

# Hooman Zolfaghari

## Contact

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## Education

B.S in Computer Science at Sharif University of Technology

*Courses of Interest Taken: (more details available on [website](#))*

- *CS828: Machine learning:*

A graduate level ML course, learned topics from Theory, Classic Methods, Neural Networks, Unsupervised Learning, Boosting, RL etc.

- *CS635: Stochastic Processes:*

An advanced probability course, learned about Markov Chains (discrete, continuous, ...), GPs, Poisson Process, Martingales etc. Final project about "MCMC: Metropolis Hastings algorithm".

- *Other courses:*

Statistical learning, Linear algebra, Game Theory, Databases, Data structures and Algorithms, Advanced programming, Probability Theory and its Applications, Statistics and its Applications, Operating Systems, Computer Networks, Principles of computer systems, Numerical Analysis

## Research Experience

- *Research in **Graph Machine Learning** and **Geometric Deep Learning**, under supervision of [Dr.A.Rafiey](#) and [Dr.A.Vaezi](#):*

In this paper, we created a metric space from the set of all homogeneous vertex-featured graphs, to use the created metrics and distance functions on machine learning tasks. We proved many theoretical properties for the functions and since they work directly on the set, as an example, they can provide a theoretically optimal k-NN classifier on vertex-featured graphs.

Here I had the opportunity to introduce many ideas and theoretical analysis, create and write theoretical proofs and conduct benchmark experiments. I tackled with concepts in Geometric Deep Learning, Fractional Graph Theory, Optimization, Topology, High Dimensional Probabilistic Proofs and Analysis.

- *Research in **Vision and Computational Neuroscience**, under supervision of [Dr.H.Peyvandi](#):*

We are working on a Bayes-Markov model for Cortical Orientation Selectivity, which is based on Markov Random Fields and Bayesian Inference, in vision tasks, improving on and experimenting with the model.

## Teaching Experience

- *EE120: Deep Generative Models, [Dr. S. Amini](#), Fall 2024 :*

This is a graduate course at the Electrical Engineering department at Sharif University of Technology. I am currently responsible for theoretical and practical exercises on Generative Flow Models. I also mentor students introducing them to related research areas and recent papers.

- *CE477: Introduction to Machine Learning, Dr. A.Sharifi-Zarchi, Fall 2024 :*

I am currently part of the team for educational content of “Breakthroughs: Vision Transformers, Self-Supervised Learning, Contrastive Learning” Chapter. (this item will likely be updated further)

*In the following courses I had many responsibilities like creating exercises, conducting workshops and TA classes, grading, creating projects, mentoring etc. details are available on my Website:*

- *Algorithmic Creativity and Programming in Python, Dr. A.Sharifi-Zarchi, Summer 2023 :*
- *Computer Networks, Dr.H.Peyvandi, Spring 2024 :*
- *Operating Systems, Dr. A.Vaezi, Spring 2024 :*
- *Data structures and Algorithms, Dr. H.Mehrabian, Spring 2024 :*
- *Advanced Programming, Dr. H.Boomeri, Spring 2024 :*

## Industrial Experience

- Software development, Mika Corporation: Here I was backend developer where I created the back-end source code for a central application for managing luxury buildings built by the company. I also helped the front-end team to communicate with the server APIs.
- Software development, Sharif Technology Center: Here I was a front-end developer.

## Skills

- **Theory:** Machine Learning Theory, Probability Theory, Geometric Deep Learning, Generative Deep Learning, Statistical Learning and Stochastic Processes. Also, Topology and Optimization at beginner level.
- **Programming Languages:** Python, C++, Java, C#, SQL, Assembly
- **Frameworks and Libraries:** PyTorch, PyG (PyTorch Geometric), CuPy, JAX, NumPy, Pandas, SciPy, Scikit-learn, CVXPY, ASP.NET Core
- **Tools:** Git, LaTeX, RabbitMQ, Docker
- **Techniques:** Deep Learning, Reinforcement Learning, Generative Models, Kolmogorov-Arnold Networks
- **Methodologies:** Agile, Scrum, Event-driven Programming, Concurrent Programming, Microservices

## Activities

- CS236: Deep Generative Models, Stanford
- CS224W: Machine Learning with Graphs, Stanford
- Completed Neuromatch academy Deep Learning course (Certificate)
- Implemented Machine learning models and Techniques (GitHub)
- Neural Style Transfer project (GitHub)
- Implemented MCMC: Metropolis-Hastings algorithm (GitHub)
- Artificial Intelligence in Clinical Practice (Certificate)

## Research Interests:

- Machine Learning Theory
- Generative Deep Learning
- Geometric Deep Learning
- Causal Inference
- Trustworthy ML