

# Lorenzo Bini

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## Education

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<b>University of Geneva</b> , Ph.D. Candidate - Department of Computer Science & CUI	Nov 2022 – Ongoing
• Major: Artificial Intelligence and Machine Learning.	
<b>Polytechnic of Turin</b> , Master of Science in Physics of Complex Systems	Sep 2020 – Sep 2022
• GPA: 4.0/4.0	
<b>Alma Mater Studiorum - University of Bologna</b> , Bachelor degree in Physics & Astronomy Systems	Sep 2017 – Sep 2020
• GPA: 3.8/4.0	

## Experience

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<b>Research Assistant</b> , 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.	
<b>Teaching Assistant</b> , University of Geneva – Department of Computer Science & CUI	Nov 2022 – Ongoing
• Introduction to Computational Finance - <a href="#">14X030</a> ;	
• TALN: Traitement de la langue approches linguistiques et approches empiriques (NLP) - <a href="#">34C2161</a> ;	
• Information Retrieval - <a href="#">14X060</a> ;	
• Data Science - Analyse et Traitement de l'Information - <a href="#">14X026</a> ;	
• Selected Chapters - Game Theory - <a href="#">14X060</a> ;	
<b>Research Assistant</b> , 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 - <a href="#">Quantum Technology Group</a> .	

## Publications

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<b>Characterizing Massive Activations of Attention Mechanism in Graph Neural Networks</b>	Oct 2024
<i>Lorenzo Bini</i> , Marco Sorbi, Stéphane Marchand-Maillet	
<a href="#">Pre-print, under double-blind review as a conference paper</a>	
<b>Injecting Hierarchical Biological Priors into Graph Neural Networks for Flow Cytometry Prediction</b>	Jul 2024
<i>Lorenzo Bini</i> , Fatemeh Nassajian Mojarrad, Stéphane Marchand-Maillet	
<a href="#">ICML'2024 Workshop on Accessible and Efficient Foundation Models for Biological Discovery, Wien, Austria</a>	
<b>FlowCyt: A Comparative Study of Deep Learning Approaches for Multi-Class Classification in Flow Cytometry Benchmarking</b>	Jun 2024
<i>Lorenzo Bini</i> , Fatemeh Nassajian Mojarrad, Margarita Liarou, Thomas Matthes, Stéphane Marchand-Maillet	
<a href="#">Conference on Health, Inference, and Learning (CHIL'24), New-York, NY.</a>	
<b>Why Attention Graphs Are All We Need: Pioneering Hierarchical Classification of Hematologic Cell Populations with LeukoGraph</b>	Feb 2024
<i>Lorenzo Bini</i> , 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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### **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

- I won the "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.

### **Kaggle/LeetCode Competitions**

2021 - Ongoing

- I do regularly participate in different Kaggle and LeetCode competitions.
- Tools Used: Python - Competitive Programming.

### **Math/Physics Olympiad**

Sep 2015 - Sep 2018

- I participated and won twice the Italian Regional Stage of Maths and Physics Team Olympiad, during my last three years in high school and bachelor.

### **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](#).

## **Technologies**

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**Languages and coding:** Python, Julia, R, Pytorch, Tensorflow, Keras, Bash (Shell), Matlab, Mathematica.

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