

EHSAN LARI

MACHINE LEARNING RESEARCHER

Trondheim, Norway

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Professional Experience

Research and Teaching Assistant

January 2020 – July 2025

Norwegian University of Science and Technology (NTNU)

Trondheim, Norway

- Developed robust algorithms using Python and MATLAB for federated learning, distributed NMF, and maximum consensus, enhancing resilience to noise and privacy in large-scale signal processing and machine learning systems.
- Authored 7 peer-reviewed publications in top-tier venues (IEEE TSIPN, Elsevier SP, ICASSP, SSP, APSIPA, EUSIPCO) on distributed optimization and privacy-preserving data systems, advancing efficient and secure technology solutions.
- Mentored students in research projects, leveraging Python, MATLAB, and Docker to bridge data science and engineering through distributed system integration and algorithm development.

Assistant Professor

August 2022 – December 2022

Norwegian University of Science and Technology (NTNU)

Trondheim, Norway

- Delivered lectures on advanced signal processing using Python and Verilog, supporting over 200 master's students in understanding engineering technology frameworks and statistical models.
- Supervised graduate projects involving machine learning and electronic systems integration.

Education

Norwegian University of Science and Technology (NTNU)

January 2020 – March 2024

Doctor of Philosophy (PhD) — Signal Processing and Machine Learning

Trondheim, Norway

Amirkabir University of Technology (Tehran Polytechnic)

September 2016 – December 2018

Master of Science (MSc) — Electrical Engineering

Tehran, Iran

Amirkabir University of Technology (Tehran Polytechnic)

September 2012 – September 2016

Bachelor of Science (BSc) — Electrical Engineering (Double-Major)

Tehran, Iran

Major Achievements

- Offered assistant professor position mid-PhD, recognizing exceptional research and teaching integrity in machine learning and signal processing.
- Accepted for M.Sc Program without Entrance Exam at Amirkabir University of Technology
- Ranked Within Top 0.4% Among More Than 220,000 Students in Nationwide University Entrance Exam for B.Sc. Degree

Certificates

- | | | | |
|----------|----------|--------------------|--------------|
| • MATLAB | • SQL | • Microsoft Azure | • Kubernetes |
| • Python | • Docker | • Microsoft Fabric | • Databricks |

Technical Skills

- **Programming Languages:** Python (Scikit-Learn, PyTorch, NumPy, Pandas), MATLAB, SQL
- **Software & Tools:** Cloud Platforms (Microsoft Azure), Docker, Kubernetes, Microsoft Fabric, Git
- **Technologies:** Machine Learning, Generative AI, Machine Vision, Forecasting, Data Analytics, IoT, Software Development, Ethical and Explainable AI, Engineering Data Management
- **Soft Skills:** Problem-Solving, Communication, Cross-Functional Collaboration, Teamwork, Adaptability, Stakeholder Management, Pragmatic Programming

Projects and Publications

Resilience in Online Machine Learning

April 2022 – August 2024

- Developed the PSO-Fed algorithm for online federated learning, enabling privacy-preserving model training on distributed streaming data with reduced communication overhead.
- Proved PSO-Fed's convergence under Byzantine model-poisoning attacks through theoretical analysis, deriving a mean square error formula incorporating stepsize and attack parameters.
- Optimized PSO-Fed's robustness by identifying a non-trivial stepsize, outperforming state-of-the-art federated learning algorithms in resilience to malicious client attacks.
- Published findings in IEEE TSIPN (Q1 journal) and presented at IEEE ICASSP, a leading signal processing conference, demonstrating PSO-Fed's superior performance via extensive simulations.

Noise-Robust and Resource-Efficient Machine Learning

April 2023 – February 2025

- Developed a novel federated learning algorithm to enhance robustness to communication noise while minimizing client-server communication load.
- Formulated the algorithm using weighted least-squares regression, solved via ADMM with random client scheduling for efficient distributed optimization.
- Enhanced performance by eliminating dual variables and enabling continuous local model updates, improving resilience to noisy links.
- Proved mean and mean-square convergence theoretically, with simulations confirming superior performance over existing FL methods.
- Published in Elsevier Signal Processing (Q1 journal) and presented at IEEE SSP and IEEE APSIPA, showcasing significant robustness and efficiency gains.

Privacy-Preserving Nonnegative Matrix Factorization

January 2024 – September 2024

- Developed a privacy-preserving algorithm for fully-distributed nonnegative matrix factorization (NMF) to decompose large data matrices over ad-hoc networks.
- Enabled collaborative estimation of matrix factors while safeguarding local data privacy using the Paillier cryptosystem for secure, encrypted computations.
- Implemented a decentralized approach to prevent raw data sharing among agents, ensuring robust privacy in distributed signal processing applications.
- Validated algorithm effectiveness through simulations on synthetic and real-world datasets, demonstrating accurate factor estimation with preserved privacy.
- Presented findings at EUSIPCO, a leading signal processing conference, showcasing the algorithm's applicability to privacy-sensitive machine learning tasks.

Distributed Maximum Consensus

February 2024 – September 2024

- Developed the RD-MC algorithm for distributed maximum consensus, enabling robust estimation of maximum values in multi-agent networks over noisy communication links.
- Reformulated the maximum consensus problem as a distributed optimization task, solved efficiently using the alternating direction method of multipliers (ADMM).
- Enhanced robustness and efficiency by utilizing a single set of noise-corrupted estimates and applying moving averaging to local estimates.
- Demonstrated RD-MC's superior resilience to communication link noise through extensive simulations, outperforming existing maximum-consensus algorithms.
- Presented results at EUSIPCO, a leading signal processing conference, showcasing the algorithm's effectiveness in noisy distributed environments.