DELFINA MARTINEZ PANDIANI

Academic Curriculum Vitae

Assistant Professor of Cultural Data Analysis
Department of Media Studies
Institute for Logic, Language and Computation
Universiteit van Amsterdam (UvA)
Amsterdam, Netherlands
 github.com/delfimpandiani
ORCID: 0000-0003-2392-6300
in *linkedin.com/in/dmartinezpandiani/*

I focus on human-centered and ethical AI, computational cultural analytics, and critical data studies. I emphasize multimodal and explainable methods for analyzing cultural heritage data. As a scientist, artist, and intersectional humanist, I challenge and play with assumed binaries, like public/private, nature/culture, male/female, and white/colored. Overall, I am committed to producing knowledge that explores how human and non-human agents adapt within the dynamic interplay of technological advancement, societal values, and cultural diversity.

Professional & Research Experience

09/2024 – **Assistant Professor of Cultural Data Analysis**, *Department of Media Studies + Institute for Logic, Language and Computation, Universiteit van Amsterdam*, Amsterdam, Netherlands.
Focus: Cultural Data Analytics, Critcal Pespectives on AI, Multimodal Memes and Misinformation, Explainable and Transparent AI.

12/2023 – **Postdoctoral Researcher**, *Human-Centered Data Analytics Research Group at CWI (Centrum*
08/2024 *Wiskunde en Informatica)*, Amsterdam, Netherlands.
Focus: Information Quality Assessment, Multimodal Propaganda Detection, Multimodal Memes and Misinformation, Explainable AI, Crowdsourcing. Project on "Transparent AI Pipelines for Information Quality Assessment."

05/2022 - **Visit (unpaid)**, *Digital Humanities Lab at the Royal Netherlands Academy of Arts and Sciences*
07/2022 *(KNAW)*, Amsterdam, Netherlands.
Focus: Dataset Design, Knowledge Engineering, Ontology Design, Neuro-Symbolic Reasoning.

07/2019 – **3D and Interactive Technologies Researcher**, *Italian National Research Council, ITBC-CNR*,
08/2019 Rome, Italy.
Focus: Photogrammetry, 3D modeling, interactive 3D texturing, Blender software, 3D models of ancient sculptures and architectural landscapes and ruins.

06/2018 - **Arts Manager**, *Shalini Ganendra Fine Art*, Kuala Lumpur, Malaysia.
08/2018 Focus: Creative and web content, creative copy for catalogs, direct mail, press releases, and print. Developed seasonal campaigns such as the Gallery Weekend Kuala Lumpur.

07/2017 - **George Peabody Gardner Fellow**, *Havard University*, Easter Island, Chile.
05/2018 Focus: Winner of renowed Gardner fellowship for self-directed year-long project, focused on cultural immersion in Rapa Nui (Easter Island) and Polynesia for the exploration of local life, which culminated in the self-published multimedia chronicle, 'The Navel of the World.'

05/2017 - **Integrated Media Fellow**, *Peabody Essex Museum*, Salem, United States.
07/2017 Focus: Media fellow at the oldest continuously operating museum in the US. Created an informational model for database, primary, and secondary research to be gathered in a detailed and effective manner for both internal and external use. The informational model was designed with the primary goal of logistically supporting background research in preparation to host a Wikipedia edit-a-thon at PEM.

09/2014 - **Radcliffe Research Partner**, *Radcliffe Institute for Advanced Study, Harvard University*, Cambridge, United States.
05/2017 Focus: Collaborator on archival, and studio work with Radcliffe Fellows and artists Jennifer Bornstein and AK Burns. Production assistant for Burn's Negative Space and Bornstein's Contemporary Archeology. Materials technology, casting, and painting, research, video editing.

Education

2020 – 2024   **PhD (*excellent*), Computer Science & Engineering**, *University of Bologna*, Bologna, Italy.
Explainable AI, Knowledge Engineering, Computer Vision, Digital Humanities. Thesis: *"Mind the Gap(s): Cognitive-Inspired AI for High-Level Visual Sensemaking. Towards Abstract Concept Image Classification."*

2018 – 2020   **Master of Arts (*cum Laude*), Digital Humanities and Digital Knowledge**, *University of Bologna*, Bologna, Italy.
Digital Humanities, Augmented Reality, Civic Education. Thesis: *"Semantic & Interactive Technologies for Civic Education: Ancient Classical Polychromy as a Case Study."*

2013 – 2017   **Bachelor of Science (*summa cum Laude*), Human Evolutionary Biology**, *Harvard University*, Cambridge, United States.
Human Behavioral Coding, Post-Conflict Reconciliation, Data Analysis. Minor degree in Studies of Women, Gender, and Sexuality. Thesis: *"Reconciliation in Homo sapiens: Behavioral Perspectives on the Human Post-Conflict Period"*

Supplementary Education

2023 - 2024   **NetWorkLab: Digital Humanities Project Management**. Year-long course on remote collaboration methods for project managers, funded by U.S. National Endowment for the Humanities.

2022   **International Summer School on Digital Art History (DAHSS)**. Málaga, Spain. *"Collapse, Creativity, and Imagination"*: AI and Computer Vision in art history and visual studies.

2022   **International Semantic Web Summer School (ISWS)**. Bertinoro, Italy. Focus: knowledge engineering, knowledge graph embeddings, semantic technologies.

2022   **Bertinoro International Spring School (BISS)**. National School of Italian Computer Science PhD granting institutions under the auspices of GRIN.

2021   **Digital Humanities and Digital Communication Summer School**. Modena, Italy. Focus: Multimodality and Transmediality, Visual Analytics, Network Visualization, Discourse Analysis.

2019   **Digital Humanities Summer Insitute (DHSI)**. Victoria, Canada. Sound and Digital Humanities, Surveillance and the Critical Digital Humanities.

2019   **48th Institute for the Editing of Historical Documents**. Princeton University, NJ, United States. Documentary Editing, Collecting and Cataloging, Transcription.

2015   **Pre-textos Teacher Training Program**. Cultural Agents Initiative at Harvard University, Cambridge, United States. Teacher-training program by Prof. Doris Sommer.

Research Funding and International Project Experience

2020 – 2023   **Ontology Engineering Task Force**, *Polifonia: a digital harmoniser for musical heritage knowledge.*, Work Package 2 of ERC project *Polifonia*, with a focus on ontology engineering and semantic web, applied in the musical cultural heritage context. Ensured that the project's ontological and knowledge-graph related work was conducted properly from a methodological perspective, and that the ontology network took shape with high quality. Experience with: RDF, OWL, SPARQL, JavaScript, Ajax, JSON. Designer and developer for the Polifonia Demo presented at SONAR AI and Music Festival, which explored the rising role of artificial intelligence in music production, October 2021, `https://cordis.europa.eu/project/id/101004746`.

2020 – 2023   **Interface Design Task Force**, *SPICE: Social cohesion, Participation, and Inclusion through Cultural Engagement.*, Work Package 5 of ERC project *SPICE*, dedicated to developing interfaces for cultural heritage interfaces guided by diverse user groups, including those with disabilities. Expertise in: User Experience, User Interaction, HTML, CSS, XML, Angular, `https://cordis.europa.eu/project/id/870811`.

2023 **Grant Writing**, *PERCEIVE: Perceptive Enhanced Realities of Colored collEctions through AI and Virtual Experiences.*, Contributed to the successful acquisition of ERC funding by translating theoretical concepts from master's thesis into practical applications. Participated in the grant writing process, developed project proposals, and ensured compliance with funding requirements and deadlines, `https://cordis.europa.eu/project/id/101061157`.

Honors & Awards

2022 **Synapse AI Symposium Awardee**, issued by *Bending Spoons S.p.A*. Selected to present my doctoral dissertation research at the annual symposium and receive a monetary award. `https://synapsesymposium.ai/`.

2022 **Best Full Paper Award**, issued by *the Program Committee of the 1st International Conference on eXtended Reality (XR Salento)* for the paper "Factors in the cognitive-emotional impact of Educational Environmental Narrative Videogames', `https://www.xrsalento.it/awards/`.

2022 **Marco Polo University Programme Fellowship**, awarded by *the University of Bologna*, as a visiting researcher at DHLab at the Royal Netherlands Academy of Arts and Sciences (KNAW), Amsterdam, Netherlands.

2021 **Best Thesis Award of AIES**, awarded by the Scientific Committee of the *Italian Association of Scientific Experts for Cultural Heritage (AIES)*. Selected as the best Master's thesis studying diagnostics, conservation, and/or enhancement of Cultural Heritage, based on originality and professionalism of the work.

2020 **Ian Lancashire Student Promise Award**, issued by *Canadian Society of Digital Humanities (Société canadienne des humanités)*. The Ian Lancashire Promise Award for Graduate Student Promise recognizes an outstanding presentation of original research in the digital humanities by a graduate student at the annual conference of the Canadian Society of Digital Humanities.

2017 **Summer Humanities and Arts Research Program (SHARP) Fellowship**, issued by *Harvard College Office of Undergraduate Research and Fellowships*, a 10-week immersive summer program for a small cohort of Harvard undergraduate researchers in the humanities and arts. SHARP fellows work on research projects with Harvard-affiliated faculty, researchers, and senior library and museum staff.

2016 **John Harvard Scholar**, issued by *Harvard University*. Designated a 2015-2016 John Harvard scholar. The honor is awarded to students in the top 5% of their respective classes, based on their grade point average.

2015 **HCRP Research Award**, issued by *Harvard College Research Program*, to support student-initiated, independent scholarly research undertaken with the guidance of a Harvard-affiliated faculty mentor. Autonomy in the development, direction, and preparation of research, on intimate partner violence and Latina immigrants in the U.S., with Prof. Madina Agenor from the Harvard T.H. Chan School of Public Health.

2015 **David Rockefeller International Experience Grant Recipient**, issued by *Harvard University*. Award for a self-created independent artistic project, funded an 8-week project, focused on mural-making and exploration of different cultural and religious movements in Kingston, Jamaica.

2013 **National Hispanic Scholar**, issued by the *College Board*.

2013 **Silverknight Nominee for General Scholarship**, issued by the *Miami Herald* newspaper.

2012 **Forensic League National Tournament Qualifier**, issued by the *United States' National Forensic League - Debate*.

Memberships

○ **AIMDLab**, AI, Media & Democracy ELSA Lab, University of Amsterdam.
○ **STLab**, Semantic Technology Laboratory, Italian National Research Council (CNR)
○ **AIxIA**, Italian Association for Artificial Intelligence (AI), member of the European Association for AI.

Lectures & Talks

2024 **[Upcoming] "Leveraging LLMs for Detection and Interpretation of Toxic Memes"** at the *Internet Research with Foundation Models* Workshop at CAT4SMR (Capture and Anaysis Tools for Social Media Research), Amsterdam, 3 September 2024. `https://cat4smr.humanities.uva.nl/index.php/2024/04/18/call-for-participation-internet-research-with-foundation-models/`

2024 **"Relación texto-imagen en memes: Construcción (en curso) de un modelo de IA para la detección automática de "narrativas tóxicas" (Text-image relationship in memes: (Ongoing) Construction of an AI model for automatic detection of "toxic narratives")"** at the *V Congreso Internacional PRISMA: Lenguaje e Inteligencia Artificial. Aproximaciones lingüísticas y desafíos interdisciplinarios.* Universidad Adolfo Ibáñez, Santiago, Chile, 28-30 May 2024. `https://artesliberales.uai.cl/v-congreso-internacional-prisma/`

2024 **"Toxic Memes Workshop"** Invited to give an interactive workshop on the legal, media, and computational approaches to toxic content moderation at the *AI, Media & Democracy LAB*. University of Amsterdam, Amsterdam, 2 April 2024. `https://www.aim4dem.nl/news/`

2024 **"Coding the Encoder: Situating Subjective and Contextual Aspects in High-Level Image Annotations."** Invited speaker at the *International Conference on Reimagining Annotation for Multimodal Cultural Heritage* on digital annotation in the humanities and the GLAM sector across three primary axes: tools, methods and projects. Rennes 2 University and the MSHB (Maison des Sciences de l'Homme en Bretagne), France, 7-9 Feb 2024. `https://reimagining-amch.sciencesconf.org/`

2023 **"Collapsing Meaning in Hypericon Images: Abstract Concepts, Distributed Reality, and Perceptual Bias."** Invited speaker at the *Operational Imaginaries: Images of Abstraction, Operational Media and Experience* cross-media seminar by the Amsterdam School for Cultural Analysis. University of Amsterdam, Netherlands, 25-26th May 2023. `https://sites.google.com/rug.nl/operational-imaginaries/home`

2023 **"The Wicked Problem of Naming the Intangible: Abstract Concepts, Binary Thinking, and Computer Vision Labels.'** Invited speaker at the *FACEing Binarism. Towards a more equitable AI* symposium. Vrije Universiteit Amsterdam, Netherlands, 30th March 2023. `https://www.identity-ai.nl/abstract/the-wicked-problem-of-naming-the-intangible%3A-abstract-concepts%2C-binary-thinking%2C-and-computer-vision-labels`

2022 **"Seeing the Intangible: Interpretable Visual Understanding of High-Level Abstract Concepts."** Guest speaker at the group meeting of the *User-Centric Data Science* group at Vrije Universiteit Amsterdam, Netherlands. 25th November 2022.

2022 **"Tip of the Iceberg: Abstract Concepts in High-level Visual Understanding."** Guest speaker at the IMT School for Advanced Studies' seminar: *Semantic Representation, Abstractness and Abstraction*. Lucca, Italy. April 27th 2022.

2022 **"Coded Visions: Cultural Bias in Assigning Meaning to Digital Images."** Invited speaker at the *2022 Digital Humanities & Digital Communication Spring Seminars* of the Università di Modena e Reggio Emilia. Modena, Italy. 28th March 2022. `https://www.dslc.unimore.it/site/home/dipartimento/articolo980058733.html`.

Posters

2024 **"Decoding Toxic Memes with Multimodal Language Models: Challenges and Opportunities"** at the Research Program Seminar on *"AI's impact on Society, Media & Democracy"*.. Workshop at Centrum Wiskunde & Informatica, Amsterdam, 23-28 May 2024. `https://www.cwi.nl/en/events/cwi-research-semester-programs/research-semester-programs-in-2024/ais-impact-on-society-media-democracy/`

2024 **"Toxic Memes: Automatic Cross-Modal Insights for Multimodal Meme Moderation"** at the *Large Language Models for media and democracy: wrecking or saving society?*. Workshop at Centrum Wiskunde & Informatica, Amsterdam, 23-24 April 2024. `https://artesliberales.uai.cl/v-congreso-internacional-prisma/`

Organization of Events

2024 **Local Chair, Organizing Committee** for *24th International Conference on Knowledge Engineering and Knowledge Management (EKAW))*, Amsterdam (Netherlands), Nov 2024. `https://ekaw.org/`

2021 **Organizing Committee** for *SciRoc*, the Second Smart City Robotics Challenge, Bologna (Italy), 06-10 Sept 2021. `https://sciroc.org/2021-challenge-description/`

2021 **Organizing Committee** for *Polifonia European Meeting*, Bologna (Italy), 13-15 Oct 2021.

Program Committees

2024 **Program Committee** for *VISART VII: Where Computer Vision Meets Art Workshop* at the 18th European Conference of Computer Vision (ECCV 2024), Milano (Italy), 29 Sept-4 Oct 2024. `https://visarts.eu/`

2024 **Program Committee** for *International Workshop on Integrating the Semantics of Data, Ontologies, Moral and cultural values and their Societal impact (WISDOMS)* at the 21st European Semantic Web Conference (ESWC 2024) - Values Track, Hersonissos (Greece), 26-30 May 2024. `https://wisdoms-workshop.github.io/`

2024 **Program Committee** for *First International Workshop of Semantic Digital Humanities (SemDH)* at the 21st European Semantic Web Conference (ESWC 2024) - Values Track, Hersonissos (Greece), 26-30 May 2024. `https://semdh.github.io/`

2023 **Program Committee** for 22th *International Federation for Information Processing – International Conference on Entertainment Computing (IFIP-ICEC 2023)*, Bologna (Italy), 15-17 November 2023.

2021 **Program Committee** for 21st *Special Issue on AI for People* on the AI & Society - Journal of Culture, Knowledge and Communication (Springer)

University Teaching/Assistantships

2022-2023 **Web Technologies**, *University of Bologna, Italy*.
Annual course for the Bachelor's degree in *Information Science for Management*. Responsibilities included teaching laboratory and exercise sessions, as well as exam preparation and correction. Topics covered: World Wide Web principles, URI, HTTP, REST, API development, HTML, CSS, XML, JSON, Javascript, Ajax, server-side technologies (NodeJs, frameworks), and client-side frameworks (Vue, React, Angular). `https://www.unibo.it/it/didattica/insegnamenti/insegnamento/2022/392954`

2021-2022 **Computer Skills**, *University of Bologna, Italy*.
Annual course for the Bachelor's degree in *Biological Sciences*. Responsible for exercise and exam sessions covering Internet, WWW, text processing, spreadsheets, and web page creation. `https://www.unibo.it/it/didattica/insegnamenti/insegnamento/2021/328022`

2021-2022 **Web Technologies**, *University of Bologna, Italy*.
Annual course for the Bachelor's degree in *Information Science for Management*. Duties and topics covered were similar to the 2022-2023 course. `https://www.unibo.it/it/didattica/insegnamenti/insegnamento/2021/367014`

2019-2020 **Master's Program General Tutor, M.A. in Digital Humanities and Digital Knowledge**, *University of Bologna, Italy*.
Tutor for the 2-year Master's degree in *Digital Humanities and Digital Knowledge*, including assisting teaching in all courses in the program. Activities included academic assistance, orientation, and information to students. `https://corsi.unibo.it/2cycle/DigitalHumanitiesKnowledge`

Supervised Students

- **[Master Thesis Co-Supervisor]** Veggi, Manuele (2023). *MyTISSE: Interactive systems as enhancement tools for the sense of care in color perception*, University of Bologna, Masters in Digital Humanities and Digital Knowledge, University of Bologna.
- **[Individual Systems Practical Co-Supervisor]** Ling, Jin (2024). *Natural Language Processing-Based Hateful Meme Detection*, Guided, individual project work for the Masters in Computer Science at Vrije Universiteit Amsterdam, `research.vu.nl/en/courses/individual-systems-practical-2`

Reviewer Portfolio

- AI & Society (Springer AI & Society: Journal of Culture, Knowledge and Communication)
- DAACH (Springer Digital Applications in Archaeology and Cultural Heritage
- SWJ (IOS Press Semantic Web Journal)
- ESWC (Extended Semantic Web Conference)
- The Web Conference
- EUROGRAPHICS (Eurographics Workshop on Graphics and Cultural Heritage)
- NordiCHI (Nordic Conference on Human-Computer Interaction)
- MISDOOM (Multidisciplinary International Symposium on Disinformation in Online Open Media)
- VISART (ECCV 2024 Workshop on Computer VISion for ART Analysis)

Skills

Computer

- **Programming/Web**: Python, HTML, CSS, JavaScript
- **Database**: SPARQL
- **Data Analysis**: Pandas, NumPy, R
- **Machine Learning**: Scikit-Learn, TensorFlow, PyTorch, Keras, OpenCV
- **Viz Design**: Tableau, Gephi, Canva, Illustrator, Photoshop

Language

- **Spanish**: Native
- **English**: Native
- **Italian**: Proficient
- **Portuguese**: Proficient
- **Dutch**: Notions

Peer-Reviewed Publications

Theses

2024 Delfina Sol Martinez Pandiani. *Mind the Gaps: Cognitive-Inspired AI for High-Level Visual Sensemaking. Towards Abstract Concept Image Classification*. PhD thesis, 2024.

2020 Delfina Sol Martinez Pandiani. Semantic & Interactive Technologies for Civic Education: Ancient Classical Polychromy as a Case Study. Master's thesis, 2020.

Journal Articles

2024 Manel Slokom, Karthikeya Puttur Venkatraj, Delfina Martinez Pandiani, Simone Ooms, Valentin Robu, Abdallah El Ali, Davide Ceolin, Laura Hollink, Pablo Cesar, Eric Pauwels, and Han La Poutré. Charting the Impact of AI on Media and Democracy: A Multidisciplinary Approach. *AI & Society*, 2024. Special Issue on Democracy and AI.

2024 Delfina Sol Martinez Pandiani. The wicked problem of naming the intangible: Abstract concepts, binary thinking, and computer vision labels. *Future Humanities*, volume 2, page e11. Wiley Online Library, 2024.

2024   Fiorela Ciroku, Stefano De Giorgis, Aldo Gangemi, Delfina S Martinez-Pandiani, and Valentina Presutti. Automated multimodal sensemaking: Ontology-based integration of linguistic frames and visual data. *Computers in Human Behavior*, volume 150, page 107997. Elsevier, 2024.

2023   Delfina Sol Martinez Pandiani, Nicolas Lazzari, Marieke van Erp, and Valentina Presutti. Hypericons for interpretability: decoding abstract concepts in visual data. *International Journal of Digital Humanities*, pages 1–40. Springer, 2023.

2022   Sofia Pescarin and Delfina Sol Martinez Pandiani. The Impact of Story Structure, Meaningfulness, and Concentration in Serious Games. *Information*, volume 13, page 567. MDPI, 2022.

2022   Delfina Sol Martinez Pandiani and Sofia Pescarin. Beyond Static Colors: An Interactive Participatory Design Perspective on Color-Centric Experiences. *International Journal of Conservation Science*, volume 13, pages 1691–1706. International Journal of Conservation Science (IJCS), 2022.

2022   Enrico Daga, Luigi Asprino, Rossana Damiano, Marilena Daquino, Belen Diaz Agudo, Aldo Gangemi, Tsvi Kuflik, Antonio Lieto, Mark Maguire, Anna Maria Marras, and Delfina Sol Martinez Pandiani. Integrating citizen experiences in cultural heritage archives: requirements, state of the art, and challenges. *ACM Journal on Computing and Cultural Heritage (JOCCH)*, volume 15, pages 1–35. ACM New York, NY, 2022.

2018   Joyce Benenson, Maxwell White, Delfina Sol Martinez Pandiani, Lindsay J Hillyer, Sera Kantor, Henry Markovits, and Richard W Wrangham. Competition elicits more physical affiliation between male than female friends. *Scientific reports*, volume 8, page 8380. Nature Publishing Group UK London, 2018.

In Conference Proceedings

2024   Delfina Sol Martinez Pandiani, Erik Tjong Kim Sang, and Davide Ceolin. Characterizing Online Meme Toxicity (Extended Abstract). In *6th Multidisciplinary International Symposium, MISDOOM 2023, Amsterdam, The Netherlands, November 21–22, 2023, Proceedings*, 2024.

2024   Delfina Sol Martinez Pandiani, Nicolas Lazzari, and Presutti Valentina. Stitching Gaps: Fusing Situated Perceptual Knowledge with Vision Transformers for High-Level Image Classification. In *SEMANTiCS 20224: Proceedings of the 20th International Conference on Semantic Systems, 17-September 2024, Amsterdam, Netherlands*. IOS Press, 2024.

2022   Sofia Pescarin and Delfina Sol Martinez Pandiani. Factors in the cognitive-emotional impact of educational environmental narrative videogames. In *International Conference on Extended Reality*, pages 101–108. Springer, 2022.

2022   Delfina Sol Martinez Pandiani and Valentina Presutti. Coded Visions: Addressing Cultural Bias in Image Annotation Systems with the Descriptions and Situations Ontology Design Pattern. In *Proceedings of the 6th International Conference of Graphs and Networks in the Humanities 2022: Technologies, Models, Analyses, and Visualizations*, 2022.

2021   Delfina Sol Martinez Pandiani and Presutti Valentina. Automatic Modeling of Social Concepts Evoked by Art Images as Multimodal Frames. In *Proceedings of the Workshops and Tutorials held at LDK 2021 co-located with the 3rd Language, Data and Knowledge Conference (LDK 2021)*, 2021.

2021   Valentina Anita Carriero, Fiorela Ciroku, Jacopo de Berardinis, Delfina Sol Martinez Pandiani, Meroño-Peñuela Albert, Andrea Poltronieri, Valentina Presutti, et al. Semantic integration of mir datasets with the polifonia ontology network. In *ISMIR Late Breaking Demo Session of the 22nd Int. Society for Music Information Retrieval Conference*, 2021.

2020   Delfina Sol Martinez Pandiani. A Collaborative Color Laboratory: Using 3D Modelling, Texturization, and AR to Challenge White Supremacist Uses of Ancient Classical Sculptures. In *Building Community Online*, 2020.

Book Chapters

2024 Delfina Sol Martinez Pandiani. *Bridging the Gap: Decoding Abstract Concepts in Cultural Heritage Images*, chapter in Decoding Cultural Heritage: A Critical Dissection and Taxonomy of Human Creativity through Digital Tools, page 157. Springer Nature, 2024.