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**: Professor Stefano Teso and professor 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.

Publications

BEARS Make Neuro-Symbolic Models Aware of their Reasoning Shortcuts
ArXiv Pre-print
E. MARCONATO*, **S. BORTOLOTTI***, E. VAN KRIEKEN*, A. VERGARI, A. PASSERINI AND S. TESO
20 Feb 2024
- Neuro-Symbolic (NeSy) models can be affected by Reasoning Shortcuts (RSs), requiring costly dense supervision for effective mitigation. `bears` (BE Aware of Reasoning Shortcuts) presents a way to calibrate concept-level confidence without compromising prediction accuracy. This encourages NeSy architectures to present uncertainty about RS-affected concepts. Empirical results show that bears enhances RS-awareness in state-of-the-art NeSy models, facilitating the acquisition of informative dense annotations for mitigation.
- * = Equal contribution.

Projects

DarkrAI: a Pareto epsilon-greedy policy [code ⧉][report ⧉]
Python

MEMBER
Apr. 2022 - Jul. 2022

- Train two ε-greedy reinforcement learning agents in the field of Pokémon battles.
- Compare the performances between classic deep Q-learning and an ε-greedy strategy which chooses Pareto optimal moves employing NSGA-II for the first part of the training.
- Conduct a quantitative analysis using the Wilcoxon Rank Sum Test on the obtained results, showing a significant improvement in the episode reward distribution for the proposed agent (p-value = 2.886e-12).

UDA (Unsupervised Domain Adaptation) [code ⧉]
Python

TEAM LEADER
Apr. 2022 - Jul. 2022

- Replicate and adapt a collection of methods concerning unsupervised domain adaptation techniques such as Deep Domain Confusion, Domain Adversarial Neural Networks, and Domain Separation Networks.
- Enhanced the Entropy Minimization vs. Diversity Maximization architecture, a state-of-the-art network for unsupervised domain adaptation, by integrating other approaches from the literature.
- Achieved a significant gain of 15.76 from product images to real-life and 2.86 from real-life to product images, thereby improving the ResNet18 baseline.

Neural PRNU Extractor [code ⧉]
Python

TEAM LEADER
Nov. 2021 - Feb. 2022

- Develop a pipeline to perform noise extraction from a set of camera images and achieve camera identification using the estimated PRNU.
- Adapt a PRNU estimation algorithm [DOI] in order to deal with noise extracted by a neural network [CODE].
- The neural network is based on FFDNet which works with different noise levels and uses state-of-the-art convolutional neural network structures.

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*