Mohammad Mahdi **Rahimi**

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Research Interests

Theory **Distributed Learning**, **Geometric Deep Learning**, **Reinforcement Learning**, **Evolutionary Algorithms**, and **Game Theory**

Practice **Robotics**, **Multi-Agent Systems**, **Big-Data and Distributed Processing** and **Foundation Model Fine-tuning**

Education

Ph.D. in School of Electrical Engineering

Daejeon, South Korea

Korea Advanced Institute of Science and Technology — *Sep. 2020 – Aug. 2025*

- **Advisor**: Prof. JaeKyun Moon
- **Thesis Title**: Communication-Efficient Federated Learning

B.Sc. in Computer Engineering Department

Tehran, Iran

Amirkabir University of Technology — *Jan. 2015 – Aug. 2020*

- **Advisor**: Prof. Mohammad Mehdi Ebadzadeh
- **Thesis Title**: Multi-Agent Deep Reinforcement Learning in Soccer Robots

Research Experience

Postdoctoral InnoCore Fellowship @ ILT Lab (Supervisor: Prof. Daewon Seo)

Daegu, South Korea

School of EECS, DGIST — *Oct. 2025 – Present*

- Addressing the **Alignment** and **Personalization** problem in Federated fine-tuning with LoRA.
- Developing an **Alignment** solutions for **Split Federated Learning**.
- Guiding 4 MS students, and 4 PhD students, while also disseminating our results at international conferences.

Research Assistant @ MoonLab (Supervisor: Prof. Jaekyun Moon)

Daejeon, South Korea

School of EE, KAIST — *Sep. 2020 – Expected Aug. 2025*

- Developing **Communication-Efficient Federated Learning** methodologies for large-scale **Foundation Models**.
- Investigated **exploration** and **curiosity-driven** mechanisms in **Multi-Agent Reinforcement Learning**, developing novel algorithms.
- Pioneered new approaches to achieve **systematic generalization** in **Reinforcement Learning** by leveraging symmetric properties.

Research Assistant @ Cognitive Robotics Lab (Supervisor: Prof. Saeed Shiry Ghidary)

Tehran, Iran

CS Department, Amirkabir University of Technology — *Dec. 2017 – Dec. 2019*

- Developed AI and control algorithms specifically designed for **2D Soccer Robot Simulations** and **3D Rescue Robot Simulation**.
- Led the development of **Vision** and **Control** modules for Rescue Simulations using platforms like **Gazebo** and **ROS**.

Research Assistant @ Parsian Robotics Lab (Supervisor: Prof. Mohammad A. Khosravi)

Tehran, Iran

EE Department, Amirkabir University of Technology — *Feb. 2015 – Feb. 2019*

- Developing a team of **vision-guided multi-agent soccer robots** within the **ROBOCUP SSL** framework.
- Exhibited **leadership** by managing a team of over 20 members for two years, successfully meeting project milestones.
- Served as the primary developer and maintainer for **grSim**, the official open-source simulator of Robocup-SSL.

Work Experience

Data Engineer

Tehran, Iran

Mobile Communications of Iran — *Jan. 2019 - Dec. 2020*

- ***R&D member*** *and lead of* ***Big Data*** *team.*
- *Developer of* ***distributed monitoring*** *platform for* ***real-time anomaly detection****.*
- ***Operation Engineer*** *for* ***Business Intelligence*** *solution on* ***Oracle RDBMS***

Publication

Communication-Efficient FL via Model-Agnostic Projection Optimization

Under review

Mohammad Mahdi Rahimi, Younghyun Park, Humaira Kousar, Dong-Jun Han, Jaekyun Moon. — *2025*

EvoFed: Leveraging Evolutionary Strategies for Efficient and Privacy-Preserving FL

NeurIPS

Mohammad Mahdi Rahimi, Hasnain Irshad Bhatti, Younghyun Park, Humaira Kousar, and Jaekyun Moon. — *2023*

Parsian Extended Team Description Papers

The Annual RoboCup Symposium

Mohammad Mahdi Rahimi, et. al. — *2015-2019*

OPEM: Open Source PEM Cell Simulation Tool

JOSS

Sepand Haghighi, Kasra Askari, Sarmin Hamidi, and **Mohammad Mahdi Rahimi** — *2018*

Academic Services

2025	**Reviewer Committee**, ICLR 2026	*Rio de Jan., Brazil*
2025	**Reviewer Committee**, NeurIPS 2025	*San Diego, USA*
2025	**Reviewer Committee**, ICML 2025	*Vancouver, Canada*
2022	**Reviewer Committee**, NeurIPS 2022	*New Orleans, USA*
2019	**Advisory Board**, AI WorldCup	*Daejeon, Korea*
2019	**League Co-Chair**, FIRA RoboWorld Cup	*Changwon, Korea*
2019	**League Chair**, FIRACup IranOpen	*Tehran, Iran*
2018	**Technical Committee**, FIRA RoboWorld Cup	*Taiwan, Taichung*
2018	**Technical Committee**, AI WorldCup	*Daejeon, Korea*
2018	**Technical Committee**, Robocup IranOpen	*Tehran, Iran*
2018	**Technical Committee**, FIRACup IranOpen	*Tehran, Iran*
2017	**Technical Committee**, FIRACup IranOpen	*Tehran, Iran*
2017	**Organization Committee**, Robocup IranOpen	*Tehran, Iran*
2016	**Organization Committee**, FIRACup IranOpen	*Tehran, Iran*

Honors & Awards

2025	**InnoCORE Postdoctoral Fellowship**, AI-Transformed Aerospace Research Group (₩90,000,000/year)	*Daegu, Korea*
2025	**Naver-Intel-KAIST Best Project**, for developing Gaudi Suite for Federated Learning with Message Efficiency	*Daejeon, Korea*
2019	**EurAI Full-Travel Grant**, The 2019 **ACAI** Summer School: **AI** for **Multi-Agent** Worlds	*Chania, Greece*
2018	**Finalist, Top 14 Among 3,224 Teams**, Alibaba (Tianchi) **BigData** Competition: **Zero Shot** Image Recognition	*Online, China*
2018	**Finalist, Top 40 Among 780 Teams**, Russian **AI Challenge** : Code Ball (3D multi-agent soccer simulation)	*Online, Russia*
2018	**3rd Place**, FIRA Robo World Cup: 2D Soccer Simulation	*Taichung, Taiwan*
2018	**3rd Place**, FIRA Robo World Cup: Robot Challenge Simulation	*Taichung, Taiwan*
2017	**4th Place**, RoboCup: Small Size League	*Nagoya, Japan*
2017	**Technical Challenge Championship**, IranOpen RoboCup: Small Size League	*Tehran, Iran*
2017	**3rd Place**, IranOpen RoboCup: Small Size League	*Tehran, Iran*
2016	**1st Place**, IranOpen Fira RoboWorldCup: Soccer Robots (Mirosot)	*Tehran, Iran*
2016	**1st Place**, Amirkabir **AI Competition** : Othello Player	*Tehran, Iran*
2016	**6th Place**, RoboCup: Small Size League	*Leipzig, Germany*
2015	**8th Place**, RoboCup: Small Size League	*Hefei, China*
2014	**1st Place**, RoboCup: Junior Soccer League	*Joao Pessoa, Brasil*
2014	**Spirit of RoboCup Award**, RoboCup: Junior Soccer League	*Joao Pessoa, Brasil*
2014	**Best Poster and Presentation Award**, RoboCup: Junior Soccer League	*Joao Pessoa, Brasil*
2014	**Final Round Qulification**, The Iranian **Mathematical** Olympiad	*Tehran, Iran*

Teaching Experience

Teaching Assistant for Artificial Intelligence
Fall 2019

Amirkabir University of Technology, Computer Engineering Department — *Prof. Ahmad Nickabadi*

- Instructed students in topics related to Evolutionary Search and Optimization Algorithms.

Teaching Assistant for Artificial Intelligence
Fall 2018

Amirkabir University of Technology, Computer Engineering Department — *Prof. Ahmad Nickabadi*

- Responsible for the grading of student assignments.

Teaching Assistant for Advanced Programming
Fall 2018

Amirkabir University of Technology, Electrical Engineering Department — *Prof. Amir Jahanshahi*

- Conducted workshops focusing on Bash, Git, Web Front-End Development, and Database Management.

Teaching Assistant for Basic Programming
Fall 2017

Amirkabir University of Technology, Electrical Engineering Department — *Prof. Amir Jahanshahi*

- Educated students in the programming languages C and C++.

Workshop Instructor at Robotic Summer School
2015 - 2018

Amirkabir University of Technology, Computer Engineering Department — *Prof. Soroush Sadeghnejad*

- Led the workshop series across four consecutive years, educating aspiring roboticists.
- Provided comprehensive training over eighteen 6-hour sessions, covering Linux, Git, C++, Python, Qt Framework, ROS Framework, and Gazebo.

Technical Skills and Proficiencies

Programming Languages	• **System**: **C/C++**, **Java**, **Rust**, **Python**, **Bash/Zsh** • **Functional**: **Lisp**, **Racket**, **LEAN 4** • **Hardware Description**: **VHDL**, **Verilog**
Frameworks	**PyTorch**, **JAX**, **TensorFlow**, **Qt**, **ROS/ROS2**, **OpenCV**
Simulation Platforms	**Gazebo**, **Webots**, **Mujoco**, **V-Rep**, **OpenAI Gym**, **Petting Zoo**
Big Data Technologies	**Hadoop Ecosystem**, **ELK Stack**, **Kafka**, **Spark**
Database Management Systems	**Oracle**, **PostgreSQL**, **MySQL**
Languages	**Persian** (Native), **English** (Fluent), **Korean** (Basic), **Arabic** (Basic)

Graduate Research Projects

Evolutionary Federated Learning: Leveraging Evolutionary Strategies for Efficient and Privacy-Preserving Federated Learning

Published in NeurIPS 2023

Mahi97/Evofed

Supervised by Prof. Jaekyun Moon

- Implemented using **JAX**.
- Published as a paper in NeurIPS 2023.

IdenticalFinder: Identifying Identical Authors in Non-Attributed Graphs

Graph and Social Network Analysis

Mahi97/Identical-User-Detection

Supervised by Prof. Kijung Shin

- Developed using **PyTorch** and **PyTorch Geometric**.
- Reduced the task of identifying identical authors to sub-graph classification.
- Conducted ablation studies on feature generation and data sampling.

MARL Influence: Capturing Long-Term Influence of Agents to Improve Exploration

MoonLab Research

Mahi97/influence

Supervised by Prof. Jaekyun Moon

- Implemented using **PyTorch**.
- Experiments conducted on an extended version of **gym-marlgrid**.
- Did not achieve an improvement in exploration performance.

LocalLoss: Utilizing Accuracy for Layer-Wise Training in MARL Settings

MoonLab Research

Mahi97/Local-Loss

Supervised by Prof. Jaekyun Moon

- Developed using **PyTorch**.
- While it did not outperform backpropagation, it updated at a lower computational cost.

PZ-RISK: Developing a Petting Zoo Environment for a Multi-Agent Game of Risk

MoonLab Research

Mahi97/pz-risk

Supervised by Prof. Jaekyun Moon

- Implemented using **PettingZoo**.
- Developed reinforcement learning algorithms based on GNNs to play the game.

XQMIX: Extending QMix for Multi-Agent Starcraft II Challenges

Game Theory and MARL Course

Mahi97/XQMIX

Supervised by Prof. Jinkyoo Park

- Implemented using **PyTorch**.
- Enhanced the original QMix architecture using **Noisy Nets** and **Multi-Step Training**.

QA-TagPrediction: Tag Prediction for Non-Attributed Graph Datasets

Graph Data Mining Course

Mahi97/QA-TagPrediction

Supervised by Prof. Kijung Shin

- Developed using **PyTorch**.
- Trained a GNN to extract structural features from Question-Answering dataset graphs for tag prediction.

XMANN: Incorporating External Memory with Neural Networks

MoonLab Research

Mahi97/XMANN

Supervised by Prof. Jaekyun Moon

- Implemented using **PyTorch** in a fully modular setting.
- Achieved robust implementations of NTM, DNC, and MANN architectures.
- Evaluated performance on all benchmark tasks.

SUMO: Reinforcement Learning for Crossroad Traffic Light Control

Game Theory and MARL Course

Mahi97/SUMO

Supervised by Prof. Jinkyoo Park

- Developed using **PyTorch**.
- Implemented both DQN and DDPG algorithms for discrete and continuous cases, respectively.

Open-Source Contribution

Tianshou – An elegant PyTorch deep reinforcement learning library. *Contributor*

THU-ML/TIANSHOU

OH-MY-ZSH – Community-Driven Framework for Managing your ZSH Configuration. *Contributor*

ROBBYRUSSELL/OH-MY-ZSH

PYCM – Multi-class Confusion Matrix Library in Python *Contributor*

SEPANDHAGHIGHI/PYCM

QPAGE – Free Project For Creating Academic Homepage Without Any Code In 3min *Co-Creator*

SEPANDHAGHIGHI/QPAGE

OPEM – Open Source PEM Fuel Cell Simulation Tool *Co-Creator*

ECSIM/OPEM

GOPEM – GUI for OPEM Simulation *Creator*

ECSIM/GOPEM

SpotifyControl – Search and Play Music from Spotify in Terminal *Creator*

MAHI97/SPOTIFYCONTROL

GrSim – RoboCup Small Size Robot Soccer Simulator *Developer & Maintainer*

ROBOCUP-SSL/GRSIM

FIRASim – FiraCup 2D Soccer Simulation Platform *Developer & Maintainer*

FIRA-SIMUROSOT/FIRASIM

SimPlus – The RoboCup Rescue Simulation environment for Robocup Junior Rescue *Developer & Maintainer*

ROBOCUP-SIMPLUS/SIMPLUS-VREP

SSL-VISION – Shared Vision System For The RoboCup Small Size League *Contributor*

ROBOCUP-SSL/SSL-VISION

SSL Visual Planner – Graphical software to arrange plans for Multi-Agent Soccer Robots *Contributor*

PARSIANROBOTICLAB/SSL-VISUAL-PLANNER

SSL FEdit – Formation Editor For Multi-Agent Soccer Robots *Creator*

PARSIANROBOTICLAB/SSL-FEDIT