Niccolò Ajroldi

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Ellis Institute Profile
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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, understanding novel sequence modelling architectures, and improving efficency in moder machine learning. I am particularly interested in benchmarking optimization algorithms for training large language models, enhancing performance and reducing computational costs. I very much enjoy developing machine learning codebases!

EXPERIENCE

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

- Research on novel sequence model architectures and optimizaton algorithms with Jonas Geiping and Antonio Orvieto.
- Developed submissions to AlgoPerf, a benchmark for optimization algorithms, scoring third in the competition leaderboard.
- Joined MLCommons Algorithmic Efficency team, developed open source contributions to AlgoPerf API.
- Mentored research interns in the CaCTüS program, researching on LLM optimization and LLM watermarking.

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 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 from transient kidney injury in ICU patients.
- Conducted statistical analyses and designed APIs for data visualization to support product promotion.

EDUCATION

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

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

PUBLICATIONS

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

Ajroldi, N., Diquigiovanni, J., Fontana, M., & Vantini, S. (2023). Conformal prediction bands for two-dimensional functional time series. Computational Statistics & Data Analysis (CSDA), 187, 107821. Article 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, 1–22. Article URL.