Niccolò Ajroldi

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Ellis Institute Profile
Google Scholar
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BIOGRAPHY

My background is in mathematics and statistics, and their application to machine learning. My research focuses on optimization for deep learning, especially on benchmarking optimization algorithms for training large language models, enhancing performance and efficiency. I very much enjoy developing machine learning codebases!

EXPERIENCE

Research Engineer - *Ellis Institute Tübingen, Max Planck Institute for Intelligent Systems* *Tübingen, DE*
Jan. 2023 - Ongoing

- Research on novel sequence model architectures and optimization algorithms with Jonas Geiping and Antonio Orvieto.
- Developed submissions to AlgoPerf, a benchmark for optimization algorithms, scoring third in the competition leaderboard.
- Developed open-source contributions to AlgoPerf API, joined MLCommons.
- Mentored research interns in the CaCTüS program, researching LLM optimization and LLM watermarking.
- Released a simple PyTorch codebase for pretraining modern language models.

AI Resident - *Meta, FAIR Labs* *Seattle, WA*
July 2022 - Aug. 2023

- Research on hypergradient methods for adaptive hyperparameter tuning with Lin Xiao.
- Investigated loss spikes in language model optimization and the Slingshot phenomenon.
- Gained experience in ML optimization, distributed training, and familiarity with vision and language models.

ML Researcher - *U-Care Medical* *Turin, IT*
Dec. 2021 - June 2022

- Developed machine learning models to forecast Acute Kidney Injury in critically ill patients.
- Developed algorithms to discriminate persistent kidney injury and transient kidney injury in ICU patients.
- Conducted statistical analyses and designed data visualization APIs to support product promotion.

EDUCATION

Politecnico di Milano - *Master of Science in Mathematical Engineering & Statistical Learning*
Mar. 2019 - Oct. 2021

- Thesis: Functional Time Series Forecasting.
- Advisor: Simone Vantini.
- Teaching assistant for "Algorithms and Parallel Computing", covering C++, OOP, data structures, parallel programming.

Politecnico di Milano - *Bachelor of Science in Mathematical Engineering*
Oct. 2015 - Mar. 2019

- Thesis: Deep Learning Optimization Algorithms and Saddle Points.
- Advisor: Danilo Ardagna.

SELECTED PUBLICATIONS

Ajroldi, N., Orvieto, A., & Geiping, J. (2025). When, where and why to average weights? *To appear in **ICLR** 2025 First Workshop on Open Science for Foundation Models*. URL

Islamov, R., **Ajroldi, N.**, Orvieto, A., & Lucchi, A. (2024). Loss landscape characterization of neural networks without over-parametrization. *Advances in Neural Information Processing Systems 2024 (**NeurIPS**)*. URL.

Ajroldi, N., Diquigiovanni, J., Fontana, M., & Vantini, S. (2023). Conformal prediction bands for two-dimensional functional time series. *Computational Statistics & Data Analysis, 187, 107821*. URL.

Alfieri, F., Ancona, A., Tripepi, G., Rubeis, A., **Ajroldi, N.**, Finazzi, S., Cauda, V., & Fagugli, R. M. (2023). Continuous and early prediction of future moderate and severe acute kidney injury in critically ill patients. *PLOS ONE, 18*. URL.