
Lorenzo Bini

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Education

- University of Geneva**, Ph.D. Candidate - Department of Computer Science & CUI Nov 2022 – Ongoing
- Major: Artificial Intelligence and Machine Learning.
 - Research interests: Graph neural networks, adversarial learning, representation learning, active and self-supervised learning. Implementation of robust models within weak/self-supervised training strategies to reduce label acquisition costs. Generative AI for medicine and healthcare.
- Polytechnic of Turin**, Master of Science in Physics of Complex Systems Sep 2020 – Sep 2022
- GPA: 4.0/4.0
- Alma Mater Studiorum - University of Bologna**, Bachelor degree in Physics & Astronomy Systems Sep 2017 – Sep 2020
- GPA: 4.0/4.0

Experience

- Research Assistant**, Hôpitaux Universitaires de Genève (HUG) – Geneva, Switzerland Nov 2022 - Ongoing
- Working on detecting Minimal Residual Disease (MRD) of Acute Lymphoblastic and Myeloid Leukemia (AML/ALL) from Flow Cytometry data.
 - Development of deep learning methods for single-cells hierarchical classification, in a weak/self-supervised context.
 - Development of deep generative models for healthcare, LLMs integration in medical scenarios.
- Teaching Assistant**, University of Geneva – Department of Computer Science & CUI Nov 2022 – Ongoing
- Introduction to Computational Finance - [14X030](#);
 - TALN: Traitement de la langue approches linguistiques et approches empiriques (NLP) - [34C2161](#);
 - Information Retrieval - [14X060](#);
 - Data Science - Analyse et Traitement de l'Information - [14X026](#);
 - Selected Chapters - Game Theory - [14X060](#);
- Research Assistant - Intern**, [Quantum Technology Group](#) - University of Norway Feb 2022 - July 2022
- Worked on quantum theory for entanglement and non-locality in optomechanics continuous variable systems. Developed quantum frameworks to analyze two-cavity optomechanics systems.

Publications

- Characterizing Massive Activations of Attention Mechanism in Graph Neural Networks** Oct 2024
Lorenzo Bini, Marco Sorbi, Stéphane Marchand-Maillet
[Pre-print, under double-blind review as a conference paper](#)
- Injecting Hierarchical Biological Priors into Graph Neural Networks for Flow Cytometry Prediction** Jul 2024
Lorenzo Bini, Fatemeh Nassajian Mojarrad, Stéphane Marchand-Maillet
[ICML'2024 Workshop on Accessible and Efficient Foundation Models for Biological Discovery, Wien, Austria](#)
- FlowCyt: A Comparative Study of Deep Learning Approaches for Multi-Class Classification in Flow Cytometry Benchmarking** Jun 2024
Lorenzo Bini, Fatemeh Nassajian Mojarrad, Margarita Liarou, Thomas Matthes, Stéphane Marchand-Maillet

Conference on Health, Inference, and Learning (CHIL'24), New-York, NY.

Why Attention Graphs Are All We Need: Pioneering Hierarchical Classification of Hematologic Cell Populations with LeukoGraph

Feb 2024

Lorenzo Bini, Fatemeh Nassajian Mojarad, Thomas Matthes, Stéphane Marchand-Maillet

[arXiv:2402.18610](#)

HemaGraph: Breaking Barriers in Hematologic Single Cell Classification with Graph Attention

Dec 2023

Lorenzo Bini, Stéphane Marchand-Maillet

[arXiv:2402.18611](#)

Awards & Oral Presentations

PhD Symposium - CHIL'24 at Cornell Tech University, NY

Jun. 2024

- Winner of the PhD Symposium money-prize to attend and present my PhD work "Adversarial Robust GNNs: Enhancing Learning with Knowledge Injection in Tabular Data" at [CHIL'24](#), conference held by Cornell Tech University, New York.

CHAIR Structured Learning Workshop - Chalmers University of Technology

Oct. 2023

- Oral presentation of the "Knowledge Distillation in Acute Myeloid Leukemia Classification: Tabular Data Meets Graph Neural Networks" poster at the [AI Structured Learning 2023 Workshop](#) in Göteborg, Sweden.

Winner of Thesis on Proposal 2021/2022

Feb. 2022

- Winner of "Thesis on Proposal 2021/2022" call for bids for my Master's Thesis on "Entanglement and non-locality in optomechanics continuous variable systems" under the supervision of Prof. Francesco Pietro Massel & Prof. Vittorio Penna.
- Received grants for my research period at USN-Kongsberg.

Projects

Flow Cytometry Deep Learning Benchmark

[FlowCyt-Benchmark](#)

- Developed the first public available deep learning benchmark for single-cell classification and clustering on flow cytometry data. Tested on a cohort of 30 selected patients by expert hematologists, from bone marrow and peripheral blood. Benchmarkd SOTA classification methods like DNNs, GNNs, Transformers, XGBoost, RandomForest, and Gaussian Mixture Models.
- Tools Used: Python, CSS, HTML.

Hackathons & Competitions

2019 - Ongoing

- Regular participation at Kaggle/LeetCode competitions and Hackathons; runner-up BR41N.IO 2021 Hackathon@PoliTO, runner-up UNIBO-IBM-Unipol Hackathon 2019, 3rd classified QuHack4IA 2023.
- Tools Used: Python - Competitive Programming.

Math/Physics Olympiad

Sep 2014 - Sep 2019

- 2x winner of the Italian Regional Math Olympiad.
- 1x winner of the Italian Regional Physics Olympiad.

Visiting Student, City Montessori School, Lucknow - Uttar Pradesh, India USN

Aug 2016 - Sep 2016

- Visited the City Montessori School together with the italian cultural association "CinemáCinemá" to provide help and needs to elementary/mid school students.

Oxfam Volunteering

2016 - Ongoing

- I do regularly serve as volunteer for charity organization, such as [Oxfam Italy](#).

Technologies

- **Programming Languages:** Python, Julia, R, , Matlab, Mathematica, C/C++ , CUDA.
- **Frameworks:** Pytorch, Pytorch-Lightning, Tensorflow, Keras, Jupyter.
- **AI/ML:** SciPy, scikit-learn, Github, GitLab, Numpy, Pandas, Matplotlib, Seaborn, wandb, PyG.
- **Tools:** Git, Linux, ssh, SLURM, pip, Anaconda, Docker, VSCode, Bash (Shell).

Software Licenses: Kaluza Analysis Software, Zemax OpticStudio | Comprehensive Optical Design Software, TeXstudio, BioVinci Software.