Eleonora Misino

Personal Data

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Short Bio

I'm currently a PhD Students in Computer Science and Engineering at the University of Bologna. My research focuses on developing novel techniques to inject knowledge into data-driven models, with an emphasis on solutions based on logic rules and differential equations. I participated in several national and international projects focusing on improving the interpretability and fairness of AI systems.

Highlights

Education	PhD student in Computer Science & Engineering; Master in Artificial Intelligence.
Reference(s)	Section Education
Research projects	Involved in **four international** projects and **one national** project.
Reference(s)	Section International Projects Section National Projects
Research visits	Visiting researcher at USI (Switzerland) and KU Leuven (Belgium).
Reference(s)	Section Research Visits
Research output	Author or co-author of 5 publications and 5 software.
Conferences	3 GGS A++; 1 GGS B
Workshops	1 publication
Reference(s)	Section Publications Section Under Review
Teaching	60 cumulative hours as Lecturer in Undergraduate and Post-Graduate Courses; 110 cumulative hours as Teaching Assistant in Master's and Bachelor's degree courses.
Reference(s)	Section Teaching

Education

2021-current	**PhD student** at University of Bologna
Curriculum	*Computer science and Engineering*
Supervisor	*Prof. Michele Lombardi*
Description	My research focuses on developing novel techniques to inject knowledge into data-driven models. In particular, I researched and designed solutions based on logic rules and differential equations to improve the interpretability and fairness of machine learning models.
2022	

Type | **Summer School**, Certosa di Pontignano, Siena
Theme | *5th Advanced Onsite Course on Data Science & Machine Learning*
Description | The 5th Advanced Course on Data Science & Machine Learning (ACDL) is a full-immersion five-day Course at the Certosa di Pontignano (Castelnuovo Berardenga – Siena – Tuscany, Italy) on cutting-edge advances in Data Science and Machine Learning with lectures delivered by world-renowned experts. The Course provides a stimulating environment for academics, early career researchers, Post-Docs, PhD students and industry leaders. Participants will also have the chance to present their results with talks or posters, and to interact with their colleagues, in a convivial and productive environment.

Type | **Summer School**, Universitat Politècnica de Catalunya, Barcellona
Theme | *Joint EurAI Advanced Course on AI, TAILOR Summer School 2022*
Description | This joint initiative is devoted to the themes of explainable and trustworthy AI and organized by Carles Sierra and Karina Gibert from the Intelligent Data Science and Artificial Intelligence Research Center at Universitat Politècnica de Catalunya. International researchers will teach advanced courses related to the state of the art in explainability in the different fields of AI, as well as the requirements to achieve a trustworthy AI, including transparency, diversity, robustness and privacy.

Type | **Summer School**, Bertinoro
Theme | *Bertinoro International Spring School 2022*
Description | Italian Computer Science PhD granting institutions under the auspices of GRIN, organizes an annual school offering three graduate-level courses aimed at PhD students in Computer Science. In addition to introducing students to timely research topics, the school is meant to promote acquaintance and collaboration among young European researchers.

2021
Type | **Master's Degree in Artificial Intelligence**
110/110 *summa cum laude*, University of Bologna, Bologna
Title | *Deep Generative Models with Probabilistic Logic Priors*
Supervisor(s) | *Prof. Claudio Sartori, Prof. Luc de Raedt, Giuseppe Marra (PhD), Emanuele Sansone (PhD)*

2018
Type | **Bachelor's Degree in Physics**
110/110 *summa cum laude*, University of Bologna, Bologna
Title | *An analysis of features extracted from PET images*
Supervisor(s) | *Prof. Gastone Castellani*

International Projects

2023-current | H2020-ICT-2018-825619-AI4EU
An AI On-Demand Platform to Support Research Excellence in Europe
Reference | https://cordis.europa.eu/project/id/101070000
Description | The rapid advancement of AI technologies has led the EU to decide on hosting a research environment focused on scientific and ethical excellence, which grows with the cooperation of members from within the EU and the assistance of academia and industry. The EU-funded AI4EUROPE project, in collaboration with AI4EU and other related projects, aims to develop this space by introducing an unbiased, open and cooperative platform from and for the European research community for excellent studies of AI. This platform will provide services ranging from data access, services and tools to cooperation with other researchers. The project will also enable a business model for guaranteeing its continued operation.
Role | Researcher. Developed horizontal matchmaking solutions for AI resources. These solutions should be compliant with AI-on-demand online services.

2022 - current | HORIZON-CL4-2021-HUMAN-01-101070363-AEQUITAS
Assessment and Engineering of Equitable, Unbiased, Impartial and Trustworthy AI Systems

Reference https://cordis.europa.eu/project/id/101070363

Description Artificial intelligence (AI) is widely used in a large number of sectors due to the benefits of automation and optimization. However, AI can be also a source of bias and discrimination that needs to be controlled, measured and avoided. In addition, there is a lack of knowledge on repairing and assessing bias in existing AI systems and on designing new bias-free AI tools. The EU-funded AEQUITAS project will change this by developing a controlled experimentation environment to help AI producers to increase awareness of bias produced by AI systems and evaluate and (possibly) repair existing AI systems. It will also provide guidelines for fair-by-design AI systems and raise awareness about risks from AI if not adequately handled and managed.

Role Researcher. Designedand developed fairness-by-design methodologies for ranking systems.

2021 - 2023 H2020-ICT-2020-101017142-StairwAI

Stairway to AI: Ease the Engagement of Low-Tech users to the AI-on-Demand platform through AI

Reference https://cordis.europa.eu/project/id/101017142

Description The StairwAI project targets low-tech users with the goal of facilitating their engagement on the AI4EU on-demand Platform. This will be achieved through a new service layer enriching the functionalities of the on-demand platform and containing: (1) a multi-lingual interaction layer enabling conversations with the Platform in the user's own language, (2) a horizontal matchmaking service for the automatic discovery of AI assets (tools, data sets, AI experts, consultants, papers, courses etc.) meeting the user business needs and, (3) a vertical matchmaking service that will dimension and provision hardware resources through a proper hardware provider (HPC, Cloud and Edge infrastructures).

Role Researcher. Developed a fair ranking algorithm for horizontal matchmaking; mentored several European SMEs in adopting AI techniques in their business.

H2020-ICT-2019-952215-TAILOR

Foundations of Trustworthy AI - Integrating Reasoning, Learning and Optimization

Reference https://cordis.europa.eu/project/id/952215

Description Maximising opportunities and minimising risks associated with artificial intelligence (AI) requires a focus on human-centred trustworthy AI. This can be achieved by collaborations between research excellence centres with a technical focus on combining expertise in theareas of learning, optimisation and reasoning. Currently, this work is carried out by an isolated scientific community where research groups are working individually or in smaller networks. The EU-funded TAILOR project aims to bring these groups together in a single scientific network on the Foundations of Trustworthy AI, thereby reducing the fragmentation and increasing the joint AI research capacity of Europe, helping it to take the lead and advance the state-of-the-art in trustworthy AI. The four main instruments are a strategic roadmap, a basic research programme to address grand challenges, a connectivity fund for active dissemination, and network collaboration activities.

Role Researcher. Researched on integrating learning, optimization, and logic reasoning for the realization of more interpretable and fair AI systems.

National Projects

2024 - Current FAIR

Future Artificial Intelligence Research

Reference https://fondazione-fair.it/

Description The objective of the FAIR project is to contribute facing the research questions, methodologies, models, technologies, and ethical and legal rules to build AI systems capable of interacting and collaborating with humans, perceiving and acting in evolving contexts, to be conscious about their limits and capable to adapt to new situations, to be aware of the perimeters of safety and trust, and to be careful with the environmental and social impact that their creation and functioning may cause.

Role Researcher. Actively participating in the TP1 - Legal and Ethical Design of Trustworthy AI Systems to design novel metrics for addressing AI systems' fairness.

Research Visits

November 2024	Short-term research stays at Università della Svizzera italiana (USI)
Location	Lugano, Switzerland
Supervisor(s)	*Pietro Barbiero (PhD)*
Description	Explored different strategies to increase deep generative models' explainability by relying on formal logic and architectural biases.

Mar-June 2023	Research internship at KU Leuven
Location	Leuven, Belgium
Supervisor(s)	*Prof. Luc de Raedt, Prof. Giuseppe Marra, Emanuele Sansone, PhD*
Description	Designed and developed a novel neuro-symbolic generative model that can achieve out-of-distribution compositional generalization by exploiting the available knowledge of the scene composition contained in the logic program.

Mar-July 2021	Research internship at KU Leuven
Location	Leuven, Belgium
Supervisor(s)	*Prof. Luc de Raedt, Prof. Giuseppe Marra, Ph.D. Emanuele Sansone*
Description	Designed and developed a deep-learning model combining probabilistic logic programming and variational autoencoders. The resulting framework represents the first neuro-symbolic generative model.

Presentations

2024	
Title	VAEL: bridging variational autoencoders and probabilistic logic programming
Venue	Generative Neuro-Symbolic AI Workshop at ESWC 2024
Reference	[S5]
Location	Virtual
Presentation	Oral
2023	
Title	VAEL: Bridging Variational Autoencoders and Probabilistic Logic Programming
Venue	Università della Svizzera italiana (USI)
Reference	[S5]
Location	Lugano, Switzerland
Presentation	Oral
Title	FAiRDAS: Fairness-Aware Ranking as Dynamic Abstract System
Venue	AEQUITAS Workshop at ECAI 2023
Reference	[S4]
Location	Kraków, Poland
Presentation	Oral
Title	Generalized disparate impact for configurable fairness solutions in ML
Venue	ICML 2023
Reference	[S2]
Location	Honolulu, Hawaii
Presentation	Poster
Title	VAEL: bridging variational autoencoders and probabilistic logic programming

Venue	KLR Workshop at ICML 2023
Reference	[S5]
Location	Honolulu, Hawaii
Presentation	Poster
Title	VAEL: bridging variational autoencoders and probabilistic logic programming
Venue	NeSy 2023
Reference	[S5]
Location	Siena, Italy
Presentation	Oral
Title	VAEL: bridging variational autoencoders and probabilistic logic programming
Venue	Neurosymbolic Generative Models at ICLR 2023
Reference	[S5]
Location	Virtual
Presentation	Oral
2022	
Title	VAEL: bridging variational autoencoders and probabilistic logic programming
Venue	NeurIPS 2022
Reference	[S5]
Location	New Orleans, Louisiana.
Presentation	Poster

Program Committees

PC Member	IJCLR (2024), AAAI (2024), TMLR (2024), CPAIOR (2024), KLR@ICML (2023) AEQUITAS@ECAI (2023), CP (2023)

Publications

Principal investigator or equal contribution entries are highlighted in **bold**.

We report the GII-GRIN-SCIE (GGS) rating for conferences as standard practice for evaluating research. Workshops and pre-prints are not evaluated.

The GII-GRIN-SCIE (GGS) Conference Rating is sponsored by GII (Group of Italian Professors of Computer Engineering), GRIN (Group of Italian Professors of Computer Science), and SCIE (Spanish Computer-Science Society).

[S1] **Eleonora Misino**, Roberta Calegari, Michele Lombardi, and Michela Milano. Ensuring fairness stability for disentangling social inequality in access to education: the FAiRDAS general framework. In *Proceedings of the Thirty-Third International Joint Conference on Artificial Intelligence, IJCAI 2024, 3rd-9th August 2024, Jeju, South Korea*. ijcai.org, in press.

[S2] Luca Giuliani, **Eleonora Misino**, and Michele Lombardi. Generalized disparate impact for configurable fairness solutions in ML. In Andreas Krause, Emma Brunskill, Kyunghyun Cho, Barbara Engelhardt, Sivan Sabato, and Jonathan Scarlett, editors, *International Conference on Machine Learning, ICML 2023, 23-29 July 2023, Honolulu, Hawaii, USA*, volume 202 of *Proceedings of Machine Learning Research*, pages 11443–11458. PMLR, 2023.

[S3] Mattia Silvestri, Federico Baldo, **Eleonora Misino**, and Michele Lombardi. An analysis of universal differential equations for data-driven discovery of ordinary differential equations. In Jirí Mikyska, Clélia de Mulatier, Maciej Paszynski, Valeria V. Krzhizhanovskaya, Jack J. Dongarra, and Peter M. A. Sloot, editors, *Computational Science - ICCS 2023 - 23rd International Conference, Prague, Czech Republic, July 3-5, 2023, Proceedings, Part IV*, volume 14076 of *Lecture Notes in Computer Science*, pages 353–366. Springer, 2023.

[S4] **Eleonora Misino**, Roberta Calegari, Michele Lombardi, and Michela Milano. FAiRDAS: Fairness-aware ranking as dynamic abstract system. In Roberta Calegari, Andrea Aler Tubella, Gabriel González-Castañé, Virginia Dignum, and Michela Milano, editors, *Proceedings of the 1st Workshop on Fairness and Bias in AI co-located with 26th European Conference on Artificial Intelligence (ECAI 2023), Kraków, Poland, October 1st, 2023*, volume 3523 of *CEUR Workshop Proceedings*. CEUR-WS.org, 2023.

[S5] **Eleonora Misino**, Giuseppe Marra, and Emanuele Sansone. VAEL: bridging variational autoencoders and probabilistic logic programming. In Sanmi Koyejo, S. Mohamed, A. Agarwal, Danielle Belgrave, K. Cho, and A. Oh, editors, *Advances in Neural Information Processing Systems 35: Annual Conference on Neural Information Processing Systems 2022, NeurIPS 2022, New Orleans, LA, USA, November 28 - December 9, 2022*, 2022.

Under Review

First author or equivalent contribution entries are highlighted in **bold**.

[R1] Luca Giuliani, **Eleonora Misino**, Roberta Calegari, and Michele Lombardi. Long-term fairness strategies in ranking with continuous sensitive attributes. *2nd AEQUITAS Workshop on Fairness and Bias in AI, ECAI 2024*, 2024.

Software Products

Research Repository

Description	This repository contains the code and resources for the project "Long-Term Fairness Strategies in Ranking with Continuous Sensitive Attributes".
Role	Creator, Principal Maintainer.
Github	https://github.com/EleMisi/FairRanking
Reference	[R1]

Research Repository

Description	This repository contains the code and resources for the project "Ensuring Fairness Stability for Disentangling Social Inequality in Access to Education: the FAiRDAS General Framework".
Role	Creator, Principal Maintainer.
Github	https://github.com/EleMisi/FAiRDAS_AIforEd
Reference	[S1]

Research Repository

Description	This repository contains the code and resources for the project "FAiRDAS: Fairness-Aware Ranking as Dynamic Abstract System".
Role	Creator, Principal Maintainer.
Github	https://github.com/EleMisi/FAiRDAS
Reference	[S4]

Research Repository

Description	This repository contains the code and resources for the project "VAEL: Bridging Variational Autoencoders and Probabilistic Logic Programming ".
Role	Creator, Principal Maintainer.
Github	hhttps://github.com/EleMisi/VAEL
Reference	[S5]

Research Repository

Description	This repository contains the code and resources for the project "Generalized Disparate Impact for Configurable Fairness Solutions in ML".
Role	Co-Maintainer.
Github	https://github.com/giuluck/GeneralizedDisparateImpact
Reference	[S2]

Languages

Italian:	Mothertongue
English:	Advanced, C1 IELTS, British Council Score: 7.5/9

Teaching

June 2024	
Role	Lecturer
Course	*Ragazze Digitali ER*
Info	40 hours
Description	Designed and held an introductory course in computer science as part of a project to reduce the gender gap that occurs in technical and scientific disciplines.
2023-2024	
Role	Teaching Assistant
Course	72938 - *Foundations of Artificial Intelligence*
Supervisor	Prof. Paola Melo
Info	8 CFUs, 30 hours
Curriculum	Master's Degree in Computer Engineering, University of Bologna, Italy
Role	Teaching Assistant
Course	28004 - *Foundations of Informatics*
Supervisor	Prof. Paola Mello
Info	12 CFUs, 30 hours
Curriculum	Bachelor's degree in Computer Engineering, University of Bologna, Italy
2022-2023	
Role	Teaching Assistant
Course	28004 - *Foundations of Informatics*
Supervisor	Prof. Paola Mello
Info	12 CFUs, 30 hours
Curriculum	Bachelor's degree in Computer Engineering, University of Bologna, Italy
2021-2022	
Role	Teaching Assistant
Course	93034 - *Foundations of Computer Science*
Supervisor	Prof. Michele Lombardi
Info	6 CFUs, 20 hours
Curriculum	Bachelor's degree in Electrical Energy Engineering, University of Bologna, Italy
Nov-Dec 2020	

Role	Lecturer
Course	Graduate Program for Data Scientists at CROS NT
Info	20 hours
Description	Designed and held a course on Python language for graduate Data Scientists.