Mohammad Hadi Babalou

Bachelor student at at School of ECE, College of Engineering, University of Tehran
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Education

University of Tehran **2020 – Present**
Bachelor student in Computer Engineering *Tehran, Iran*

- Current GPA: 18.78/20 (3.97/4.0) - Avg. Dept. GPA: 15.01/20

Allame Helli High School **2017 – 2020**
Diploma in Mathematics and Physics *Tehran, Iran*

- GPA: 19.59/20 (4.0/4.0)

Research Interests

- Machine Learning
- Natural Language Processing
- Image Processing
- Trustworthy AI
- Explainable AI
- Data Science and Analytics
- Deep Learning
- Astroinformatics
- Bio-informatics

Publications

Benchmarking Large Language Models for Persian: A Preliminary Study Focusing on ChatGPT **2023**
Accepted in LREC-COLING 2024 ***Turin, Italy***
The 2024 Joint International Conference on Computational Linguistics, Language Resources and Evaluation

Honors and Awards

University of Tehran **2021 – 2024**
Ranked top 5 out of 90 B.Sc. students in Computer Engineering

University of Tehran **2021**
Received scholarship from Supporter Foundation of the University of Tehran

Nationwide University Entrance Exams **2020**
Ranked in the top 0.25% of all participants in Mathematical Sciences

Iranian Astronomy and Astrophysics Olympiad **2019**
Silver Medalist

Research Experience

Natural Language Processing Lab **March 2023 – Present**
Under the Supervision of Professor Yadollah Yaghoobzadeh *University of Tehran*

* Our research investigates the capabilities and limitations of large language models (LLMs) for the Persian language. We conducted a comprehensive benchmarking study across various tasks, including reasoning and knowledge-based, to evaluate LLM performance and identify areas for improvement.
* Repository: https://github.com/Hadi-loo/Benchmarking_ChatGPT_for_Persian

Convergent Technologies Research Center (NBIC) **July 2023 – August 2023**
Under the Supervision of Professor Yadollah Yaghoobzadeh and M. Abolghasemi Dehaqani *University of Tehran*

* My research focuses on developing a mobile app for early autism detection in children, using interactive games to analyze facial expressions and speech patterns. I also improved the user interface with React and evaluated models like Meta's SeamlessM4T and Google's Speech-to-Text for Persian language processing.

Formal Methods and Validation of Systems Lab **March 2023 – March 2024**
Under the Supervision of Professor Fatemeh Ghassemi Esfahani *University of Tehran*

* Our research extended Hybrid Rebeca to model non-deterministic time behavior in asynchronous event-based Cyber-Physical Systems (CPSs). We developed a new semantic model and analysis technique based on over-approximation of reachable states, improving the efficiency of analyzing Hybrid Rebeca models.
* Repository: https://github.com/SaeedZhiany/HybridRebecaReachabilityAnalysis

Teaching Experience

Artificial Intelligence — **Fall 2023 – Present**
Head Teaching Assistant, Prof. Y. Yaghoobzadeh and Prof. H. Fadaei

Advanced Programming — **Fall 2023 – Present**
Teaching Assistant, Prof. R. Khosravi

Software Testing — **Fall 2024 – Present**
Teaching Assistant, Prof. E.Khamespanah

Discrete Mathematic — **Spring 2023 – Fall 2024**
Supervising Teaching Assistant, Prof. S. Mohammadi

Computer-Aided Digital System Design — **Fall 2023**
Teaching Assistant, Prof. M. Modarresi and Prof. M.Salehi Ersali

Machine Learning — **Summer 2023**
Course Mentor, Summer of Code - ACM Student Chapter

Work Experience

Software Engineer Internship — **Bale Messenger**
Software Engineering and Backend Development using Golang — *Summer 2022*

Astronomy and Astrophysics Olympiad — **Allame Helli High School**
Teacher and Consultant — *2019 – 2020*

Mathematics and Physics — **Allame Helli High School**
Consultant — *2020*

Academic Projects

Benchmarking Large Language Models for Persian | *Python, PyTorch*
This repository covers the implementation of the following paper: Benchmarking Large Language Models for Persian: A Preliminary Study Focusing on ChatGPT

LoRA and Fraud Detection in Credit Card Transactions | *Python, PyTorch*
Implementing LoRA for fine-tuning large language models like RoBERTa & fraud detection in credit card transactions

VAE & GAN | *Python, PyTorch*
This repository explores Variational Autoencoders (VAEs) and Generative Adversarial Networks (GANs). It implements Control VAE for disentangled representation learning and trains various GAN models (Basic, WGAN, SS-GAN) to generate new data (dSprites, MNIST-like digits).

Transformers | *Python, PyTorch*
This repository implements Transformers for Speech Emotion Recognition (SER) and Natural Language Inference (NLI). It uses HuBERT to classify emotions in speech data (ShEMO) and ParsBERT for Natural Language Inference on the FarsTail dataset (Persian).

LSTMs | *Python, PyTorch*
This repository implements Long Short-Term Memory (LSTM) networks and their variants for time series forecasting and sentiment analysis. It uses PyTorch to implement LSTM, GRU, Bidirectional LSTM for time series prediction, and LSTM, 2-Layer LSTM, CNN + 2-Layer LSTM for classifying suicidal vs non-suicidal tweets.

SAM & Faster RCNN | *Python, PyTorch*
This repository tackles object segmentation and detection using deep learning. It implements Segment Anything Model (SAM) for segmenting water bodies in satellite imagery and Faster R-CNN for detecting fire and smoke in wildfire images.

CNNs | *Python, PyTorch*
This repository implements Convolutional Neural Networks (CNNs) for image classification tasks. Train models to recognize facial expressions (AlexNet, VGG16, MobileNet) and detect Covid-19 from X-ray images.

Fully Connected Neural Networks | *Python, PyTorch*
This repository explores Neural Networks & Deep Learning with code for McCulloch-Pitts, Adaline, Madaline, Deep Autoencoders & Multi-Layer Perceptrons. It tackles classification (Iris, Moons) & clustering (MNIST) tasks.

Neural Networks and Deep Learning Course Projects | *Python, PyTorch*
This repository contains the code and the material for the course "Neural Networks and Deep Learning" at the University of Tehran. The implementation of about 15 papers in the field of deep learning and neural networks is included in this repository.

Image Classification on CIFAR-10 | *Python, PyTorch*

Implementation of different traditional machine learning algorithms and deep learning models to classify images from the CIFAR-10 dataset. The comparison of KNN, Random Forest, Support Vector Machine, MLP, and CNN models is included in this repository.

Artificial Intelligence Course Projects | *Python, PyTorch, TensorFlow*

Developed a series of AI projects for the Artificial Intelligence course at the University of Tehran. The projects covered various topics, including search algorithms, genetic algorithms, machine learning, neural networks, and deep learning techniques, with practical applications in classification, game theory, and optimization problems.

Concurrent Ticket Reservation System | *Go*

Developed a concurrent ticket reservation system implementing multithreading to ensure efficient and synchronized ticket booking operations. Designed to handle high-traffic scenarios, the system ensures data integrity, resolves race conditions, and improves overall performance through concurrent handling of requests.

Software Testing Course Projects | *Java*

Developed a comprehensive repository for a Software Testing course, consisting of six projects covering essential topics such as unit testing, test doubles with Mockito, graph-based testing, API testing, mutation testing with CI, and GUI testing with BDD. The repository demonstrates proficiency in various testing techniques and tools, including JUnit, JaCoCo, PIT, and Katalon Recorder.

Skills

Languages: Python, C++, C, Java, Go, R, SQL, MATLAB, LaTeX, HTML/CSS, Verilog

Technologies/Frameworks: PyTorch, TensorFlow, Linux, Git, Keras, Scikit-Learn, Docker, Kubernetes, Apache Cassandra, MongoDB, Elasticsearch, PostgreSQL, Redis

Languages

Persian: Native
English: Advanced, IELTS Academic: 8 (L: 9, R: 9, W: 7, S: 6.5)
Arabic: Elementary Proficiency

Personal Interests

- Astronomy and Astrophysics
- Football
- Classic Novels
- Video Games
- Music
- Mathematical Puzzles