Mohammad Javad Ranjbar — CV

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Research Interests

- Machine Learning
- Deep Learning
- Computer Vision
- Speech Synthesis
- Natural Language Processing
- Speech Recognition

Education

- **Master of Science in Computer Software Engineering — University of Tehran** Tehran-Iran
  - Overall GPA: : **4/4 (18.94)** 2022 – Present
    Supervisors: Dr. Heshaam Faili and Dr. Azadeh Shakery
  - **Research Title**: Investigating Foundation and Text-to-Speech(TTS) models and their applications in audio generation, focusing on Zero-Shot TTS.
- **Bachelor of Science in Electrical Engineering— Amirkabir University of Technology** Tehran-Iran
  - Last 2 years GPA: : **3.64/4 (17.1)** via 67 passed credits 2016 – 2021
  - **Thesis Title: Facial Expression Recognition**
    This project involved fine-tuning the Resnet model for facial emotion recognition. The FER model was implemented on a robot that reacts to the owner's emotions and displays appropriate gestures. The robot can also play music based on the audience's expressions, using speech commands. In addition, a data mining app was developed to extract emotions and their relevant duration from videos.
    Supervisors: Dr. Mohammad Bagher Menhaj and Dr. Hassan Taheri

Work Experience

- **Co-founder — Sofia**
  - Sofia is a helpful chatbot designed to improve customer service using Retrieval-Augmented Generation and large language models. It's capable of operating across all social media platforms. Aug 2023 – Present
- **Teaching Assistant & Research Assistant — University of Tehran**
  - Machine Learning Teaching Assistant: Designed the final project and HW assignments. Jan 2023 – Present
  - Statistical Inference Teaching Assistant: Designed hands-on and HW assignments. Jan 2023 – Present
  - Deep Learning Teaching Assistant: Designed the final project. Jan 2024 – Present
  - Research assistant at NLP lab and Intelligent Information System Lab Jan 2023 – Present
- **Teaching Assistant & Research Assistant — Amirkabir University of Technology**
  - Teaching assistant for Introduction to Computational course Intelligence Oct 2021 – Jan 2022
  - Research assistant at Computer Intelligence and Large Scale System Research Lab 2020 – 2022
- **Teaching Assistant & Research Assistant — Sharif University of Technology**
  - Machine Learning Teaching assistant: Designed the final project Feb 2024 – Present
  - Research Assistant at DML lab worked on a computer vision project Oct 2021 – Jan 2022
- **Instructor and Robotics Developer — Amirkabir Robotics and Programming School (FIRA Academy)**
  - Instructor of image processing course: Developed and delivered an engaging course on introduction to machine learning and computer vision, focusing on image processing concepts 2020 – 2021
  - Member of the production team of SWIMBot (Designed for Diginext): SWIMBot is a platform for implementing various applications such as image processing, mapping, obstacle avoidance, and more. March 2021
- **Volunteer works**
  - Innovation Center of Amirkabir University of Technology: executive committee member. 2019 – 2020
  - International Conference on Robotics and Mechatronics: Member of Student Committee. 2019 , 2021
- **Intern — Canavat electric Iranian Arvand**
  - Implemented a low-priced IR-remote dimmer with the help of Arduino Nano Summer 2019

Publications

- **MJ. Ranjbar**, MB. Menhaj, H. Taheri. "Social Robots: An Open-Source Framework for Personal Assistant Robots." Published in *Proceedings of the 10th RSI International Conference on Robotics and Mechatronics (ICRoM 2022)*.

Selected Courses

- Machine Learning (Grad) 4/4 (20/20)
- Statistical Inference (Grad) 4/4 (19.2/20)
- Digital speech processing (Grad) (In progress)
- Natural Language Processing (Grad) 4/4 (18.2/20)
- Trust Worthy AI (Grad) 4/4 (17.4/20)
- Computational Intelligence & lab 4/4 (18.5/20)
- Deep Learning (Grad) 4/4 (18.75/20)
- Advanced Algorithm Design (Grad) 4/4 (19.4/20)

Online Courses

- Machine Learning [Certificated]
- Algorithms Specialization (D & C) [Certificated]
- Natural Language Processing [C1 C2, C3, C4]
- Generative AI with LLMs [Certificated]

Technical & Personal Skills

- **Programming/Scripting:** Python *(Pytorch, Tensorflow, Keras, NLTK, OpenCV, SciPy, Scikit-learn, Pandas, Matplotlib, Numpy, Pygame, Pyaudio, Threading, PyQt, Xlsxwriter)*, R, C/C++, C#, Matlab, VHDL, Assembly, HTML, MySQL, LaTeX
- **Simulation Tools and hardware:** ARM(STM32), Arduino, Raspberry Pi, NodeMCU, Simulink, Proteus, H SPICE, Advanced Design System.
- **IDEs/Tools:** Jupyter Notebook, Google Colab, Visual Studio, Keil5, STM32 Cube MX, Microsoft Office, Adobe Photoshop, Adobe Premiere, Unity, Git, Docker
- **Language:** Persian(Native), English(Fluent), Toefl Score: 107 (R: 29, L: 30, S: 24, W: 24)

Selected Projects

- **Persian Text-to-Speech (TTS)** Deep Learning [2023]
  - Fine-tuned the SpeechT5 model using the Mozilla Common Voice dataset for the persian Language.
- **Speech emotion recognition** Deep Learning [2023]
  - the Hubert model was fine-tuned on SheMO: Persian Speech Emotion Detection Database.
- **Fine-tuning Segment Anything Model (SAM) with Meta-Learning** Deep Learning [2023]
  - SAM was fine-tuned on a custom dataset for detecting bodies of water.
- **AVA Tutor** Personal Project [2023]
  - AVA is an English teaching AI tutor leveraging the capabilities of large language models to enhance English language proficiency. Currently, its primary focus lies in assessing written English skills.
- **Summarization with FLAN-T5** Generative AI with Large Language Models [2023]
  - Fine-tuned the FLAN-T5 model using traditional fine-tuning techniques and PEFT methods like LoRA to enhance its summarization capabilities. Additionally, reinforcement learning (RL) training was implemented to improve the model's detoxification.
- **FAQ chatbot** Natural language processing [2023]
  - FAQ chatbot specialized in selling airplane tickets, capable of detecting intents, classifying domains, and extracting slot values (e.g., destination city, date, etc.)
  - Specialized FAQ chatbot responding to users seeking information on weight loss strategies, nutrition, fitness, and general healthcare inquiries.
- **Faster R-CNN from scratch** Deep Learning [2023]
  - A custom Faster R-CNN implementation trained specifically for wildfire smoke detection.
- **Training robust model** Trustworthy AI [2023]
  - A robust model was trained with diverse data augmentation techniques. It also incorporated the Angular loss function and was rigorously tested for resistance to fast gradient methods and its ability to perform well with noisy data.
- **Persian music dastgah detection** Machine Learning [2022]
  - After preprocessing the gathered data, audio features such as zero-crossing rate and short-time Fourier transform, among others, have been extracted. Multiple models, including neural networks, support vector machines, and others, have been trained to detect Dastgath. Additionally, various clustering methods were employed.

- **Correction of skewed text** DML lab [2021]
  - Developed a deep neural network using Self-Supervised Learning to predict optimal page rotation angles of skewed text accurately.
- **Self-driving Car** Personal Project [2021]
  - Using OpenCV to detect lanes and control the car movement in the Avis Engine simulator.
- **Snake game with Voice Control and Motion Detection** Advanced Programming [2020]
  - The game was developed using the Pygame module and features voice control, trained with four wake words. Motion control is implemented by detecting the movement of a designated color.
- **2x2 Rubik's Cube Solver** Advanced Programming [2020]
  - The developed program allows user interaction with a 2x2 Rubik's Cube via command inputs. Color assignments provided by users are utilized in solving the Rubik's Cube using DLS (depth-limited search), with the required moves printed as output.
- **Face Recognition System** Advanced Programming [2020]
  - Applying the Eigenfaces method to project and classify faces by comparing their positions in a subspace with those of recognized individuals.
- **Irrigation System using STM32** Microprocessor Systems Interfaces [2020]
  - I used stm32, LCD, keypad and YL-69 to implement an irrigation system. The LCD shows the menu, the user can choose how long the irrigation should be, and YL-69 determines the soil condition.
- **Smart Temperature Control System using STM32** Microprocessor Systems Interfaces [2020]
  - Developed a smart temperature control system using STM32, LM35, and Stepper motor HCSR05 components. Integrated remote control for setpoint adjustment via an Arduino Due.
- **Handwriting Digit Recognition** Introduction to Machine Learning [2019]
  - Various convolutional neural networks (CNNs) were employed, each with distinct activation functions and learning rates, to train on the Mnist dataset. Subsequent analysis involved comparing these variations' impact on loss and accuracy metrics.
- **Music algorithm** Linear Algebra [2019]
  - Implementing a music algorithm for estimating the Direction Of Arrival (DOA) in sound sources.

Honors

- Ranked within the top 0.5% (76th) among approximately 13000 participants in the computer engineering national master entrance exam for Iranian universities. 2022
- Ranked within the top 1% (35th) among approximately 2000 participants in the computer science national master entrance exam for Iranian universities. 2022
- Ranked within the top 0.6% (27th) among approximately 4000 participants in the information technology engineering national master entrance exam for Iranian universities. 2021
- Ranked within the top 0.25% in the nationwide entrance exam for B.Sc. degree among 163000 participants. 2016
- Accepted to participate in "Iranian Physics Olympiad stage 2 " from the top 5%
- Accepted Three times to participate in "Iranian Olympiad on Astronomy and Astrophysics stage 2 " from the top 5%

References

- **Dr. A Shakery** — Associate Professor, Electrical and Computer Engineering Department, University of Tehran
  - Email: Shakery@ut.ac.ir
- **Dr. H Faili** — Professor, Electrical and Computer Engineering Department, University of Tehran
  - Email: hfaili@ut.ac.ir
- **Dr. MB Menhaj** — Professor, Electrical Engineering Department, Amirkabir University of Technology
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Further information, and Proofs are available upon Request