

# 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 real-world scenarios, and I aim at improving them and solving challenging problems.

## CONTACT

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🌐 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, *under review at IJCNN 2023*
- 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 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