Samuele Bortolotti

PH.D. STUDENT IN COMPUTER SCIENCE

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Education

University of Trento   *Trento, IT*
PH.D. IN COMPUTER SCIENCE   *Nov. 2023 - Current*

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

University of Trento   *Trento, IT*
MASTER'S DEGREE IN COMPUTER SCIENCE   *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   *Trento, IT*
BACHELOR'S DEGREE IN COMPUTER SCIENCE   *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   *Trento, IT*
RESEARCH INTERN   *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   *Barcelona, ES*
JUNIOR DATA SCIENTIST   *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.

Alysso Srl   *Trento, IT*
JUNIOR SOFTWARE DEVELOPER   *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   *Trento, IT*
JUNIOR SOFTWARE DEVELOPER   *Jun. 2016 - Jul. 2016*

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

Teaching Experience

Department of Industrial Engineering, University of Trento   *Trento, IT*
MACHINE LEARNING TUTOR   *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.

Department of Information Engineering and Computer Science, University of Trento   *Trento, IT*
<small>Introduction to Web Programming Tutor</small>   *Feb. 2025 - Jun. 2025*

- Fundamentals of web development, including HTTP protocol, HTML, JavaScript, CSS, request-response cycle, asynchronous JavaScript frameworks (AJAX, AJAJ), 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.

Publications

Conference Proceedings [3]

A neuro-symbolic benchmark suite for concept quality and reasoning shortcuts

<u>Samuele Bortolotti</u>*, 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

Benchmarking in Neuro-Symbolic AI

Robin Manhaeve, Francesco Giannini, Mehdi Ali, Damiano Azzolini, Alice Bizzarri, Andrea Borghesi, <u>Samuele Bortolotti</u>, 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

BEARS Make Neuro-Symbolic Models Aware of their Reasoning Shortcuts

Emanuele Marconato*, <u>Samuele Bortolotti</u>*, Emile Krieken*, Antonio Vergari, Andrea Passerini, Stefano Teso

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

Preprints [1]

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

<u>Samuele Bortolotti</u>*, Emanuele Marconato*, Paolo Morettin, Andrea Passerini, Stefano Teso

Under review, 2025

* = Equal contribution.

Reviewing activity

Conferences

<small>Reviewer</small>
Uncertainty in Artificial Intelligence   2024

Extracurricular Training

Nordic Probabilistic AI School   *Copenhagen, DK*
<small>Attendee</small>   *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*