Francesco Caporali

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EDUCATION

Master's degree (M.Sc.) in Stochastics and Data Science (Mathematics)
Turin, Italy

University of Turin — *September 2022 − Ongoing*

- Current GPA: 29.65/30.
- Graduation expected in July 2024.
- Master's degree in Mathematics with emphasis on probability, statistics and machine learning.

Master in Statistics and Applied Mathematics
Turin, Italy

Collegio Carlo Alberto — *September 2022 − Ongoing*

- Current GPA: 29.25/30.
- Graduation expected in July 2024.

Bachelor's degree (B.Sc.) in Mathematics
Pisa, Italy

University of Pisa — *September 2018 − May 2022*

- Final grade: 110/110 cum laude.
- Computational Mathematics curriculum.
- **Thesis:** 🔗 Deep neural networks: approximation capabilities and gaussian behaviour
    - *Original title*: Reti neurali profonde: capacità di approssimazione e convergenza a processi gaussiani
    - *Supervisor*: Prof. Dario Trevisan
    - *Description*: Reviewing some relevant theoretical results, we analysed neural networks (NNs) as a formal model. We presented some versions of the density result of the functions that can be generated by NNs in L^p spaces and in $C(X)$ with X compact in $\mathbb{R}^k$. Then we studied the Gaussian asymptotic behaviour of random NNs. The work includes experiments developed independently using Python's PyTorch module.

High school diploma
Viterbo, Italy

Liceo Scientifico Paolo Ruffini — *September 2013 − July 2018*

- Final grade: 100/100.

HONORS AND AWARDS

Allievi Honors Program
Turin, Italy

Collegio Carlo Alberto — *September 2022 − Ongoing*

- Competitive admission to a study program in applied mathematics and statistics. The Allievi are admitted after a nation-wide selection.
- The scholarship is comprehensive of lodging and meals.

EXTRACURRICULARS

Topics in Modern Machine Learning (ModML)
Genoa, Italy

University of Genoa — *June 2023*

- Summer school on the latest developments in Machine Learning organised by Lorenzo Rosasco within the Ph.D. program in Computer Science and Systems Engineering.

Predictive uncertainty in machine learning with conformal inference
Turin, Italy

University of Turin — *May 2023*

- Intensive course on cutting-edge frequentist statistical methods for distribution-free predictive inference using complex machine learning algorithms. The lectures were held by Matteo Sesia (University of Southern California).

Stochastic Processes, Analysis and Semigroups
Trento, Italy

Universities of Trento and Wuppertal — *December 2022*

- Winter school for Master and Ph.D. students, on selected topics in Probability Theory.

Academic Interests

As a master's student in applied mathematics, my academic studies have focused on the intersection of mathematical theory and practical applications, particularly in the field of machine learning. My main areas of interest and expertise include *probability theory*, *functional analysis*, *statistical machine learning*, *theoretical analysis of neural networks*, *data structures* and *programming*.

University projects

Master's projects
University of Turin and Collegio Carlo Alberto

Turin, Italy

2022 − 2023

- 𝒮 *Algorithms*: Design and implementation of a text-based game on a graph with RL integration (Python).
- 𝒮 *Models and Algorithms*: Bayesian inference of a contact network of Potts variables (Python).

Bachelor's projects
University of Pisa

Pisa, Italy

2018 − 2022

- 𝒮 *Scientific Computing*: Preconditioned conjugate gradient method applied to the GeneRank problem (Matlab).

- 𝒮 *Algorithms and Data Structures*: Implementation of a city route planner (C++).
- 𝒮 *Computational Laboratory:* Simulated Annealing applied to the TSP and the Edwards-Anderson model (Python).

Professional experience

Tutorial teaching
University of Turin

Turin, Italy

March − June 2023

- Tutorial teacher of the *Probability and Statistics* course within the Bachelor's program in Mathematics for Finance and Insurance.

PHC System administrator
University of Pisa

Pisa, Italy

December 2018 − May 2022

- Member of a group of technicians that maintains a network of Linux computers and offers various services for mathematics students.
- Maintenance of the web server poisson.phc.dm.unipi.it .

Skills

Languages
- *Italian:* native.
- *English:* advanced level.

Programming languages
- Python (PyTorch, scikit-learn, . . .) | R | Matlab | C\C++ | SQL (basic) | Julia (basic)

Markup languages
- LaTeX | HTML (basic)

Other computer skills
- Operating systems: Linux (all major distributions), Windows, macOS.
- Microsoft Office.