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# Lorenzo Bini

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## Education

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- 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, and Self-supervised learning. Making models more robust, and easing the cost of acquiring labels by adopting weak/self-supervised training strategies.
- 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

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- 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 from Flow Cytometry data.
  - Developing deep learning methods for single-cells hierarchical classification, under weak/self-supervised 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**, University of South-Eastern Norway - USN Feb 2022 - July 2022
- Working on quantum theory for the entanglement and non-locality in optomechanics continuous variable systems, under the co-supervision of Prof. Francesco Pietro Massel and Prof. Vittorio Penna - [Quantum Technology Group](#).

## Publications

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- 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 Mojarad, 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 Mojarad, Margarita Liarou, Thomas Matthes, Stéphane Marchand-Maillet

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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 Mojarrad, 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

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**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

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**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, XGBoost, RandomForest, and Gaussian Mixture Models.
- Tools Used: Python, CSS, HTML.

**Hackathons & Competitions**

2019 - Ongoing

- Regular participation at Kaggle/LeetCode competitions and Hackathons; UNIBO-IBM-Unipol Hackathon 2019, QuHack4IA 2023.
- Tools Used: Python - Compative 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 "CinemíCinéma" 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](#).

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## Technologies

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- **Programming Languages:** Python, Julia, R, , Matlab, C++ , Mathematica,
- **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.