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Education

2019–Present **Massachusetts Institute of Technology, Ph.D.**
2017-2019 **University of Rochester**, Bachelor of Science with Highest Distinction, Physics/Mathematics

Experience

2024 Spring **FAIR**, Research Scientist Intern, Meta AI - Fundamental AI Research, NYC
2023 Summer **MSR**, Research Intern, Microsoft Research, Cambridge UK
2022 Summer **FDL**, ML Researcher Intern, The NASA/SETI Frontier Development Lab
2019–Present **LHCb**, Ph.D. Researcher, Large Hadron Collider, European Center for Nuclear Research (CERN)

Selected Publications

(See [Scholar](#) for a full list.)

- [1] “*KBFormer: A Diffusion Model for Structured Entity Completion*”, **ICLR 2024** (pending).
- [2] “*NuCLR: Nuclear Co-Learned Representations*”, Synergy of Scientific & ML Modeling, **ICML 2023**.
- [3] “*Expressive Monotonic Networks*”, **ICLR 2023**.
- [4] “*Towards Understanding Grokking: An Effective Theory of Representation Learning*”, **NeurIPS 2022 Oral**.
- [5] “*NEEMo: Geometric Fitting using a Neural Estimation of the Energy Mover’s Distance*”, Machine Learning and the Physical Sciences **NeurIPS 2022**.
- [6] “*Robust and Provably Monotonic Networks*”, ML and the Physical Sciences **NeurIPS 2021**, (JMLST).
- [7] “*Controlling Classifier Bias with Moment Decomposition: a method to enhance searches for resonances*”, **Journal of High Energy Physics** 10.1007/JHEP04(2021)07 and the Workshop on ML and Physical Sciences **NeurIPS 2020**.
- [8] “*Lower Bounds for the Laplacian Spectral Radius of an Oriented Hypergraph*”, **Australasian Journal of Combinatorics**. 74(3). 408-422.

Honors and Awards

2019 **Frank Fellowship**, Awarded to a selection of incoming first-year doctoral students.
2017-2019 **Dean’s List**, Awarded based on GPA
2017-2019 **Whipple Science and Research Scholarship**, Awarded based on academic and research excellence.
2018 **U of R Research Presentation Award**, For presenting excellent research at academic conferences.
2015-2017 **Dean’s List**, Awarded based on GPA.
2017 **Bailey Scholarship**, Awarded to one outstanding student across the departments of physics, mathematics, chemistry, and biology.
2017 **Harvard House Award**, Awarded to top student in the Physics department.
2017 **Interdisciplinary Award**, Awarded to top student interested in interdisciplinary research in applied mathematics.
2015-2017 **Honors Scholarship**, Merit scholarship awarded to top incoming first-year students every fall semester.
2016-2017 **Integration Bee Gold Medal**, Competition at SUNY Brockport’s Mathematics department (2016/2017).
2014 **Cirta-Science 1st Place**, National high school science competition in Algeria.

Languages

Native Level **Arabic, French, English**

Service

Reviewer @ ICML, ICLR, NeurIPS. Organizer @ ML4PS NeurIPS. Mentor @ MIT RSI/Course 8.

About Me

I worked on various topics such as ML robustness, fairness, and interpretability with applications to physics. I am also interested in understanding the science of deep learning and AI foundations. Recently, I've been very excited about AI reasoning, multi-modal foundation models and their safe and scalable deployment.