Mohammad Mahdi Mirrashid

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Education and Selected Courses

2019 – Ongoing

Sharif University of Technology, Electrical Engineering - B.Sc.

Graduate Courses

- 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.)

Undergraduate Courses

- Algorithms and Data Structures, Convex Optimization, Linear Algebra

Research Experience

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

2023 - Ongoing

Graph Structural Shift - Research Assistant

Supervisor: Dr. Gholamali Aminian at The Alan Turing Institute

- Investigating the effect of hemophily 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

Supervisors: Prof. Hamid Rabiee, Gita Sarafraz at Data Science and Machine Learning Laboratory (DML)

- 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

- 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

Supervisor: Dr. Mojtaba Tefagh, Blockchain Programme Manager at the University of Edinburgh

- 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

Supervisor: Mohammad Bagher Shamsollahi, Biomedical Signal and Image Processing Laboratory (BiSIPL)

- 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

Speech and Language Processing Lab (SLPL) and Asr Gooyesh Pardaz Company Joint Projects

- 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

Scientific Association of The Electrical Engineering Department at Sharif University (Resana)

- Lecturer (2x) (60 participants at the 2023 workshop) **[2022, 2023]**

2021, 2022, 2023

Teaching Assistant

- Introduction to Machine Learning (4x) - EE Department, IE Department [Materials Example]
- Linear Algebra (Mathematical Methods in Engineering) - EE Department
- Object-Oriented Programming (2x) (course project head, 200 students) - EE Department

Research Proposals

2023 **3D Medical Image Segmentation with Segment Anything**
Supervisor: Dr. Mojtaba Tefagh
- 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**
Supervisor: Dr. Mohammad Hossein Yassaee
- Proposed the idea of taking model architecture into account when designing DP mechanism, by utilizing the dependence of backpropagation on gradient multiplications only.

School Projects

2022 **SVM Implementation from Scratch - Convex Optimization**
- Numpy implementation of an SVM classifier with interior-point optimization from scratch **[Github]**

2022 **EEG Classification for Bistable Perception - Fundamentals of Neuroscience**
- 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