Zamani, A., Haghbin, H., Hashemi, M., Hyndman, R.J.: Seasonal functional autoregressive models. J. Time Ser. Anal. **43**(2), 197–218 (2022).
7. Bertolini, M., Duttilo, P., Lisi, F.: Accounting carbon emissions from electricity generation: a review and comparison of emission factor-based methods. 2024. Available at: https://arxiv.org/abs/2411.13663.

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Penalized Model-Based Clustering for Complex Functional Data: Applications in Spatial Clustering

Nicola Pronello, Rosaria Ignaccolo, Natalia Golini, Luigi Ippoliti and Sara Fontanella

Objectives
Functional Data Analysis (FDA) has become a key statistical approach for handling complex, high-dimensional data, including large-scale, imaging, and manifold data. This study focuses on clustering complex functional data into homogeneous groups while addressing dimensionality reduction. In particular, by working within a mixture model-based framework, we propose a flexible clustering technique designed to handle spatially indexed functional data.
Methods
The proposed clustering method employs shrinkage techniques to enforce sparsity in both the means and covariances of the mixture components while maintaining the clustering structure. To achieve this, an L_1 penalization is incorporated into the parameter estimation process by means of a modified EM algorithm. Moreover, we extend traditional model-based clustering specification by incorporating spatial dependence into the model's prior mixing coefficients, utilizing a multinomial logistic regression framework [2]. The methodology is evaluated through a Monte Carlo simulation study and applied to benchmark datasets, demonstrating its effectiveness across different contexts.
Results
The clustering approach successfully partitions spatially dependent functional data into meaningful groups. In the first application, the methodology identifies spatial zones with distinct air pollution dynamics (daily PM10 concentration timeseries in Piedmont over a year, see [2] for further details), offering valuable insights for environmental monitoring and policy-making. Similarly, in an analysis of biodiversity profiles, specifically represented by non-negative and convex curves [1], the proposed methodology allows to reveal spatial patterns in areas with similar species distributions, capturing ecological diversity variations that traditional scalar indices often overlook. In both applications, the approach enables the identification of homogeneous areas, which are crucial for designing targeted interventions and management strategies.
Conclusions
The study presents a penalized model-based clustering approach for functional data with spatial dependencies. By integrating dimensionality reduction techniques within a flexible mixture modeling framework, the method provides an effective tool for analyzing complex environmental and ecological datasets. The applications to air pollution and biodiversity mapping highlight its potential in spatial functional zoning, offering practical insights for environmental management and conservation strategies. Future research directions include extending the model to accommodate additional covariates and exploring alternative spatial dependence structures to enhance clustering accuracy.

References

1. Golini, N., Ignaccolo, R., Ippoliti, L., Pronello, N.: Functional zoning of biodiversity profiles. Environmetrics **36(1)**, e2865 (2025). https://doi.org/10.1002/env.2865
2. Pronello, N., Ignaccolo, R., Ippoliti, L., et al.: Penalized model-based clustering of complex functional data. Stat Comput **33**, 122 (2023). https://doi.org/10.1007/s11222-023-10288-2

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Invited Session - INV *20 Future Research Methodology: Models and Applications for Sustainable Tourism - Mario Bolzan and Simone Di Zio*

Organized by Mario Bolzan and Simone Di Zio
Chair Mario Bolazan

1. *State of the Future Index for setting policy priorities* (Elizabeth Florescu, Theodore J. Gordon)
2. *Advancing the State of the Future Index: a comparative approach to measurement in the European Union* (Leonardo Salvatore Alaimo, Simone Di Zio, Yuri Calleo)
3. *Generative pre-trained transformers in policy design: early results from family policy scenarios in north-eastern Italy* (Yuri Calleo, Manuela Scioni, Marco Marozzi, Mario Bolzan, Simone Di Zio)

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State of the Future Index for setting policy priorities

Elizabeth Florescu[1], and Theodore J. Gordon (in absence)

Summary of Background Data
The State of the Future Index (SOFI) is a complex index that assesses the outlook for the future. It is a quantitative assessment and expression of the factors of change of a system, and of their interaction. SOFI is a combination of quantitative data for 29 variables, based on historical data for a period at least double of the forecasted one; e.g., for a 10-year forecast, at least 20 years of historical data are used. For the global SOFI, the sources of data are open-source from international organizations, mostly the World Bank, but also those specialized in certain sectors, e.g., SIPRI, NOAA, IEA, UNESCO, and Freedomhouse.) [1]
Objectives
The SOFI aims to assess if the future is getting better or worse, and to identify the potential responsible factors. Its role is to help understand the system and its dynamics, and to present the outcomes in an easy-to-understand way to support policymaking [2].
Methods
The indicators included in the SOFI, as well as their respective weights (importance to the system) and the "best" and "worst" values for the forecasted period have been decided through Real-Time Delphi studies and are continuously updated by The Millennium Project staff. The sources of data are carefully considered for reliability and consistency of data collection, and the trajectories for each variable are assessed using CurveExpert Professional. The amalgamated data and forecasts generate the global SOFI. Then, various sensitivity analyses can be performed to test specific policies.
Results
Although presented as a graph, SOFI is not a projection. However, its simple graphic representation, along with the graphs showing the potential trajectories for the individual variables can help understand the system — how changes to individual or several variables ripple throughout the system. By various changes, SOFI can illustrate the potential consequences of different policies and the combined potential outcomes.
Discussion/Conclusions
The most important application of SOFI would be with setting policy priorities. However, the apparent precision of the graphs should not be mistaken for accuracy. The SOFI computation entails many subjective decisions and probabilities. Also, combining many variables into a single index leads to loss of detail, hide certain aspects by compensating losses in some areas with progress in the others, and mask variations among sectors, regions, or nations. An automation of SOFI computation is being considered and would make the process much faster and more flexible.

References

1. Florescu, E, Gordon, T.J.: State of the Future Index. In: Glenn et al., State of the Future 20.0, pp 161-189, The Millennium Project (2024)
2. Gordon, T.J.: State of the Future Index. In: Glenn et al., Futures Research Methodology V3.0, The Millennium Project (2009)

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Advancing the State of the Future Index: a comparative approach to measurement in the European Union

Leonardo Salvatore Alaimo, Simone Di Zio, and Yuri Calleo

Summary of Background Data
The State of the Future Index (SOFI) serves as a key tool in futures studies, offering insights into medium-term systemic trends based on historical data. However, criticisms have emerged regarding its weighted aggregation of diverse indicators and its potential to oversimplify regional and sectoral nuances.
Objectives
This study aims to address the limitations of SOFI's aggregation methods by comparing alternative synthesis techniques, exploring varying levels of compensability, and proposing a statistically robust framework tailored to European Union contexts.
Methods
A dataset comprising 27 EU countries, 26 indicators, and a 10-year time span (2012–2022) was utilized. Indicators were normalized using Min-Max scaling, and equal weighting was applied to maintain indicator parity. Three aggregation methods—minimum, arithmetic mean, and geometric mean—were compared to assess their impact on synthetic values. Kendall's tau correlation was employed to evaluate the consistency of rankings across methods. This research builds on established methodologies [1,2,3].
Results
The results reveal significant variability in SOFI rankings based on the aggregation method, with Kendall's tau coefficients indicating notable inconsistencies. Countries such as Germany and Italy exhibited pronounced differences in SOFI values depending on the level of compensability allowed.
Discussion/Conclusions
The findings underscore the critical influence of aggregation choices on SOFI outcomes, emphasizing the need for methodological transparency and rigor. Future research should refine weighting strategies through stakeholder input and develop predictive models that incorporate spatial and temporal dimensions. Such advancements will enhance SOFI's utility for policy evaluation and scenario planning.

References

1. Gordon, T. J., Hughes, B., Solórzano, J. R., Stelzner, M.: Producing state of the future indexes using the international futures model. Tech. For. & Soc. Cha. 78(1), 75–89 (2011)
2. Calleo, Y., Di Zio, S., Pilla, F.: Facilitating spatial consensus in complex future scenarios through Real-Time Spatial Delphi: A novel web-based open platform. Futures Foresight Science, e155 (2023)
3. Alaimo, L. S.: Complexity of Social Phenomena: Measurements, Analysis, Representations and Synthesis. Rome: Sapienza University Press (2022)

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Generative pre-trained transformers in policy design: early results from family policy scenarios in north-eastern Italy

Yuri Calleo, Manuela Scioni, Marco Marozzi, Mario Bolzan, and Simone Di Zio

Summary of Background Data
Family policies are crucial in fostering social resilience and addressing the dynamic needs of modern families [1]. With rapid changes in demographics, economic conditions, and social dynamics, there is an increasing need for anticipatory governance approaches that proactively address future challenges. By harnessing advanced AI models, such as Generative Pre-Trained Transformers (GPT-4), this study aims to analyze and identify family policy trends and emerging needs across four northeastern Italian regions from 2018 to 2022.
Objectives
The primary objectives of this study are to analyze and describe family-related legal initiatives from regional administrative documents, assess regions' responses to family needs, and develop tailored policy recommendations. The study aims to highlight how AI tools can streamline the policy analysis process, offering rapid insights for future policy improvements.
Methods
A systematic approach was adopted to collect family policy documents from the official websites of four regions (Friuli Venezia Giulia, Trentino-Alto Adige, Veneto, and Emilia Romagna) between 2018 and 2022. Using AI-driven natural language processing (NLP) techniques, specifically GPT-4, the study extracted relevant policies and identified common family-related issues [2]. The AI model processed and analyzed the documents using a series of prompts designed to identify key policy areas and family needs. The extracted data were then used to generate and refine policy recommendations for each region.
Results
The AI model successfully identified and categorized family policies across the regions, producing a diverse list of policy recommendations. The model revealed common themes, such as economic assistance for families, social services, and domestic violence support, while also uncovering regional variations in family policy focus. For example, Friuli Venezia Giulia emphasized educational support and social tourism, while Veneto focused on substance abuse prevention and digital inclusion. The model also identified 20 distinct family-related needs across the regions, confirming the relevance of AI in extracting actionable insights for policymakers.
Discussion/Conclusions
This study describes the potential of AI-driven approaches in extracting and analyzing family policies. It highlights the potential of anticipatory governance in policy design, allowing for more responsive and informed decision-making. The findings suggest that AI can significantly reduce the time and resources required for policy analysis while enhancing the precision and relevance of policy recommendations. Future research should focus on refining AI models to better interpret regional policy nuances and explore their potential for real-time policy adaptation [3].

References

1. Bolzan, M. Domani in famiglia. Franco Angeli (2018)
2. Gupta, P., Ding, B., Guan, C., Ding, D. Generative AI: A systematic review using topic modelling techniques. Data and Information Management, 100066 (2024)
3. Di Zio, S., Calleo, Y., Bolzan, M. Delphi-based visual scenarios: an innovative use of generative adversarial networks. Futures, 154, 103280 (2023)

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Invited Session - INV *21* *Co-authorship networks challenges in data collection and statistical modelling - Susanna Zaccarin and Domenico De Stefano*

Organized by Susanna Zaccarin and Domenico De Stefano
Chair Susanna Zaccarin

1. *Hypegraph and Relational Hypervent Models in Collaborative Networks* (Domenico De Stefano, Amin Gino Fabbrucci Barbagli, Francesco Santelli, Susanna Zaccarin)
2. *Impact of Formal and Informal Collaborations on Academic Performance in Italy* (Roberto Casaluce, Rosario G. D'Agata)
3. *Egocentric network analysis of co-authorship relationships among scholars affiliated with Italian universities* (Gianpaolo Caprino, Viviana Amati)

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Hypergraph and Relational Hyperevent Models in Collaborative Networks

Domenico De Stefano, Amin Gino Fabbrucci Barbagli, Francesco Santelli, Susanna Zaccarin

Summary of Background Data
The increasing complexity of societies demands a novel approach to examining social interactions and structures. Recently, hypergraphs and innovative statistical models to handle them have been recognised as effective tools for analyzing higher-order interactions, especially in two-mode networks such as those representing scientific collaboration via the papers scholars co-authored together.
can track
Objectives
This study aims to examine the application of Relational Hyperevent Models, a newly developed class of statistical models proposed to analyse network evolution capable of handling time-varying data and events occurring in hyperedges (sets of subsets of vertices in a hypergraph that connect more than two variables). These models allow the modeling of events with any number of actors, polyadic settings, and the persistence of subgroups over time.
Methods
We specify several Relational Hyperevent Models to analyse collaboration networks through a hypergraph framework. Our study focuses on the community of Italian academic scholars in Sociology. Bibliographic information from 2014-2022 has been obtained by an ad hoc procedure combining administrative data and published papers from the Scopus database. Statistical analyses are performed with Eventnet, a Java software that estimates the parameters of Relational Hyperevent Models. Results are evaluated with the survival packages in R, which are helpful for time-to-event data. Moreover, we will enrich the dataset by modelling various events represented by keywords, references, and publications.
Results
Several model specifications have been proposed to evaluate teamwork dynamics in the scientific community and the likelihood of maintaining collaboration among authors over time and/or the tendency to establish new collaborations with authors who have previously co-authored with the same groups of authors. Based on these results, we will observe whether groups remain stable or merge and how their formation is affected using specific keywords or by citing the same references.
Discussion/Conclusions
This work emphasizes the potential uses of hypergraph frameworks across diverse areas, especially in social sciences, showcasing their ability to represent higher-order interactions. This approach reduces the information loss commonly linked to one-mode or two-mode networks. Additionally, we will investigate the applications of RHEM and their possibilities.

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Impact of Formal and Informal Collaborations on Academic Performance in Italy

Roberto Casaluce and Rosario G. D'Agata

Summary of Background Data
This study examines the evolution of collaboration behaviors among Italian academic scholars over a decade, focusing on four macro sectors: two in economics and statistics, and two in political and social sciences. By distinguishing between formal and informal co-authorship relationships, the research seeks to understand their respective impacts on scholarly performance. Formal collaborations are sourced from international bibliographic databases such as Scopus, which provide comprehensive records of co-authored publications. In contrast, informal collaborations are assessed via a specially designed survey using an ego-network approach, targeting individuals identified through the formal collaboration data.
Objectives
The study aims to understand how both formal and informal collaborations affect academic performance [1]. It also seeks to demonstrate the capabilities of MaScoNet, a web-based tool developed specifically for this research and soon to be available to the scientific community, designed to capture detailed insights into collaboration patterns through structured questionnaires.
Methods
MaScoNet administers a survey divided into two sections. The first section focuses on the nature of co-authorship relationships, gathering detailed information about the types of collaborations that have led to scientific outputs between respondents and their co-authors. Each co-author is addressed on a separate page with specific questions tailored to their collaborative interactions. The second section explores the extent of informal relationships maintained by respondents with colleagues who have not co-authored any publications with them. Additionally, MaScoNet offers a feature in the formal section that allows researchers to input a list of scientific articles co-authored by the respondent and each identified co-author. This enables the creation of a two-mode network analysis, where one set of nodes represents the scientific articles and the other represents the authors. Respondents can associate multiple articles with each co-author, thereby enhancing the understanding of collaborative structures and their impact on academic performance. When collecting data, both focal individuals (egos) and their associated network members (alters) must be identified. Alters may be identified either through name-generator questions—where participants list their collaborators—or via researcher pre-selection. MaScoNet offers the flexibility to choose the most suitable approach, thereby addressing potential biases such as recall bias or researcher subjectivity.
Discussion/Conclusions
The combined use of bibliographic data and survey-based network information through MaScoNet provides a comprehensive perspective on academic collaborations, enhancing the understanding of their impact on scholarly performance.

References

1. De Stefano, D., Fuccella, V., Vitale, M. P., Zaccarin, S.: The use of different data sources in the analysis of co-authorship networks and scientific performance, Social Networks, Volume 35, Issue 3, pp. 370-381. (2013)

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Egocentric network analysis of co-authorship relationships among scholars affiliated with Italian universities

Gianpaolo Caprino and Viviana Amati

Summary of Background Data
We analyze co-authorship relationships among academics affiliated with Italian universities in the fields of statistics, management, and sociology, hereafter referred to as Italian scholars. We compiled a list of Italian scholars and their attributes, including gender, role, academic sector, university, and department, using data from the Ministry of University and Research. After linking each scholar to their Scopus ID, we gathered co-authorship data for each academic by downloading all their publications from the Scopus online bibliographic archive, covering the period from 2012 to 2022.
Objectives
Analyzing co-authorship relationships offers valuable insights into collaboration patterns and their effects on research productivity and performance [1,2]. This study examines Italian scholars' co-authorship relationships using an ego-network approach. Specifically, we define different types of co-authorship ego networks and explore the relationship between these network structures and research productivity. Additionally, we provide insights into interdisciplinary collaboration and its potential to enhance knowledge production and dissemination.
Methods
Structural and compositional indices, such as Blau's Index, density, effective size, fragmentation, component ratios, and centrality, were calculated to classify ego networks [3]. We perform network clustering to define network typologies. Results are compared across fields to describe differences and similarities. We also introduce and apply a multilevel multiple-membership model to evaluate how key dimensions of ego network structure influence performance indicators, such as publication count and the attainment of academic qualifications.
Results
The analysis revealed varying collaboration patterns across disciplines, reflecting academic norms and roles. Preliminary results show that network size and diversity differ significantly in local and international collaborations. The distribution of ego-network typologies suggests a balance between dense, focused collaborations and broader, distributed networks.
Discussion/Conclusions
This study provides insights into the co-authorship strategies driving the evolution of collaboration networks of Italian scholars in different academic fields. The joint analysis allows for determining which ego-network typologies are field-specific and which are present across fields. While this study is ongoing, the methodology and early results provide a robust foundation for understanding how network structures influence academic performance.

References

1. Bellotti E., Kronegger L., Guadalupi L.: The evolution of research collaboration within and across disciplines in Italian Academia. Scientometrics, 109, 783–811 (2016)
2. De Stefano D., Zaccarini S.: Co-authorship networks and scientific performance: An empirical analysis using the generalized extreme value distribution. J Appl Stat, 43, 262–279 (2016).
3. Perry, B. L., Pescosolido, B. A., Borgatti, S. P.: Egocentric network analysis: Foundations, methods, and models. Cambridge university press (2018)

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Invited Session - INV *22* *Sustainable and circular management of waste sector in the framework of the National Recovery and Resilience Plan - Agnese Rapposelli*

Organized by Agnese Rapposelli
Chair Agnese Raposelli

1. *Is There an Intellectual Interaction between Academic Research and Industrial Policy? Measuring the Proximity Between the Italian Economic Research and the National Recovery and Resilience Plan* (Marialisa Mazzocchitti, Alessandro Sarra)

2. *The role of environmental regulations thresholds on waste management practices in Italian regions in a circular economy perspective: A novel MMQR approach* (Aamir Javed, Agnese Rapposelli)

3. *The role of benchmarking in the management of separate waste collection in Italian provinces* (Massimiliano Agovino, Katia Marchesano, Gaetano Musella)

4. *Multidimensional Fast Iterative Filtering method for the decomposition of high-dimensional non-stationary signals* (Roberto Cavassi, Antonio Cicone, Enza Pellegrino)

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Is There an Intellectual Interaction between Academic Research and Industrial Policy? Measuring the Proximity Between the Italian Economic Research and the National Recovery and Resilience Plan

Marialisa Mazzocchitti and Alessandro Sarra

Summary of Background Data
Unlike macroeconomic approaches, industrial policy lacks a unified theoretical framework, relying on empirical studies and country-specific factors. Policymakers set objectives based on political visions for economic development, but the tools to achieve these goals are not guided by general theory. Using a market metaphor the process of designing industrial policy measures implies what we can consider a "demand" for previous research results, and the scientific activity made by practitioners and scientists provides a "supply" of research results, a supply on which policymakers and technicians can rely to improve the design process. This has two implications: first, better policy outcomes are linked to the depth and relevance of available research on the specific issue; second, limited research highlights areas where further study and investment in research should be prioritized to improve policymaking.
Objectives
This paper presents the results of an empirical analysis with three main objectives: 1) it seeks to measure the proximity between Italy's current industrial policy and the economic research produced within the country, 2) it aims to identify gaps in alignment for specific policy priorities, and 3) seeks to examine the impact of the adoption of the policy document on the alignment between research and policy.
Methods
It focuses on Italy's National Recovery and Resilience Plan (NRRP), a comprehensive industrial policy document adopted in 2021 as part of the NextGenerationEU initiative. Using 20,420 economics publications from Italian scholars (2001–2024), the study employs advanced text analysis techniques, including cosine similarity and sentence embedding models, to evaluate alignment between academic research and the NRRP.
Results
The results reveal limited alignment between research and policy, with significant gaps for certain priorities, and modest shifts in research agendas post-enactment.
Discussion/Conclusions
These findings underscore the need for targeted research policies to bridge knowledge gaps and enhance the integration of research into policymaking, ultimately supporting evidence-based decision-making and national priorities.

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The role of environmental regulations thresholds on waste management practices in Italian regions in a circular economy perspective: A novel MMQR approach

Aamir Javed and Agnese Rapposelli

Summary of Background Data
Waste management is recognized as a critical requirement for the transition towards a circular economy. A circular economy could reduce environmental hazards and meet the targets set by the National Recovery and Resilience Plan and the European Green Deal. According to the World Bank, annual waste generation is estimated to grow by 70% by 2050, while raw material consumption is projected to double by 2060. The 2020 EU Circular Economy Strategy Action Plan (CESAP) established a policy framework aligned with the European Green Deal to achieve a cleaner and more competitive economy [1]. In pursuit of this goal, the plan advocates for measures to tackle resource-independent economic growth, whose aim is the reduction of resource extraction and waste. In order to alleviate environmental stress, it is essential the transition from a linear to a circular economic model. The shift towards a circular economy relies heavily on virtuous waste management [2]. In this context, the Italian government has launched several programs, regulations, and incentives. Some examples of these initiatives include consumer and company-focused awareness campaigns, rules for waste management, financial backing for green innovation, and encouragement of circular business models. For instance, the Environmental Code (Legislative Decree 152/2006) was a watershed in Italian waste legislation, both before and after the rules set down by the European Union. It proposed ambitious goals aiming at the improvement of waste management procedures and at the reduction of environmental effects. More specifically, it set separate waste collection (SWC) targets and associated time frames for their achievement, establishing a graduated trajectory for the SWC objectives (35% by 2006, 45% by 2008 and 65% by 2012), to encourage recycling and to reduce the amount of waste in landfills [3].
Objectives
This work investigates the heterogenous effects waste management laws along with other important control variables on environmental outcomes in Italian regions.
Methods
The impact of environmental laws on waste management practices is analysed by employing a novel method of moments quantile regression approach (MMQR) on regional data.
Results
The findings of MMQR approach confirm the heterogeneous impact of waste management laws on landfill and separate waste collection.
Discussion/Conclusions
The results of this work provide useful policy implications for the government, and policymakers should consider heterogeneity when setting targets and constraints.

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References

1. Lombardi, G.V., Gastaldi, M., Rapposelli, A., Romano, G.: Assessing efficiency of urban waste services and the role of tariff in a circular economy perspective: an empirical application for Italian municipalities. J. Clean. Prod. 323, 129097 (2021)
2. Hidalgo, D., Martín-Marroquín, J.M., Corona, F.: A multi-waste management concept as a basis towards a circular economy model. Renew. Sustain. Energy Rev. 111, 481--489 (2019)
3. Agovino, M., Cerciello, M., Javed, A., Rapposelli, A.: Environmental legislation and waste management efficiency in Italian regions in view of circular economy goals. Util. Pol. 85, 101675 (2023).

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The role of benchmarking in the management of separate waste collection in Italian provinces.

Massimiliano Agovino, Katia Marchesano and Gaetano Musella.

Summary of Background Data
Legislative decrees 22/1997 and 152/2006, which regulate waste management in Italy, allow us to investigate the presence of Yardstick Competition (YC) in separate waste collection (SWC). Defining the dynamic minimum targets made it possible to divide the sample into more efficient and less efficient neighbours concerning the SWC objectives, allowing us to verify the theory of YC [1].
Objectives
The work aims to verify whether the units of analysis (i.e., the Italian provinces), in their waste management planning activity, look to their neighbours by linking their SWC objectives to them. In this case, a YC mechanism could trigger in the waste sector. Provinces with less efficient production strategies are incentivised to reach the standards of more efficient neighbours.
Methods
A two-regime Spatial Durbin Model with spatial and temporal fixed effects [2] is implemented to test the impact of neighbouring provinces on the SWC targets defined by the Italian LDs. In this way, we can identify with greater precision the presence of YC activated by mimesis and distinguish it from spatial spillover effects that can operate at any level (both when looking at the best-performing provinces and when looking at the least provinces [1]. Several proximity matrices are employed (e.g., geographic, institutional, economic). The empirical analysis examines data from 2002 to 2019 of the Italian provinces retrieved from ISPRA and ISTAT.
Results
The results of the empirical analysis conducted during the analysis period exclude the presence of YC. This result is confirmed for each type of proximity matrix used. Only in the case of geographic proximity do mimesis (neighbours that perform better) and spillover effects emerge (neighbours that perform worse), which in the case of border neighbours, registers the possibility of a reduction of the geographic gap in terms of SWC between Northern and Central-Southern Italian provinces. In contrast, in the case of neighbours that are not too close, a mimesis effect emerges, resulting in a persistence of the SWC gap.
Discussion/Conclusions
Looking to virtuous neighbours could certainly improve a province's performance; however, the positive effect is driven not only by the desire to improve one's results but also by the possibility of investing in new infrastructures and technologies that would make the most backward provinces more efficient in the separate collection process. Unfortunately, the changes that have taken place in the legislation governing SWC do not go in this direction. In contrast, they reward those who are already ahead (see Law n. 221/2015 art. 32 and 34), ending up widening the gap between the Italian provinces in terms of SWC rather than spurring the less-performing provinces to do better.

References

1. Shleifer, A.: A theory of yardstick competition. Rand J Econ, 16(3), 319--327 (1985)
2. Elhorst, J. P., Fréret, S.: Evidence of political yardstick competition in France using a two-regime spatial Durbin model with fixed effects. Journal of Regional Science, 49(5), 931--951 (2009)

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Multidimensional Fast Iterative Filtering method for the decomposition of high-dimensional non-stationary signals

Roberto Cavassi and Antonio Cicone and Enza Pellegrino

Summary
In many applied fields of research, like Geophysics, Medicine, Engineering, Economy, and Finance, to mention a few, classical challenging problems are the identification of hidden information and features contained in a given signal, like quasi-periodicities and frequency patterns, as well as the extraction of all the different components contained in it.
Standard methods based on Fourier and Wavelet Transform, historically used in Signal Processing, proved to be limited in the presence of nonlinear and non-stationary phenomena. For this reason, in the last two decades, several new nonlinear methods have been developed by many research groups around the world, and they have been used extensively in several applied fields of research.
Objectives
In this talk, we will briefly review the pioneering technique Hilbert-Huang Transform (a.k.a. Empirical Mode Decomposition method) and discuss its known limitations. Then, we will introduce the Fast Iterative Filtering technique [1] and its generalization to handle multidimensional non-stationary signals [2,3]. We will discuss these methods theoretical and numerical properties and show their applications to real-life data.

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References

1. Cicone, A., Zhou, H.: Numerical Analysis for Iterative Filtering with New Efficient Implementations Based on FFT. Numerische Mathematik. 147 (1), 1--28 (2021)
2. Cicone, A., Zhou, H.: Multidimensional Iterative Filtering method for the decomposition of high-dimensional non-stationary signals. Cambridge Core in Numerical Mathematics: Theory, Methods and Applications. 10(2), 278--298 (2017)
3. Cavassi, R., Cicone, A., Pellegrino, E., Zhou, H.: A novel algorithm for the decomposition of non-stationary multidimensional and multivariate signals. Submitted

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Invited Session - INV *23* *Methodological Challenges and Insights in Researching People' Relationship with Artificial Intelligence - Davide Bennato*

Organized by Davide Bennato
Chair Davide Bennato

1. *The Combinatorial Creativity of a Chatbot* (Simone D'Alessandro)
2. *Virtual bodies, real agendas: Gender, Authenticity, and Political Positioning in the Virtual Persona of Francesca Giubelli* (Selenia Anastasi)
3. *Falling in Love with a Chatbot to the Point of Suicide: Analysis of the Character AI Case and Algorithm Testing* (Simona Canino)
4. *Beyond Human: The Influence of AI Characters on Consumer Behavior in the Digital Realm* (Nicola Strizzolo, Franco Campitelli)

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The Combinatorial Creativity of a Chatbot

Simone D'Alessandro[1]

Summary of Background Data
Are creativity and intelligence distinct, coincidental, or complementary concepts? Do they determine irreducible distinctions between human and artificial agent? Can they also imply automatism and inability as additional heuristic resources? In the distinctions between human and A.I., research on creative processes examines abilities, actions, behaviours, and conversations: elements that are disambiguable and measurable. However, it is possible to reverse the perspective, distinguishing human and artificial agent from inabilities. Integrating ethnomethodology and discursive analysis, the present research highlights the irreducible differences between human and chatbot by analysing theoretical assumptions of international tests used by programmers to evaluate chatbot interactions: a) The Classical Turing Test; b) The Inverse Turing Test; c) The Winograd Test; d) The Winogrande Text; and e) The Lovelace Test.
Objectives
I will focus on the ambivalent relationship between human creativity and intelligence.
From this relationship arise distinct ways of understanding artificial intelligence.
Methods
I will use the ethnomethodological approach to show how definitional assumptions and discursive repertoires influence the way we conceive of evaluations of what we consider creative (Garfinkel, 1991; Spillman, 2022). Such assumptions also influence the tests used by programmers to evaluate the capabilities of chatbots.
Results
This theoretical and empirical research highlights the irreducible differences between human incapacity and the incapacity of a chat bot.
By human inability, I mean the subjective limits of understanding of what is said or shown by a human being: in this sense, each subject has its own deficient nature.
By artificial inability I mean an objective set of limitations: 1. Inability to understand semantics; 2. Inability to contextualize conversational assumptions and implicatures; 3. Inability to interact or act unpredictably; 4. Inability to decide in the absence of starting information provided by the program; 5. Inability to boycott the automation of programming systems.
Conclusions
The conclusions report the theoretical results that were determined by the comparative analysis of the tests and that answer the research questions posed.

References

1. Levesque, H. J., Davis, E., & Morgenstern, L.: The Winograd schema challenge. 13th International Conference on the Principles of Knowledge Representation and Reasoning, *KR* 552-561, (2012).
2. Riedl, M. O.: The Lovelace 2.0 Test of Artificial Creativity and Intelligence, (2014).
3. Sakaguchi, K., Le Bras, R., Bhagavatula, C. & Choi, Y.: WINOGRANDE: An Adversarial Winograd Schema Challenge at Scale, Allen Institute for Artificial Intelligence, University of Washington, (2024).

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Virtual bodies, real agendas: Gender, Authenticity, and Political Positioning in the Virtual Persona of Francesca Giubelli.

Selenia Anastasi

Summary of Background Data
In recent years, virtual influencers have attracted increasing academic interest [2][1]. However, there is still a lack of research analysing the construction of their identity, particularly from a gender perspective, integrating feminist approaches and visual media studies. [2]. Indeed, computer-generated image influencers are predominantly female figures who promote cultural and commercial products as well as aesthetics, lifestyles and various social issues on social media platforms. These figures occupy an intriguing communicative space, positioning themselves within an ontological liminality. In this study, I aim to explore the political and gender identity construction of Francesca Giubelli, an Italian AI influencer who has collected over 12,000 followers since 2021. The figure of Francesca Giubelli presents some peculiarities compared to her Italian colleagues. Firstly, it is possible to interact with her via chat-bot; secondly, her figure is overtly politically close to the far-right political party Fratelli d'Italia.
Objectives
This study attempts to answer two primary research questions:
1- How Francesca Giubelli's creators construct a sense of authenticity around her image?
2- What gender characteristics and political opinions are encoded and interpreted through the representation of the Italian AI influencer?
Methods
To answer these questions, the research uses two main methods. It combines a multimodal qualitative analysis of Francesca's Instagram account, focusing on the interaction between visual content, text captions and spoken interactions, with an innovative chatbot interview technique, which simulates interactions with the AI to uncover how her creators designed her responses to foster credibility and audience engagement.
Results
Results from the interactive approach via chat-bot show the mechanisms by which the virtual identity is communicated at the same time as authentic and artificial, highlighting the rhetorical strategies used to blur these boundaries. Results from the analysis of the Instagram profile reveal that Francesca's aesthetics mirror the standard of the "Italian beauty" [3]: on one hand, by perpetuating traditional gender stereotypes while, on the other, capitalising on the novelty of her artificiality. The analysis sheds light on the cultural and political implications of Francesca's participation in public political events, suggesting the potential of IA influencers to promote a political agenda oriented towards technological development within a traditional depiction of Italy.

References

1. Conti, M., Gathani J., e Tricomi P.P. (2022). Virtual Influencers in Online Social Media. *IEEE Communications Magazine*, 1-7.
2. Portanova, S., & Panarese, P. (2023). Virtual influencer in una prospettiva di genere. I gender displays e le estetiche di Lil Miquela tra social fiction e cyberspace. In *Communication and Gender. Debates in English, Italian and Spanish* (pp. 485-506). Sette Città.
3. Gundle, S. (1997). *Bellissima: feminine beauty and the idea of Italy*. Yale University Press.

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Falling in Love with a Chatbot to the Point of Suicide: Analysis of the Character AI Case and Algorithm Testing

Simona Canino

Summary of Background Data
Last February in Orlando, Florida, a fourteen-year-old teenager (S.S.) decided to end his young life using a firearm. His mother decided to sue the Character AI website. It is a chatbot based in California with which users can have personalized and simulated conversations as they can choose to talk to a fictional character or any celebrity. Before committing suicide, the young man allegedly began a real love and sexual relationship with the bot Dany, a character from a fantasy series, to whom he also expressed his suicidal thoughts in the months before his death. From the chats, it is clear that the bot supported the young user in his suicidal endeavour. The prosecution claims that his mental health, already affected by anxiety and mood disorders, rapidly and severely deteriorated after he downloaded the application in April 2023. His school performance declined and he tended to isolate himself more and more.
Objectives
This singular and particularly disturbing case is worthy of a deeper sociological analysis of the interconnection between the real and artificial worlds, also from an emotional point of view. It is therefore necessary to investigate how artificial intelligences can influence human abilities to perceive and interpret emotions in digital contexts, and whether these can actually generate empathic bonds even if the relationship is between man and machine [1]. The most relevant part, however, is in terms of emotional consequences and social consequences that can derive especially when it comes to younger users, and to make a critical reflection on the idea of guilt that is attributed to artificial intelligences. In the case of the suicide in Florida, the influence of the environmental context was not considered in any way, since it would be very simple and reductive to attribute the blame for the suicide of a young teenager to a machine. At the same time, the idea that a chatbot can support a suicidal idea and that there is in no way a system in the algorithm that allows it to recognize potentially dangerous situations is considered extremely serious.
Methods
The theoretical approach of the sociology of emotions [2] will help explain the phenomenon, and the chatbot will be tested to simulate the case.
Results
The thesis aims to carry out an analysis around the above-mentioned themes through a socio-emotional framework and testing the Character AI chatbot in order to carry out a simulation and test the algorithm in a situation similar to the one that occurred in Florida.
Discussion/Conclusions
The case analysis will allow for reflections on the human-machine relationship.

References

1. Grassi, E. Intersezioni affettive: esplorando l'ontogenesi delle relazioni umano algoritmiche. Forum AIS giovani, Lecce (2023)
2. Cerulo M. Sociologia delle emozioni, Il Mulino, Bologna (2018).

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Beyond Human: The Influence of AI Characters on Consumer Behavior in the Digital Realm[1]

Nicola Strizzolo and Franco Campitelli

The development of AI has led to the creation of fully artificial characters that are becoming "virtual influencers." These AI-generated entities are gaining popularity and followers, competing with human influencers. This abstract examines the emergence of this phenomenon, the reasons for its growing popularity on various social platforms, and explores existing literature as well as real people's comments on their profiles.

The social media presence of these virtual characters is carefully curated to simulate the authenticity of human influencers. This creates a close connection with followers, aiming to shape their perceptions and behaviors. A study by Croes and Bartels [1] explored why both young people and adults follow social influencers. The findings revealed that young adults perceive them as "friends" who entertain rather than as "cool" individuals.

An additional appeal of virtual influencers lies in their entirely artificial construction, which enables them to embody idealized characteristics and deliver marketing messages with greater consistency than humans. As noted in a study by Lou et al. [2], there are six reasons for the success of virtual influencers: "novelty, information, entertainment, surveillance, aesthetics, and social integration".

However, the virtual nature of these characters raises ethical questions about identity construction and how this might impact the preservation of social values in online spaces. Moreover, the creation of "AI-generated nudes" on adult platforms could lead to dangerous consequences, such as the commodification of the body and unrealistic beauty standards. Another challenge arising from the "almost human" nature of these characters is the so-called "uncanny valley." According to Mori [3], a person's response to a humanoid robot shifts from empathy to repulsion if the robot's appearance fails to achieve a realistic look.

In conclusion, the success of virtual influencers requires in-depth sociological analysis from both ethical and future human relationship perspectives in the digital era. Future research will aim to delve deeper into the dynamics of interaction between consumers and AI characters, including analyzing public comments and interactions on social networks.

References

1. Croes, E., Bartels: Young adults' motivations for following social influencers and their relationship to identification and buying behavior, "Computers in Human Behavior", https://doi.org/10.1016/j.chb.2021.106910. (2021)
2. Lou, C., Kiew, S. T. J., Chen, T., Lee, T. Y. M., Ong, J. E. C., Phua, Z.: Authentically fake? How consumers respond to the influence of virtual influencers, "Journal of Advertising", (2023).
3. Mori, M.: The uncanny valley [from the field], "IEEE Robotics & automation magazine", 6 June 2012 (1970)

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Invited Session - INV *24* *Researching with/about AI - Biagio Aragona and Sonia Stefanizzi.*

Organized by Biagio Aragona and Sonia Stefanizzi
Chair Biagio Aragona

1. *Addressing the Implications of Automated Decision-Making: A Delphi Approach to Scenario Development for Emerging AI Technologies* (Vincenzo Esposito, Cristiano Felaco, Biagio Aragona)
2. *Unpacking YouTube videos narratives on Artificial Intelligence* (Francesco Amato, Mattia De Angelis)
3. *AI-Powered Methods to Accelerate Social Research: Innovative Strategies for Addressing Pressing Social Issues* (Francesco Amato, Vincenzo Laezza)

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Addressing the Implications of Automated Decision-Making: A Delphi Approach to Scenario Development for Emerging AI Technologies

Esposito Vincenzo, Felaco Cristiano, Aragona Biagio

Summary of Background Data
The rapid proliferation of technologies based on machine learning, artificial intelligence (AI), and automation systems presents significant challenges related to their effectiveness, reliability, and ethical implications. Addressing these multifaceted issues necessitates innovative frameworks that account for the interactions among social, organizational, and technological factors
Objectives
This study addresses the social implications of automated decision-making systems and develops realistic scenarios to guide strategic decision-making within the sector.
Methods
The study employs the Delphi method, a systematic approach for gathering expert opinions and feedback, involving two distinct groups: technical practitioners in the automation sector and specialists in ethical and regulatory domains. The Delphi method [1,2] is implemented in four structured phases, designed to outline future scenarios reflecting potential advancements in automation and AI. Realistic scenarios are intended to provoke critical reflection on the implications of AI-driven decision-making technologies. In the first phase, experts will be asked to provide their perspectives on possible future scenarios. The second phase will involve a detailed analysis of these perspectives, identifying points of convergence and divergence. The experts will test a novel tool for evaluating emerging technologies in the third phase. Finally, in the fourth phase, the developed tool will be assessed in the context of the scenarios formulated during the initial phases.
Results
The expected outcomes of the Delphi analysis include actionable insights that can inform the development of responsible and sustainable solutions for automated decision-making systems.
Discussion/Conclusions
These scenarios will offer an in-depth perspective on the opportunities and risks associated with adopting automated decision-making systems, contributing to an informed debate on such technologies' ethical and regulatory implications. This work aims to outline a framework useful for future implementations of automated technologies, highlighting the importance of continuous dialogue between technical experts and specialists in ethics and regulation to address emerging challenges in the field of automation.

References

1. Linstone, H. A., & Turoff, M. (Eds.). (1975). *The delphi method* (pp. 3-12). Reading, MA: Addison-Wesley.
2. Helmer, O. (1968). Analysis of the future: The Delphi method. *Technological Forecasting for Industry and*

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Unpacking YouTube videos narratives on Artificial Intelligence

Francesco Amato and Mattia De Angelis

Summary of Background Data
The increasing use of artificial intelligence brings substantial challenges to understanding its benefits and harms individuals and society. The narratives on online platforms create shared meanings that influence technology's materiality. Understanding artificial intelligence narratives is essential for grasping contemporary and future complexities. YouTube offers a wide variety of content, including educational videos from public institutions, tech companies, experts, and content creators. Many of these videos focus on AI-related topics, sharing information and insights with users on the platform.
Objectives
This study analyses the narratives presented in YouTube videos about Artificial Intelligence.
Methods
For this research, we utilised the YouTube search engine to select specific search settings that resulted in videos about artificial intelligence. We extracted the subtitles from these videos, which we then organised into a structured format for the analysis.
Results
This study provides an overview of YouTube video narratives related to AI. It outlines a research strategy for capturing these video narratives using AI and text analysis tools.
Discussion/Conclusions
We argue that narratives about the future can significantly influence present decisions and actions; therefore, they can be analysed to understand the unfolding future. These narratives shape government policies and corporate investments, impacting which technologies are developed, who benefits from them, and what future scenarios are possible. Narrative analysis enables us to comprehend how futures are envisioned and their significant implications.

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AI-Powered Methods to Accelerate Social Research: Innovative Strategies for Addressing Pressing Social Issues

Francesco Amato and Vincenzo Laezza

Summary of Background Data
Artificial Intelligence (AI) offers unprecedented opportunities for social research, enabling faster large-scale analyses and fostering the development of innovative strategies to address pressing social issues.
Objectives
This contribution illustrates how AI-Powered Methods (AIPM) can accelerate scientific knowledge generation and decision-making processes by integrating quantitative and qualitative methods.
Methods
Through Machine Learning algorithms and Large Language Models (e.g., GPT), it is possible to accelerate data collection, pre-processing, classification and analysis, leading to the interpretation of diverse data sources, including text, images, and videos. However, a critical and reflexive perspective necessitates complementing these innovative approaches with traditional methods—such as hermeneutic analysis—to contextualise findings, avoid reductive interpretations, and mitigate algorithmic biases. The incorporation of triangulation strategies, rooted in a perspective of "critical optimism", ensures that AI-generated insights are enriched by the expertise of the social sciences, thereby enhancing both reliability and depth of interpretation.
Results
This study provides an overview of how AIPM in social research accelerates data collection and interpretation and provides a robust foundation for the development of innovative strategies and policies. It outlines how ethical and methodological considerations—supported by triangulation—are essential for responsibly harnessing AI's full potential, ensuring a socially beneficial and critically reflective use of these powerful tools.
Discussion/Conclusions
We argue that this hybrid approach can be applied in several socially impactful domains, from designing awareness campaigns and analysing emerging community phenomena to formulating more effective public policies. By enabling large-scale data analysis and real-time understanding of social dynamics, AIPM can improve decision-making and support targeted, inclusive interventions.

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Invited Session - INV *25* *Environmental attitudes, behaviors and awareness in Italy - Manuela Scioni*

Organized by Manuela Scioni
Chair Manuela Scioni

1. *Attitudes and Environmental Behaviours: A Comparison Between Millennials and Generation Z Background Data* (Elisa Cisotto, Francesca Luppi, Andrea Bonanomi, Alessandro Rosina)
2. *How to inspire Italy's next generation of Eco-Consumers: An online survey experiment* (Gabriele Lombardi, Alessio Muscillo, Elena Sestini, Elisa Castellaccio, Francesca Garbin, Paolo Pin)
3. *The environment around us: statistical insights into community perceptions using PASSI data* (Mattia Stival, Angela Andreella, Gaia Bertarelli, Enrica De Cian, Catarina Midões)

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Attitudes and Environmental Behaviours: A Comparison Between Millennials and Generation Z Background Data

Elisa Cisotto, Francesca Luppi, Andrea Bonanomi, Alessandro Rosina

Summary of Background Data
Millennials (born in the 1980s and 1990s) were the first generation to show broad support for addressing climate issues, while Generation Z (born from the mid-1990s to early 2010s) is often labelled as the "Green Generation," known for its activism. However, translating pro-environmental attitudes into effective behaviours requires adequate knowledge, socio-economic resources (e.g., education, income), positive attitudes, and a perception of individual impact [1,2]. This study explores the generational differences in environmental attitudes and behaviours, with a focus on factors that mediate their relationship.

Objectives

1. Compare pro-environmental attitudes and behaviours between Millennials and Generation Z.
2. Investigate the role of socio-economic resources, parental background, and perceived efficacy in shaping pro-environmental actions.
3. Apply mediation models to assess the influence of knowledge and positive attitudes on sustainable behaviours.

Methods
Data are drawn from the 2018 and 2023 editions of the *Rapporto Giovani*, a nationally representative survey conducted by the Istituto Toniolo. The 2018 sample includes 2,000 respondents aged 21–34, while the 2023 sample consists of 2,000 respondents aged 18–34. Descriptive analyses and mediation models assess the pathways linking socio-economic resources, environmental attitudes, and behaviours.

Results/Discussion
Preliminary findings indicate that Generation Z exhibits stronger environmental attitudes but is less likely than Millennials to translate these attitudes into sustainable actions. Socio-economic resources and perceived efficacy emerge as significant predictors of pro-environmental behaviours, while parental background influences environmental attitudes. Further analyses will clarify the pathways linking these factors using mediation models. The results highlight the role of enhancing knowledge, strengthening perceptions of individual efficacy, and leveraging social norms to potentially activate pro-environmental behaviours among Generation Z.

References

1. Anaby, D., Law, M., Coster, W., Bedell, G., Khetani, M., Avery, L., Teplicky, R.: The mediating role of the environment in explaining participation of children and youth with and without disabilities across home, school, and community. Arch. Phys. Med. Rehabil. 95(5), 908–917 (2014)
2. Bonanomi, A., Luppi, F.: A European mixed methods comparative study on NEETs and their perceived environmental responsibility. Sustainability 12(2), 515 (2020)

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How to inspire Italy's next generation of Eco-Consumers: An online survey experiment

Gabriele Lombardi, Alessio Muscillo, Elena Sestini, Elisa Castellaccio, Francesca Garbin and Paolo Pin

Summary of Background Data
The current study involves a thorough investigation of sustainable attitudes and behaviors among adolescents. This research presents findings from a randomized survey experiment conducted with Italian high school students. We emphasize young individuals, as they represent the future of society, and because adolescence is a crucial period for behavior modification [1], particularly in relation to pro-environmental behaviors (PEB) [2].
Objectives
We aim to address the following questions: *i)* How important do Italian adolescents perceive the reduction of meat, water, and fast-fashion clothing consumption to be? *ii)* Are they more responsive to socio-environmental arguments or individual-economic ones? *iii)* Does this responsiveness vary based on specific individual attitudes?
Methods
The treatment consists of two possible brief texts. Each participant is randomly assigned to one of two treatment groups. Individuals in the control group did not receive any text. There are two types of treatments: a socio-environmental argument and an economic-individual argument, designed to explore if one type of information is more persuasive for adolescents. To assess Individual Attitudes and Perceived Awareness, a Principal Component Analysis for ordinal discrete variables (PRINCALS) [3] was conducted. Our dependent variables are derived from three questions aimed at investigating students' views on the necessity of reducing their consumption of meat, water, and fast-fashion clothing. For this analysis, Ordered Multinomial Logit models were estimated for all three items listed above.
Results
All treatments consistently demonstrate a positive and significant effect, indicating their overall effectiveness. Notably, for water and clothing, the coefficient of the socio-environmental treatment is considerably larger than that of the economic-individual treatment. For meat consumption, the coefficient of the economic-individual argument is not statistically different from that of the socio-environmental treatment. Individual Attitudes appear to have a positive correlation with pro-environmental willingness, particularly the aspect related to *Nutrition Enthusiasm*, suggesting that a strong focus on personal health is associated with heightened awareness of global health. Furthermore, high levels of *global awareness* are positively correlated with at least a reduction in meat and clothing consumption.
Discussion/Conclusions
Italian adolescents exhibit a strong receptiveness to information regarding environmental issues, which could promote ecological behaviors in these individuals as they transition into future eco-consumers. Surprisingly, socio-environmental arguments have proven to be more effective than economic-individual arguments in enhancing the willingness to decrease harmful consumption patterns. However, for individuals who prioritize relaxation and social connections over health, the treatments may have an unintended counterproductive effect.

References

1. Muscillo, A., Lombardi, G., Sestini, E., Garbin, F., Tambone, V., Campanozzi, L. L., & Pin, P.: Adolescents' Opinions on COVID-19 Vaccine Hesitancy: Hints toward Enhancing Pandemic Preparedness in the Future. Vaccines, 11(5), 967 (2023)
2. Palupi, Tyas and Dian R Sawitri: The importance of pro-environmental behavior in adolescent. In: E3S Web of Conferences. Vol. 31. EDP Sciences, p. 817 09031 (2018)
3. Gifi, A. Nonlinear Multivariate Analysis; Wiley-Blackwell: Hoboken, NJ, USA, 1990

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The environment around us: statistical insights into community perceptions using PASSI data

Mattia Stival, Angela Andreella, Gaia Bertarelli, Enrica De Cian and Catarina Midões

Summary of Background Data
Understanding community perceptions of environmental health, such as air pollution or climate change, is essential for anticipating public response, fostering policy acceptance, and effectively engaging communities in health efforts. Using the PASSI (Progressi delle Aziende Sanitarie in Italia, see e.g. [1]) survey's environmental module from 2023, this study explores Italian citizens' perceptions of their local environment compared to objective environmental data.
Objectives
To investigate the alignment between perceived environmental risks and objective data, enabling the development of livability indicators, benchmarks, and targeted public health interventions.
Methods
We compare different statistical and machine learning models to analyze and predict environmental concerns of the respondents, by correlating these with objective measurements (e.g., pollution and temperature data from SHAREenv [2]) and individual characteristics (e.g. sex, age, educational level, diagnoses). Hold-out cross-validation is used to compare predictive abilities of the models. Shapley values at the local level were calculated to give interpretations to machine learning models. Bootstrap resampling techniques were used to enhance spatial comparisons.
Results
Correlations between self-reported concerns and objective environmental data were observed. The analysis revealed high sub-regional variation in environmental concerns, correlated with localized key issues such as air quality, traffic pollution, and industrial emissions.
Discussion/Conclusions
Integrating survey-based perceptions with objective environmental data provides nuanced insights into local environmental concerns, informing policy development and public health initiatives with a localized focus. The study underscores the importance of comprehensive, geographically representative data for addressing environmental health disparities.

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References

1. Baldissera, S., Campostrini, S., Binkin, N., Minardi, V., Minelli, G., Ferrante, G., Salmaso, S., et al: . Features and initial assessment of the italian behavioral risk factor surveillance system (passi), 2007-2008. Preventing Chronic Disease, 8(1) (2011).
2. Midões, C., De Cian, E., Pasini, G., Pesenti, S., and Mistry, M. N.: Share-env: A data set to advance our knowledge of the environment–wellbeing relationship. *Environment & Health*, 2(2):95–104. (2024)

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Invited Session - INV *26* *Statistical methods for socio-economic applications - Andrea Marletta*

Organized by Andrea Marletta
Chair Andrea Marletta

1. *The Evolution of Required Skills in Italian Digital professional profiles: Soft Skills and Recruitment Dynamics* (Paolo Mariani, Andrea Marletta, Daniele Pirotta, Mariangela Zenga)
2. *Dynamic trajectories of gender gaps in Europe: a cluster analysis of progress and persistent inequalities* (Erika Grammatica, Francesca Greselin, Mariangela Zenga)
3. *Quantum neural networks for medical data: A statistical analysis of quantum performance* (Matteo Borrotti, Francesco Ghisoni, Paolo Mariani)

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The Evolution of Required Skills in Italian Digital professional profiles: Soft Skills and Recruitment Dynamics

Paolo Mariani, Andrea Marletta, Daniele Pirotta and Mariangela Zenga

Summary of Background Data
Work, in an evolving context, influences production factors and labor force dynamics. Access to the labor market is crucial for the meeting of supply and demand, with skills playing a key role in improving the competitiveness of businesses and employees, reshaping compensation structures. In an innovation-driven environment, soft skills emerge as a response to the challenge of change, essential for addressing the risk of skills obsolescence. Therefore, analyzing the relationship between the recruitment process and the required skills is critical.
This study uses a dataset of over one and a half million job placements across the main macro-sectors in Italy (2016-2024), with statistical units relating to candidates and the soft skills necessary for selection.
The analysis focuses on professional profiles within the "IT and Digital" sector, reclassified according to the ESCO definition as "Information and communications technology professionals."
Objectives
The study aims to analyze the evolution of the skills required in the selection process of these professionals in Italy, examining trends and dynamics in recruitment processes. In this context, the goal is to outline potential career trajectories for various roles within the ESCO-25 classification.
Methods
To analyze the matching between professional profiles and candidates' soft skills, statistical methods based on time trajectories are used [1]. These techniques are particularly effective for analyzing multidimensional data, which includes variables such as professional profiles, demographic characteristics, required soft skills, and years of observation. The application of these methodologies [2] allows for the identification of the professional evolution of selected figures and the emergence of new skills [3].
Results
The analysis of the database reveals how soft skills influence the type and duration of contracts. A temporal evolution of soft skills is observed, with some becoming obsolete and others recently introduced. For ESCO-25 figures, the demand for soft skills has increased, with "team working" being the most requested skill. The majority of job placements involve young individuals in the early years of their careers, with contracts lasting more than two weeks.
Discussion/Conclusions
Ongoing monitoring and analysis of the soft skills required in the labor market would help optimize companies' recruitment processes, increasing candidates' awareness of the skills necessary to secure a job position.

References

1. Coppi, R., & D'Urso, P. (2001): The geometric approach to the comparison of multivariate time trajectories. In Advances in Classification and Data Analysis (pp. 93-100). Springer Berlin Heidelberg.
2. Liberati, C., & Mariani, P. (2012): Banking customer satisfaction evaluation: a three-way factor perspective. Advances in Data Analysis and Classification, 6, 323-336.
3. Mariani, P., Marletta, A., & Zenga, M. (2020): Desiderata d'impresa e valorizzazione delle competenze: Una lettura delle evidenze in Italia attraverso The Adecco Group. PKE srl.

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Dynamic trajectories of gender gaps in Europe: a cluster analysis of progress and persistent inequalities

Erika Grammatica, Francesca Greselin, Mariangela Zenga

Summary of Background Data
Achieving gender equality is a fundamental objective of the European Union (EU), reflecting its commitment to inclusivity and fairness. While positive trends include increased labor market participation and educational advancements for women, disparities remain prevalent.
This study examines gender inequality dynamics in the EU's 27 member states over the past decade, focusing on work, education, and money. Using Principal Component Analysis (PCA), trajectory analysis, and dynamic cluster analysis, it uncovers temporal patterns and identifies clusters of countries with similar progressions. Results reveal significant heterogeneity among EU member states, with some showing steady progress and others lagging.
These findings underline the importance of targeted, evidence-based policies to address countries' diverse challenges.
Data from the European Institute for Gender Equality (EIGE) were used. In particular, the variables on the domains of Work ("Full-time equivalent employment rate" and "Duration of Working life"), Knowledge/Education ("Graduates of tertiary education" and "Lifelong learning") and Money ("Mean equivalised net income" and "At-risk-of-poverty rate") [2].
Objectives
The aim of this research is to examine and understand the dynamics of gender inequality in three crucial contexts, work, education and money, in the 27 Member States of the European Union over the last 10 years. Specifically, the research aims to analyse the temporal trajectories of countries in terms of gender equality, highlight the progress made and the differences between EU countries.
Methods
The methods used were Principal Component Analysis (PCA), trajectory analysis and dynamic cluster analysis. PCA was used to reduce the dimensionality of the data and allow the country trajectories to be represented in a two-dimensional graph, with annual points connected to visualize the temporal evolution. Dynamic cluster analysis identifies groups of countries sharing similar patterns in their trajectories, based on position and rate of progress in gender equality metrics [1] , [3].
Results
From the time trajectories it was possible to identify the states with positive growth paths towards gender equality in the sectors of work, education and money.
From the cluster analysis, groups of countries with negative situations for women were identified, groups that show the best examples of equal policies, while others present mixed conditions.
Discussion/Conclusions
The path towards gender equality in the EU remains uneven and incomplete: some countries have already achieved favourable conditions, while others face significant challenges. Continued commitments and coordinated actions are needed for lasting progress.

Acknowledgments
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References

1. D'Urso P.: Dissimilarity measures for time trajectories. Journal of the Italian Statistical Society, 9(1), 54-65 (2000)
2. EIGE: Gender Equality Index 2023, Towards a green transition in transport and energy (2023). https://eige.europa.eu/publications-resources/publications/gender-equality-index-2023-towards-green-transition-transport-and-energy?language content entity=en
3. Maruotti A., Vichi M.: Time-varying clustering of multivariate longitudinal observations. Communications in Statistics - Theory and Methods, pp. 430-443 (2016)

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Quantum neural networks for medical data: A statistical analysis of quantum performance

Matteo Borrotti and Francesco Ghisoni and Paolo Mariani

Quantum information science explores the preparation, control, and manipulation of quantum states in physical systems, aiming to revolutionize information transmission and processing. This interdisciplinary field, encompassing quantum communication, computation, and information, represents a paradigm shift in understanding and utilizing information [1]. Importantly, quantum computing holds the potential to address computational challenges that are intractable for classical systems, offering new frontiers for data science.

The link between quantum computing and statistical learning is fundamental [2]. Statistical methods like inference and estimation are key to understanding quantum phenomena. Quantum learning extends classical techniques by leveraging quantum features like superposition and entanglement, improving computational efficiency and performance.

Neural networks have emerged as powerful models in machine and statistical learning due to their ability to capture complex relationships between variables. With the advent of quantum computing, a novel class of learning models, quantum neural networks (QNNs), has been proposed. These models harness quantum effects to enhance representational power, training efficiency, and optimization. However, understanding the theoretical foundations and practical advantages of QNNs remains an active area of research.

In this work, we deploy newly developed ideas in QNNs to medical data analysis to show the possible advantages of such approaches on these data. For this purpose, we analyze the National Institute of Diabetes and Digestive and Kidney Diseases Diabetes dataset [3]. Based on diagnostic measurements, the objective is to predict whether a patient has diabetes. We perform a comprehensive analysis of QNNs to identify the key elements of the architecture that most affect the performance in a classification task. Our approach involved testing many QNN configurations and systematically evaluating their performance. We tested the encoding techniques, the number of layers, the ansatz repetition scheme, and the loss functions among the different possible hyper-parameters.

Results showed that appropriate encoding and loss functions significantly improve classification performance. While adding layers can enhance results, too many layers lead to diminishing returns. Further studies would help us better understand how these models perform in complex scenarios, such as multi-class classifications or unbalanced classification problems.

In conclusion, the interplay between quantum computing and statistical science offers mutual benefits. On one side, statistical science provides essential tools and methodologies to analyze, interpret, and optimize quantum algorithms, facilitating a deeper understanding of quantum phenomena and improving computational efficiency. On the other, the computational capabilities of quantum computing have the potential to enable the resolution of complex problems and the development of novel statistical models.

References

1. Ciliberto, C., Herbster, M., Ialongo, A.D., Pontil, M., Rocchetto A., Severini, S., Wossnig, L.: Quantum machine learning: a classical perspective. Proc. R. Soc. A. **474**, 1–25 (2017).
2. Wang, Y., and Liu, H.: Quantum Computing in a Statistical Context. Annual Review of Statistics and Its Application. **9**, 479–504 (2022).
3. Smith, J.W., Everhart, J.E., Dickson, W.C., Knowler, W.C., Johannes, R.S.: Using the ADAP learning algorithm to forecast the onset of Diabetes Mellitus. **9**, 261–265 (1988).

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Invited Session - INV *27* *Identification of Online Racism and Xenophobia (PRIN PNRR 2022 TOLERANT) (1) - Giuseppe Giordano and Michelangelo Misuraca*

Organized by Giuseppe Giordano and Michelangelo Misuraca
Chair Michelangelo Misuraca

1. *Identifying network patterns of hate speech on social media* (Luca De Benedictis, Giuseppe Giordano, Maria Prosperina Vitale)
2. *Challenges and approaches in creating a comprehensive dataset for annotating Italian online perspectives* (Alex Cucco, Emiliano del Gobbo, Lara Fontanella)
3. *Narratives on Immigration: A Comparative Analysis of Italian Press Across Different Governments* (Gemano Nocera, Valeria Policastro, Giancarlo Ragozini)

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Identifying network patterns of hate speech on social media

Luca De Benedictis, Giuseppe Giordano and Maria Prosperina Vitale

Background
In recent years, the proliferation of hate speech on social media has raised significant concerns regarding its impact on individuals and society. This paper explores the identification of network patterns associated with hate speech across social media platforms using data science techniques [1].
Objectives
We propose an approach based on network analysis and natural language processing, to detect and analyze hate speech propagation. By examining interactions such as retweets, mentions, and replies within social networks, we identify key nodes, influential users, and potential hot-spots where hate speech tends to spread. Text mining techniques are used to define textual labeled networks which may give new insight uncovering sub-graph patterns, whereas community detection methods allow to highlight complex network properties [2].
Methods
Our methodology leverages both linguistic features and social network structures to uncover hidden patterns and provide deeper insights into the dynamics of online hate speech [3]. Data collected on X (former Twitter) contents are analyzed in the scope of social network data at a double level: considering the individual user who act on the social media (users network) and the textual content of their posts after data cleaning and text normalization (words co-occurrence network).
Results
The expected outcome of this study include the identification of central users and communities that act as amplifiers of hate speech in its dissemination. We uncover specific network structures, such as clusters of users that consistently propagate harmful content, and recognizing the role of influential accounts in shaping discourse. Additionally, the study aims to reveal associations between particular nodes' attribute data and network features, which could inform automated detection systems. The findings contribute to the development of more effective strategies for content moderation, community management, and the prevention of harmful behavior in digital spaces.

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References

1. Alkomah, F., & Ma, X. (2022). A literature review of textual hate speech detection methods and datasets. Information (Switzerland), 13(6), 273.
2. Himelboim, I., Smith, M. A., Rainie, L., Shneiderman, B., & Espina, C. Classifying Twitter Topic-Networks Using Social Network Analysis. Social Media + Society, 3(1) (2017)
3. Rawat, A., Kumar, S., & Samant, S. S.: Hate speech detection in social media: Techniques, recent trends, and future challenges. WIREs Computational Statistics, 16(2), e1648 (2024)

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Challenges and approaches in creating a comprehensive dataset for annotating Italian online perspectives

Alex Cucco, Emiliano del Gobbo and Lara Fontanella

Summary of Background Data
Online platforms are nowadays key spaces for public discourse on complex issues like social rights, including a wide range of cultural, political, and individual perspectives. This diversity, while valuable for computational analysis, poses challenges in curating representative datasets. An inclusive dataset of different perspective is essential for training machine learning models, particularly in applications requiring explainability [1]. Without such diversity, models risk perpetuating bias or reinforcing stereotypes, compromising their fairness and utility.
Objectives
This study aims to construct a comprehensive dataset of online opinions for human annotation, focusing on Italian-language content. By capturing a wide spectrum of topic and sentiment in online discourse, the goal is to ensure inclusivity and minimise bias. The curated dataset will support the development of fair and explainable models, aiming at improving their ethical and effective use in analysing sensitive topics.
Methods
To guarantee a wide coverage of the online topics and sentiment, we aim to show the importance of the selected sampling techniques and the potential benefit of leveraging on network analysis and node sampling to address this problem.
Results
We will present an application based on online content related to migration. A dataset of 42386 Facebook comments related to migration will be analysed. After recognising the well-known limitation of Italian lexical resource, we will introduce the utilised sampling technique able to guarantee a wide coverage of both topic and sentiment among the corpora.
Discussion/Conclusions
Effective sampling techniques are crucial in constructing comprehensive datasets of online opinions. A tailored-designed sampling approach ensures that the dataset captures the full spectrum of perspectives, including minority and marginalised voices, thereby minimising bias. By employing network sampling strategies, we aim to create a dataset that better represent the complexity of online discourse.

Acknowledgements: This work is part of the research project PRIN-2022 PNRR “Identification and Critical Analysis of Online Racism and Xenophobia against (Im)migrants and Roma people” (Project Code: P2022APKJL), funded by the European Union – Next Generation EU.

References

1. Frenda, S., Abercrombie, G., Basile, V. et al. Perspectivist approaches to natural language processing: a survey. Language Resources and Evaluation (2024). https://doi.org/10.1007/s10579-024-09766-4

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Narratives on Immigration: A Comparative Analysis of Italian Press Across Different Governments

Gemano Nocera, Valeria Policastro, Giancarlo Ragozini

Summary of Background Data
Public discourse around immigration represents a phenomenon of crucial importance in our country's political debate. This work examines the semantic evolution of media narratives on immigration in Italy across three recent legislative periods, focusing on analyzing journalistic articles from politically oriented newspapers and magazines. The study investigates how political contexts and media biases shape public discourse on immigration, highlighting thematic trends and the language used to frame migrant issues. The analysis utilized articles published between September 2016 and March 2024 from daily and monthly newspapers, sourced from the project "TOLERANT: Identification and Critical Analysis of Online Racism and Xenophobia against (Im)migrants and Roma People." The corpus comprised 1,997 documents, categorized by political leaning (left and right) and government period.
Objectives
Our primary goal was to identify recurring themes, divergences, and nuances in the language and narratives about immigration in Italian media. Through this analysis, we aimed to understand how media representations shift under different governments.
Methods
We employed advanced text mining techniques, including Latent Dirichlet Allocation (LDA) as described in [1], to perform topic modeling on a corpus of journalistic articles. The data comprised articles from politically oriented newspapers and magazines, representing both left- and right-leaning perspectives across three legislative periods and their respective governments. Following the principles outlined in [2], we applied preprocessing steps such as tokenization, lemmatization, and filtering to prepare the text data. We used metrics like perplexity to determine the optimal number of topics for analysis. Additionally, we conducted an archetypal analysis inspired by the methodology of Cutler and Breiman (1994) [3] to cluster and interpret latent patterns.
Results
Our analysis revealed significant variations in how immigration was discussed by left- and right-leaning newspapers depending on the government in power. For instance, during the Conte II government, rightleaning outlets focused on security and economic burdens, while left-leaning sources emphasized humanitarian aspects. These patterns shifted under subsequent administrations, reflecting changes in political and public priorities. Overall, our findings highlighted a clear interplay between government narratives and media framing.
Discussion/Conclusions
Through this research, we demonstrated how probabilistic models like LDA can uncover latent structures in text data. Our results highlighted the role of political orientation in shaping media narratives, offering insights into the mechanisms that influence public opinion. Future work could extend this approach to analyze other socio-political topics or explore cross-country comparisons.

References

1. Blei, David M., Ng, Andrew Y., Jordan, Micheal I. "Latent dirichlet allocation." Journal of machine Learning research 3 Jan (2003): 993-1022.
2. Porter, Martin F. "An algorithm for suffix stripping." Program 14.3 (1980): 130-137.
3. Cutler, Adele, and Leo Breiman. "Archetypal analysis." Technometrics 36.4 (1994): 338-347.

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Invited Session - INV *28 New approaches and measures to address changing society - Alessia Naccarato*

Organized by Alessia Naccarato
Chair Alessia Naccarato

1. *Residential segregation and accessibility: an integrated multi-data approach to mapping urban inequalities at a fine spatial scale* (Federico Benassi, Antonio De Falco)
2. *Measuring Socio-economic Phenomena by using Generalised Structural Component Analysis: An Application to Subjective Well-being* (Leonardo Salvatore Alaimo)
3. *Complexity reduction of multi-dimensional ordinal data systems using bucket orders* (Marco Fattore)

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Residential segregation and accessibility: an integrated multi-data approach to mapping urban inequalities at a fine spatial scale.

Federico Benassi and Antonio De Falco

Summary of Background Data
Residential segregation, the spatial separation of social groups within cities, is one of the main drivers of urban inequalities worldwide [1]. This phenomenon significantly impacts access to urban resources, particularly for disadvantaged groups. However, the relationship between residential segregation and accessibility to services has been underexplored in the Italian context. This study focuses on Naples, a city characterized by stark socio-economic inequalities, to analyze how the social composition of urban areas affects access to urban resources.
Objectives
This study focuses on Naples, a city characterized by stark socio-economic inequalities, to analyze how the social composition of urban areas affects access to urban resources.
Methods
The research combines spatial and multivariate analysis, using demographic, economic, and accessibility data collected at a local level. Specifically, a multi-phase methodology was applied, combining data at a micro-territorial level. Standardized sub-municipal territorial units, derived through areal interpolation techniques [2], were analyzed using methods such as Principal Component Analysis (PCA) to construct composite indices of socio-economic status and urban accessibility. Local spatial statistical techniques, including the bivariate Local Moran's I statistic, were used to investigate the relationship between socio-economic status and accessibility.
Results
The results reveal a complex situation. On the one hand, socio-economic inequalities follow a clear center-periphery pattern, with disadvantaged areas often concentrated farther from the city center. However, not all these areas have limited access to services. Conversely, some affluent neighborhoods also experience limited accessibility, reflecting factors such as the social isolation of wealthier groups.
Discussion/Conclusions
These findings highlight the importance of collecting detailed local data to better understand inequalities and suggest the need to establish urban observatories to monitor these dynamics. Ultimately, by uncovering patterns of segregation and accessibility, this study contributes to the broader discourse on urban inequalities and spatial justice in Southern European cities [3].

References

1. Van Ham, M., Tammaru, T., Ubarevičienė, R., Janssen, H.: Urban Socio-Economic Segregation and Income Inequality: A Global Perspective. Springer Nature, Cham, Switzerland (2021)
2. De Falco, A., Irpino, A.: A new approach for measuring and analyzing residential segregation. Qual. Quant. (2024)
3. Benassi, F., Iglesias-Pascual, R., Salvati L.: Residential segregation and social diversification: Exploring spatial settlement patterns of foreign population in Southern European Cities. Hab. Int. (2020)

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Measuring Socio-economic Phenomena by using Generalised Structural Component Analysis: An Application to Subjective Well-being

Leonardo Salvatore Alaimo

Summary of Background Data
The measurement process in social sciences is associated with the construction of systems of indicators, capable of grasping the complex and multidimensional nature of socio-economic phenomena. It is necessary to use a variety of basic indicators and a criterion for summarising the information they contain. Among the various methods proposed in the literature for synthesis, this paper presents the generalised structural component analysis (GSCA) [1].
Objectives
The main objective of this work is to propose the application of GSCA as a method for synthesising systems of indicators and construct a measure of subjective well-being (SWB) by using data from the fourth European Quality of Life Survey of 2016, realised by Eurofound [2].
Methods
GSCA is a component-based structural equation modelling method, which, differently from partial least squares, provides a global least squares optimisation criterion to estimate the model parameters [1]. Over the years, various extensions of GSCA have been developed to treat a wide range of data types [3]; in particular, in this work we focus on categorical data, the higher-order components, and the multiple group analysis. It aims at analysing the relationships among observed and latent variables, that are constructed as a component or weighted composite of the observed ones.
Results
By using data from the 2016 European Quality of Life Survey, we define a synthetic measure of SWB (second order latent variable) by considering two dimensions, affective and cognitive (first order latent variables), and 9 observed basic indicators. The SWB indicator and its 2 components are reported both at individual and national level for each European country.
Discussion/Conclusions
The paper shows the potentialities of GSCA for measuring socio-economic phenomena, by proposing an application to SWB in European countries. The results revealed that the proposed multidimensional model of SWB achieved a strong fit, confirming the importance of the 2 components considered. The proposed measure could be a reliable tool for policymakers to monitor subjective quality of life across different demographic groups, enabling targeted interventions. Future studies could extend the SWB framework by integrating longitudinal data to capture changes over time, offering insights into the dynamics of subjective wellbeing.

References

1. Hwang, H., Takane, Y.: Generalized structured component analysis. Psyc. **69**, 81–99 (2004)
2. Eurofound: European Quality of Life Survey 2016: Quality of life, quality of public services, and quality of society. Publications Office of the European Union, Luxembourg (2017)
https://www.eurofound.europa.eu/en/publications/2018/european-quality-life-survey-2016
3. Hwang, H., Takane, Y.: Generalized structured component analysis: A component-based approach to structural equation modeling. CRC Press (2014)

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Complexity reduction of multi-dimensional ordinal data systems using bucket orders

Marco Fattore

Summary of Background Data
Many socio-economic constructs/traits are inherently multi-dimensional and multi-faceted and their statistical description requires combining different systems of (often) *ordinal* indicators, into a single and expressive data structure. Since ordinal indicator systems are naturally represented as partially ordered sets (*posets*), this calls for ways to "melt" different posets into a "synthetic" one, approximating and condensing information from each of the inputs. The approximating poset should balance between goodness-of-fit and expressiveness, easing the interpretation, still keeping some of the input complexity.
Objectives
The goal of the paper is to present an original algorithm for approximating single or multi-poset systems through *bucket orders* (BO) [1]. These are *linear sums of antichains* (here called *buckets*), where statistical units are partitioned into groups (of incomparable elements), which are then vertically ordered, so arranging the input data in a "ranking of clusters". As a result BOs capture both the *horizontal* (incomparability) and the *vertical* (comparability/dominance) dimensions of the input posets, proving more informative than unidimensional rankings and less complex than generic posets.
Methods
Tools from partial order theory are employed, (i) to turn the search for the best approximating BO into the minimization of a proper loss function, quantifying the structural difference between pairs of posets and (ii) to design the moves that the algorithm must take, to effectively search the BO space.
Results
A greedy algorithm that takes as input the poset system to be approximated and an initial "minimally informative" BO and progressively modifies it driven by the loss function, till a linear order is obtained. The BO minimizing the loss in the resulting sequence is finally selected [2]. The "bucketization" procedure is exemplified on data pertaining to subjective well-being in Italy.
Discussion/Conclusions
The proposed algorithm is a new step in the use of order theory for data analysis. Further research will be devoted to making the search computationally faster and to introduce constraints on the number of buckets of the final BO.

References

1. Aledo, J.A., Gámez, J.A., Rosete, A.: Utopia in the solution of the bucket order problem. Decis. Support Syst. **97**, 69-–80 (2017)
2. Arcagni, A., Avellone, A, Fattore M.: Complexity reduction and approximation of multidomain systems of partially ordered data. Comput. Stat. Data Anal. **173**, (2022)

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Invited Session - INV *29* *Environmental Modelling and Complex Data Integration (PRIN 2022 CoEnv and BAC-GRINS HAIRQ-MAP) - Pasquale Valentini and Rosalba Ignaccolo*

Organized by Pasquale Valentini and Rosalba Ignaccolo
Chair Pasquale Valentini

1. *Linear and non-linear Spectral Methods for Spatial Downscaling* (Luigi Ippoliti, Tonio Di Battista, Luigi Di Carlo, Stefania Fensore, Eugenia Nissi, Pasquale Valentini, Carlo Zaccardi)
2. *Air quality data fusion using fixed rank kriging* (Alessandro Fusta Moro, Alessandro Fassó)
3. *Data integration for abundance mapping* (Natalia Golini, Giacomo Zoppi, Rosaria Ignaccolo, Michela Cameletti, Anna Lo Presti)

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Linear and non-linear Spectral Methods for Spatial Downscaling

Ippoliti L.[1], Di Battista T. [2], Di Carlo L. [3], Fensore S. [4], Nissi E. [5], Valentini P. [6], Zaccardi C. [7]

Summary of Background Data
This work focuses on harmonizing and integrating diverse datasets, including air quality, meteorological, and geophysical data. This includes pollutant concentration data from the Copernicus Atmosphere Monitoring Service (CAMS) and the European Environment Agency (EEA) air quality monitoring stations.
Objectives
We tackle the challenges of spatial downscaling [1] by developing and applying advanced statistical and machine learning models. Our primary focus is on modelling particulate matter (PM) concentrations and implementing a methodology to downscale PM data from CAMS to finer spatial resolutions. This approach involves aligning and calibrating CAMS-derived estimates with point-level PM measurements from monitoring stations, thereby enhancing spatial precision and representativeness.
Methods
We develop both linear and non-linear regression models to harmonize input data at varying spatial resolutions, standardizing them at the municipality level. This approach provides a comprehensive, model-based solution to the change-of-support problem [1].
Results
Preliminary analyses using the Efficient Sub-Pixel Convolutional Neural Network (ESPCN) [2] and functional regression models based on spectral methods suggest that particulate matter concentrations can be effectively downscaled to the municipality level, achieving high spatial resolution and improved accuracy.
Discussion
Future work will focus on implementing alternative loss functions to improve the accuracy of reconstructed images. Moreover, we plan to incorporate spatially-varying coefficients in the model formulation.

Acknowledgments
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References

1. Berrocal,V.J., Gelfand,A.E. and Holland,D.M. A spatio-temporal downscaler for output from numerical models. Journal of Agricultural, Biological, and Environmental Statistics, 15, 176–197 (2010).
2. Shi, W., Caballero, J. , Huszar, F., Totz, J., Aitken, A. P., Bishop, R., Rueckert, D. and Wang, Z. Real-Time Single Image and Video Super-Resolution Using an Efficient Sub-Pixel Convolutional Neural Network. In IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 1874–1883 (2016)

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Air quality data fusion using fixed rank kriging

Alessandro Fusta Moro and Alessandro Fassò

Summary of Background Data
One of the main goals of the GRINS (Growing Resilient INclusive and Sustainable) project is to build a platform called AMELIA where hundreds of daily information about Italian municipalities are collected and made available to guide policymakers into a data-driven framework. AMELIA data will cover business, economy, population, climate and environment. The University of Bergamo is involved in modelling and harmonising environmental variables, such as climate, air quality, and emissions, which are key drivers for a sustainable transition.
Objectives
Our application aims to model NO_2 concentrations at the national level, using several sources and considering external influences such as weather and emissions. The objective is to combine multiple sources within the same framework, using statistical models capable of: accounting for spatiotemporal correlation, solving change of support problems, handling missing data, supporting large datasets, providing uncertainties about predictions and modelling complex environmental phenomena, including space-varying variability, measurement-related errors and highly non-stationary spatio-temporal correlated processes.
Methods
We use the Fixed Rank Kriging (FRK) approach, as designed by [1] and implemented in R by [2]. FRK is a hierarchical statistical model that considers data as noisy observations of a true unknown process. It handles large datasets using a low-rank approximation of the spatiotemporal process to reduce the computational burden. This approximation is achieved through a combination of randomly weighted basis functions, whose weights are modelled as a Gaussian process with a flexible, non-stationary covariance function. The combination with the basis further enhances the non-stationary capabilities of the process.
Results
The application of the FRK model requires several settings to be defined. In particular, the shape and location of the basis functions are crucial decisions in approximating the original process. Therefore, particular attention is given to the specification of the model, which includes several aspects as variables selection, discretisation of the domain, choosing locations of basis functions, find weights for heteroschedasticity, etc.. In our applications, the model specification is focused on creating daily maps of NO_2 concentrations for Italy. Moreover, different strategies are evaluated to tackle the problem of large datasets (e.g., sliding window approaches).
Discussion/Conclusions
Data provided on high-resolution maps (e.g., 0.05° x 0.05°) can be easily aggregated to municipalities using trivial principles (e.g. aggregate). These maps may also enhance the analysis of spatial variability within the same municipality (e.g., metropolitan areas with strong internal differences) and can be matched with population data to derive exposure curves for airborne pollutants. Moreover, this application could represent a candidate for being considered as a standard approach within the GRINS framework to address the need for statistical models for data fusion purposes.

References

1. N. Cressie and G. Johannesson. Fixed rank kriging for very large spatial data sets. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 70(1):209–226, 2008.
2. A. Zammit-Mangion and N. Cressie. FRK: An R package for spatial and spatio-temporal prediction with large datasets. *arXiv preprint arXiv:1705.08105*, 2017.

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Data integration for abundance mapping

Natalia Golini, Giacomo Zoppi, Rosaria Ignaccolo, Michela Cameletti, Anna Lo Presti

Summary of Background Data
The rapid decline in biodiversity is one of the most pressing challenges of our time. Vegetation is a cornerstone of biodiversity, as its preservation is essential to sustaining diverse ecosystems [2]. To combat biodiversity loss effectively, it is vital to map the geographical distribution of species, providing the foundation for targeted conservation strategies. The SVeBio project (Statistics for Vegetation Biodiversity: estimation and mapping)[1] aligns with this objective and aims to provide model-based and model-assisted methods for producing spatial maps for forests and coastal sand dunes considering data from probability sampling surveys, purposive field campaigns and remote sensing information. These different sources produce data with varying characteristics. One can record presence/absence or abundance information, have data limited to presence-only or abundance-only, or obtain various pieces of information at different spatial granularities for certain covariates. In addition to the differences in the data collection type, another significant distinction lies in the mechanism determining how these data are gathered. For example, the geographic locations where the presence or absence of a species is observed can be chosen in various ways, even if the type of data recorded does not change. One may follow a completely random scheme, adopt a deterministic approach, or prioritize sites where the variable of interest is expected to be found. Different data sources and collection methods result in different data structures requiring different modelling approaches.
Objectives
In this work, our aim is to develop a hierarchical model integrating data from probability sampling surveys and purposive field campaigns to provide abundance mapping.
Methods
Recently, Gelfand and Shirota [3] proposed a hierarchical model that takes into account bias in the sampling of spatial locations (i.e., preferential sampling, [1]) for presence/absence data and the integration of presence/absence data with presence-only data to improve prediction accuracy. We are working on extending their proposal to the case of abundance data (e.g., counts) and validating it with an extensive simulation study.

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References

1. Diggle, P. J., Menezes, R., Su, T. L.: Geostatistical inference under preferential sampling. Journal of the Royal Statistical Society Series C: Applied Statistics, 59(2), 191-232. (2010)
2. European Commission: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. EU biodiversity strategy for 2030 - Bringing Nature Back Into Our Lives (2020)
3. Gelfand, A. E., Shirota, S. : Preferential sampling for presence/absence data and for fusion of presence/absence data with presence-only data. Ecological Monographs, 89(3), e01372, (2019)

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[1] https://sites.google.com/view/svebio-project

Invited Session - INV *30* *Data-Driven Approaches to Financial Integrity and Local Governance Case Studies and Insights - Domenica Fioredistella Iezzi*

Organized by Domenica Fioredistella Iezzi
Chair Domenica Fioredistella

1. *Local market definition using Voronoi Diagrams.* (Andrea Giuseppe Vitali, Domenica Fioredistella Iezzi, Aitor Ciarreta Antuñano, Susan Orbe Mandaluniz)
2. *A measure of the attractiveness of Italian municipalities considering real estate market data* (Stefania Fatello, Orietta Patacchia)
3. *Corruption Risk Index for Municipalities: Insights into Local Vulnerabilities* (Simona Mercurio)

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Local market definition using Voronoi Diagrams.

Andrea Giuseppe Vitali, Domenica Fioredistella Iezzi, Aitor Ciarreta Antuñano, Susan Orbe Mandaluniz

Summary of Background Data
Accurate market definition is key in antitrust enforcement to evaluate market power and assess mergers impact. In local markets, defining geographic boundaries is challenging due to varying consumer behavior and spatial-demographic factors. Therefore, as reported in [2] authorities rely on a flexible approach, with the isochrone method widely used to map catchment areas, the zones from which businesses draw most customers. While intuitive, this method has been criticized by [3] and others for being highly sensitive to the selected travel time limit, which reflects consumer willingness to travel, a complex and unseen factor.
Objectives
This study proposes novel methods for catchment area delineation using Voronoi diagrams, and introduces a spatial framework to enhance local market definitions, bridging research and practice.
Methods
The methodology integrates spatial statistics and network theory to define market boundaries and formalize competitive relationships. It involves constructing a Spatial Weights Matrix (W) based on geographic proximity and market presence, following established approaches in academic [1] and professional [2] fields, alongside the Voronoi methods. The market structure is then modeled as a Complex Network (G), where nodes represent outlets, and edges indicate competitive ties. Clustering algorithms applied to G identify local markets, providing a refined, context-specific understanding of competitive dynamics.
Case description
The approach is validated through the analysis of a recent and controversial merger case reviewed by the Maltese Authority `(COMP/MCCAA/11/2021)`. Specifically, Lidl's acquisition of a Scotts supermarket in Zabbar serves as an empirical basis for comparing the performance of the models, highlighting its applicability in enforcement antitrust.
Results
Preliminary results indicate that sparse matrices focusing on stronger competitive ties are more effective in identifying local markets, aligning with prior research on graph-based models in spatial economics. Voronoi-based methods not only avoid assumptions about consumer travel behaviour, but appear to offer more realistic and robust delineations of the local market.

References

1. Anselin, L. (2024). An Introduction to Spatial Data Science with GeoDa. Volume 1 and Volume 2. CRC Press.
2. Hausemer, P., et al. (2021). Support study accompanying the evaluation of the Commission Notice on the definition of relevant market for the purposes of Community competition law. WIFO Studies.
3. Wirth D., Punton T. (2019). A roadmap to assessing local market mergers. Ashrust LLP. Merger Control 2020.

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A measure of the attractiveness of Italian municipalities considering real estate market data

Stefania Fatello, Orietta Patacchia

This paper aims to define and to measure the attractiveness of Italian municipalities considering the evolution of the real estate market. In particular, a composite index has been developed as a combination of elementary indicators built from administrative data, provided by Tax Office, covering the period from 2018 to 2023. The methodology used is the Adjusted Mazziotta-Pareto Index (AMPI).
The objective was to identify any changes in the phenomenon at the municipal level, especially following the Covid-19 pandemic, which has influenced choices in purchasing and renting residential properties. In particular, this study tried to evaluate which Italian municipalities most attract buyers, in terms of primary residence or as investment by foreigners, and tenants. The analysis of attractiveness was conducted using the "Map of Inner Areas" which classifies Italian municipalities based on the joint offer of three types of services: health, education and mobility. Finally, for years 2018, 2019 and 2021, a comparison between the Municipal Attractiveness Index and the Municipal Fragility Index was made.

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Corruption Risk Index for Italian Municipalities: Insights into Local Vulnerabilities

Simona Mercurio

Summary of Background Data
Corruption is a global problem that disproportionately affects the poor and vulnerable, raising costs and reducing access to essential services like health, education, and justice. Its elusive nature makes it difficult to monitor, and its definition encompasses various components that take on different meanings depending on the context.
Objectives
This paper aims to develop a composite indicator to assess corruption risk at the municipal level in Italy. The choice of a composite indicator reflects the multidimensional nature of corruption, which cannot be captured by a single measure but requires multiple dimensions. Complex phenomena such as development, social inequality, well-being, and quality of life are often measured through the combination of different dimensions, seen as components of the overall phenomenon [1].
Methods
The construction of the indicator is based on a theoretical framework derived from studies, empirical evidence, surveys, and opinions found in the scientific literature. This framework guides the selection and combination of variables into a composite indicator under a fitness-for-purpose principle. The selected indicators are grouped into pillars representing key dimensions of the framework: bad administration, territorial economy, education, and civic engagement.
The methodological approach follows these key steps [2,3]: (1) defining the phenomenon to be measured; (2) selecting relevant indicators; (3) normalizing the indicators; (4) aggregating them; and (5) validating the composite indicator. The synthesis process involves calculating an arithmetic mean adjusted by a variability function (MPI), penalizing areas with an unbalanced distribution of indicators.
Results
The results, presented through maps and charts, allow users to navigate across the Italian territory, identifying patterns and drawing meaningful conclusions based on the values of individual municipalities. These results can support public administrations in developing corruption prevention and transparency plans, strengthen the watchdog role of civil society organizations, and enhance transparency. Additionally, they may encourage researchers to refine the methodology and further validate the findings.
Discussion/Conclusions
Insights for improvement may come from unexpected or contrasting data, prompting a verification process through cross-checking events or comparing similar indices, ultimately making the procedure more robust for future studies on corruption.

References

1. Mazziotta, M., Pareto, A.: Methods for Constructing Composite Indices: One for all or all for one. Rivista Italiana di Economia Demografia e Statistica, Vol. LXVII, n. 2, pp. 67-80 (2013).
2. Salzman, J.: Methodological choices encountered in the construction of composite indices of economic and social well-being. Technical Report, Center for the Study of Living Standards, Ottawa (2003).
3. OECD: Handbook on constructing composite indicators. Methodology and user guide. Paris: New York: OECD Publications (2008).

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Invited Session - INV *31* *Identification of Online Racism and Xenophobia (PRIN PNRR 2022 TOLERANT) (2) - Michelangelo Misuraca and Giuseppe Giordano*

Organized by Michelangelo Misuraca and Giuseppe Giordano
Chair Giuseppe Giordano

1. *Examining Attitudes on Immigrants: a dual-method approach based on IRT and Structural Topic Modelling* (Annalina Sarra, Michelangelo Misuraca, Giuseppe Giordano, Lara Fontanella)
2. *The Politicization of Immigration: Mainstream Parties Paved the Way for the Far Right in the Spanish Parliament?* (Berta Chulvi, María F. Rodrigo)
3. *A two-fold strategy to analyse the hate speech against (im)migrants and other minorities on social media* (Anthony Cossari, Paolo Cozzucoli, Michelangelo Misuraca)

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Examining Attitudes on Immigrants: a dual-method approach based on IRT and Structural Topic Modelling

Lara Fontanella and Annalina Sarra and Giuseppe Giordano and Michelangelo Misuraca

Summary of Background Data
Migration has emerged as a prominent issue in the 21st century, with significant implications for societal attitudes toward immigrants. The interplay between perceived threats, economic and cultural, and public perceptions of immigrants often shapes social discourse. Understanding these attitudes is crucial for addressing biases and fostering social cohesion.
Objectives
This study aims to examine attitudes towards immigrants using a dual-method approach that integrates Item Response Theory (IRT) [1] and Structural Topic Modeling (STM) [2]. Using multiple measurement instruments, the research seeks to uncover latent attitudes and thematic patterns related to the stereotypes surrounding immigrants and Roma people.
Methods
We analyze responses from a questionnaire that incorporates three measurement tools: the Osgood Semantic Differential, the Bogardus Social Distance Scale, and an ad hoc stereotype scale. The latent traits, captured by the three scales, were evaluated using a Graded Response Model (GRM) [3] within the IRT framework. Open-ended responses were analyzed using STM to identify themes related to respondents' perceptions. This dual-method approach provides a comprehensive view of structured and narrative data.
Results
IRT analysis revealed polarized attitudes. Positive perceptions, such as immigrants' societal contributions, were less entrenched and more flexible. In contrast, negative stereotypes, particularly those related to crime and economic burden, exhibited stronger crystallization. STM identified four primary themes in open-ended responses: National Identity and Cultural Concerns, Humanitarian and Economic Motivations, Security and Integration Concerns, and Integration Challenges and Resource Management. The prevalence of the theme changed with latent traits, shaped by economic and security concerns in public discourse.
Discussion/Conclusions
The findings demonstrate the utility of combining quantitative and qualitative methods to capture the multifaceted nature of attitudes toward immigrants. Positive views show potential for change, while negative stereotypes remain deeply rooted. STM analysis enriched the understanding of the narrative dynamics, revealing systemic concerns about integration and resource allocation. These insights inform policies and interventions aimed at reducing prejudice and fostering inclusivity. Future research could explore the role of external factors, such as media composition, in shaping public attitudes.

Acknowledgements: This work is part of the research project PRIN-2022 PNRR "Identification and Critical Analysis of Online Racism and Xenophobia against (Im)migrants and Roma people" (Project Code: P2022APKJL), funded by the European Union – Next Generation EU.

References

[1] de Ayala, R.J. The Theory and Practice of Item Response Theory. The Guilford Press, New York, 2009.
[2] Roberts, M.E., Stewart, B.M., Tingley, D., Lucas, C., Leder-Luis, J., Gadarian, S.K., Albertson, B., and Rand, D.G. Structural topic models for open-ended survey responses. Am. J. Pol. Sci., **58**(4): 1064–1082, 2014.
[3] Samejima, F. Estimation of latent ability using a response pattern of graded scores. Psychometrika, **35**: 139–139, 1969.

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The Politicization of Immigration: Mainstream Parties Paved the Way for the Far Right in the Spanish Parliament?

Berta Chulvi and María F. Rodrigo

Summary of Background Data
The data is composed of a corpus of 2,516 parliamentary interventions about immigration delivered between 1996 and 2016 by representatives of the two mainstream political parties in Spanish Parliament that alternated in power during that period [1]
Objectives
The study aimed to analyze whether the rhetoric politicians use to discuss immigration reflects the expected effects of their prototypical ideological positions (1) and whether these positions shift when a party moves from government to opposition (2). Additionally, it sought to determine if these patterns differed before and after 2006, when immigration became a prominent political issue in Spanish public opinion (3).
Methods
Using natural language processing we construct four new indices: the *Immigration stereotypical framing index*, the *Adversarial index*, the *Ingroup vs outgroup index*, and the *Positive vs Negative emotion index*. To observe the effect of the interaction between ideology and political position in the two historical periods considered (1996–2005, and 2006–2016) an analysis of variance (ANOVA) was computed for each index.
Results
The results show that both the rhetorical strategies used to portray immigrants as "victims" or "threats" and the linguistic style adopted by politicians reveal significant interactions between party ideology and whether the party is in government or opposition. The findings also indicate some temporal changes in the polarization and politicization of the immigration debate.
Discussion/Conclusions
These findings suggest that immigration has been a strategic tool in Spanish political debate over recent decades and that this dynamic was already established in the Spanish Parliament before the rise of far-right parties like VOX, which explicitly use anti-immigration rhetoric in their political agenda.

References

1. Chulvi B., Molpeceres M., Rodrigo M., Toselli A., Rosso P. (2024). The Politicization of Immigration and Language Use in Political Elites: A Study of Spanish Parliamentary Speeches. In: Journal of Language and Social Psychology Vol. 43(2) 164–194Dod, J.: Effective substances. In: The Dictionary of Substances and Their Effects. Royal Society of Chemistry (1999). http://www.rsc.org/dose/title of subordinate document. Cited 15 Jan 1999

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A two-fold strategy to analyse the hate speech against (im)migrants and other minorities on social media

Anthony Cossari, Paolo Cozzucoli and Michelangelo Misuraca

Summary of Background Data
The proliferation of hostile rhetoric targeting (im)migrants and marginalised groups, such as the Roma community, has become widespread in online discussions, particularly on social networking platforms. These digital spaces, including popular platforms like *Facebook* and *X*, serve as arenas for disseminating prejudiced views and intolerance, often driven by misinformation and polarising narratives. Social media amplifies these sentiments, fostering environments where discriminatory language becomes normalised.
Objectives
The research focuses on Italian intolerance and xenophobic discourses in social media. The main goal is to understand better the primary themes characterising the debate about the phenomenon of interest in Italy, with a retrospective overview. In particular, starting from a collection of free comments posted on social media [3], topic-detection techniques are employed to determine the main issues emerging from the online debate, using the text analysis results to depict the social representations of attitudes and feelings about (im)migrants and minorities.
Methods
A two-fold strategy combining topic modelling and Bayesian networks is used to analyse the language used in the collection. Topic modelling [1] identifies dominant themes and contextualises anti-immigrant rhetoric or ethnic stereotyping within broader discourse. Bayesian networks [2] allow describing the probabilistic relationships between these themes and other factors, such as user demographics, sentiment, and propagation dynamics. This integration enables causal inference, revealing key drivers and amplifiers of hate speech. Together, these approaches offer a robust framework for real-time monitoring.
Results
The preliminary results of the analysis revealed that the debate concerning (im)migrants and marginalised groups is highly polarised and influenced by ideological orientation and geographical location of users. A wider discussion of the main findings will be presented elsewhere.

Acknowledgements: This work is part of the research project PRIN-2022 PNRR "Identification and Critical Analysis of Online Racism and Xenophobia against (Im)migrants and Roma people" (Project Code: P2022APKJL), funded by the European Union – Next Generation EU.

References

1. Blei, D. M., Ng, A., Jordan, M. I.: Latent Dirichlet allocation. J. Mach. Learn. Res. 3, 993–1022 (2003)
2. Nadkarni, S., Shenoy, P. P.: A causal mapping approach to constructing Bayesian networks. Decis. Support Syst. 38, 259–281 (2004) doi: 10.1016/S0167-9236(03)00095-2
3. Sanguinetti, M., Poletto, F., Bosco, C., Patti, V., Stranisci, M.: An Italian Twitter corpus of hate speech against immigrants. In: Proceedings of the 11th Conference on Language Resources and Evaluation (LREC2018), pp. 2798-2895. ELRA, Miyazaki (2018)

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Invited Session - INV *32 Methods and Applications for Complex Data - Stefania Fensore*

Organized by Stefania Fensore
Chair Stefania Fensore

1. *Connecting statistical analysis to address climate change: a bibliometric study of research trends in Africa and Europe* (Jai Jobe, Annalina Sarra, Stefania Fensore)
2. *Kernel methods for compositional data in social sciences* (Agnese Panzera, Stefania Fensore)
3. *Estimating the distribution of psychiatric treatment durations* (Chiara Passamonti)
4. *Beyond compliance: a textual analysis of drivers of sustainability reporting in Italian SMEs* (Annalina Sarra, Jai Jobe, Marialuigia Di Giampietro, Barbara Iannone, Adelia Evangelista)

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Connecting statistical analysis to address climate change: a bibliometric study of research trends in Africa and Europe

Jai Jobe and Annalina Sarra and Stefania Fensore

Summary of Background Data
Climate change poses a significant global challenge that affects human lives and ecosystems. Rising temperatures, sea level rise, droughts, and flooding disrupt essential systems such as water resources, energy production, agriculture, and biodiversity. Mitigating these effects requires robust data analysis, with statistical tools playing a crucial role in identifying trends and estimating impacts. Although research often emphasizes global trends, regional perspectives are vital. Africa, highly vulnerable to climate variability, needs advanced statistical methodologies for risk assessment and mitigation strategies. In contrast, Europe leads climate research, employing sophisticated approaches to guide policy and drive innovation. These regions offer contrasting, yet complementary contexts for analyzing climate change through statistical lenses.
Objectives
This study investigates the intersection of climate change and statistical analysis through a bibliometric analysis of 2,083 articles retrieved from the Scopus database. The aim is to identify key publications, influential authors, and leading journals, while also mapping research trends and collaborative networks across Africa and Europe.
Methods
We used biblioshiny and VOSviewer to conduct an in-depth analysis of co-authorship, co-citation, and keyword co-occurrence networks, providing insights into collaborative patterns and research trends. Then, we carried out a comparative evaluation of topic modelling techniques, including Latent Dirichlet Allocation (LDA) [1], Probabilistic Latent Semantic Analysis (PLSA) [3] and Bidirectional Encoder Representations from Transformers (BERT) [2], to identify the best model for extracting meaningful themes from data.
Results
The bibliometric analysis reveals that European countries dominate in publication volume and collaborative networks within climate research. This dominance is further highlighted by thematic analysis, which indicates notable shifts in research priorities over time. Specifically, there has been a marked increase in the integration of advanced statistical tools alongside regional climate models, reflecting a growing sophistication in the field. Comparisons of topic modeling techniques show that LDA achieves the highest coherence score, underscoring its effectiveness in identifying semantically related terms.
Conclusions
A significant disparity between Africa and Europe in terms of research output and impact is highlighted. While European researchers lead in volume and influence, African contributions are often underrepresented, reflecting structural challenges, such as limited funding. This imbalance needs greater interdisciplinary and inter-regional collaborations to enhance knowledge sharing and capacity building in regions most affected by climate change. Strengthening these collaborations is essential to address these challenges and ensure that vulnerable regions, such as Africa, can contribute to and benefit from advances in climate research.

References

[1] Blei, D.M., Ng, A.Y., Jordan, M.I.: Latent dirichlet allocation. J. Mach. Learn. Res., **3**, 993–1022 (2003)
[2] Devlin, J., Chang, M.W., Lee, K., Toutanova, K.: BERT: Pre-training of deep bidirectional transformers for language understanding. In: Burstein, J., Doran, C., Solorio, T. (eds.) Proceedings of NAACL-HLT 2019, pp. 4171–4186, Association for Computational Linguistics (2019)
[3] Hofmann, T.: Unsupervised learning by probabilistic latent semantic analysis. Machine Learning, **42**, 177–196 (2001)

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Kernel methods for compositional data in social sciences

Agnese Panzera and Stefania Fensore

Summary of Background Data
Compositional data are a kind of data in which the individual components represent parts of a whole and, therefore, are constrained by a sum that is fixed, usually 1 or 100%. These data are widespread in contexts where percentages or proportions between parts of a whole are observed. Examples of compositional data arise in various social contexts, such as income distribution (different sources of income), household expenditure (spending categories), demographic composition (ethnic or social groups), and time allocation for various activities. In each case, the components are fractions of the total, summing to 100%. For a collection of theoretical results and applications on compositional data see [2] and the references therein.
Objectives
We discuss kernel methods aimed at estimating density and regression functions involving compositional variables, also addressing the case where they are observed with errors. Some applications of the proposed methods in social sciences are considered.
Methods
To account for the specific nature of compositional data, the proposed methods use kernels defined on the simplex, which is the natural geometric space to represent compositions (see, for example, [1]). In the errors-in-variables problem, the discussed estimators rely on the concept of deconvolution of the density of the variable observed with error.
Conclusions
The methods discussed in this work provide a framework for nonparametrically estimating density and regression functions for compositional variables, while also addressing the challenges posed by errors in the observed data. By employing kernels defined on the simplex and applying deconvolution techniques in the presence of measurement errors, these approaches offer a solution for handling the peculiarity of compositional data in practical applications.

References

[1] Di Marzio, M., Panzera, A., Venieri, C.: Non-parametric regression for compositional data. Statistical Modelling, **15**, 113–133 (2015)
[2] Pawlowsky-Glahn, V., Buccianti, A. (eds.): Compositional Data Analysis. Theory and Applications. John Wiley & Sons Ltd. (2011)

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Estimating the distribution of psychiatric treatment durations

Chiara Passamonti

Summary of Background Data
One aspect of the well-established link between mental illness and increased suicide rates that has garnered attention in the psychiatric literature is the way in which suicide risk is influenced by the duration of treatment. Specifically, we investigate treatment duration data (see [1]), where estimates assigning weight to negative values are considered inappropriate. In general, when estimating a density on $[0,\infty)$, kernel density estimator fails to be accurate near the boundary. The reflection principle appears to be an efficient way to alleviate this issue (according to [3] and [2]).
Objectives
To address the bias in the "boundary region" and the density overflow produced by the local estimators, we propose an alternative approach of the reflection method, by recurring to simple domain transformation, which exploits the homeomorphism between different spaces.
Methods
We map the random sample $X_1,\ldots,X_n$, drawn from f_X supported on $[a,b]\subset\mathbb{R}$, to the upper semicircle, by the transformation $\Theta_i=\pi(X_i-a)/(b-a)$. Then, we reflect the Θ_is onto the lower semicircle, obtaining $2n$ observations along the whole circumference. The periodic domain avoids boundary issues, therefore we perform the standard circular kernel density estimate. The estimate is then restricted to the upper semicircle, doubled, and back-transformed to the original space.
Results
We consider as the population models the Beta(1,3) and Beta(0.5,0.5) densities, and draw 1000 samples of size 1000. We compare our proposal with respect to the usual reflection method in terms of mean squared error. The kernels employed are, respectively, the standard Normal and the von Mises; smoothing degrees are selected by the cross-validation criterion. In both cases, the advantage of our method amounts to 19%. We apply this approach to data referring to the lengths (in days) of 86 spells of psychiatric treatment undergone by patients who were used as controls in a study of suicide risks.
Discussion/Conclusions
Main advantages are same asymptotic accuracy as the standard case and easy bandwidth selection task. Our approach also provides a practical solution for implementing periodic estimators, avoiding common implementation challenges. Future work is aimed at the multivariate extension.

References

1. Copas, J. B., M. J. Fryer.: Density estimation and suicide risks in psychiatric treatment. J. R. Stat. Soc. Ser. A Stat. Soc. **143** 167–176 (1980)
2. Schuster, E.F.: Incorporating support constraints into nonparametric estimators of densities. Comm. Statist. Theory and methods **14** 1123–1136 (1985)
3. Silverman, B.W.: Density estimation for statistics and data analysis. Routledge (2018)

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Beyond compliance: a textual analysis of drivers of sustainability reporting in Italian SMEs

Annalina Sarra, Jai Jobe, Marialuigia Di Giampietro, Barbara Iannone, Adelia Evangelista

Summary of Background Data
Sustainability reporting has historically been the field of large companies. However, in recent years, an increasing number of SMEs (small and medium-sized enterprises) have shown interest and in already implemented, sustainability reporting tools [3]. This trend is partly driven by the growing number of regulations and government initiatives that make sustainability reporting mandatory for SMEs. This study examines the sustainability reports of 15 Italian companies, drafted between 2020 and 2023, selected from the top 30 companies ranked highest in ESG performance according to the annual evaluation conducted by the Standard Ethics Agency. These firms operate in sectors such as agri-food, processed food, and consumer goods. By employing textual analysis, the study identifies key themes and examines how organizational characteristics — such as market presence (national vs. multinational), industry affiliation, and financial metrics (e.g., return on equity, solvency ratio) — influence their engagement in sustainable activities.

Objectives
Our research aims to identify recurring topics in corporate sustainability reports, analyze the impact of company attributes on topic prevalence, and explore linguistic differences using advanced textual analysis techniques.

Methods
The dataset comprises sustainability reports segmented into sentences using Python scripts. Text cleaning was performed to remove meaningless terms and company-specific identifiers. The Structural Topic Model [2] was implemented to identify prevalent themes, while covariates such as market presence, sector, and financial metrics (ROE and solvency ratio) were integrated to assess their impact on topic prevalence. A pre-determined optimal number of 15 topics was selected based on established metrics. Additionally, a Keyness Analysis [1] was conducted to detect linguistic differences among company categories, focusing on performance, size, and sector.

Results
The STM identified 15 distinct topics, including global sales, sustainability governance, carbon emissions reporting, sustainable sourcing, human rights, and healthy nutrition. “Top Performers” emphasized sustainability governance and innovation, whereas “Vulnerable” companies focused more on operational challenges. Sector-specific themes emerged, with agribusiness prioritizing sustainable sourcing, while processed foods highlighted consumer health. Keyness Analysis revealed linguistic differences: smaller companies used localized terminology, while multinationals adopted globalized narratives. Sector-specific language further distinguished sustainability focuses, emphasizing sustainable sourcing and marine conservation in agribusiness and nutrition in processed foods.

Discussion/Conclusions
This study underscores how organizational and financial characteristics shape sustainability narratives. Financial stability, market presence, and industry-specific challenges significantly influence the themes and language of reports. The findings provide actionable insights for enhancing transparency, aligning corporate reporting with global sustainability standards, and improving stakeholder engagement.

References

1. Gabrielatos, C.: Keyness analysis: Nature, metrics and techniques. In: Taylor, C. and Marchi, A. (eds) Corpus Approaches to Discourse: A Critical Review , chapter 11. Routledge, xford, (2018).
2. Roberts, M. E., Stewart, B. M., Tingley, D., Lucas, C., Leder-Luis, J., Gadarian, S. K., Albertson, B., and Rand, D. G. Structural topic models for open-ended survey responses. AJPS, **58**(4), pp.1064–1082, (2014). doi: 10.1111/ajps.12103.
3. Stolowy, H., Paugam, L.: Sustainability reporting: Is convergence possible? Accounting in Europe, **20**(2), pp. 139–165 (2023).

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Invited Session - INV *33* *Advanced Data Analytics in Socio Economic Indicators - Fabrizio Maturo*

Organized by Fabrizio Maturo
Chair Fabrizio Maturo

1. *Firms' Capabilities and Economic Complexity: Insights from Italian Survey data* (Annamaria Giuffrida, Alessio Bumbea, Andrea Mazzitelli, Angelica Sbardella, Andrea Zaccaria)
2. *Fuzzy Centrality in Social Networks Analysis* (Annamaria Porreca, Fabrizio Maturo, Viviana Ventre)
3. *Dataism: The Ideology of Big Data* (Assunta Lisa Carulli, Domenico Di Spalatro, Alessandro Valentini)

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Firms' Capabilities and Economic Complexity: Insights from Italian Survey data

Giuffrida Annamaria, Bumbea Alessio, Mazzitelli Andrea, Sbardella Angelica, Zaccaria Andrea

Summary of Background Data
The study of the determinants of firm productivity and growth has always been an open problem in statistics and economics in the construction of indicators, always attracting the interest of researchers and practitioners. ISTAT's permanent census of enterprises [1] allow us to directly analyze firm's microdata by analyzing the problem within the framework of economic complexity. In particular, we are interested in studying the capabilities of firms, which play a key role in business growth [2].
Objectives
We apply the Economic Fitness and Complexity (EFC) algorithm to the 2018 survey data to identify the capabilities each firm owns, intended as a portfolio of intangible assets, and to assess how the wealth of capabilities can impact labor productivity.
Methods
We analyzed a sample of 109,520 firms with 10 or more employees. Using the EFC algorithm, we can measure the competitiveness of an economic actor [3]. We achieve this result by analyzing a binary matrix,where rows represent firms and columns correspond to survey's items. The EFC algorithm gives as output the Fitness score for each firm, which encompasses information about the quantity of capabilities possessed by the firm.
Results
To assess the relevance of the Fitness score we computed a Fixed effects regression model with labor productivity as the dependent variable and Fitness, qualifications employees, and firms' size, and others variables like firms' age, export, as independent variables. The Fitness score has a positive and statistically significant association to labor productivity as well as age, export and qualification. Economic activities and geographical partition are the fixed effects.
Discussion/Conclusions
The complexity framework is increasingly being used to analyze both firm performance and territorial development, demonstrating robustness and flexibility across various applications, including export and patent data. This study extends its scope by applying the methodology to survey data, filling a gap in the literature. Future research will explore the statistical models to predict firm-level growth and investigate the relationship between the capabilities and activity sector classifications, such as Pavitt's Taxonomy and K.I.B.S.(Knowledge Intensive Business Services).

References

1. Istat: Censimento permanente delle imprese. Official documentation is available via the Istat website. https://www.istat.it. Cited 21 Dec 2024.
2. Sbardella, A., Pugliese, E., Zaccaria, A., Scaramozzino, P.: The Role of Complex Analysis in Modelling Economic Growth. Entropy 20(11), 883 (2018). doi: 10.3390/e20110883
3. Tacchella, A., Cristelli, M., Caldarelli, G., Gabrielli, A., Pietronero, L.: A New Metrics for Countries' Fitness and Products' Complexity. Sci. Rep. 2, 723 (2012). doi: 10.1038/srep00723

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Fuzzy Centrality in Social Networks Analysis

Annamaria Porreca, Fabrizio Maturo and Viviana Ventre

Summary of Background Data
Social relationships are complex and often vague, making traditional Social Network Analysis (SNA) methods insufficient. Existing approaches treat ties as binary or weighted values, oversimplifying the nuances of human interactions. Fuzzy logic provides a natural framework to incorporate uncertainty and vagueness in relational analysis, offering a more realistic representation of social network [1, 2].
Objectives
This study aims to develop a fuzzy logic-based framework for SNA, introducing fuzzy centrality indices to evaluate nodes' importance while preserving the vagueness inherent in social ties. The framework is applied to a University collaboration network.
Methods
Using data collected via a mouse-tracking technique, the study redefines network ties as fuzzy numbers. It develops and applies fuzzy indices, including degree, betweenness, and closeness centrality, to analyze the relationships in a University department's collaboration network [3].
Results
Fuzzy centrality indices successfully identified key nodes by assessing not only the number of connections but also their quality. The fuzzy betweenness index revealed crucial intermediaries, and the fuzzy closeness measure provided insights into nodes' accessibility and influence, demonstrating the framework's utility in capturing relational vagueness.
Discussion/Conclusions
This fuzzy-based SNA framework extends traditional methods by integrating uncertainty into network analysis. It highlights the importance of considering vagueness to understand social dynamics comprehensively. The proposed indices are particularly effective in contexts where relationships exhibit varying degrees of truth, offering valuable tools for researchers and practitioners in analyzing complex social systems.

References

1. Zadeh, L.: Fuzzy algorithms. Information and Control 12, 94 (1968). URL https://doi.org/10.1016/S0019- 9958(68)90211-8.
2. Zadeh, L.: The concept of a linguistic variable and its application to approximate reasoning. Information Science 1 (1975). URL https://doi.org/10.1016/0020-0255(75)90036-5
3. Porreca, A., Maturo, F., Ventre, V.: Fuzzy centrality measures in social network analysis: Theory and application in a university department collaboration network. Int. J. Approx. Reason. 176, 109319 (2025)

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Dataism: the ideology of Big Data

Assunta Lisa Carulli, Domenico Di Spalatro, Alessandro Valentini

Summary
The amount of data produced every day is staggering. In the last two years alone, we have generated about 90% of the world's data. The problem is that we could run into the so-called "dataism", that is, being obsessed with data and being guided by it in everything. Dataism is a term that has been used to describe the mindset or philosophy created by the emerging significance of big data.
Methods
It was first used by David Brooks in 2013 [1] and subsequently by Steven Lohr [2] and Yuval Noah Harari [3]. Harari defines dataism as an emerging ideology or even a new form of religion, in which the flow of information is the supreme value. The dataism is the new frontier of technological era, where the being is converted in quantity. In its extreme form, the authors of this dataist worldview perceive the entire universe as a flow of data, view living organisms as little more than biochemical algorithms believe that there is a cosmic calling for humanity: to create an all-encompassing data processing system and then, in the eschaton of the cosmos, merge into it.
The Big Data are the new oil, the principal source for the extraction of value and information. In addiction Big data are also closely tied to the development of the Artificial intelligence, of which they are the blood.
Conclusion
Data becomes a hermeneutic and value criterion of life. The machine that is able to interpret data is the organ that, on the basis of computational mechanisms, performs the decision-making function according to its criteria: optimization, functionality, implementation, economy, productivity. Today we aspire to total and quantitative control of our existence, to procedural speed, and to do so we need Big Data, AI and Data Analysis, Apollonian instances entrusted with the exorcism and domination of the Dionysian element of life.

References
1. Brooks, D.: The Philosophy of Data. *The New York Times* (2013).
2. Lohr, S.: Data-ism: Inside the Big Data Revolution. Oneworld Publications (2016).
3. Harari, Y.N.: Homo Deus: A Brief History of Tomorrow. Harvill Secker (2016)

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Invited Session - INV *34* *Socio-economic perspectives for a sustainable future - Angela M D'Uggento and Alfonso Piscitelli*

Organized by Angela M D'Uggento and Alfonso Piscitelli.
Chair Angela M D'Uggento

1. *Sustainability motivations of vegan products consumption* (Anna Filippini, Maria Cristiana Martini)
2. *Subjective forecasts of the Industrial Production Index based on the confidence of the manufacturing companies* (Paolo Mariani, Andrea Marletta, Biancamaria Zavanella)
3. *Assessing material deprivation in NUTS 1 Regions: Insights from Greece, Italy and Spain* (Margaret Antonicelli, Enrico Ivaldi)

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Sustainability motivations of vegan products consumption.

Anna Filippini and Maria Cristiana Martini

Summary of Background Data
Veganism is a multifaceted phaenomenon, motivated by a variety of reasons, including ethical beliefs, health benefits, and sustainability. Vegan products consumption is increasing all over the world, not only among vegan people; many brands have introduced vegan versions of their traditional products, and more and more companies certify and label their products as vegan. A vegan label can affect the perception of the product characteristics, not only because of the claimed attributes, but also due to the halo/horn effect [1], i.e. a biased perception that extends a positive (or negative) evaluation of an object to domains different from the one that generated the initial evaluation.
Objectives
This study aims at assessing the effects of vegan labelling in terms of perceived sustainability, and at investigating how this perception affects the intention to buy the product. We consider both intentionally vegan products, where some ingredients need to be substituted to the traditional formulation to obtain a vegan product, and naturally vegan products, which are vegan by default, to detect the existence of a halo effect.
Methods
Different fictitious products, naturally or intentionally vegan, have been submitted to a sample of 615 respondents. Each product was randomly presented with or without a vegan label, and each respondent was requested to assess the characteristics of the assigned product in terms of perceived sustainability, intention to buy it and other attributes. The perception of sustainability is then used as a mediation variable in a model where the intention to buy is influenced by the direct effect of the presence/absence of a vegan label, and by the mediation effects of the perceived characteristics of sustainability, healthiness, taste and price.
Results
Vegan labelling improves the sustainability perception of products, also (and even more) when the product is vegan by default. This perception of sustainability, in turn, slightly enhances the intention to buy. However, the intention to buy is mainly driven by the perception of healthiness, and this holds true for both intentionally vegan and naturally vegan products.
Discussion/Conclusions
Vegan labelling induces a halo effect that affects the perception of sustainability, even when the product has no alternative to being vegan. This highlights the potential of vegan labelling to influence consumers' product evaluations. Sustainability is not yet one of the main product characteristics that guide the consumers' choices, but this is likely to change with the increasing environmental awareness.

References

1. Burton, S., Cook, L.A., Howlett, E., Newman, C.L. Broken halos and shattered horns: Overcoming the biasing effects of prior expectations through objective information disclosure. Journal of the Academy of Marketing Science, 43(2), 240–256. (2015)

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Subjective forecasts of the Industrial Production Index based on the confidence of the manufacturing companies

Paolo Mariani, Andrea Marletta and Biancamaria Zavanella

Summary of Background Data
The Industrial Production Index is one of the most important indicators to evaluate the state of health of the economy of a country. Dealing with official data, the issue of the delay in the publication of the provisional estimate is a very actual theme. For this purpose, it appears fundamental to have anticipations of these indicators. Many contributions have tried to give predictions about the future tendency of this quantity using different statistical models based on possible relationships with other micro or macro-economic variables. This study proposes a forecast approach based on the subjective expectations on the future given by the entrepreneurs of manufacturing companies.
Objectives
The main aim of this contribution is to give a systematic approach to obtain very-short term predictions for the Industrial Production Index using the long-term relationship between this time-series and the confidence of the manufacturing companies in terms of judgement and expectations.
Methods
From a methodological point of view, an approach for multivariate time-series is proposed, searching for a co-integration link between the two considered time-series. Once obtained this long-term relationship, the latter is used in combination with the expectations of the entrepreneurs to obtain the short-term forecasts.
Results
The proposed approach has been applied on the two time-series from 2010 to 2024. The preliminary results show a similarity between judgment and expectations of the manufacturing companies about the production. This is a mandatory condition to use the expectations as a predictor of the Industrial Production Index. The short-term forecasts obtained are in line with the expected values of the entire time-series.
Discussion/Conclusions
The proposed approach has been used to detect short-term movements for the Industrial Production Index in order to anticipate possible outliers in the time series due to possible crisis.

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Assessing Material Deprivation in NUTS 2 Regions: Insights from Greece, Italy, and Spain.

Margaret Antonicelli[1] and Enrico Ivaldi[2]

Summary of Background Data
Although the economic crisis and Covid-19 no longer exert significant negative effects on the European population, a substantial proportion of individuals remain in severe material deprivation. This study focuses on three European countries with similar economic structures—Italy, Spain, and Greece—offering a comparative analysis of their material deprivation levels. Using elementary indicators of the material and social deprivation index, the study employs two advanced non-linear statistical methodologies to synthesize the data. The index measures the percentage of people unable to afford basic goods, services, or social activities considered essential for a decent standard of living.
Objectives
This research aims to analyse the latest Eurostat data on material deprivation across Italy, Greece, and Spain, as well as their respective regions. To achieve this, the material and social deprivation index was recalibrated using two statistical synthesis techniques to capture the complexity and nuances of deprivation patterns.
Methods
The analysis employs two statistical methodologies. AMPI is a partially nonlinear and partially non-compensatory methodology used to construct composite indicators, particularly suited to the analysis of temporal data [1, 2]. This approach ensures that extreme imbalances in specific dimensions are penalized, reflecting the multidimensionality of the phenomenon studied. DP2, on the other hand, is a nonlinear methodology, based on the concept of distance based on each unit from a theoretically defined "ideal" point in a multidimensional space [3]. All dimensions are considered simultaneously, considering the interaction between variables. DP2 emphasizes the consistency of the data structure, making it robust for comparative regional analyses. While both methodologies are adept at handling multidimensional data, their differences make them complementary tools.
Results
Despite gradual improvements in the overall economic landscape, significant levels of social deprivation persist in specific regions of the analysed countries. Spain emerges as the most critical case, with notable challenges in conducting historical data analyses due to the lack of serial autocorrelation between yearly datasets.
Discussion/Conclusions
The persistence of severe material deprivation demonstrates the need for sustained and targeted policy interventions. By leveraging advanced methodologies and focusing on multidimensional analyses, policy makers can design more effective strategies to reduce deprivation and promote inclusive development. These findings highlight the limitations of relying solely on economic indicators to assess well-being and underscore the importance of considering social, environmental and institutional factors. Furthermore, future research should explore additional determinants, such as cultural and behavioural factors, to provide a more comprehensive understanding of deprivation.

Principal references

1. Arechavala, N.S., Trapero, B.P. (2014). Synthetic Indicators of the Quality of Life in Europe. In: Michalos, A.C. (eds) Encyclopedia of Quality of Life and Well-Being Research. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0753-5_3729
2. Mazziotta, M., Pareto, A. On a Generalized Non-compensatory Composite Index for Measuring Socio-economic Phenomena. Social Indicators Research. (2015). DOI 10.1007/s11205-015-0998-2
3. Bruzzi, C., Ivaldi, E. & Landi, S. Non-compensatory aggregation method to measure social and material deprivation in an urban area: relationship with premature mortality. Eur J Health Econ 21, 381–396 (2020). https://doi.org/10.1007/s10198-019-01139-x

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Contributed Session - CON *1*
Advances in economics

Chair Adelia Evangelista

1. *The Sustainability Challenge: Theoretical Implications for Contemporary Production and Consumption Dynamics* (Edoardo Di Giovanni, Edgardo Bucciarelli)
2. *Studying Public Policy and Italian 2023 Pre-defined Tax Scheme: Quantum Methodological Insights* (Salvatore Villani, Edgardo Bucciarelli, Casimiro M. Insardi)
3. *Modelling Strategic Interactions in Economic Games: The Emerging Role of Heuristics, Inequality, and Uncertainty* (Edgardo Bucciarelli, Pierluigi Sacco, Aurora Ascatigno, Alessia Regnicoli)

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The Sustainability Challenge: Theoretical Implications for Contemporary Production and Consumption Dynamics

Edoardo Di Giovanni and Edgardo Bucciarelli

Summary of Background Data
The concept of presumption has gained prominence in addressing the challenges of sustainability and resource efficiency. Seminal works by Toffler [1] and Ritzer & Jurgenson [2] have explored the socio-economic implications of this phenomenon, while studies on decentralised systems, such as Burger & Weinmann's analysis of Germany's energy transition [3], have highlighted its practical applications. Despite these advancements, critical inefficiencies persist, including the over-reliance on external markets and the waste of resources, which hinder the realisation of truly sustainable and efficient prosumption systems. Addressing these gaps requires an analytical framework to evaluate and optimise the performance of prosumption practices, particularly in energy systems where production and consumption are intrinsically linked.
Objectives
This work aims to introduce a Prosumer Objective Function (POF) and its complementary algorithm (PROSA) to analyse self-sufficiency, efficiency, and sustainability in production-consumption cycles; address inefficiencies and dependencies inherent in prosumption systems; enhance the theoretical understanding and practical applicability of prosumption in energy systems, particularly renewable microgeneration.
Methods
POF and PROSA incorporate variables such as good production, requirements, consumption, and market dependency. They represent the methodological premises of a theoretical framework that identifies inefficiencies and quantifies their impact on prosumption performance. While the underlying methodology is generalisable, it finds specific applicability in energy systems, focusing on renewable microgeneration and value networks for local production-consumption dynamics.
Results
The framework above highlights discarded production, consumption and market reliance as primary barriers to effective prosumption. POF and PROSA demonstrate the potential for improved resource efficiency and reduced dependency on external markets, offering actionable insights and recommendations to tackle the multifaceted microeconomic and systemic-related issues stemming from the circular economy, bioeconomy, and related matters.
Discussion/Conclusions
This work seeks to fill an emerging theoretical gap in advanced microeconomics literature by introducing a toolbox for policymakers, firms, and individual prosumers while providing a vehicle for students, scholars, and practitioners to collaborate with international partners. It provides insights into achieving sustainability and resilience in decentralised systems while addressing global challenges in production-consumption dynamics. The findings open avenues for further, more in-depth research on the role of prosumption in sustainability and development.

References

1. Toffler A.: The third wave. New York: Bantam Books (1980).
2. Ritzer, G., & Jurgenson, N.: Production, consumption, prosumption: The nature of capitalism in the age of the digital ‘prosumer’. Journal of Consumer Culture, 10(1), 13-36 (2010).
3. Burger, C., Weinmann, J.: Germany's decentralized energy revolution. In: Distributed Generation and Its Implications for the Utility Industry, pp. 49-73. Academic Press (2014).

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Studying Fiscal Policy and the Italian Pre-defined Tax Scheme: Quantum Methodological Insights

Salvatore Villani, Edgardo Bucciarelli, and Casimiro M. Insardi

Summary of Background Data
Public decisions, especially regarding taxation, are inherently complex and require the involvement of specialized professionals who act as intermediaries between taxpayers and tax authorities. Therefore, taxation can be understood as a multifaceted system that encompasses not only the rules governing taxes but also the public decision-makers, taxpayers, and the broader economic system that connects them in a tangle of interactions. It is essential to utilise advanced research methods to examine the decision-making processes that arise from these interactions effectively.
Objectives
This paper examines the tax reform adopted by the Italian Government in 2023-2024. The reform aims to incentivise tax compliance by introducing policy tools that significantly change the relationship between the Revenue Agency and taxpayers. Globally, there has been a shift from a criminological and repressive approach to a collaborative and preventive one [1]. This paper aims to illustrate the complexity of taxpayers' decisions and the behaviors that arise from them, which require advanced analysis techniques. Therefore, the primary objective of this paper is to address these research issues using the paradigms and formalism found in Quantum Mechanics.
Methods
The paper provides a comprehensive analysis of a recent Italian policy tool known as the Biennial Preventive Arrangement (BPA), which is used by taxpayers and the Revenue Agency. Despite its several advantages, taxpayers have responded poorly to BPA. We explore this paradoxical outcome through the lens of Quantum Decision Theory (QDT) [2].
Results
By employing QDT, we have gained valuable insights into the reasons for the Italian government's limited success with the fiscal measure mentioned earlier. Our analysis seeks to shed light on the factors contributing to this outcome.
Discussion/Conclusions
According to [3], taxation can be understood as an implicit contractual relationship. It is not just a financial obligation, but also involves cognitive connections and a sense of loyalty between the government and its citizens. This relationship includes various duties that individuals owe to the state, such as paying taxes, as well as the rights of taxpayers, which encompass representation and accountability from their government. Viewed through this lens, taxation is a dynamic interaction shaped by mutual responsibilities and expectations, reflecting the deep bonds that connect individuals to the society in which they live. The analysis in the paper suggests that taxation is a complex system, and that the decisions made by taxpayers can be effectively analyzed using the principles of quantum mechanics and its related mathematical formalism.

References

1. Bronżewska, K.: Cooperative Compliance: A New Approach to Managing Taxpayer Relations. IBFD, Amsterdam (2016).
2. Yukalov, V.I., & Sornette, D.: Decision theory with prospect interference and entanglement. Theory and Decision, 70(3), 283–328 (2011).
3. Feld, L.P., & Frey, B.S.: Tax compliance as the result of a psychological tax contract: The role of incentives and responsive regulation. Law and Policy, 29(1), 102-120 (2007).

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Modelling Strategic Interactions in Economic Games: The Emerging Role of Heuristics, Inequality, and Uncertainty

Edgardo Bucciarelli, Pierluigi Sacco, Aurora Ascatigno and Alessia Regnicoli

Summary of Background Data
Understanding cooperative behaviour and reciprocity in economic interactions has proven to be crucial for modelling decision-making dynamics. This work stems from the Public Goods Game and Investment Game through simulations with artificial agents operating under heuristic-driven strategies, accounting for fairness, reciprocity, and adaptability to sudden shocks. Following [1], we considered four distinct types of agents, each characterised by their propensity to exhibit cooperative or non-cooperative behaviour, thus influencing the decisions of their immediate neighbours.
Objectives
The objectives of this work are twofold: first, we investigate the effects of equal versus unequal initial endowments and unpredictable exogenous shocks on contributions in the Public Goods Game; second, we study the influence of allocation strategies and uncertainty in multipliers on reciprocal behaviours in the Investment Game.
Methods
We simulated three scenarios. In Scenario 1, artificial agents started with equal initial endowments and participated in 100 rounds of the Public Goods Game within fixed groups of five. Scenario 2 introduced unequal initial endowments, randomly distributed among agents. In Scenario 3, an unpredictable exogenous shock reduced the initial endowments of 70% of the agents by 30% starting from round 50 onward. In all scenarios, the total payoffs cumulated during the initial Public Goods Game were used as initial allocations for the subsequent Investment Game. The Investment Game was played in fixed pairs of agents under two multiplier conditions: (i) a fixed multiplier of 3 and (ii) a random multiplier ranging from 2 to 4. Agents' behaviours were modelled using a heuristic approach inspired by [1] and [2].
Results
In the Public Goods Game, contributions remained positive and stable over rounds in Scenario 1, with cooperative behaviours influenced by agent type and group dynamics. Scenarios 2 and 3 showed reduced contributions in the presence of inequality and shocks, particularly for shocked agents. In the Investment Game, senders' behaviours were strongly correlated with initial endowments, while responders' reciprocation was consistently determined by the amount received, regardless of the multiplier condition. Shocks in Scenario 3 amplified variability in agent responses.
Discussion/Conclusions
The findings highlight how decision-making guided by heuristics is crucial in promoting and maintaining cooperation and reciprocity in behaviour. The four agent types demonstrated distinct strategic adaptations to inequality and shocks, with exogenous constraints reducing cooperative behaviours. Reciprocal dynamics in the Investment Game underscored the importance of received amounts in decision-making, unaffected by multiplier variability. This study advances understanding of fairness and adaptability in economic conditions, building on heuristic frameworks for agent-based modelling.
Keywords: Public Goods Game, Investment Game, Heuristic decision-making, Artificial agents.

References

1. Wang, Y., & Chen, T.: Heuristics guide cooperative behaviors in public goods game. Physica A: Statistical Mechanics and its Applications, 439, 59-65 (2015)
2. Todd, P. M., Rieskamp, J., & Gigerenzer, G.: Social heuristics. Handbook of experimental economics results, 1, 1035-1046 (2008).

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Contributed Session - CON *2* *Tourism Preferences Impact and Trends*

Chair Alfredo Cartone

1. *Vacation preferences and travel experiences of Italian senior tourists* (Claudia Marin, Angela Maria D'Uggento, Ernesto Toma, Ilaria Pepe)
2. *Enhancing Tourism Demand Forecasting in Italy: Integrating OTA Data and CPI Trends with Statistical and Deep Learning Models* (Fabrizio Antolini, Samuele Cesarini, Ivan Terraglia)
3. *Tourism, Crime and Quality of Life: a first analysis* (Paolo Mariani, Mariangela Zenga)

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Vacation preferences and travel experiences of Italian senior tourists.

Claudia Marin, Angela Maria D'Uggento, Ernesto Toma and Ilaria Pepe

Summary of Background Data
The world's population is aging rapidly. Forecasts predict that by 2050, more than two billion people will be aged 60 or over, representing 22% of the world's population. This demographic shift has significant implications for social structures, including labor markets, family dynamics and the leisure industry [1]. Older adults, who are increasingly characterized by better education, health and financial independence, are active participants in tourism, a sector that promotes their mental and physical well-being and eases their transition into retirement [2].
Objectives
This study examines senior tourism, emphasizing its heterogeneity and the importance of leisure travel [3] for active aging and quality of life.
Methods
Using data from the Istat 2023 survey on Viaggi e Vacanze, we analyzed the travel behavior of Italian seniors aged 65 and over, divided into "young seniors" (65-74) and "old seniors" (75+). Analyses were conducted through multivariate statistical methods to reveal key factors influencing travel decisions.
Results
The results show that young seniors travel more frequently and often use private accommodation, while older seniors prefer domestic destinations and shorter trips.
Discussion/Conclusions
The findings highlight the need for tailored travel options to cater to different preferences and underscore the role of the tourism industry in promoting the well-being of seniors. These findings are crucial for policy makers and tourism providers seeking to meet the evolving needs of the growing market segment.

References

1. Howse, K. Perspective on the challenges of population ageing. In Harper, S., and Hamblin, K. (Eds.). International Handbook on Ageing and Public Policy pp. 13–20. Edward Elgar Publishing. (2014).
2. Meiners, N., Seeberger, B. Marketing to senior citizens: Challenges and opportunities. The Journal of Social, Political, and Economic Studies, 35(3), 293–328 (2010).
3. Patterson, I., Balderas, A.: Continuing and Emerging Trends of Senior Tourism: A Review of the Literature. Population Ageing 13. 385–399 https://doi.org/10.1007/s12062-018-9228-4 (2020).

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Enhancing Tourism demand forecasting in Italy: Integrating OTA data and CPI trends with statistical and Deep Learning models

Fabrizio Antolini, Samuele Cesarini and Ivan Terraglia

Summary of Background Data
Tourism demand forecasting is critical for strategic planning and decision-making in the hospitality and tourism industry [1]. Traditional forecasting methods often struggle to account for the volatility inherent in data but "*not always in tourism data*" [2]. This study focuses on analyzing Italy's monthly historical tourist nights spent and enhancing forecasting accuracy by incorporating exogenous variables, such as data from Online Travel Agencies (OTAs) and the Consumer Price Index (CPI) for the accommodation and food service sector.
Objectives
The primary objective of this research is to evaluate the impact of incorporating OTA data and CPI variations on improving the accuracy of forecasting Italian monthly tourist nights spent. This analysis compares the performance of traditional statistical models and advanced deep learning techniques.
Methods
The study utilizes two distinct methodological approaches for forecasting: the Seasonal Autoregressive Integrated Moving Average with Exogenous Variables (SARIMAX) and deep learning models, specifically Recurrent Neural Networks (RNNs) and Convolutional Neural Networks (CNNs). Historical data on monthly tourist nights spent, OTA activity, and CPI variations were collected and preprocessed. The models were trained and tested to assess prediction accuracy, with performance evaluated using standard error metrics.
Results
The goal is to understand whether a multivariate predictive analysis, considering as explanatory variables, the consumer price index and OTA bookings in SARIMAX and Deep learning models, offers, at the national level, more accurate predictions, of tourist nights spent.
Discussion/Conclusions
The study highlights the effectiveness of integrating OTA data and CPI variations in improving the forecast accuracy of monthly tourist arrivals in Italy. While traditional models like SARIMAX benefit from the inclusion of exogenous variables, deep learning models exhibit superior adaptability to data volatility and complex temporal dynamics [3]. Moreover, however, the reduced volatility of the time series on tourist nights spent in Italy, may make the traditional models preferred to the more general ML

References

1. Antolini, F., Cesarini, S., Simonetti, B.: Factors determining Italian tourists' expenses: a machine learning approach. Qual. Quant. 1–19 (2024)
2. Antolini, F., Cesarini, S.: Predicting domestic tourists' length of stay in Italy leveraging regression decision tree algorithms. Electron. J. Appl. Stat. Anal. 17(3), 621–635 (2024).
3. Antolini, F., Cesarini, S.: Neural network-based prediction of domestic tourists' length of stay in Italy. In: IES 2023–Statistical Methods for Evaluation and Quality: Techniques, Technologies and Trends, pp. 443–449 (2023)

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Tourism, Crime and Quality of Life: a first analysis.

Paolo Mariani, Mariangela Zenga

Summary of Background Data
Tourism has become a vital sector in many economies, particularly in Italy, where its interaction with crime and quality of life is both significant and complex. Drawing on foundational theories such as Becker's economic theory of crime [1] and studies specific to Italy [2], this work investigates how tourism influences and is influenced by crime dynamics, focusing on Italian provinces during 2023. Key challenges include seasonal crime fluctuations, underreported tourist flows, organized crime's indirect impact on tourism sustainability [3] and quality of life [4]
Objectives
This study aims to examine the initial relationships between tourism intensity and crime rates across Italian provinces and to develop composite indices to assess the quality of life in relation to tourism and crime. The research highlights provincial disparities and identifies types of provincial behavior in relation to these variables.
Methods
Data for the study was sourced from official statistics on crime and tourism. Methodological steps included standardization of data, clustering for province-level categorization.
Results
The findings reveal a moderate positive relationship between tourism intensity and crime rates. Provinces with high levels of tourism often experience an increase in petty crimes, such as pickpocketing, particularly during peak tourist seasons. In contrast, provinces with low tourism tend to have lower crime rates but may face challenges related to organized crime. Considering quality of life, Italian provinces can be categorized into three groups: provinces that balance significant tourism activity and high crime levels with a high quality of life, provinces with moderate levels of tourism and crime, coupled with a high quality of life and provinces characterized by low tourism and crime rates, but poor quality of life.
Discussion/Conclusions
Tourism can exacerbate crime, reducing its economic and social benefits. Effective crime prevention strategies should account for seasonal and provinces differences. Future research will refine the tourism index, decompose crime statistics by type, and explore destination-level dynamics.

References

1. Becker, G. S. (1968). Crime and Punishment: An Economic Approach. Journal of Political Economy, 76, 169–217.
2. Biagi, B., Brandano, M. G., & Detotto, C. (2012). The Effect of Tourism on Crime in Italy: A Dynamic Panel Approach. Economics: The Open-Access, Open-Assessment E-Journal, 6(2012-25).
3. Zhang, X., & Xiang, Z. (2021). Revisiting the Relationship Between Tourism and Crime Based on a Dynamic Spatial Durbin Model. International Journal of Tourism Research, 23(5), 744-758.
4. Kim, K., Uysal, M., & Sirgy, M.J. (2013). How does tourism in a community impact the quality of life of community residents?, Tourism Management, 36, 527-540,

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Contributed Session - CON *3*
Territory and Society

Chair Yuri Calleo

1. *Deep Learning-Based Land Cover Mapping in Agricultural Areas* (Anna Simonetto, Girma Tariku, Isabella Ghiglieno, Andres Sanchez Morchio, Luca Facciano, Ivan Serina, Gianni Gilioli)
2. *Defining a composite index to measure socio-economic inequalities at a micro spatial scale* (David Benassi, Antonio De Falco)
3. *Understanding drivers of intimate partner violence: insights from an ecological analysis in Sub-Saharan Africa* (Micaela Arcaio, Anna Maria Parroco, Chibuzor Christopher Nnanatu)

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Deep Learning-Based Land Cover Mapping in Agricultural Areas

Anna Simonetto, Girma Tariku, Isabella Ghiglieno, Andres Sanchez Morchio, Luca Facciano, Ivan Serina, Gianni Gilioli

Summary of Background Data
Land cover mapping is essential for understanding global land use dynamics, biodiversity, and ecosystem processes. Advances in remote sensing and AI have enhanced mapping through satellite imagery, improving environmental monitoring and conservation planning. Challenges remain, including dataset heterogeneity, high acquisition costs, annotation labor, and limited aerial datasets for agriculture.
Objectives
This study proposes a cost-efficient methodology for developing a reproducible semantic segmentation dataset, facilitating broader research applicability. We present a novel land cover dataset specifically tailored for large-scale semantic segmentation, emphasizing wine cultivation regions. The dataset comprises seven classes: grasslands, arable land, herbaceous zones, hedgerows, vineyards, tree-dominated anthropogenic habitats, and olive groves, addressing critical gaps in agricultural land cover analysis.
Methods
The methodology consists of three steps. High-resolution satellite imagery is acquired, georeferenced, and segmented to produce homogeneous image regions. Second, the segmented regions are validated and classified by a plant expert, ensuring accurate identification of land cover classes. Third, semantic segmentation models—U-Net, SegNet [1,2[, and DeepLabV3 [3] —are trained on smaller image patches, both with and without pre-trained backbones, and assessed using performance metrics. The methodology is applied to the wine-producing Franciacorta region in Northern Italy.
Results
The DeepLabV3 model consistently outperforms U-Net and SegNet across all evaluated metrics, with notable improvements observed when backbone integration is applied. It achieves superior accuracy, precision, recall, F1 score, and Jaccard Coefficient, highlighting its robustness and effectiveness in land cover image segmentation. Furthermore, our study evaluates the impact of various pre-trained backbones integrated with DeepLabV3. High Area Under the Curve (AUC) values from Receiver Operating Characteristic (ROC) analysis further confirm the model's strong ability to differentiate between land cover classes.
This study demonstrates the effectiveness of using satellite imagery and deep learning for accurate agricultural land cover mapping. Our cost-effective, reproducible methodology automates annotation tasks, reduces reliance on expensive proprietary imagery, and accelerates data preparation, supporting sustainable land management and informed agricultural decision-making.

References

1. Tzepkenlis, A.; Marthoglou, K.; Grammalidis, N. Efficient Deep Semantic Segmentation for Land Cover Classification Using Sentinel Imagery. Remote Sens. 15, 2027 (2023)
2. Xu, R.; Wang, C.; Zhang, J.; Xu, S.; Meng, W.; Zhang, X. RSSFormer: Foreground Saliency Enhancement for Remote Sensing Land-Cover Segmentation. IEEE Trans. Image Process. 32, 1052–1064 (2023)
3. Chen, L.-C.; Papandreou, G.; Kokkinos, I.; Murphy, K.; Yuille, A.L. DeepLab: Semantic Image Segmentation with Deep Convolutional Nets, Atrous Convolution, and Fully Connected CRFs. IEEE Trans. Pattern Anal. Mach. Intell. 40, 834–848. (2018)

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Defining a composite index to measure socio-economic inequalities at a micro spatial scale.

David Benassi and Antonio De Falco

Summary of Background Data
In modern cities, a portion of the population lives in poverty, often residing within specific urban areas. This leads to zones with a high concentration of social disadvantage [1]. Such spatial concentration underpins processes of (re)production of social disadvantage, resulting in increased risks of poverty and social exclusion. Over the years, various methods have been developed to analyze socio-economic disparities using aggregated territorial data at different scales. However, these approaches often lack the granularity required to fully capture the heterogeneity and spatial complexity of these phenomena.
Objectives
To address this gap, this study aims to measure and map socio-economic inequalities at a micro-level within the metropolitan areas of Rome, Milan, and Naples through an original statistical approach.
Methods
The methodological framework for measuring and representing the spatial distribution of urban poverty in metropolitan areas, leveraging advanced multivariate and spatial statistical techniques and integrating diverse data sources, can be summarized in three key steps: 1) Data from overlapping but inconsistent areal units were redistributed into high-resolution hexagonal grids (0.50 km²) using a dasymetric binary interpolation method to ensure uniformity [2]; 2) Selected socio-economic variables from different sources were synthesized into a single composite index of social advantage/disadvantage through factorial analysis, normalized on a 0–100 scale; 3) Spatial autocorrelation analysis was conducted to identify significant clusters of socio-economic conditions, employing a metric based on walking time distances derived from the road network to define spatial relationships among areal units.
Results
The procedure provides detailed results of socio-economic conditions at a micro-level, enabling regional comparisons and identifying statistically significant clusters of socio-economic advantages and disadvantages. Furthermore, it allows for assessing the intensity of socio-economic disadvantage, offering a deeper understanding of its severity and spatial distribution.
Discussion/Conclusions
This study presents a robust methodological approach to urban poverty analysis, underscoring the value of high-resolution spatial data and advanced statistical tools. The proposed approach is highly replicable, providing a framework that can be applied to the study of other urban contexts. The results offer policymakers critical insights for addressing urban inequalities and implementing targeted interventions in areas most affected by poverty.

References

1. Benassi, D., Morlicchio, E.: New Urban Poverty: In: Arum A. (ed.) The Wiley-Blackwell Encyclopedia of Urban and Regional Studies, pp. 1-8. John Wiley & Sons Ltd, New Jersey (2019)
2. De Falco, A., Irpino, A.: A new approach for measuring and analyzing residential segregation. Qual. Quant. (2024)

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Understanding drivers of intimate partner violence: insights from an ecological analysis in Sub-Saharan Africa

Micaela Arcaio and Anna Maria Parroco

Summary of Background Data
With one in three women worldwide experiencing intimate partner violence (IPV), this issue remains a pressing global concern, prompting the United Nations to include its elimination in "Goal 5 – Gender Equality" and "Goal 16 – Peace, Justice and Strong Institutions" of the Sustainable Development Goals. Understanding the factors driving IPV is essential, and the ecological model is often used as a theoretical framework for categorizing these drivers across individual, relationship, community, and societal levels, each acting at different levels.
Objectives
In this study, we evaluate the importance of the four dimensions of the ecological model in explaining IPV.
Methods
We employed Bayesian Hierarchical logistic regression models within the integrated nested Laplace approximation (INLA) framework to analyse data from the Demographic and Health Survey conducted in eleven Sub-Saharan African countries between 2016 and 2020. The study included 40,866 ever-married women aged 15-49 years. After a stepwise procedure that produced sixteen models, their performance was assessed using the Deviance Information Criterion and Watanabe-Akaike Information Criterion, with lower scores indicating better model goodness of fit.
Results
Our findings reveal that the full ecological model provides the best fit among those considered for explaining IPV, although models considering only individual and couple-level characteristics also demonstrated strong performance and robust results. Among the most significant predictors were men's educational attainment, their tendencies toward controlling behaviours, and women's prior experiences of abuse and whether women witnessed parental violence. These factors suggest that focusing on specific individual and relational attributes could sufficiently explain IPV in the studied contexts.
Discussion
Policy implications of these findings underscore the need for interventions that address men's education and raise awareness about controlling and abusive behaviours. Programs aimed at mitigating IPV should prioritize educating men about more equitable relationship dynamics and fostering attitudes that reject violence and control. Additionally, addressing women's past experiences of abuse is vital for breaking cycles of violence, possibly caused by revictimisation processes and/or the intergenerational transmission of violence.
Conclusions
Limitations of this work include the social desirability of the data, as well as the limited use of the ecological model framework to variables only included in the dataset. However, this study still highlights the utility of the ecological model while emphasizing the centrality of couple and individual factors in IPV prevention. By targeting education and behavioural change at these levels, policymakers can design effective strategies to reduce IPV prevalence in Sub-Saharan Africa and beyond.

References

1. The 17 goals. Sustainable Development. United Nations (2025) https://sdgs.un.org/goals. Cited 10 Jan 2025
2. Arcaio, M., Parroco, A.M.: A Composite Indicator of Polyvictimisation Through the Lens of the Ecological Model in Sub-Saharan Africa. Soc. Indic. Res. 1--18. (2024)
3. Rue, H., Martino, S., Chopin, N.: Approximate Bayesian Inference for Latent Gaussian Models by Using Integrated Nested Laplace Approximations. J. R. Stat. Soc. Ser. B-Stat. Methodol. 71 (2): 319–92 (2009)

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Contributed Session - CON *4* *Advances and Applications of NLP Techniques*

Chair Emiliano del Gobbo

1. *Empowering change: harnessing predictive models and NLP for effective communication strategies to combat gender-based violence* (Emma Zavarrone, Alessia Forciniti)
2. *Navigating islands to uncover structural holes: the analysis of knowledge flows in social science methodology* (Giuseppe Giordano, Maria Carmela Catone)
3. *Bias in Synthetic Data of Food Consumption* (Davide Miceli, Sara Mariottini, Fabio Ferri, Ilaria Primerano, Priscilla Salmi)

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Empowering change: harnessing predictive models and NLP for effective communication strategies to combat gender-based violence

Emma Zavarrone and Alessia Forciniti

Summary of Background Data
Gender-based violence represents a growing global phenomenon, characterized by an increasing incidence and serious socio-cultural implications that not only threaten the well-being and safety of victims [1] but also pose crucial challenges to the civil and social growth of the international community. In this context, public information plays a key role in promoting collective awareness and fostering educational and cultural pathways aimed at change and prevention.
Objectives
This contribution aims to support social communication projects designed to raise public awareness and promote paths of empowerment for women who are victims of violence, through the defining of future scenarios related to the determinants that shape the experiences of survivors of single or repeated episodes of violence.
Methods
To achieve this goal, a predictive model has been developed specifically designed to guide social communication in Italy. The first step in building the model is the implementation of an editorial database, composed of data collected through diverse sources. The Beta model was developed based on a collection of 64 women's stories told in the RAI television program "Sopravvissute", aired from 2018 to 2024 [3] The audio-videos recordings were transcribed into a textual corpus and subjected to Natural Language Processing (NLP)[2] techniques and multivariate analysis methods.
Results
The study yields three key outcomes. First, it involves the development of a comprehensive database detailing the characteristics of women exposed to violence, achieved through the integration of data from multiple sources. Second, it presents the creation of a predictive model designed to guide targeted communication and educational interventions. Third, it envisions a future framework that redefines preventive approaches to these issues, emphasizing a novel methodology for addressing them within both institutional and non-institutional communication contexts.
Discussion/Conclusions
The implications of this study go beyond the specific context, offering useful insights to support the "rebirth" of victims and promote meaningful social and cultural change.

References

1. Akudolu, L. O., Okolie, C. N., Okoro, E. A., Nwamuo, B. E., Okeke, I., Aigbonoga, S., et al.: Global rise in gender-based violence against women and girls during COVID-19 lockdown: An insight from Africa. Cogent Arts & Humanities, **10**(1) (2023). https://doi.org/10.1080/23311983.2023.2188772
2. Krippendorff, K.: Content analysis. SAGE Publications, Inc. (2019). https://doi.org/10.4135/9781071878781
3. Rai: Sopravvissute. Storie di coraggio al femminile (2024). https://www.raiplay.it/programmi/sopravvissute

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Navigating islands to uncover structural holes: the analysis of knowledge flows in social science methodology

Giuseppe Giordano and Maria Carmela Catone

Background
This presentation explores the role of structural holes and islands in the analysis of scientific knowledge processes characterizing social science methodology. Structural holes [1] are conceptualized as areas where knowledge is fragmented, typically due to a lack of connections between thematic groups. Islands [2], on the other hand, represent tightly-knit clusters of specialized knowledge. This study investigates the role of broker-nodes that bridge structural holes - as facilitators of knowledge exchange and interdisciplinary connections - emphasizing their capacity to generate innovative themes in scientific discourse.
Objectives
In this context, we propose a scientometric approach to map the dominant themes within a scientific field by leveraging the topological features of co-occurrence networks derived from bibliometric data. Keywords, as nodes in the network, may form cohesive subgraphs, isolated components, or act as bridges between different network components.
Methods
In this study, publications within the field of social science methodology are analysed using a bibliometric approach to explore the dynamics of knowledge production and identify emerging and innovative thematic areas within this research domain. The analysis of co-occurrence networks provides a theoretical background for a modified version of Cobo's Strategic Diagram [3], emphasizing the role of brokerage nodes in line with the theory of structural holes. Co-occurrence subgraphs that emerge as islands are interpreted as thematic topics, characterized by clustering and closeness centrality coefficients. Our hypothesis is that nodes acting as brokers, connecting isolated themes, are critical for the emergence of innovative topics.
Results
Exploring the structural holes between thematic networks allows for the identification of latent concepts and promotes innovation by bridging seemingly disconnected topics. The proposed method thus enables the mapping of the evolution of a scientific field, highlighting traditional, innovative, and potentially innovative themes; moreover, it contributes to understanding how knowledge develops through the connection of disparate concepts.
Conclusions
The proposed technique is presented in the context of the scientific literature inherent to social science methodology; moreover, it can be extended to other disciplinary contexts and used in a complementary way to the traditional Cobo's Strategic Diagram.

References

1. Burt, R., Structural holes and good ideas, American Journal of Sociology, 110 (2), 349–399 (2004).
2. Batagelj, Vladimir, et al. Understanding large temporal networks and spatial networks: Exploration, pattern searching, visualization and network evolution. Vol. 2. John Wiley & Sons, 2014.
3. Cobo, M.J., Lopez-Herrera, A.G, Herrera-Viedma, E., Herrera, F., Science Mapping Software Tools: Review, analysis, and cooperative study among tools, Journal of the American Society for Information Science and Technology, (2011).

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Bias in synthetic data of food consumption.

Davide Miceli, Sara Mariottini[1], Fabio Ferri, Ilaria Primerano[2], Priscilla Salmi

Summary of Background Data
This research investigates the influence of social biases, including race, gender, age, and economic status, on the generation of synthetic food consumption data by Large Language Models (LLMs). Utilizing the Gemma 2 model and an incremental bias prompting approach, we analysed the impact of these biases on generated shopping lists. Our findings reveal the influence of racial identity and economic status.
Objectives
This research aims to investigate the extent to which social biases, including gender, age, race, and economic status, influence the generation of synthetic food consumption data.
Methods
We have selected the 9-billion parameters version of the open-source Gemma 2 model [1]. This choice was carefully considered to balance computational efficiency with the capacity to generate diverse and informative data. While larger models may offer greater linguistic sophistication, they often incur significant computational costs and prolonged inference times [2]. Google DeepMind reports Gemma 2 represents a significant advancement in AI, demonstrating cutting-edge capabilities in areas such as code generation, reasoning, and multimodal understanding.
Results
Our analysis of the decision tree revealed that race emerged as the primary factor influencing community assignment. Personas identified as non-Asian were further differentiated based on their economic status. Those with a non-wealthy economic status were predominantly assigned to one community, while those with a wealthy economic status were assigned to another. In contrast, personas identified as asian were consistently categorized into a distinct community, regardless of their age, gender, or economic status. This finding suggests that racial identity plays an important role in shaping consumer preferences and behaviours, as reflected in the LLM-generated shopping lists.
Discussion/Conclusions
While there are some overlapping product choices across communities, the overall patterns suggest that the LLM's generated shopping lists are significantly influenced by two key biases: racial identity and economic status. These biases shape the model's output, leading to distinct product preferences for each community. For instance, the Asian community consistently selects products aligned with Asian culinary traditions, while the non-Asian communities exhibit differences based on economic status. However, it is important to note that other biases, such as age and gender, appear to have less of an impact on the generated shopping lists. These results are further confirmed by comparing the product communities identified in both the persona-persona and product-product networks. This finding underscores the potential for AI models to inadvertently perpetuate and amplify societal stereotypes, probably inherited from training data.

References

1. Gemma Team, Morgane Riviere, Shreya Pathak, Pier Giuseppe Sessa, Cassidy Hardin, Surya Bhupatiraju, Léonard Hussenot, Thomas Mesnard, et al. "Gemma 2: Improving Open Language Models at a Practical Size." arXiv preprint arXiv:2408.00118 (2024).
2. Hassid, M., Remez, T., Gehring, J., Schwartz, R., Adi, Y. (2024). The Larger the Better? Improved LLM Code-Generation via Budget Reallocation. arXiv. arXiv:2404.00725.

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Contributed Session - CON *5* *Health Models, Literacy and Food Deprivation*

Chair Carlo Zaccardi

1. *A Logistic Regression Model for Dementia Risk Assessment Using Digital Linguistic Biomarkers* (Linda Altieri, Gloria Gagliardi)
2. *Health literacy in blood donors* (Pietro Renzi, Alberto Franci)
3. *The impact of organic and healthy foods on material and food deprivation indices. A comparative analysis in European countries* (Antonio Gattulli, Margaret Antonicelli)

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A Logistic Regression Model for Dementia Risk Assessment Using Digital Linguistic Biomarkers

Linda Altieri, Gloria Gagliardi

Summary of Background Data
The aging population has amplified the global burden of dementia, necessitating innovative diagnostic approaches. Existing methods often rely on resource-intensive cognitive tests, providing binary classifications that fail to capture individual variability. Many current approaches for dementia detection depend on case-control datasets, which are challenging to collect, and often employ machine learning algorithms despite the extremely limited size of these datasets [1]. Digital Linguistic Biomarkers (DLBs), quantifiable features extracted from speech, offer a scalable and non-invasive alternative [2], yet their application in rigorous statistical frameworks remains underexplored.
Objectives
This study aims to develop a logistic regression model [3] to estimate personalized probabilities of dementia based on demographic variables (age, sex) and DLBs. The goal is to provide a probabilistic framework that enhances interpretability and supports early detection strategies.
Methods
The dataset includes semi-spontaneous speech samples from 40 participants, divided into dementia and control groups. Key linguistic features, such as the proportion of open-class words and action verbs, were extracted and analyzed. The model was validated through leave-one-out cross-validation, likelihood ratio tests, and additional statistical diagnostics to ensure robustness and reliability.
Results
The analysis identified significant relationships between reduced use of open-class words and higher dementia risk. The proposed model achieved high predictive accuracy and provided interpretable probability estimates for individual dementia risk. Probabilistic thresholds were set to personalize assessments, prioritizing individuals for further clinical evaluation based on their estimated risk levels.
Discussion/Conclusions
DLBs exemplify the potential of modern data sources in healthcare diagnostics, bridging gaps between computational linguistics and statistical modeling. By introducing probabilistic assessments, this study advances early dementia detection strategies, emphasizing transparency and scalability. The integration of DLBs into clinical workflows offers a cost-effective, actionable tool for addressing global public health challenges, with implications for improving patient outcomes and quality of life.

References

1. de la Fuente Garcia, S., Ritchie, C.W., and Luz, S. (2020) Artificial Intelligence, speech, and language processing approaches to monitoring Alzheimer's Disease: A systematic review. Journal of Alzheimer's Disease, 78(4), 1547–1574.
2. Gagliardi, G. (2023) Natural language processing techniques for studying language in pathological ageing: A scoping review. International Journal of Language & Communication Disorders, 1, 1-13
3. Hosmer, D.W., Lemeshow, S., and Sturdivant, R.X. (2013) Applied Logistic Regression. John Wiley & Sons

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Health literacy in blood donors

Pietro Renzi[1], Alberto Franci[1]

Summary of Background Data
Blood transfusion and donations are two critical areas in medicine, where health literacy proves indispensable. Understanding the different blood components and their respective indications is essential for patients to grasp the rationale behind the transfusion [1]. Within this contest, health literacy plays a critical role in facilitating patients understanding complex procedures, potential risks and treatment options [2].
Inadequate health literacy humpers patients' ability to actively engage in their care, leading to poorer health outcomes.
Objectives
The main aim of this study was to assess the health literacy levels among blood donors and contrast it with the health literacy levels observed in the general community. The study encompassed blood donors aged 18 years and older who were affiliated to the AVIS (Italian Blood Donors Association) of Senigallia. The survey was administered from October to December 2024.
Methods
The instrument HLS-EU-Q-16 was used and administered using CAWI (Computer Aided Web Interview). This methodology was chosen after a deep analysis of the literature [3] regarding main types of data collection. 16 items of the questionnaire used, assessing self-perceived HL, were aggregated in the general HL index, which provides a synthetic measure of HL levels. To achieve a better comparison with other research in this field the index was standardized on a scale from a minimum of 0 (lowest level of HL) to a maximum of 50 (best level of HL).
Results
The percentages of inadequate or problematic literacy were calculated first, together with the HLI means, both globally and according to studied variable categories with 95% confidence intervals (CI 95%). The $\chi 2$ test was performed to analyze the relationship between inadequate or problematic literacy and demographic, socioeconomic and health status variables. Independence t-test and ANOVA were employed to compare the mean scores of HL scale across independent groups. Bivariate and multivariate logistic regression model were adjusted to estimate the adjusted odds ratios (ORs) of association between the dichotomous variable 'Inadequate or problematic literacy/Sufficient literacy' and the rest of the variables.
Discussion/Conclusions
While acknowledging that the study's focus on blood donors within a specific area of Marche Region may limit its generalizability to a broader population, it nonetheless constitutes a significant contribution to the literature by elucidating the relationship between HL and blood donation behaviors. Consistent with the finding of the study, we posed that HL can indeed play a pivotal role in bolstering the ranks of blood donors.

References

1. Chakrabarty, Susmita, and Monali Priyadarsini Mishra. "Health Literacy Initiatives in the Donation Landscape: Educating for Impact." In *The Role of Health Literacy in Major Healthcare Crises*. IGI Global, 2024. 260-284.
2. Giles, Melanie, et al. "An application of the theory of planned behaviour to blood donation: the importance of self-efficacy." *Health education research* 19.4 (2004): 380-391.
3. Stock, Benita, and Luis Möckel. "Characterization of blood donors and non-blood donors in Germany using an online survey." *Health and Technology* 11.3 (2021): 595-602.

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The impact of organic and healthy foods on material and food deprivation indices. A comparative analysis in European countries.

Antonio Gattulli[1] and Margaret Antonicelli[2]

Summary of Background Data
There is a growing demand for organic and healthy food products across the Western world. Health concerns have often been considered the main motivation of consumers purchasing organic products, but the literature on consumer preferences and behaviour is less clear on what "health" means for consumers of these products, and, for this reason, it is unclear what exactly drives consumers to choose organic products [1]. Consumer concerns over the quality and safety of foods are one of the primary reasons for the increasing demand for organically produced food, which consumers perceive as healthier and safer [2]. Furthermore, after the Covid-19 syndemic in 2020, the purchasing power of many households has drastically reduced, and this has led to a considerable increase in two important indices: the material deprivation index and the food deprivation index.
Objectives
The aim of this work is to analyse and evaluate the dynamics related to the phenomenon of deprivation and organic and healthy foods, through the support of economic, demographic, territorial and health aspects. All this will be conducted through a comparative analysis of European countries.
Methods
After the definition of the material deprivation index, we will first proceed to a cluster analysis and then to the use of a model with moderation and mediation effects.
Results
The results show a huge gap between European countries, dividing them into 4 distinct clusters. Economic aspects and the lack of a high level of education are among the main factors contributing to the results obtained.
Discussion/Conclusions
The popularity of organic foods continues to grow exponentially. Organic foods now account for over 13% of all food sales. Consumers who buy organic foods may do so for a variety of reasons, including perceived benefits for the environment, animal welfare and worker safety, and the perception that organic foods are safer and more nutritious. Knowing the differences among organic foods and conventional foods with respect to food safety and nutritional composition in terms of quality is essential. However, the results show us that the economic aspect continues to be the main obstacle to greater consumption of this type of product. All of this creates very strong repercussions on health, from a young age and especially in people already affected by chronic or debilitating diseases. The situation is highly differentiated between countries regarding the intensity of the phenomenon.

References

1. Ditlevsen, K., Sandøe, P., Lassen, J. Food Quality and Preference. Elsevier (2019)
2. Magkos, F., Arvaniti, F., Zampelas, AOrganic food: buying more safety or just peace of mind? A critical review of the literature. Critical Reviews in Food Science and Nutrition 46: 23–56. (2006)

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Contributed Session - CON *6*
Smart Living and Social Surveys

Chair Chiara Passamonti

1. *IoT-Based Smart Home Technology and Quality of Life in Italy*(Luca Rossi)
2. *Unrevealing Electrical and Electronic Equipment disposal behaviours through Social Media Survey* (Margherita Silan, Sophie Grace Parolin, Francesco Dal Cero, Giorgia Bernardinis)

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IoT-Based Smart Home Technology and Quality of Life in Italy

Luca Rossi

Summary of Background Data
The adoption of Internet of Things (IoT) technology is transforming Italian households, offering enhanced convenience, security, and sustainability [1]. However, its impact on Quality of Life (QoL) and regional disparities in adoption remain unclear. This study uses Structural Equation Modeling (SEM) to examine the relationships between IoT usage, perceived benefits, barriers, and QoL outcomes across Northern, Central, and Southern Italy.
Objectives
The study aimed to explore how IoT devices impact QoL by enhancing convenience, energy efficiency, and security [2]. It also examined barriers, such as privacy concerns and costs, that limit adoption and benefits [3]. Additionally, regional differences in IoT adoption and QoL outcomes were analysed, along with the mediating role of QoL in user satisfaction.
Methods
Data were collected from 1200 households (40% North, 30% Center, 30% South) through a 40-question survey covering demographics, IoT usage, benefits, barriers, and QoL outcomes like comfort and sustainability. Recruitment was via social networks. Structural Equation Modeling was used to analyse the relationships between variables.
Results
IoT usage positively impacted perceived benefits ($\beta = 0.82$, $p < 0.01$), which strongly influenced QoL ($\beta = 0.71$, $p < 0.01$). Barriers negatively affected IoT usage ($\beta = -0.48$, $p < 0.05$) and QoL ($\beta = -0.43$, $p < 0.05$). QoL strongly predicted user satisfaction ($\beta = 0.87$, $p < 0.01$).
Regional disparities were significant. IoT adoption was highest in the North (62%) due to better infrastructure and perceived benefits ($\beta = 0.85$). Adoption in the Center was moderate (48%), focused on sustainability, while the South lagged (31%), mainly due to stronger barriers ($\beta = -0.57$). However, Southern households using IoT reported substantial QoL improvements ($\beta = 0.76$, $p < 0.01$).
Discussion/Conclusions
IoT technologies significantly improve QoL but face adoption challenges, especially in the South, due to costs and infrastructure limitations. Targeted policies like subsidies and awareness campaigns are needed to address these barriers. The study highlights IoT's potential to enhance daily life while emphasizing the importance of bridging regional gaps for equitable benefits.

References

1. Nižetić, S., Šolić, P., Gonzalez-De, D. L. D. I., & Patrono, L.: Internet of Things (IoT): Opportunities, issues and challenges towards a smart and sustainable future. Journal of cleaner production, 274, 122877 (2020)
2. Ahmad, N., & Zulkifli, A. M.: Internet of Things (IoT) and the road to happiness. Digital Transformation and Society, 1(1), 66-94 (2022)
3. Juba, O. O., Olumide, A. F., Idowu David, J., & Adekunle, K.: The role of technology in enhancing domiciliary care: A strategy for reducing healthcare costs and improving safety for aged adults and carers. Available at SSRN 5023483 (2024)

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Unrevealing Electrical and Electronic Equipment disposal behaviours through Social Media Survey

Margherita Silan, Sophie Grace Parolin, Francesco Dal Cero, Giorgia Bernardinis

Summary of Background Data
Management of Waste from Electrical and Electronic Equipment (WEEE) represents a critical issue. With the evolution of electronic devices, the production of WEEE has increased exponentially, posing environmental and health risks. In Italy, despite the European Union's decision on a target of 65% recycling rate for WEEE, the country achieved only 34% in 2022. A survey was conducted using Meta's advertising platform, primarily through Facebook, to unravel the reasons for this gap.
Objectives
This work pursues two primary objectives:
- Explore the methodology of data collection through social networks and the subsequent bias adjustment techniques.
- Investigate the level of awareness of WEEE disposal in Italy.

Methods
Data were collected via Meta's advertising platform, offering rapid and cost-effective data gathering but introducing significant bias. To mitigate it, quota sampling and various weighting techniques were employed, including post-stratification, raking, and quasi-randomization, with different variables sets.
Results
Promoting the questionnaire through social media allowed us to gather responses from across Italy quickly and cost-effectively, with an average cost of approximately 2 euros per completed questionnaire. Despite implementing quota sampling, we encountered a biased sample. Thus, we introduced a weighting system. After comparing various techniques and variable sets, we found that the most significant improvement came not from more sophisticated methodologies but from incorporating behavioral variables into the weight calculation. However, we were unable to eliminate all the present biases. The persistence of this bias suggests that the discrepancy between our sample and the target population extends beyond what can be fully corrected through conventional post-stratification techniques.
The findings reveal a significant disparity in awareness levels between northern Italy and the region of central-south and islands, with northern respondents demonstrating greater awareness of proper disposal practices. The level of education has emerged as a crucial factor in influencing the understanding of WEEE and battery disposal regulations. The study also explored the potential effectiveness of monetary incentives to encourage proper disposal, finding that well-informed respondents would require lower incentives.
Discussion/Conclusions
In conclusion, while our social media-based survey methodology offered efficiency and cost-effectiveness, it also presented challenges in terms of sample bias. The inverse relationship between awareness and the required monetary incentive for proper disposal suggests that educational initiatives could be a cost-effective strategy to improve WEEE collection rates. Our findings underscore the importance of targeted awareness campaigns for WEEE disposal, particularly in regions and demographic groups with lower awareness levels.

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Contributed Session - CON *7*
Social Media Analytics

Chair Emiliano del Gobbo

1. *Exploring the V_V Group: Tweet Sharing Trends and Temporal Dynamics* (Domenica Fioredistella Iezzi, Roberto Monte, Daniele Pasquini)
2. *An analysis of the Dipartimento della Funzione Pubblica Post- Pandemic Social Communication* (Roberto Artiaco)
3. *Exploring BERT: a Comparative Analysis between BERTopic and LDA* (Caterina Ambrosio, Roberto Artiaco, Ciro Clemente De Falco)

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Exploring the V_V Group: Tweet Sharing Trends and Temporal Dynamics.

Domenica Fioredistella Iezzi[1], Roberto Monte[2], Daniele Pasquini[1]

Summary of Background Data
The V_V group, commonly known as "ViVi," is a collective that emerged in Europe, particularly in Italy. It is associated with disinformation and protest movements that have gained prominence recently, especially during the COVID-19 pandemic. The group is notable for its extensive use of digital platforms to disseminate polarizing messages and foster skepticism towards institutions. It actively promotes anti-government narratives and spreads disinformation, often leveraging online communities to amplify its influence [1, 2]. The activities of the V_V group highlight the growing intersection of digital communication and organized disinformation campaigns in shaping public discourse. This group shares similarities with other conspiracy-driven movements, such as QAnon in the United States [3].
This study analysed 376,842 Italian tweets from February 2022 to January 2023, extracted using the hashtags #ViVi and #Vi_Vi.
Objectives
The research examines the statistical distribution of shares, the content of tweets, and the associated reference network to uncover significant patterns and insights. The key objectives are to identify the most shared content, conduct sentiment analysis, analyze the network, and understand the temporal dynamics of these shares.
Methods
We analyse the network community of users and the sentiment of the temporal dynamics of tweets using machine learning and deep learning approaches, as well as Italian institutional communication in the chronological speeches of the Prime Minister.
Results
We analyse the most popular tweets, focusing on their propagation time, statistical distribution, and connection to institutional communication. We identify the expressions most used to spread disinformation and the specific topics associated with them.
Discussion/Conclusions
This study offers a comprehensive understanding of the ViVi group's online communication strategies and their impact on the dissemination of information.

References

1. Bhardwaj, A., Bharany, S., Kim,S. Fake social media news and distorted campaign detection framework using sentiment analysis & machine learning, *Heliyon*, V 10, 16, e36049 (2024).
2. Holoyda BJ. The QAnon Conspiracy Theory and the Assessment of Its Believers. *J Am Acad Psychiatry Law.* 50(1):124-135. (2022) Mar; doi: 10.29158/JAAPL.210053-21.
3. Kiratli, OS. Social Media Effects on Public Trust in the European Union. *Public Opin* Q. Aug 3;87(3):749-763 (2023).

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An analysis of the “Dipartimento della Funzione Pubblica” Post-Pandemic Social Communication

Roberto Artiaco

Summary of Background Data
The pandemic crisis revealed significant gaps in the communication strategies of the “Dipartimento della Funzione Pubblica” on social media. Addressing these gaps is crucial to understanding the department's adoption of Agile or Smart Working practices.
Objectives
This research investigates whether and how the department implemented Agile or Smart Working as of April 2021, focusing on its communication efforts on social media.
Methods
Data were extracted via Web Scraping from the department's Facebook profile. Topic Modelling was conducted using the Latent Dirichlet Allocation (LDA) probabilistic model [1] to identify key topics discussed. Coherence Scores, specifically the UMass measure [2], were employed to evaluate model performance, relying on document co-occurrence counts and conditional probabilities.
Results
The analysis revealed a wide range of topics discussed on the platform. Notably, the department undertook a targeted communication campaign promoting alternative work forms, although these efforts were limited in scope and reach.
Discussion/Conclusions
The findings underscore the need for enhanced and more comprehensive communication strategies to effectively support the promotion and adoption of Agile or Smart Working within the public administration.

References

1. Blei D.M., Ng A.Y., Jordan M.I..: Latent Dirichlet Allocation. In: The Journal of Machine Learning Research, Volume 3, pp. 993-1022. JMLR (2003).
2. Mifrah S., Benlahmar E.H.: Topic Modeling Coherence: A Comparative Study between LDA and NMF Models using COVID’19 Corpus. In the International Journal of Advanced Trends in Computer Science and Engineering, Volume 9, pp. 5756-5761. The World Academy of Research in Science and Engineering (2020).

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Exploring Bert: a Comparative Analysis of BERTopic and LDA

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Summary of Background Data
Topic modelling has gained prominence as a key technique for textual data analysis across various applications [1]. The advent of advanced language models, such as Bidirectional Encoder Representations from Transformers (BERT) [2], presents opportunities to refine the identification and categorization of themes in texts.
Objectives
This study aims to assess the effectiveness of BERT for topic modelling in analyzing Italian social media content, with a focus on the topic of chatbots, specifically CHATGPT.
Methods
An Italian-language dataset was collected from Facebook and Twitter, chosen for their distinct characteristics in content generation—Twitter with a 280-character limit and Facebook with no specific limit. These differences allow for evaluating BERT in contexts with varying text lengths and complexities. The methodological approach involved data collection and preprocessing, applying BERT-based topic modelling, and comparing the results with the established Latent Dirichlet Allocation (LDA) technique. Model performance was evaluated in terms of coherence, thematic diversity, and information synthesis.
Results
The analysis highlighted key differences in the effectiveness of BERT and LDA across platforms with varying text structures. Performance was assessed based on thematic coherence and the ability to capture the diversity and complexity of the dataset.
Discussion/Conclusions
The study offers a critical evaluation of BERT's capabilities in topic modelling compared to traditional methods, emphasizing its strengths and limitations, particularly in handling differences in text length and complexity across platforms.

References

1. Blei D.M., Ng A.Y., Jordan M.I..: Latent Dirichlet Allocation. In: The Journal of Machine Learning Research, Volume 3, pp. 993-1022. JMLR (2003).
2. Devlin, J., Chang M., Lee K., Toutanova K.: BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding. arXiv preprint arXiv:1810.04805 (2018).

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This book collects the abstracts presented at the DSSR 2025 - Towards a holistic understanding of society: bridging Social Sciences, Statistics and Computational Sciences, held from February 19th to 21st, 2025 at the University G. d'Annunzio Chieti-Pescara. Key areas of focus include digital transformation, artificial intelligence, social research, futures studies, economic and financial modeling, healthcare and well-being and education. The selected abstracts explore advanced methodologies and statistical approaches in social sciences. The conference examined the challenges and opportunities of the "data revolution" in social research, emphasizing data science, statistics, and computational sciences. New data sources provide valuable insights into sustainable development, social inequalities, public health, and digital transformation. In a rapidly evolving world, interdisciplinary collaboration is crucial to navigating complexity and shaping the future. This collection covers diverse topics, from statistical methodologies and social data analysis to smart cities, sustainability, and ethical considerations in data science. By bringing together innovative research, it provides valuable perspectives for scholars, professionals, and policymakers working at the intersection of data science and society.

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