ANDREA CAVALLO

M.Sc. in Computer Engineering and Artificial Intelligence from Politecnico di Torino

SUMMARY

I hold a M.Sc. Degree in Computer Engineering and I am looking for PhD opportunities in **Machine Learning and Deep Learning**. I am currently working as a research assistant on network traffic data analysis using **Graph Machine Learning** techniques. My Master Thesis focuses on Graph Neural Networks and their limitations when applied to heterophilous graphs. I also worked with **Explainable AI** applied to the healthcare world. I enjoy diving into the details of Machine Learning algorithms, understanding their limitations and trying to explain the motivations behind their predictions. I am also fascinated by the impact these algorithms can have in several real-world scenarios, and I aim at improving them and solving challenging problems.

CONTACT

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SKILLS

Programming

- *Advanced*: Python
- *Intermediate*: C, C++, SQL
- *Basic*: Java, JavaScript

Software & Tools

- *Advanced*: Pytorch, Numpy
- *Intermediate*: Pandas, MATLAB, LaTeX
- *Basic*: TensorFlow, Hadoop, Spark, React, Git

Main ML and CS topics

- *Machine Learning and Deep Learning*: Graph Machine Learning, Explainable AI, Computer Vision, Natural Language Processing
- *Computer Science*: Databases (DBMS and Data Warehouses), Operating Systems (Unix/Linux environment and concurrent programming), Computer Networks, Cybersecurity, Embedded Systems

PUBLICATIONS

- Cavallo, A.; Grohnfeldt, C.; Russo, M.; Lovisotto, G.; Vassio, L. 2022. 2-hop Neighbor Class Similarity (2NCS): A graph structural metric indicative of graph neural network performance, *accepted at AAAI GCLR 2023*, https://arxiv.org/abs/2212.13202
- Cavallo, A. 2022, Graph Neural Networks on heterophilous graphs: performance analysis and new architectures, *Master's thesis*, *Politecnico di Torino*, http://webthesis.biblio.polito.it/id/eprint/24501

LANGUAGES

Italian (native speaker)
English (IELTS 8.0)

EDUCATION

09/2020 - 10/2022
Politecnico di Torino, Torino
Master's - Computer Engineering

- Specific track: Artificial Intelligence and Data Analytics
- Final grade: 110/110 cum laude (GPA: 29.6/30)
- Master Thesis: *Graph Neural Networks on heterophilous graphs: performance analysis and new architectures*, supervised by Prof. Luca Vassio, Dr. Claas Grohnfeldt, Michele Russo and Dr. Giulio Lovisotto

02/2021 - 09/2022
Alta Scuola Politecnica, Torino - Milano
Excellence Program

- Program involving the best 150 students from Politecnico di Torino and Politecnico di Milano
- Participated in conferences and group activities on innovation, management of change, design and complex decision making
- Realized a Clinical Decision Support System (NEAR) based on Explainable AI in collaboration with Dedalus, a leading company in software for healthcare

09/2017 - 09/2020
Politecnico di Torino, Torino
Bachelor's - Electronic Engineering

- Final grade: 110/110 cum laude (GPA: 29.88/30)
- Member of Percorso Giovani Talenti, a program for the best 200 students in the university

08/2019 - 12/2019
University of Georgia, Athens, GA, USA
Exchange Program

- Won a scholarship to finance the program

WORK EXPERIENCE

10/11/2022 - ongoing
Politecnico di Torino, Turin
Research Assistant

- Performed research on network traffic data analysis using Graph Neural Networks

01/04/2022 - 30/09/2022
Huawei Munich Research Center, Munich
Research Intern

- Performed research on Node Anomaly Detection and Graph Neural Networks on heterophilous graphs for the Master Thesis

01/10/2021 - 30/06/2022
Team PoliTOcean, Torino
Computer Vision team member

- Implemented computer vision tasks (line detection, object detection) for an ROV to take part in the international Mate ROV Competition

01/04/2020 - 30/06/2021
Team Icarus PoliTo, Torino
Machine Learning team member

- Applied Machine Learning algorithms for flight parameters estimation and trajectory prediction

15/01/2020 - 29/02/2020
WeStudents s.r.l., Torino
Data Analyst

- Applied ML techniques to improve the design and analyze customers' behavior for a mobile app

SELECTED RESEARCH PROJECTS

Graph Neural Networks on heterophilous graphs

- Defined 2NCS, a new metric to characterize a graph property that affects GNN performance
- Designed and tested GATH and GCNH, two GNN models that achieve competitive results with SOTA on heterophilous graphs

Graph Machine Learning for Node Anomaly Detection

- Designed and tested GNN-based architecture with generative component to perform node anomaly detection on graphs

Explainable AI for cardiac event risk prediction

- Implemented NEAR, an explainable ML-based model to predict the risk of cardiac events
- The explainable model is built based on the explanations provided by SHAP

Real-time Domain Adaptation in Semantic Segmentation

- Implemented and trained a semantic segmentation architecture (BiSeNet)
- Implemented domain adaptation (also real-time) to train the network on synthetic data
- Generated pseudo-labels for the target domain with Maximum Probability Threshold