

# Hosna Oyarhoseini

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## Education

- **Master of Science in Artificial Intelligence** 2023–2025
  - GPA: 3.7/4 (17.82/20)
  - **Thesis:** “Mitigating spurious correlation in VLMs in an efficient manner”  
*Sharif University of Technology*, Iran, Tehran
- **Bachelor of Computer Engineering** 2019–2023  
*Amirkabir University of Technology*, Iran, Tehran
  - **Ranked 1<sup>st</sup>** among 150 students, **GPA: 4/4 (19.68/20)**

## Research Experience

- **Research Assistant / Sharif University of Technology, Iran** Spring 2024 - current
  - \* Working on robustness and understanding of large models under the supervision of [Dr. Mohammad Hossein Rohban](#) at RIML (Robust and Interpretable Lab).
    - Mitigating spurious correlation in VLMs in an efficient manner (zero/few-shot)
    - Robustness of zero-shot OOD detection method
- **Internship / École Polytechnique Fédérale de Lausanne (EPFL Switzerland)** Summer 2023
  - \* Collaborated with the [VILAB \(Visual Intelligence Lab\)](#) on developing a **multimodality and multitask** model for vision tasks named **4M (Massively Multi-modal Masked Model)**.  
Under the supervision of [Prof. Amir Zamir](#).
  - \* My specific responsibilities included incorporating new modalities, such as edge detection, color palette (for style transfer), and SAM to this transformer encoder-decoder which is trained on a wide range of modalities using a multi-modal masked modeling objective. More detailed:
    - Identified and optimized the most suitable functions for downstream tasks.
    - Created pseudo-labeled datasets for new modalities and integrated them with existing ones.
    - Train tokenizers for the new modality to unified representational spaces.
    - Fine-tuned the tokenizers to accommodate various resolutions.
- **Research Assistant / Amirkabir University of Technology, Tehran, Iran** Fall 2022 - Spring 2023
  - \* Conducted research on Adversarial Attacks against Face Recognition Systems.  
Under supervision of [Dr. Ahmad Nickabadi](#).
    - Examined the susceptibility of diverse face recognition models to adversarial attacks, including FGSM, CW, and DeepFool, offering insights into the security vulnerabilities of these systems.
    - Performed a comparative analysis of these adversarial attacks (especially between **sparse and non-sparse** groups), evaluated their effectiveness, and the areas of focus.

## Work Experience

- **Intern and Python developer / Tosan Techno AI group** Summer 2022
  - Implemented a scenario of question answering on **Pepper robot** (Aldebaran Robotics product).
  - Used English paraphrase models and **translator models** to assemble a **Persian paraphrase** service.
  - Developed a **face detection microservice**, gaining expertise in microservice architecture, scalability, and pressure handling within a distributed system environment.

## Technical Skills

- **Programming Languages:** Python, C, C++, ROS, Java.
- **Artificial Intelligence Tools:** PyTorch, TensorFlow, Scikit-Learn, NumPy, Pandas, Matplotlib, Keras
- **Tools:** Linux, Docker, Kubernetes, Spark, Hadoop, Bash, Gazebo, Git,  $\text{\LaTeX}$ .
- **Others:** Assembly, Verilog, VHDL, JavaScript, HTML5, CSS, React.js, Arduino, ModelSim

## Courses

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### ○ Related Courses,

- Data Structure & Algorithm Design (20 / 20)
- Cloud computing (20 / 20)
- Introduction to Robotics (19.5 / 20)
- Linear Algebra (20 / 20)
- Artificial Intelligence (19.9 / 20)
- ML & Data Mining (20 / 20)
- Deep Learning (Graduate)
- Large Language Models (Graduate)
- Stochastic Process (Graduate)
- Convex Optimization (Graduate)
- Reinforcement Learning(Graduate)
- Natural Language Processing (Graduate)

### ○ Online Courses

- DL for Computer Vision ([Michigan University](#))
- Machine Learning Specialization ([DeepLearning.AI](#))
- Neural Networks& Deep Learning ([DeepLearning.AI](#))
- Intro and Intermediate Machine Learning ([Kaggle](#))
- Human Cognitive Neuroscience ([MIT University](#), by Prof. Nancy Kanwisher )

## Projects

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### ○ Machine Learning Exercises [\[GitHub\]](#)

- Classification of Brain MRI using Transfer Learning and PyTorch. [\[GitHub\]](#)
- Image compression by reducing the number of colors in an image using k-means.
- Implementing anomaly detection and using it to identify broken servers in the network.
- Implementing collaborative filtering and content-based filtering to build a movie recommender system.
- Train an agent to land a lunar lander safely on a landing pad on the surface of the moon.
- Implement an Evolutionary Games intelligent agent using neural network and evolution algorithm. [\[GitHub\]](#)

### ○ LLM Exercises [\[GitHub\]](#)

- Implemented fine-tuning methods such as Soft Prompt, Adapter, LoRA, and Full Fine-tuning from scratch and fine-tuned T5 with PEFT, OpenDelta, and AdapterHub libraries.
- Calibration on PiL1.5 using Mitigating label biases for in-context learning and calibration before use.
- Implementing unimodal and multimodal RAG.

### ○ Solving ODE using NN [\[GitHub\]](#)

- Trained a neural network with orthogonal activation functions to find a function that satisfies a given ordinary differential equation condition.

### ○ Deep Learning Exercises [\[GitHub\]](#)

- Dimensionality reduction and autoencoder training on the Fashion-MNIST dataset using PyTorch, including PCA and t-SNE visualization.
- Implementation of a CNN from scratch and fine-tuning a pre-trained ResNet model for the CIFAR dataset, demonstrating transfer learning.
- Construction and training of a masked language model (similar to BERT) and fine-tuning for POS-tagging tasks; applied Deepwalk for graph-based learning on the MovieLens dataset.
- Implementation of an autoregressive image model (PixelCNN), GAN and cGAN training for image generation, and a self-supervised contrastive model for Fashion-MNIST.
- Implementation of PPO and TRPO algorithms for the Lunar Lander environment and comparison with DQN to address environment challenges.
- Developed a Deep Convolutional Generative Adversarial Network using PyTorch for handwritten digit generation. Trained discriminator and generator networks on MNIST dataset.

### ○ NLP Exercises [\[GitHub\]](#)

- Analyzed speeches given by US Presidents to extract and interpret key linguistic and thematic elements.
- Developed a bot that translates Finglish (Persian written with Latin script) to Persian using regex.
- Trained an LSTM model and fine-tuned a medical BERT model for the Named Entity Recognition (NER) task on the n2c2 medical dataset (Task 2).
- Implemented an information retrieval system from scratch on a Persian news dataset, optimizing query answering using TF-IDF score, champion list, and ranked retrieval search.

## Languages

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- **Persian:** Native
- **English:** Full professional proficiency (TOEFL:103 : R:26, L:29, S:24, W:24)

## Teaching Experience

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### ○ Teaching Assistant, Amirkabir University of Technology

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|---------------------------|-------------|--|-------------------|
| - Cloud Computing         | Fall 2023   | - Data Structures and Algorithms       | Fall, Spring 2022 |
| - Computer Networks       | Fall 2022   | - Advanced Programming                 | Fall 2022         |
| - Applied Linear Algebra  | Spring 2023 | - Microprocessor and Assembly Language | Spring 2022       |
| - Artificial Intelligence | Spring 2023 |  |                   |

### ○ Teaching Assistant, Sharif University of Technology

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|-----------------|-----------|--------------------|-----------|
| - Deep Learning | Fall 2024 | - Machine Learning | Fall 2024 |
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I assisted undergraduate students with their homework, quizzes and projects.

## Extracurricular Activities

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|---|------|
| ○ <b>Students' Scientific Chapter</b> , Participating at Students' Scientific Chapter of AUT-CEIT | 2022 |
| ○ <b>Mentoring</b> , Mathematics and physics teacher assistant for high school student.           | 2021 |
| ○ <b>Olympiad</b> , Participated in National Olympiad of Computer at high-school.                 | 2017 |
| ○ <b>Art</b> , Participated in painting, photography, and digital art courses.                    | -    |