Amirhossein Mohammadi

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Research Interests

I am broadly interested in learning structure from sensory data at scale, which encompasses **representation learning**, **self-supervised learning** and **world modeling**. I am also interested in inference from sensory data for **generative modeling** and **prediction**.

Education

York University, Toronto, Canada — Jan 2024 - Now
M.A.Sc in Electrical and Computer Engineering — **GPA:** A$^+$
Thesis: **Multi-User Activity Recognition from Wi-Fi CSI**
Advisor: Dr. Hina Tabassum

University of Tehran, Tehran, Iran — Sep 2018 - July 2023
B.Sc. in Electrical Engineering — **GPA:** 3.61/4
Thesis: **Toward Model Agnostic Federated Learning**
Advisor: Dr. Alexander Jung

Publications

AMAR: Efficient Attention Based Multi-User Activity Recognition from Wi-Fi CSI
Amirhossein Mohammadi, *Hina Tabassum*
Submitted to IEEE Transactions on Neural Networks and Learning Systems (TNNLS), under review.

Your Data, My Model: Learning Who Really Helps in Federated Learning
Shamsiiat Abdurakhmanova, ***Amirhossein Mohammadi,*** *Yasmin SarcheshmehPour, Alexander Jung*
Submitted to Journal of Machine Learning Research (Springer), under review. Preprint: arXiv:2409.02064

Generative AI at Application Layer: Mobile AI-Generated Content
Paria Mohammadzadeh Hesar, ***Amirhossein Mohammadi,*** *Hina Tabassum*
Book chapter in *GenAI for Communications Systems and Networking*, Cambridge University Press, 2025.

Research Experience

Research Assistant, *York University, Canada* — Jan 2024 - Present
Supervisor: *Dr. Hina Tabassum*

- ◇ Developed self-supervised pretraining method for finding structure in WiFi CSI data without relying on labeled samples
- ◇ Developed a novel end-to-end transformer-based architecture for multi-person human activity recognition using WiFi Channel State Information (CSI)
- ◇ Reformulated the problem as set prediction task and achieved SOTA results
- ◇ Efficient design for low resource edge devices, while maintaining extremely low communication cost

Research Assistant, *Aalto University, Finland* — Nov 2022 - Feb 2023
Supervisor: *Dr. Alexander Jung*

- ◇ Developed a novel model-agnostic federated learning algorithm enabling heterogeneous model architectures
- ◇ Implemented knowledge distillation techniques for efficient information distribution in federated networks
- ◇ Extended the framework to handle non-networked datasets using regret minimization principles

Notable Projects

Energy-Based Transformer Models for Text Generation — Fall 2025 - Now
Developing a energy-based transformer architectures for text generation tasks, focusing on reformulating sequence modeling as an energy minimization problem, in hope to develope system two thinkers.

Self-Supervised Learning for CSI Representation Learning Spring 2024
Implemented contrastive self-supervised learning frameworks (SimCLR, DirectCLR) for Channel State Information data representation without relying on labeled data. Demonstrated competitive performance with supervised methods while using unlabeled datasets from SignFi.

Implementing Various GMs from Scratch: Diffusion, VAEs, GANs Spring 2025
During Deep Generative Modelling course, implemented various generative models from scratch including VAEs, Diffusion Models, and GANs. Focused on understanding the theoretical foundations and practical implementations of these models using PyTorch.

AI-Generated Code Evaluation Using Log Probability Fall 2024
Developed a probabilistic framework for evaluating LLM-generated Python code without execution, combining statistical analysis with ML classifiers. Validated on HumanEval and MBPP benchmarks, showing significant improvements in scalability over traditional execution-based testing.

Open-set Speech Synthesizer Models Classification *(ICASSP)* Spring 2022
Developed a Transformer-based model for open-set synthetic speech classification using self-supervised learning (wav2vec 2.0) and a two-stage architecture for handling unknown synthesis methods.

Persian Music Genre Classification Winter 2022
Implemented classic ML models (XGBoost, MLP, SVM) for Persian music genre classification with full ML pipeline from data collection to evaluation using Librosa and Surfboard.

Relevant Courses (Graduate courses are indicated by †)

◇ Deep Learning†	A^+	◇ Pattern Recognition†	(20/20)
◇ Deep Generative Models†	A^+	◇ Convex Optimization†	(20/20)
◇ Stochastic Processes†	A^+	◇ Statistical Inference†	(20/20)
◇ Intro to Machine Learning†	A^+	◇ Data Structures & Algorithms	(18.7/20)
◇ Data Mining†	A^+	◇ Digital Signal Processing	(16.2/20)

Teaching Experience

- **Teaching Assistant**, York University
  - Digital Communication (Lab Organizer, Grader) Fall 2025
  - Signals and Systems(Lab Organizer, Grader) Fall & Winter 2024
  - Communication Networks (Grader) Summer 2024
- **Teaching Assistant**, Aalto University
  - CS-E4740: Federated Learning† (Grading Quizzes, Reviewing Lecture Notes) Spring 2023
- **Teaching Assistant**, University of Tehran
  - Pattern Recognition† (Quiz Designer) Spring 2022
  - Statistical Inference† (Homework Designer) Fall 2022
  - Digital Signal Processing (Python Assignments Designer) Spring 2022
  - Signals and Systems (Quiz & Homework Designer) Fall & Winter 2021

Extracurricular Courses

Deep Learning Specialization, *Certificates issued by Coursera* Dec 2021 - Sep 2022

- ◇ Neural Networks and Deep Learning
- ◇ Improving Deep Neural Networks
- ◇ Structuring Machine Learning Projects
- ◇ Convolutional Neural Networks

Deep Learning with PyTorch, *Offered at NYU by Yann Lecun & Alfredo Canziani* Jul 2022 - Sep 2022

Matrix Methods in Data Analysis, Signal-Processing, and Machine Learning
Offered at MIT by Gilbert Strang Jul 2021 - Aug 2021

Machine Learning, *Certificate issued by Coursera* Jul 2021 - Aug 2021

Honors and Awards

- ◇ **Graduate Fellowship from York University($67,000 for 20 months)** Jan 2024
- ◇ **Top Rank Certification at Faculty of Engineering (FOE)** Sep 2019
- ◇ **Full Scholarship from University of Tehran (Tuition Fee)** Sep 2018
- ◇ **Ranked in the top 1 % among more than 147,000 participants of National Universities Entrance Exam.**

Skills

Programming: Python, C/C++, R **ML Frameworks:** PyTorch, Jax, TensorFlow, Hugging Face
Tools: NumPy, Scikit-learn, Git, Linux/Ubuntu, SLURM, Jupyter, Docker, Weights & Biases

Languages

- ◇ Farsi: Native
- ◇ English: Fluent

  TOEFL iBT (Sept. 25, 2022) — **101** (Reading: 28, Listening: 30, Speaking: 22, Writing: 21)

  GRE General (Dec. 20, 2022) — **316** (V: 151, Q: 165, AW: 3)

References

- **Dr. Alexander Jung**
  Associate Professor, Aalto University
  Email: alex.jung@aalto.fi
  Undergraduate Research Supervisor
- **Dr. Hina Tabassum**
  Associate Professor, York University
  Email: hinat@yorku.ca
  Graduate Research Supervisor