Mahdi Haji

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Education

B.Sc. in Computer Science Eng., University of Tehran 2021–Present

GPA: 18.40/20 Ranked top 5 in CE at University of Tehran

Publications

- **Chess: Test-Guided Program Synthesis for Distributed System Checkers** 2025
  Wanning He, **Mahdi Haji**, Peng Huang, Rui Dong
  Submitted to 23rd USENIX Symposium on Networked Systems Design and Implementation - NSDI

- **Argos: A Decentralized Federated System for Detection of Traffic Signs in CAVs** 2024
  Mahdi Haji, Alireza Hosseini, Amirali Shahriary, Soheil Hajian
  Available as a preprint on arXiv; presented at the Flower Event, ***University of Cambridge.***

Research Experience

- **Research Assistant at Ordered Systems Lab, University of Michigan** 2023–Present
  Supervised by Prof. Peng Huang
  Projects Repository
  - Developed a runtime validator to detect silent semantic violations in distributed systems.
  - Contributed to finding silent semantic violations in systems such as Zookeeper, HBase, and Kafka for testing the synthesizer.
  - The results contributed to a paper submitted to NSDI 2026 titled *"Chess: Test-Guided Program Synthesis for Distributed System Checkers"*.

- **Bachelor Thesis at University of Tehran** 2025–Present
  Supervised by Prof. Kargahi
  - Investigating batch-invariance in LLM inference to eliminate nondeterministic outcomes in real-time embedded CPS.
  - Developing a shielded reinforcement-learning agent to mediate LLM decisions and enhance deterministic performance in safety-critical systems.

- **Research Intern at McGill University** (Remote) 2025–2025
  Supervised by Dr. Majid Babaei
  - Expanded a Knowledge Graph–based framework for detecting system performance anomalies using tracing data from LTTng with a Retrieval-Augmented Generation (RAG) approach.

Industry Experience

- **Software Engineer at rastai.ai** 2025–Present
  Supervised by Prof. Majid Nili and Prof. Ramtin Khosravi
  - Working on a platform to personalize E-Learning for individuals using Reinforcement-Learning.
  - Served as the backend system architect, leading the design and development of the platform's core infrastructure (Kotlin).

- **Software Engineer at Engima Investing** 2023–2025
  - Designed and implemented a financial application to calculate NAV for investment portfolios with an event-sourcing architecture (Django).

- Launched a RAG agent in Django using LangChain with LLMs and ChromaDB as a vector database to answer user queries on Tehran Stock Exchange data and reduced query time from 1s to 0.3s.

- **Co-founder at Bibadeal** 2022–2023
  - Led NLP and neural network initiatives to deliver strategic business insights and deployed LLMs for automated customer QA based on business data.
  - Acquired by the accelerator of Iran University of Science and Technology.

Teaching Experience (University of Tehran)

Head Teaching Assistant
Software Testing, Dr. Khames-Panah

Head Teaching Assistant
Software Engineering, Prof. Ghasemi

Teaching Assistant
Computer Networks, Prof. Khonsari

Teaching Assistant
Compiler & PL, Dr. Tavasoli

Head Teaching Assistant
Introduction to Computing Systems & Programming, Prof. Moradi

Teaching Assistant
Data Structures & Algorithms, Prof. Faili

Teaching Assistant
Operating Systems, Prof. Kargahi

Teaching Assistant
Ordinary Differential Equations, Dr. Rahami

Selected Projects

- **Distributed Systems Course Projects** Go
  - Implemented Raft protocol for replicated state machines, including leader election, log replication via RPC, persistent storage, and log compaction with snapshots.
  - Built a distributed Map-Reduce service handling network uncertainties via RPC.
- **Design of Deep Neural Networks projects (Graduate Course)** Python, PyTorch
  - Constructed Oriented R-CNN for rotated object detection.
  - Built image captioning models using hybrid LSTM-GRU networks.
  - Studied robust zero-shot classification against adversarial attacks.
  - Conducted unsupervised learning and domain transfer experiments using GANs.
- **Operating System Course Projects** C, XV6
  - Customized MIT XV6 OS with new terminal features, system calls, multiple schedulers, priority-based synchronization, and shared memory/CPU coherency.
  - Prepared parallel image processing programs using multi-threading.
- **Stock Exchange Matching Engine** Java, Spring Boot
  - Built a stock exchange matching engine supporting real-time trade execution.
- **Full ARM Processor Implementation** Verilog
  - Designed a complete ARM processor supporting forwarding, SRAM, and cache.

Skills

Programming
- Proficient: Python, Kotlin, C++, Java, GoLang
- Familiar: Rust, SystemVerilog, R, SQL, Bash

Technologies
Django, Spring Boot, Docker, Kubernetes, PostgreSQL, Redis, Mongo, ELK