Francesco Caporali

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@ francescocaporali@outlook.com
@ fc4978@princeton.edu
+1 (609) 786 0295
224 - Sherrerd Hall, Princeton (NJ), 08540, USA
caporali.github.io
francescocaporali

Education

Ph.D. in Operations Research and Financial Engineering — Princeton University
Princeton (NJ), USA — *August 2024 – Ongoing*
- *Advisor:* Prof. Boris Hanin.

M.Sc. in Stochastics and Data Science (Mathematics) — University of Turin
Turin, Italy — *September 2022 – July 2024*
- Final grade: 110/110 cum laude and special mention.
- **Thesis:** Student-t processes as infinite-width limits of posterior Bayesian Neural Networks
  Advisor: Prof. Stefano Favaro and Prof. Dario Trevisan

M.Sc. in Statistics and Applied Mathematics — Collegio Carlo Alberto
Turin, Italy — *September 2022 – July 2024*
- *Allievi Honors Program* full scholarship. Competitive admission to a study program in applied mathematics and statistics. The Allievi are admitted after a nationwide selection.

B.Sc. in Mathematics (computational curriculum) — University of Pisa
Pisa, Italy — *September 2018 – May 2022*
- Final grade: 110/110 cum laude.
- **Thesis:** Deep Neural Networks: approximation capabilities and Gaussian behaviour
  Advisor: Prof. Dario Trevisan

Academic Interests

My research lies at the intersection of probabilistic ML and optimization dynamics. I am currently interested in analyzing the stability and implicit bias of GD/SGD and designing principled noise, clipping, and step-size schedules for reliable training. Previously, I studied Bayesian neural networks and their infinite-width/posterior limits to characterize uncertainty and robustness.

Research

Student-t processes as infinite-width limits of posterior Bayesian NNs
F. Caporali, S. Favaro, D. Trevisan — *TASC workshop, COLT 2025*
- Showed that Bayesian Neural Networks with Gaussian priors on weights and Inverse-Gamma priors on variances converge to Student-t processes in the infinite-width limit.

Conferences and workshop

38th Annual Conference on Learning Theory (COLT 2025)
Lyon, France — *June 2025*

Summer School "Topics in Modern Machine Learning" — University of Genoa
Genoa, Italy — *June 2023*

Winter School "Stochastic Processes, Analysis and Semigroups" — University of Trento/Wuppertal
Trento, Italy — *December 2022*

Projects

Master's projects — University of Turin and Collegio Carlo Alberto
Turin, Italy — *2022 – 2023*
- *Machine Learning*: implementation of GANs from scratch for image generation.
- *Algorithms*: design of a text-based game on a graph with RL integration.

Professional experience

Teaching Assistant — Princeton University
Princeton, NJ, USA — *September 2025 – Ongoing*
- Teaching Assistant, *Probability Theory (ORF526).*

Tutorial teaching — University of Turin
Turin, Italy — *March – June 2023*
- Tutorial Instructor, *Probability and Statistics* (B.Sc. Mathematics for Finance and Insurance).

PHC System administrator — University of Pisa
Pisa, Italy — *December 2018 – May 2022*
- Maintained Linux lab network and departmental *web server* serving mathematics students.

Skills

Languages

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

Programming languages

- Python (PyTorch, Pyro, pandas, 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.