

Samuele Bortolotti

PH.D. STUDENT IN COMPUTER SCIENCE

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Education

University of Trento

PH.D. IN COMPUTER SCIENCE

Trento, IT

Nov. 2023 - Current

- **Supervisors:** Stefano Teso and Andrea Passerini
- **PhD Scholarship:** Trustworthy Neuro-Symbolic Machine Learning

University of Trento

MASTER'S DEGREE IN COMPUTER SCIENCE

Trento, IT

Sept. 2021 - Oct. 2023

- **GPA:** 4.0/4.0
- **Grade:** 110/110 cum laude
- **Final dissertation:** "From Models to Arguments and Back", supervised by professors Andrea Passerini and Stefano Teso

University of Trento

BACHELOR'S DEGREE IN COMPUTER SCIENCE

Trento, IT

Sept. 2018 - Jul. 2021

- **GPA:** 4.0/4.0
- **Grade:** 110/110 cum laude
- **Final dissertation:** "Analysis of user warnings in Wikipedia", supervised by professor Alberto Montresor

Work Experience

Structured Machine Learning Group

RESEARCH INTERN

Trento, IT

Nov. 2022 - Jun. 2023

- Work on a novel interactive multi-shot debugging protocol that allows the exchange of arguments between a machine and a user in order to correct the model's beliefs.
- Integrate state-of-the-art eXplainable Artificial Intelligence techniques, such as the 'Right for the Right Reasons' loss, into structured prediction output Neuro-Symbolic models like Coherent Hierarchical Multi-label Classification Networks and Semantic Probabilistic Layers.
- Successfully recover the performance of confounded models in the field of hierarchical classification.

Eurecat - Centre Tecnològic de Catalunya

JUNIOR DATA SCIENTIST

Barcelona, ES

May. 2021 - Jun. 2021

- Extract Wikipedia data from the Wikipedia dumps - 937GB bz2 and 157GB 7z compressed.
- Design an effective way to extract and analyze the languages spoken by the Wikipedia users - 109'452 database entries.
- Develop a strategy to retrieve Wikipedia users' User Warnings and Wikibreaks, studying how they affect the users' activity level - respectively 25'843 and 2'777'181 database entries.
- Build an automated pipeline to download the dumps, extract the data, and compute the statistics using Docker.

Alyso Srl

JUNIOR SOFTWARE DEVELOPER

Trento, IT

Jul. 2017 - Aug. 2017

- Create corporate libraries with the aim of handling database connections regardless of the database management system (SQLite, PostgreSQL, MySQL, and Oracle) in Java.
- Develop a Java-based internal software function that can calculate the distance between two buildings using GIS data.
- Develop a web application in HTML5, CSS3, and JavaScript to show the obtained results.

Social IT

JUNIOR SOFTWARE DEVELOPER

Trento, IT

Jun. 2016 - Jul. 2016

- Contribute to the development of an internal Customer Relationship Management System using Java, JavaScript, HTML5, CSS3, and MySQL.

Teaching Experience

Master in Mechatronics Engineering, University of Trento

MACHINE LEARNING FUTURA TUTOR

Trento, IT

Sep. 2024 - Dec. 2024

- Introduction to machine learning, probability theory and linear algebra. Standard machine learning algorithms such as decision trees, k-nearest neighbors, Bayesian networks, support vector machines, and kernel machines, along with an introduction to neural networks and deep learning. Model evaluation, parameter estimation, and common techniques in unsupervised and reinforcement learning.

Bachelor in Computer Science, University of Trento

Trento, IT

INTRODUCTION TO WEB PROGRAMMING TEACHING ASSISTANT

Feb. 2025 - Jun. 2025

- Fundamentals of web development, including HTTP protocol, HTML, JavaScript, CSS, request-response cycle, asynchronous JavaScript frameworks (AJAX, AJAX), state persistence, and database interaction, with practical experience in common web technologies, DOM manipulation, and the design and development of simple web applications using Java Spring.

Master in Artificial Intelligence Systems, University of Trento

Trento, IT

MACHINE LEARNING TEACHING ASSISTANT

Sep. 2025 - Dec. 2025

- Introduction to machine learning, probability theory and linear algebra. Standard machine learning algorithms such as decision trees, k-nearest neighbors, Bayesian networks, support vector machines, and kernel machines, along with an introduction to neural networks and deep learning. Model evaluation, parameter estimation, and common techniques in unsupervised and reinforcement learning.

Publications

CONFERENCE PROCEEDINGS [4]

Shortcuts and Identifiability in Concept-based Models from a Neuro-Symbolic Lens

SAMUELE BORTOLOTTI^{*}, EMANUELE MARCONATO, PAOLO MORETTIN, ANDREA PASSERINI, STEFANO TESO

Proceedings of the Thirty-ninth Annual Conference on Neural Information Processing Systems, 2025, San Diego & Mexico City, Poster

A Neuro-Symbolic Benchmark Suite for Concept Quality and Reasoning Shortcuts

SAMUELE BORTOLOTTI^{*}, EMANUELE MARCONATO^{*}, TOMMASO CARRARO, PAOLO MORETTIN, EMILE VAN KRIEKEN, ANTONIO VERGARI, STEFANO TESO, ANDREA PASSERINI

Proceedings of the Thirty-Eighth Annual Conference on Neural Information Processing Systems, 2024, Vancouver, Poster

Benchmarking in Neuro-Symbolic AI

ROBIN MANHAEVE, FRANCESCO GIANNINI, MEHDI ALI, DAMIANO AZZOLINI, ALICE BIZZARRI, ANDREA BORGHESI, SAMUELE BORTOLOTTI, LUC DE RAEDT, DEVENDRA DHAMI, MICHELANGELO DILIGENTI, SEBASTIJAN DUMANCIC, BOI FALTINGS, ELISABETTA GENTILI, ALFONSO GEREVINI, MARCO GORI, TIAS GUNS, MARTIN HOMOLA, KRISTIAN KERSTING, JENS LEHMANN, MICHELE LOMBARDI, LUCA LORELLO, EMANUELE MARCONATO, STEFANO MELACCI, ANDREA PASSERINI, DEBJIT PAUL, FABRIZIO RIGUZZI, STEFANO TESO, NEIL YORKE-SMITH, MARCO LIPPI

Proceedings of The 4th International Joint Conference on Learning & Reasoning, 2024, Nanjing, Poster

BEARS Make Neuro-Symbolic Models Aware of their Reasoning Shortcuts

EMANUELE MARCONATO^{*}, SAMUELE BORTOLOTTI^{*}, EMILE KRIEKEN^{*}, ANTONIO VERGARI, ANDREA PASSERINI, STEFANO TESO

Proceedings of the Fortieth Conference on Uncertainty in Artificial Intelligence, 2024, Barcelona, Spotlight

PREPRINTS [1]

Symbol Grounding in Neuro-Symbolic AI: A Gentle Introduction to Reasoning Shortcuts

EMANUELE MARCONATO^{*}, SAMUELE BORTOLOTTI^{*}, EMILE KRIEKEN^{*}, PAOLO MORETTIN, ELENA UMILI, ANTONIO VERGARI, EFTHYMIA TSAMOURA, ANDREA PASSERINI, STEFANO TESO

Under review, 2025

* = Equal contribution.

Reviewing activity

Conferences

REVIEWER

- | | |
|---|------|
| • Uncertainty in Artificial Intelligence (UAI) | 2025 |
| • Neural Information Processing Systems (NeurIPS) | 2025 |

Extracurricular Training

Nordic Probabilistic AI School

Copenhagen, DK

ATTENDEE

Jun. 2024

- Acceptance rate:** 18%.
- Topics:** Probabilistic models, bayesian workflow, variational inference and optimization, deep generative models, diffusion models, Monte Carlo methods, probabilistic circuits, gaussian processes and causal inference.

Skills

Programming	Python (proficient), Java (proficient), Ruby (intermediate), JavaScript (intermediate), TypeScript (intermediate), R (intermediate), C++ (intermediate), C (intermediate), C# (academic), Matlab (academic)
Miscellaneous	Linux, Git, GitHub, LaTeX, SQL, PyTorch, TensorFlow, Keras
Languages	English (C1), Italian (native), German (A2)

Honors & Awards

- 2022

Merit Grant, Premio allo studio Marco Modena (Cassa Rurale Alto Garda - Rovereto, Trento, IT)

Trento, IT
- 2023

Ph.D. scholarship, Three year sponsorship: rank 6th out of 120 participants

Trento, IT