Matteo Spanio

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Current Position

PhD Student in the Brain, Mind & Computer Science program, University of Padova, currently at 2nd year of the 3 years long PhD. Supervisor: Prof. Antonio Rodà

Areas of Specialization

Sound and music computing, Affective computing, Computational creativity, Computing and cultural heritage

Education

2019 Bachelor's Degree in Clarinet, C. Pollini Conservatory. Supervisor: Prof. Luca Lucchetta

2021 Master's Degree in Clarinet, C. Pollini Conservatory. Supervisor: Prof. Luca Lucchetta

2023 Bachelor's Degree in Computer Science, Data Science track, Ca' Foscari University. Supervisor: Prof. Ilaria Prosdocimi

Other Training Activities

2022 24 FIT, C. Pollini Conservatory. Course for obtaining the 24 university credits in anthropological, psychological, and pedagogical disciplines, as well as teaching methodologies and technologies. The 24 credits are required to participate in future competitions for initial teacher training and recruitment.

2023 Security Analyst Certificate, Fastweb Digital Academy. I attended the 160-hour online Cyber Security Analyst course at Fastweb Digital Academy. Skills acquired during the course: 1) Network traffic analysis; 2) Understanding and identifying the main types and tools of attack: vulnerability exploit, SQL injection, XSS injection, backdoor, RCE, data leak, ransomware, password stealing, lateral movement, …; 3) Using traffic analysis, Intrusion Detection, and SIEM tools; 4) Analyzing alarm signals; managing and analyzing the phases of a cybersecurity incident; 5) Interpreting the stages of the cyber kill chain; 6) Detection systems; 7) Blue Team, Red Team, Purple Team; 8) Threat intelligence; 9) Cyber incident response; 10) Malware analysis.

2024 7th Advanced Course on Data Science & Machine Learning, ICAS — The Interdisciplinary Centre of Advanced Studies. Five-day summer school focused on state-of-the-art topics in Deep Learning, Data Science, and Generative AI, with lectures delivered by industry experts.

Research Interests

My research interests lie within the scientific field of **Sound and Music Computing**, which is included under Human-centered computing – Interactive systems and tools, and Applied Computing – Arts and Humanities, according to the ACM Computing Classification System 2012. Specifically, my work focuses on the use of generative multimodal deep learning models to explore latent connections between different sensory perceptions, with the aim of generating synesthetic experiences.
During my PhD, I am applying these principles through active collaboration with SoundFood S.r.l. to develop innovative solutions in the food service sector, using artificial intelligence to generate sounds from taste descriptions [**spanio2025arxiv**]. In parallel, I have contributed to the preservation of sound archives by studying AI-based methods for the digitization and restoration of materials stored on analog media, such as records and magnetic tapes. These studies led to the development of the international standard MPAI/IEEE-CAE ARP, in collaboration with Stanford University [2, 1, 5, 3].
More recently, I have also delved into the interaction between music and emotions, a key aspect of my research [6]. This approach has led me to develop models for musical representation and generation based on emotional and perceptual vectors. I also continually develop software solutions that integrate with AI technologies to support my research [7, 4].

Main Scientific Collaborations

- Prof. Marina Bosi, Center for Computer Research in Music and Acoustics (CCRMA), Stanford University, California
- Prof. Massimiliano Zampini, Center for Mind/Brain Sciences (CIMeC), University of Trento, Italy
- Dr. Leonardo Chiariglione, founder of MPEG and MPAI
- Prof. Bruno Mesz, Universidad Nacional de Tres de Febrero, Argentina
- Dr. Masaki Ohno, Ritsumeikan University, Japan

Previous Positions

2023 Software Developer for 7 months at Audio Innova S.r.l. Main activities: Software development in PHP, Python, JavaScript, SQL, Rust, C/C++.

Teaching Activities

2024 12 hours of C programming lab for the course *Data and Algorithms* (second year of the Bachelor's degree in Electronic Engineering) at the Department of Information Engineering (DEI), University of Padua.

2025 16 hours of C programming lab for the course *Data and Algorithms* (second year of the Bachelor's degree in Electronic Engineering) at the Department of Information Engineering (DEI), University of Padua.

Research Projects

I actively contribute to research within the following national and international projects:

2023–present MPAI: Moving Picture, Audio and Data Coding by Artificial Intelligence — project for the development of the MPAI-CAE ARP standard, co-funded by Audio Innova S.r.l.

2023–present SoundFood — project co-funded by the company SoundFood S.r.l. for the generation of sounds based on multimodal AI

2023–2024 AIDA 2 — Restoration and digitization of the archive of the Fondazione Arena di Verona, funded by Audio Innova S.r.l.

Awards and Recognitions

2021 Cyber Challenge 2021 – Finalist. A competition for students focused on cybersecurity challenges. Events take place in jeopardy mode (individual) or capture the flag (team CTF).

2023 MPAI Certificate of Appreciation – Awarded for contributions to the development of Conformance Testing of Context-based Audio Enhancement (MPAI-CAE).

2024 Start Cup Padova 2024 – Finalist. Participated with Ilaria Lorenzi on the project *MusicCare_Baby*, proposing a series of serious games based on rule learning to support the cognitive development of prematurely born infants.

Publications

[1] Marina Bosi et al. "A novel derivative-based approach for the automatic detection of time-reversed audio in the MPAI/IEEE-CAE ARP international standard". en. In: *Journal of the Audio Engineering Society* 10190 (2024). URL: https://aes2.org/publications/elibrary-page/?id=22693.

[2] Marina Bosi et al. "From Tape to Code: An International AI-Based Standard for Audio Cultural Heritage Preservation - Don't Play That Song for me (If it's Not Preserved With ARP!)" en. In: *IEEE Access* 12 (2024), pp. 152544–152558. DOI: 10.1109/ACCESS.2024.3474529.

[3] Zafer Çınar et al. "Filming the sound: Anomaly Detection on Audio Tape Recordings using Computer Vision Algorithms". In: *Proceedings of the 3rd Workshop on Artificial Intelligence for Cultural Heritage (IAI4CH 2024) co-located with the 23rd International Conference of the Italian Association for Artificial Intelligence (AIxIA 2024)*. CEUR Workshop Proceedings. http://CEUR-WS.org, 2024. URL: https://ceur-ws.org/Vol-3865/.

[4] Alessandro Fiordelmondo et al. "Toward a Repository Template for Music Technology Research". In: *Proceedings of the International Conference on New Interfaces for Musical Expression*. Brisbane, Australia: Queensland Conservatorium Griffith University, 2025.

[5] Alessandro Russo, Matteo Spanio, and Sergio Canazza. "Enhancing Preservation and Restoration of Open Reel Audio Tapes Through Computer Vision". en. In: *Image Analysis and Processing - ICIAP 2023 Workshops*. Ed. by Gian Luca Foresti, Andrea Fusiello, and Edwin Hancock. Cham: Springer Nature Switzerland, 2023, pp. 297–308. ISBN: 978-3-031-51026-7. DOI: 10.1007/978-3-031-51026-7_26. URL: https://doi.org/10.1007/978-3-031-51026-7_26.

[6] Matteo Spanio. "Towards Emotionally Aware AI: Challenges and Opportunities in the Evolution of Multimodal Generative Models". In: *Proceedings of the AIxIA Doctoral Consortium 2024 co-located with the 23nd International Conference of the Italian Association for Artificial Intelligence (AIxIA 2024)*. CEUR Workshop Proceedings. http://CEUR-WS.org, 2024. URL: https://ceur-ws.org/Vol-3914/.

[7] Matteo Spanio and Antonio Rodà. *TorchFX: A modern approach to Audio DSP with PyTorch and GPU acceleration*. en. 2025. arXiv: 2504.08624 [eess.AS]. URL: https://arxiv.org/abs/2504.08624.

[8] Matteo Spanio et al. "A multimodal symphony: integrating taste and sound through generative AI". en. In: *Frontiers in Computer Science* Volume 7 - 2025 (2025). ISSN: 2624-9898. DOI: 10.3389/fcomp.2025.1575741. URL: https://www.frontiersin.org/journals/computer-science/articles/10.3389/fcomp.2025.1575741.

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