Mohammad Jafari

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Education

Sharif University of Technology *Tehran-Iran*

B.Sc in **Computer Engineering** [Transcript] Sept. 2019 - Present

GPA: $18.72/20 - 3.91/4$,   GPA Major: $18.86/20 - 3.94/4$

Thesis: A data-driven approach for intelligent and robust detection of out-of-distribution data

Advisor: Prof. Mohammad H.Rohban

Publications

[1] **Unsupervised Out-of-Distribution Detection in High-Variation Settings** [To be Submitted]
*Hossein Mirzaei, **Mohammad Jafari***, Mojtaba Nafez*, Mohammad Bagher Soltani, Mohammad Sabokrou, Mohammad Hossein Rohban, **CVPR 2024**.*

[2] **Contrast and Conquer: A Universal Approach to Anomaly Detection** [To be Submitted]
*Hossein Mirzaei, Mojtaba Nafez, **Mohammad Jafari**, Mohammad Bagher Soltani, Mohammad Sabokrou, Mohammad Hossein Rohban, **CVPR 2024**.*

[3] **RODEO: Robust Out-of-Distribution Detection Via Exposing Adaptive Outliers** [Under Review]
*Hossein Mirzaei, **Mohammad Jafari**, Hamid Reza Dehbashi, Ali Ansari, Sepehr Ghobadi, Masoud Hadi, Arshia Soltani Moakhar, Mahdieh Soleymani Baghshah, Mohammad Hossein Rohban, **ICLR 2024**.* [Access upon request]

[4] **The Power of Few: Accelerating and Enhancing Data Reweighting with Coreset Selection** [Under Review]
***Mohammad Jafari**, Yimeng Zhang, Yihua Zhang, Sijia Liu, **ICASSP 2024**.* [Access upon request]

[5] **Killing it with Zero-Shot: Adversarially Robust Novelty Detection** [Under Review]
*Hossein Mirzaei, **Mohammad Jafari**, Hamid Reza Dehbashi, Zeinab Sadat Taghavi, Mohammad Sabokrou, Mohammad Hossein Rohban, **ICASSP 2024**.* [Access upon request]

[6] **Perfected by Imperfections: Adversarially Robust Detection of Out-of-Distribution Samples** [Under Review]
*Hossein Mirzaei, **Mohammad Jafari***, Hamid Reza Dehbashi*, Mohammad Hossein Rohban, **AAAI 2024**.* [Access upon request]

Research Interests

◇ Trustworthy & Safe AI ◇ Fairness & Model Interpretability ◇ Multi-Level Optimization

◇ Adversarial Learning ◇ Anomaly Detection ◇ Contrastive Learning

Research Experiences

Hyperparameter Optimization, Dataset Pruning, Data Reweighting *Michigan, USA*

OPTML Lab, Michigan State University Summer 2023 - Present

- Participated in a research initiative supervised by Prof. Sijia Liu, in collaboration with PhD students Damon Zhang and Yihua Zhang.
- Served as the first author for a paper submitted to *ICASSP2024*, emphasizing our team's commitment to advancing machine learning optimization.
- Developed coding skills specific to hyperparameter optimization and dataset pruning. Gained an in-depth understanding of data reweighting techniques, which enhanced my capacity for constructing robust machine learning models.

Adversarial Robustness, Anomaly and Out-of-Distribution Detection *Tehran, Iran*

RIML Lab, Sharif University of Technology Spring 2022 - Present

- Conducted research under the supervision of Prof. Rohban, and in collaboration with Prof. Mahdieh Solaymani and Prof. Mohammad Sabokrou.
- Contributed to research papers submitted to *AAAI2024*, *ICASSP2024*, and *ICLR2024*, highlighting the lab's interdisciplinary research activities.
- Gained practical insights into adversarial robustness, strengthening my coding skills in implementing defenses against adversarial attacks. Further developed my understanding of anomaly detection algorithms, which aided in improving model reliability for out-of-distribution data.

Highlight Courses

Machine Learning (20/20) - 1st Rank，Computer Vision (18.7/20) - 1st Rank，Artificial Intelligence (20/20) - 1st Rank，Image Processing (19.3/20) - 5th Rank，Linear Algebra (20/20) - 1st Rank，Design of Algorithms (20/20) - 1st Rank，Data Structures (20/20) - 1st Rank，Advanced Programming (20/20) - 1st Rank，Web Programming (20/20) - 1st Rank，Machine Learning-Coursera† (Audited)，Deep Learning-Coursera† (Audited)

Highlight Projects

Hyperparameter Optimization

Hyper Parameter Optimization on Coreset 🔵   Summer 2023

Developed a strategy for hyperparameter tuning through coresets, achieving enhanced model performance by validating the selected hyperparameters on the full dataset.

Evaluating Anomaly Detection Methods' Robustness

Robust Test 🔵   Summer 2023

Investigated the resilience of anomaly detection algorithms by performing adversarial attacks, serving as a benchmark for assessing robustness under adversarial conditions.

Comprehensive Anomaly Detection with Outlier Exposure

ExposureExperiment 🔵   Spring 2023

Executed a series of anomaly detection experiments across multiple datasets, offering valuable insights into dataset limitations and aiding in the creation of more robust anomaly detection models.

Anomaly Detection Bias Testing

Bias Test 🔵   Spring 2023

Developed a framework for evaluating anomaly detection methods in multi-class normal settings, challenging the commonly held bias towards single-class normal configurations.

Computer Vision Algorithms

ComputerVisionProjects 🔵   Spring 2022

Developed a comprehensive repository of computer vision algorithms. Topics covered: Harris Corner Detection and Matching, Perspective Transform, Scene Matching using Homography & RANSAC, Creating Panorama from Video, Background Extraction & Stabilization, Epipolar Geometry, 3D Reconstruction, and HoG Face Detection.

Image Processing Algorithms

ImageProcessingProjects 🔵   Fall 2021

Implemented various image processing algorithms. Topics include Prokudin Gorski Colorization, Template Matching, CamScanner, Hybrid Images, Chess Board Detection via Hough Transform, Texture Synthesis, Image Completion and Hole Filling, Image Segmentation, Image Morphing, and Image Blending.

Teaching Experiences

Sharif University of Technology

◇ Image Processing — Spring 2023	◇ Data Structures and Algorithms — Fall 2021
◇ Linear Algebra — Spring 2023, Fall 2022, Fall 2021	◇ Web Programming — Fall 2021
◇ Artificial Intelligence — Spring 2022	◇ Advanced Programming — Spring 2021

Technical Skills

Programming Languages	Python, R, C++, C, Java, Javascript, TypeScript, LaTeX
Frameworks & Operating Systems	Linux, Git, React, Django, Bash
Machine Learning Libraries	OpenCV, Numpy, Pandas, Scikit-Learn, Matplotlib, Seaborn
Deep Learning Libraries	PyTorch, PyTorch Lightning, Keras, TensorFlow
Professional Software	Adobe Illustrator, Adobe Photoshop, Davinci Resolve, Adobe Premiere
Languages	Persian (Native), English (Proficient): IELTS Score 8 (L9.0, R8.5, S7.5, W7.0)