

Paolo Morettin | Ph.D.

Trento, Italy

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My research lies at the intersection of *machine learning* and *automated reasoning*, with a focus on probabilistic inference with algebraic and logical constraints. I am currently fully supported by a Marie Skłodowska-Curie Action fellowship. The project aims at advancing the trustworthiness of AI systems by developing verification tools that provide formal guarantees on their correctness.

Current position

DISI, University of Trento

Assistant professor (RTDa)

From March 2023 to February 2024, I was supported by the PNRR project FAIR.

Since March 2024, my position is self-funded with a Marie Skłodowska-Curie Action fellowship.

Trento, Italy

2023–now

Work Experience

Declarative Languages and AI group, KU Leuven

Postdoctoral researcher

Advisor: Prof. Luc De Raedt.

Funded by the ERC project SYNTH.

Leuven, Belgium

2020–2023

Advanced Laboratory on Embedded Systems, (UTRC)

Engineer

Formal methods group

Trento, Italy

2016 Jun–Nov

ITIS J.F. Kennedy

Substitute teacher

Substitute teacher in a technical high school (computer science program)

Pordenone, Italy

2016 Apr–Jun

Compix

Software developer

Consulting, Visual Basic and .NET development

Pordenone, Italy

2008–2009

Academic Visits

Marta Kwiatkowska's group, University of Oxford

Visiting scholar

Probabilistic formal verification of ML models, contact: Prof. Marta Kwiatkowska

Oxford, United Kingdom

2025 Feb

Statistical Relational AI lab, UCLA

Visiting scholar

Tractable WMI models, contact: Prof. Guy Van den Broeck

Los Angeles, California

2019 Jul–Oct

Declarative Languages and AI group, KU Leuven

Visiting scholar

Learning hybrid and structured distributions, contact: Prof. Luc De Raedt

Leuven, Belgium

2018 Apr–Jun

Insight Centre for Data Analytics, University College Dublin

Data science intern

Dynamic tracking of communities in social networks, advisor: Prof. Pádraig Cunningham

Dublin, Ireland

2015 Mar–May

Education

ICT Doctoral School, University of Trento

PhD, *cum laude*

Trento, Italy

2016–2020

Thesis: *Learning and reasoning in hybrid structured spaces*.
Advisor: Prof. Andrea Passerini, co-advisor: Prof. Roberto Sebastiani

University of Trento

MSc in Computer Science, 110/110 cum laude

Thesis: *Learning Modulo Theories with latent variables*.

Advisor: Prof. Andrea Passerini, co-advisor: Prof. Stefano Teso

Trento, Italy

2013–2016

University of Udine

BSc in Computer Science, 110/110 cum laude

Thesis: *A comparative study on constraint solvers*.

Advisor: Prof. Agostino Dovier

Udine, Italy

2009–2013

Projects

Marie Skłodowska-Curie Action Postdoctoral Fellowship

Role: fellow.

Probabilistic Formal Verification for Provably Trustworthy AI (PFV-4-PTAI).

UniTN

2024 – now

PNRR project FAIR

Role: researcher.

Future AI Research (FAIR).

UniTN

2023 – 2024

ERC project SYNTH

Role: postdoc.

Synthesising Inductive Data Models (SYNTH).

KU Leuven

2020 – 2022

International collaborations

Luc De Raedt: Full professor, KU Leuven.

Topics: Neuro-symbolic artificial intelligence.

Guy Van Den Broeck: Associate professor, UCLA.

Topics: Weighted Model Integration

Antonio Vergari: Associate professor, University of Edinburgh.

Topics: Weighted Model Integration, Neuro-symbolic artificial intelligence.

Pedro Zuidberg Dos Martires: Assistant professor, Örebro University.

Topics: Weighted Model Integration.

Zhe Zeng: Assistant professor, University of Virginia.

Topics: Weighted Model Integration.

Research output

Google Scholar citations: 239, h-index: 10. Scopus citations: 127, h-index: 7.

Books

Learning and Reasoning in Hybrid Structured Spaces

Book, 2022

P. Morettin

Frontiers in Artificial Intelligence and Applications series, IOS Press.

My PhD thesis was published by IOS Press after being shortlisted for the EurAI Dissertation Award ([link](#)).

Selected articles in journals

Enhancing SMT-based Weighted Model Integration by structure awareness

2024

G. Spallitta, G. Masina, P. Morettin, A. Passerini, R. Sebastiani

Artificial Intelligence (AIJ), volume 328,

Q1 (impact factor 5.1).

Advanced SMT techniques for Weighted Model Integration 2019
P. Morettin, A. Passerini, R. Sebastiani
Artificial Intelligence (AIJ), volume 275,
Q1 (impact factor 5.1).

Selected articles in conference proceedings.....

A neuro-symbolic benchmark suite for concept quality and reasoning shortcuts 2024
S. Bortolotti, E. Marconato, T. Carraro, P. Morettin, E. van Krieken, A. Vergari, S. Teso,
A. Passerini
Proc. of the 38th Conference on Neural Information Processing Systems (NeurIPS)
CORE ranking: A*.

SMT-based weighted model integration with structure awareness 2022
G. Spallitta, G. Masina, P. Morettin, A. Passerini, R. Sebastiani
Proc. of the 38th Conference on Uncertainty in Artificial Intelligence (UAI)
CORE ranking: A.

Hybrid Probabilistic Inference with Logical and Algebraic Constraints: a Survey 2021
P. Morettin, P. Zuidberg Dos Martires, S. Kolb, A. Passerini
Proc. of the 30th International Joint Conference on Artificial Intelligence (IJCAI)
CORE ranking: A*.

Probabilistic Inference with Algebraic Constraints: Theoretical Limits and Practical Approximations 2020
Z. Zeng*, P. Morettin*, F. Yan*, A. Vergari, G. Van den Broeck
Proc. of the 34th Conference on Neural Information Processing Systems (NeurIPS)
CORE ranking: A*.

Efficient Generation of Structured Objects with Constrained Adversarial Networks 2020
L. Di Liello, P. Ardino, J. Gobbi, P. Morettin, S. Teso, A. Passerini
Proc. of the 34th Conference on Neural Information Processing Systems (NeurIPS)
CORE ranking: A*.

Scaling up Hybrid Probabilistic Inference with Logical and Arithmetic Constraints via Message Passing 2020
Z. Zeng*, P. Morettin*, F. Yan*, A. Vergari, G. Van den Broeck
Proc. of the 37th International Conference on Machine Learning (ICML)
CORE ranking: A*.

Learning Weighted Model Integration distributions 2020
P. Morettin, S. Kolb, S. Teso, A. Passerini
Proc. of the 34th AAAI Conference on Artificial Intelligence (AAAI)
CORE ranking: A*.

The pywmi Framework and Toolbox for Probabilistic Inference using WMI 2019
S. Kolb, P. Morettin, P. Zuidberg Dos Martires, F. Sommariva, A. Passerini, R. Sebastiani,
L. De Raedt
Proc. of the 28th International Joint Conference on Artificial Intelligence (IJCAI)
CORE ranking: A*.

Efficient Weighted Model Integration via SMT-Based Predicate Abstraction 2017
P. Morettin, A. Passerini, R. Sebastiani
Proc. of the 26th International Joint Conference on Artificial Intelligence (IJCAI)
CORE ranking: A*.

Workshop papers.....

Top-Down Knowledge Compilation for Counting Modulo Theories 2023
V. Derkinderen, P. Zuidberg Dos Martires, S. Kolb, P. Morettin
Workshop on Counting and Sampling (MC).

Is Parameter Learning via Weighted Model Integration Tractable? 2021
Z. Zeng*, P. Morettin*, F. Yan, A. Vergari, A. Passerini, G. Van den Broeck
4th Workshop on Tractable Probabilistic Modeling (TPM).

Co-creating Platformer Levels with Constrained Adversarial Networks 2021
P. Morettin, A. Passerini, S. Teso
ACM Workshop on Intelligent User Interfaces (IUI).

* denotes equal contribution.

Tutorials / Invited talks

Towards Probabilistic Verification of ML Models via Weighted Model Integration:
Invited talk, SAE G-34 (Artificial Intelligence in Aviation Committee) / EUROCAE WG-114, 15/05/2025.

Towards Probabilistic Verification of ML Models via Weighted Model Integration:
Invited talk, Verification Seminars, Department of Computer Science, University of Oxford, 27/02/2025.

Towards Probabilistic Verification of AI Systems via Weighted Model Integration:
Invited talk, International Symposium on AI Verification, co-located with the Conference on Computer Aided Verification (CORE ranking: A*), 22/07/2024.

Hybrid Probabilistic Inference with Algebraic and Logical Constraints:
Tutorial, 31st International Joint Conference on Artificial Intelligence, 24/07/2022.
Co-organizers: Pedro Zuidberg Dos Martires, Samuel Kolb and Andrea Passerini.

Awards

ECAI 2024 Outstanding SPC Member Award:
Awarded to 2-3% of the SPC members ([link](#)).

Shortlisted to the EurAI Dissertation Award 2021:
PhD thesis published by IOS Press as a result ([link](#)).

Service

Program/reviewing committee member:
AAAI 2021, 2022, 2023, 2024, 2025
AISTATS 2022, 2023 ([top reviewer](#)), 2024, 2025
ECAI 2020, 2024 ([outstanding SPC member award](#))
KR 2024
ICLR 2022, 2023, 2024
ICML 2021, 2022, 2023
IJCAI 2020, 2021, 2022, 2023
NeurIPS 2020, 2021, 2022, 2024

Reviewer for journals: Machine Learning Journal (editorial board member), Journal of Machine Learning Research, Frontiers in AI, Data Mining and Knowledge Discovery, Künstliche Intelligenz (Journal of AI of the German Informatics Society).

Volunteer: AI*IA 2018

Organizer: GNI 2016 finals (the Italian Computer Science competition for high-school students)

Teaching

Courses.....

Fundamentals of AI

Teaching assistant, 12CFU, Master in AI Systems
Laboratory sessions, exams.

UniTN
2024-2025

Fundamentals of AI

Teaching assistant, 12CFU, Master in AI Systems
Laboratory sessions, exams.

UniTN
2023-2024

Uncertainty in AI

Teaching assistant, 4ECTS, Master of AI
Laboratory sessions, exams.

KU Leuven
2022-2023

Uncertainty in AI

Teaching assistant, 4ECTS, Master of AI
Laboratory sessions, exams.

KU Leuven
2021-2022

Computer Science

Teaching assistant, 6CFU, *BSc Scienze e Tecnologie Biomolecolari*.
Laboratory sessions, exams.

UniTN
2019-2020

Computer Science

Teaching assistant, 6CFU, *BSc Scienze e Tecnologie Biomolecolari*.
Laboratory sessions, exams.

UniTN
2018-2019

Computer Science

Teaching assistant, 6CFU, *BSc Scienze e Tecnologie Biomolecolari*.
Laboratory sessions, exams.

UniTN
2017-2018

Thesis co-advisor.....

Gianvito Taneburgo. *Constrained Adversarial Networks*. 2018.

Pierfrancesco Ardino. *Multinomial Constrained Adversarial Network*. 2019.

Jacopo Gobbi. *Constraining Generative Adversarial Networks with Semantic Loss*. 2019.

Luca Di Liello. *Level Generation with Constrained Adversarial Networks*. 2019.

Francesco Somnavilla. *Pushing the envelope of SMT-based Weighted Model Integration*. 2019.

Senne Dirks. *Co-creative Generation of Game Levels using Generative Adversarial Networks*, 2022.

Quentin Stroobants. *Co-creative Generation of Game Levels using Generative Adversarial Networks*, 2022.

Giulia Tortoioli. *Learning Constraints in Robot Trajectories*, 2022.

Georgios Patrikis. *Keeping humans safe from robots*, 2023.

David Debot. *Approximating Volume Computations with Neural Networks*, 2023.

Software

I am the core maintainer of the following software:

ReCoIn An approximate WMI solver based on the relax-compensate-recover framework.

MP-WMI An exact WMI solver based on Belief Propagation.

LARIAT A framework for learning distributions with hard logical/algebraic constraints.

pywmi A python toolbox for probabilistic modelling and inference using WMI.

WMI-PA The state-of-the-art exact WMI solver based on advanced Satisfiability Modulo Theories techniques.