

Alireza Hashemi

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I am a 2nd-year PhD student in Physics with a strong foundation in data science and machine learning. Having a previous degree in physics, I have a solid background in mathematics and my academic background is complemented by over two years of hands-on experience as a data scientist, gaining experience with Python, C++, and data engineering tools such as SQL and ETL. My PhD research centers around the application of graph neural networks and graph symmetrical methods to complex biological data, specifically focusing on proteins. My Master's thesis, which was on the numerical simulation of chaos in systems of many-body topological defects, has fortified my proficiency in programming and numerical methods. My multidisciplinary background and interests equip me with the problem-driven approach to bridge the gap between theory and application to use different mathematical and computational tool to tackle different problems, from fraud detection in banking to protein sequence analysis.

EDUCATION

The City University of New York – City College of New York

PhD in Physics

Sep 2022 – Fall 2026

Master of Science in Physics

Sep 2022 – Sep 2024

- Applied graph theory and graph machine learning on biological data. Application of symmetries and fibrations in studying graph-based problems. (Python, PyTorch)

Supervisor: Hernán Makse

Sharif University of Technology

Master of Science in Physics

Sep 2019 – Jan 2022

- Numerical simulation of chaos in systems of many topological defects. (Python)
- Simulation of social distancing in pedestrian dynamics. (Python)

Supervisor: Mohammad-Reza Ejtehadi

University of Zanjan

Bachelor of Science in Physics

Sep 2015 – Jun 2019

- Numerical simulation of radiative heat transfer in many-body fractal nano-structures. (C++, OpenMP, CUDA)
- Numerical calculation of ground-state energy eigenvalues for fractal quantum potentials. (C++, MATLAB)

Supervisor: Amirhossein Darooneh, Moladad Nikbakht

WORK EXPERIENCE

blubank, Iran

Data Scientist

May 2020 – Aug 2022

- Fraud detection on user transactional data using isolation forests, autoencoders, and other anomaly detection methods.
- Fine-tuning and training of several CNNs for face vs. ID card verification and liveness detection.
- Development of a Neo4j graph database and graph machine learning solutions on various internal data sources to identify money-laundry networks, community detection, fraud detection, and recommender system in a user transaction database with >2 million users.
- Data engineering pipelines & automations with Apache Airflow and ETL with Python on different databases (SQL, NoSQL).
- High-level presentations of results and solutions to business and marketing teams.

Rahnema College, Iran

Machine Learning Course Mentor (Volunteer work)

Mar 2021 – Jun 2021

- Mentored a group of interns to work on machine learning projects in anomaly detection on website traffic data.

Rahnema College, Iran

Machine Learning Intern

Jan 2020 – Mar 2020

- Three-month internship on theory and applications of machine learning, gained experience with big data tools such as Spark & Hadoop. Worked on a music recommender system project for a music streaming website (beeptunes).

PUBLICATIONS

[Visiting distant neighbors in graph convolutional networks](#)

Alireza Hashemi, Hernán A. Makse - *arxiv preprint* (2023)

[Social distancing in pedestrian dynamics and its effect of disease spreading](#)

Alireza Hashemi, Sina Sajjadi and Fakhteh Ghanbarnejad - *Physical Review E* (2021)

[Chaotic dynamics of active topological defects](#)

Alireza Hashemi, Mohammad Reza Ejtehad - *Soft Materials* (2021)

[Analysis of the ground-state energy eigenvalues of fractal quantum potentials](#)

Alireza Hashemi, Amirhossein Darooneh - *Physica Scripta* (2019)

[Many-body effects on the radiative heat transfer in fractal nanostructures](#)

Moladad Nikbakht, Serviyeh Ahmadian, Alireza Hashemi - *IJAA* (2017)

CONFERENCE PRESENTATIONS

[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)

RELEVANT SKILLS

Programming Languages: Python, C++, MATLAB, R, **Standard Machine Learning Libraries, Network Science Libraries:** NetworkX, graph-tool, **Deep Learning:** Keras, TensorFlow, PyTorch (and PyTorch geometric), **Parallel Computation:** LAPACK, OpenMP, CUDA, **SQL & NoSQL Databases:** PostgreSQL, MongoDB, Neo4j, **Timeseries:** Causal impact analysis, timeseries prediction, anomaly & fraud detection, **Data Reporting:** Metabase, Superset, **Data Engineering & ML Automation Tools:** Apache Airflow, Python ETL

OTHER

[NTD Hackathon](#) runner-up team (report on [NPR.org](#)), 23rd & 24th school on physics at [IASBS](#), Tehran School on Complex Networks ([TACN2018](#)) participant, Teaching experience as an adjunct lecturer at CCNY, Translation of the book “Dark Matter & Dark Energy” by Brian Clegg to Farsi (2020). Student representative in Doctoral & Graduate Student Council at CUNY. Dynamical Biological Systems 2020 award for best visualization.

RELATED COURSEWORK

Deep Learning, Stochastic Optimization, Numerical Methods in Physics, Advanced Programming, Elements of Statistical Learning

LINKS

[Google Scholar](#)

[Researchgate](#)

[Linkedin](#)

[Github](#)