

Mohammad Mahdi Mirrashid

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Education and Selected Courses

2019 – Ongoing	Sharif University of Technology, Electrical Engineering - B.Sc. <i>Graduate Courses</i> <ul style="list-style-type: none">Statistical Machine Learning (Differential Privacy, Interpretability, Bayesian Nonparametrics, PGMs)High-Dimensional Probability Analysis (Concentration Inequalities, Covering/Packing Numbers, etc.)Statistical Learning (Classical Machine Learning, Mathematical Foundations of Machine Learning)Applied Stochastic Processes (Audited) (Markov Processes, Hitting Times, Monte Carlo Methods, etc.) <i>Undergraduate Courses</i> <ul style="list-style-type: none">Algorithms and Data Structures, Convex Optimization, Linear Algebra
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Research Experience

Broad Research Interests: Applied Probability, Reliable and Secure Machine Learning, Theory of Deep Learning

2023 - Ongoing	Graph Structural Shift - Research Assistant <i>Supervisor: Dr. Gholamali Aminian at The Alan Turing Institute</i> <ul style="list-style-type: none">Investigating the effect of homophily properties of graphs on domain adaptation techniques for graph neural networks. Wrote project code. [Github]
2023 - Ongoing	Improving DP-SGD with Self-Supervision - Research Assistant <i>Supervisors: Prof. Hamid Rabiee, Gita Sarafrasz at Data Science and Machine Learning Laboratory (DML)</i> <ul style="list-style-type: none">Proposed several ideas to improve upon DP-SGD (gradient and instance normalization, nearest centroids with self-supervised pretraining). Wrote project code. [Github]
2023 - Ongoing	Self-Supervised Anomaly Detection - Independent Research <ul style="list-style-type: none">Proposed an approach utilizing self-supervised models such as DINO and developed a novel outlier threshold selection method. Wrote project code. [Github]
2023 - Ongoing	Revenue Maximization in The Bitcoin Lightning Network - Research Assistant <i>Supervisor: Dr. Mojtaba Tefagh, Blockchain Programme Manager at the University of Edinburgh</i> <ul style="list-style-type: none">Helping develop a realistic model of the Lightning Network and an approximate algorithm for revenue-optimal channel selection.
2022 - 2023	Transfer Learning for EEG Signal Classification - Research Assistant <i>Supervisor: Mohammad Bagher Shamsollahi, Biomedical Signal and Image Processing Laboratory (BiSIPL)</i> <ul style="list-style-type: none">Studied applications of transfer learning in EEG classification. Implemented papers and proposed novel ideas. Gave many presentations on the topic. [Project Github]
2022 - 2023	Speech Recognition for Farsi, Stable Diffusion with Persian Artstyle - Research Assistant <i>Speech and Language Processing Lab (SLPL) and Asr Gooyesh Pardaz Company Joint Projects</i> <ul style="list-style-type: none">Fine-tuned deep speech recognition models such as the Conformer for Farsi. Worked on fine-tuning Stable Diffusion both language-wise (Farsi) and style-wise (Persian). [Github]

Teaching Experience

2022, 2023	Machine Learning Summer Workshop - Instructor <i>Scientific Association of The Electrical Engineering Department at Sharif University (Resana)</i> <ul style="list-style-type: none">Lecturer (2x) (60 participants at the 2023 workshop) [2022, 2023]
2021, 2022, 2023	Teaching Assistant <ul style="list-style-type: none">Introduction to Machine Learning (4x) - EE Department, IE Department [Materials Example]Linear Algebra (Mathematical Methods in Engineering) - EE DepartmentObject-Oriented Programming (2x) (course project head, 200 students) - EE Department

Research Proposals

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| 2023 | 3D Medical Image Segmentation with Segment Anything
<i>Supervisor: Dr. Mojtaba Tefagh</i> <ul style="list-style-type: none">Proposed several research directions for automated and accurate 3D medical image segmentation with applications in radiotherapy. Helps and meets with students working on the projects. |
| 2023 | Architecture-Aware Deep Differential Privacy
<i>Supervisor: Dr. Mohammad Hossein Yassaee</i> <ul style="list-style-type: none">Proposed the idea of taking model architecture into account when designing DP mechanisms, by utilizing the dependence of backpropagation on gradient multiplications only. |

Relevant School Projects

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| 2022 | SVM Implementation from Scratch - Convex Optimization <ul style="list-style-type: none">Numpy implementation of an SVM classifier with interior-point optimization from scratch [Github] |
| 2022 | EEG Classification for Bistable Perception - Fundamentals of Neuroscience <ul style="list-style-type: none">Classification of EEG when watching an optical illusion. Recorded data and trained deep classifier. |

Skills

- Comfortable coding in Python, Matlab, C++, C, and Java
- Presentation of technical subjects to large audiences
- Team communication

Hobbies and Interests

- Wrote several simple games with an AI player
- Hosted and coordinated English free discussion sessions at Sharif University (3 years)
- Amateur piano player, writes little tunes sometimes