

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 opportunities to expand my experience 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 real-world scenarios, and I aim at improving them and solving challenging problems.

CONTACT

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in Andrea Cavallo

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.; GCNH: A Simple Method For Representation Learning On Heterophilous Graphs, *IJCNN* 2023, <https://arxiv.org/abs/2304.10896>
- Cavallo, A.; Grohnfeldt, C.; Russo, M.; Lovisotto, G.; Vassio, L.; 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.; Graph Neural Networks on heterophilous graphs: performance analysis and new architectures, *Master's thesis, Politecnico di Torino*, 2022, <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 dynamic 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 GCNH, a simple GNN model that achieves SOTA results on both homophilous and heterophilous graphs

Network traffic data analysis with Graph Neural Networks

- Applied GNNs to network traffic data to learn the behavior of nodes in an unsupervised and self-supervised manner.

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