

Alireza Hashemi

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

RESEARCH EXPERIENCE

- PyTorch development of custom modules and functions for LLM models pruning, multi-GPU training experience with LLMs
- PyTorch geometric and graph representation learning, knowledge graph design and implementation
- LLM models evaluation on math problems, experience with LLM-as-a-judge methods, evaluation using agentic workflows
- LLM fine-tuning methods such as LoRA and QLoRA, SFT for labeling tasks in social sciences

WORK EXPERIENCE

The New York Times, New York, USA

Machine Learning Scientist

Oct 2026 – Present

- Research & Development on foundational AI models

Machine Learning Science Intern

Jun 2026 – Aug 2026

- Research & Development on online gateway models, working on improving CVR and engagement metrics.

Machine Learning Science Intern

Jun 2025 – Aug 2025

- Designed and deployed a Neo4j graph database for the advertisement team using Google Cloud Compute Engine, providing graph tools for advertisement and product design, experimented with user clustering algorithms using latest tools in graph neural networks and user graph metrics.
- Improved ad targeting precision and reduced infrastructure cost by optimizing vector search, migrating embedding lookup from linear to logarithmic time.
- Developed data flow DAGs using Google Cloud Composer and Apache Airflow, improving workflow scalability and reliability by migrating from Python Operators to Kubernetes Pod Operators.

Memorial Sloan Kettering Cancer Center, New York, USA

Feb 2025 – Jan 2026

Graduate Research Assistant

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

blubank 1st Iranian Neobank, Tehran, Iran

May 2020 – Aug 2022

Data Scientist

- Implementation and design of the first online fraud detection system and money-laundry detection platform in Iranian banking network on large-scale user transactional data using user-specific isolation forests.
- End-to-end development of a KYC system featuring liveness detection and on-device OCR, reducing the sign-up process time from days to minutes, while reducing fraudulent sign-ups to <1%.
- 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).

Rahnema Co., Tehran, Iran

Jan 2020 – Mar 2020

Machine Learning Intern

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

EDUCATION

The City University of New York - PhD in Physics

Aug 2022 – Present

- Applied graph machine learning and graph fibration symmetries on biological neural networks of C. Elegans, and machine learning on protein structure. (Python: [Github](#))
- Applied graph fibrations to prune and collapse artificial neural networks, preserving dynamics and performance.

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 with fluctuational electrodynamics. (C++, OpenMP, LAPACK)
- Numerical calculation of ground-state energy eigenvalues for fractal quantum potentials. (C++: [Github](#))

RELEVANT SKILLS

Programming Languages: Python, C++, R, MATLAB, SQL, **Tools & Libraries:** sklearn, TensorFlow, PyTorch, Torch Geometric,

Apache Airflow, Google Cloud Services, BigQuery, Python ETL (with PostgreSQL, MongoDB, Neo4j, MySQL), GBM (xgboost), Elasticsearch, MLFlow, git, NetworkX, Metabase, Superset, experience with Cursor AI coding integration for development.

RELEVANT COURSEWORK

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

PUBLICATIONS & CONFERENCES

- Emergence of Fibrations, Compression, and Symmetry Breaking in Artificial Neural Networks - *under review*
- CombiGraph-Vis: A Multimodal Olympiad Benchmark for Discrete Mathematical Reasoning - *NeurIPS 2025 MATH-AI*
- RefGrader: Automated Grading of Mathematical Competition Proofs using Agentic Workflows - *NeurIPS 2025 MATH-AI*
- Brains vs. Bytes: Evaluating LLM Proficiency in Olympiad Mathematics - *COLM (2025)*
- Symmetries and synchronization in *C. elegans* connectome: Integration of functional and structural networks - *PNAS (2025)*
- 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)*

ACADEMIC WORK EXPERIENCE

- Adjunct Lecturer for General Physics, Introduction to Modern Physics for Engineers, CCNY, 2023-Present
- 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
- Reviewer for Journal of Physics A: Mathematical and Theoretical (2024)
- Reviewer for IEEE Transactions on Neural Networks and Learning Systems (2023-2024)

HONORS & AWARDS

- NTD Hackathon runner-up team ([NPR.org](https://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