

Alireza Hashemi

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[Linkedin](#) | [Google Scholar](#) | [Github](#)

EDUCATION

The City University of New York - PhD in Physics

Aug 2022 – Present

- Applied graph machine learning and graph neural networks on social & biological data. Application of symmetries and graph fibrations in biological neural networks of C. Elegans, machine learning on protein structure. (Python: [Github](#))
- Application of open-source LLMs in social media sentiment classification. Inference & finetuning (unsloth, PyTorch)

Sharif University of Technology - Master of Science in Physics

Sep 2019 – Jan 2022

- Numerical simulation of chaos in many-body systems of topological defects in active nematic matter. (Python: [Github](#))
- Simulation of social distancing in pedestrian dynamics, analysis of COVID-19 spread patterns. (Python: [Github](#))

University of Zanjan - Bachelor of Science in Physics

Sep 2015 – Jun 2019

- Radiative heat transfer in many-body fractal nano-structures, using computational linear algebra for numerical solution of fluctuational electrodynamics in fractal patterns. (C++, OpenMP, LAPACK)
- Ground-state energy eigenvalues for fractal quantum potentials. (C++: [Github](#))

WORK EXPERIENCE

The New York Times, New York, USA

Data Science Intern

Jun 2025 – Aug 2025

Memorial Sloan Kettering Cancer Center, New York, USA

Research Assistant

Jul 2024 – Present

- Studying the brain functional and physical networks using graph theory & machine learning on fMRI data. (AFNI, Python)

City College of New York, New York, USA

Adjunct Lecturer – Physics

Sep 2023 – Present

blubank (1st Iranian Neobank), Tehran, Iran

Data Scientist (Founding Member of the Data Science Team)

May 2020 – Aug 2022

- Implementation and design of fraud detection system on large-scale user transactional data using user-specific isolation forests, designing a pioneering platform for money-laundry detection in Iranian banking system.
- End-to-end development of a KYC system featuring liveness detection and on-device OCR, reducing the sign-up process time by 90% and enhancing the overall customer onboarding experience.
- Development and design of a Neo4j graph database and graph machine learning solutions to identify money-laundry networks, community detection, and recommender system in a user transaction database with >2 million users.
- Development of an effective credit scoring platform with <0.5% annual default rate, optimizing the risk in loans product.
- Data engineering pipelines & automations with Apache Airflow and ETL with Python on different databases (SQL, NoSQL).
- In-app user experience A/B testing and drill-down analysis using Elasticsearch to identify bottlenecks and patterns.
- Strategic insights as on-demand dashboards and in-depth analytics on customer acquisition and business growth.

Rahnema Co., Tehran, Iran

Machine Learning Intern

Jan 2020 – Mar 2020

- Worked on a team to design a recommendation system for beeptunes, an Iranian music streaming platform.

PUBLICATIONS & CONFERENCES

Brains vs. Bytes: Evaluating LLM Proficiency in Olympiad Mathematics – *arXiv* (2025)

Symmetries and synchronization in C. elegans connectome: Integration of functional and structural networks – *under review*

Protein Secondary Structure Prediction with GNNs and a Large-Scale Novel Graph Dataset – *under review*

Visiting distant neighbors in graph convolutional networks - *ICTIS* (2024)

Social distancing in pedestrian dynamics and its effect of disease spreading - *Physical Review E* (2021)

Chaotic dynamics of active topological defects - *Soft Materials* (2021)

Social distancing in pedestrian dynamics - *Dynamical Biological Systems* (2020)

COVID-19 in Iran - *NetSci* (2020)

Effectiveness of social distancing through the lens of Agent-Based Modelling - *Complex Systems Society* (2020)

Analysis of the ground-state energy eigenvalues of fractal quantum potentials - *Physica Scripta* (2019)

Many-body effects on the radiative heat transfer in fractal nanostructures - *IJAA* (2017)

RELEVANT SKILLS

Programming Languages: Python, C++, MATLAB, R, SQL, **Tools & Libraries:** GBM (xgboost), sklearn, NetworkX, TensorFlow, PyTorch, PyTorch Geometric, Unsloth, Ollama, Metabase, Elasticsearch, Superset, Apache Airflow, Python ETL, Spark, AWS, MLFlow, Python ETL (with PostgreSQL, MongoDB, Neo4j, MySQL), git, bash.

RELEVANT COURSEWORK

Deep Learning (with Prof. Yann LeCun, NYU), Stochastic Optimization, Numerical Methods in Physics, Statistical Machine Learning, Algorithms & Data Structures, Linear Algebra, Probability Theory, Complex Networks Analysis

SERVICE

- Teaching assistant for Physics I & II, University of Zanjan, Fall 2017-2018
- Teaching assistant for Analytical Dynamics, University of Zanjan, Fall 2018
- Teaching assistant for Nonlinear Dynamics & Chaos, Sharif University of Technology, Fall 2020
- Lab assistant for Physics I, II, City College of New York, Fall 2023-2024
- Reviewer for Journal of Physics A: Mathematical and Theoretical (2024)
- Reviewer for IEEE Transactions on Neural Networks and Learning Systems (2023-2024)

OTHER

- NTD Hackathon runner-up team ([NPR.org](https://www.npr.org)) for designing an graph-theoretical approach for contaminated water management for neglected tropical diseases.
- Dynamical Biological Systems award for best visualization, 2020.
- Translation of the book “Dark Matter & Dark Energy” by Brian Clegg to Farsi, Chatrang Pub, 2020