

Hooman Zolfaghari

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LinkedIn



GitHub



Website

Education

B.Sc. in Computer Science at [Sharif University of Technology](#),

GPA:16.31/20.00, without first year:17.04/20.00

Courses of Interest Taken: (more information available on my [website](#))

- **EE841: High-dimensional Probability Analysis** ([Prof. M.H. Yassaee](#), *in-progress*): This is a graduate course where we study topics like concentration inequalities and sub-Gaussian distributions, with applications in areas such as machine learning and random matrix theory. Our team's final project is on "*Neural Tangent Kernel: Convergence and Generalization in Neural Networks*".
- **CE718: Theory of Machine Learning** ([Prof. A. Najafi](#), *in-progress*): This is a graduate course where we learn many of the mathematical concepts of today's Machine Learning and Deep Learning, along with studying related papers.
- **CS635: Stochastic Processes** ([Dr. H. Peyvandi](#), *20/20*): An advanced probability course, studied Markov Chains, Gaussian Processes, Poisson Process, Martingales. [Final project](#) about "MCMC: Metropolis Hastings algorithm".
- **CS828: Machine learning** ([F. Seyyedsalehi](#), *19.3/20*) A graduate-level ML course, learned topics from Theory, Classic Methods, Neural Networks, Unsupervised Learning, Boosting, RL etc.
- *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

- **Graph Similarity Search**, under [Prof. A. Rafiey](#) and [Dr. A. Vaezi](#): Research on [Graph Machine Learning](#). We worked on Expressive measures of graph similarity for ML tasks. Here I had the opportunity to introduce many ideas and theoretical analysis, create theoretical proofs and conduct benchmark experiments, under the guidance of my supervisors. I studied concepts in [Geometric Deep Learning](#) and Graph NNs, Approximation on Graphs, Graph Theory, Optimization and Topology. Paper is in draft stage.
- **On Security and Privacy of Kolmogorov-Arnold Networks**, under [Prof. S. Amini](#): We are experimenting with many aspects of Trustworthy ML on KANs, such as Adversarial Robustness, Membership Inference, Certified Robustness, Catastrophic overfitting, and Machine Unlearning. Collaborated with students at the University of Massachusetts.
- **Bayes-Markov model of Cortical Orientation Selectivity**, under [Dr. H. Peyvandi](#): We studied and experimented on a model based on Markov Random Fields and Bayesian Inference, inspired by their use in vision tasks.

Teaching Experience

- **EE120: Deep Generative Models**, Prof. 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. [Course Page](#).

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

I created the educational content and slides on Multi-Modal, Self-Supervised and Contrastive Learning, and [course slides](#) for Unsupervised Learning and Clustering. [Course Page](#).

Also, in these courses I had many responsibilities like creating theoretical and practical exercises, holding workshops and TA classes, grading, creating projects, mentoring etc. details are available on my [Website](#):

- *Algorithmic Creativity and Programming in Python*, Prof. 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. Mehrabiun, Spring 2024
- *Advanced Programming*, Dr. H. Boomeri, Spring 2024

Industrial Experience

Software development, *Mika Corporations*: Created the backend code base for the with services, like ticketing, reservations, concierge etc. Here I developed my programming skills in large-scale code bases.

Other Activities

- Achieved 108 on the TOEFL.
- Extensive experience with **many programming languages and libraries** at an [advanced level](#). Public codes are on [GitHub](#).
- Created Generative Models and with Kolmogorov-Arnold Networks ([GitHub](#))
- [CS236: Deep Generative Models](#) and [CS224W: Machine Learning with Graphs](#), Stanford
- Completed *Neuromatch Academy's* Deep Learning course ([Certificate](#))
- Implemented *MCMC: Metropolis-Hastings* algorithm ([GitHub](#)) and Neural Style Transfer project ([GitHub](#))

Research Interests:

- **Machine Learning Theory**: Generalization Bounds, Provable Guarantees, Learning on Infinite-dimensional Spaces, Domain Adaptation.
- **Trustworthy ML**: Distributional Robustness, Differential Privacy, Certified Robustness, Catastrophic Overfitting, Interpretability
- **Geometric Deep Learning**: Learning data with Geometric Priors, Symmetries and Invariants behind DL, Universal Approximation on non-Euclidean data like Graphs.
- **Generative Deep Learning**: Universal Distribution Approximation, Text Guided Generation or Editing
- **Causal Inference**: Machine Learning based on Causality, Representation Learning of Causal Structures