Reza Karbasi

Robotic AI Engineer

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Summary

AI Software Engineer with 4+ years experience in autonomous driving perception. Master's in AI and Robotics. Skilled in C++, Python, ROS, PyTorch. Experienced in computer vision, object detection, multi-object tracking, and sensor fusion. Contributed to open source like DeepFace. Adept at collaborating in multidisciplinary teams.

Work Experience

Automotive Software Engineer — *SoftwareMotion*
04/2023 - Now — *Remote, China*

- Made a **CI/CD** pipeline in **Gitlab** with **GTest** for the Autosar-based codebase, reducing on-field testing through automated unit and integration tests by 30%
- Built a **PyQT** visualization software for AEB and ACC systems, integrating BEV plots to drastically reduce debugging time. Processed MF4 and CAN signals (BLF, DBC) to expedite vehicle issue diagnosis.
- Evaluated and integrated advanced path planning solutions, such as lattice-based and Apollo's EM planner. Also, developed obstacle avoidance algorithms with **DP** and **A*** techniques, validated through a custom Python-based simulator.

Machine Learning Engineer — *Hara AI Company*
06/2022 - 03/2023 — *Tehran, Iran*

- Leveraged Google's YamNet within the TensorFlow framework to automate the categorization of audio files by gender and age, fine-tuning the model on the company's labeled dataset. Introduced a custom loss function that balances precision and recall, achieving an average precision of 0.55 and an average recall of 0.51 across various categories.
- Building a filter for detecting operator interruptions and poor voice quality using VAD algorithms.
- Deployed **MLflow** to facilitate experiment tracking.
- Conducted an in-depth assessment and visualization of the company's Speech-to-Text (**STT**) models under varied real-world conditions (such as noise and reverbation) to pinpoint vulnerabilities.

AI Engineer — *Iran's National Elites Foundation*
10/2022 - 12/2023 — *Tehran, Iran*

Leading a team, we developed a microservice-based platform for a vehicle monitoring, focusing on a graph-based path planning module. By implementing advanced algorithms like Dynamic Programming and A*, we enhanced navigation precision and system responsiveness, achieving a tenfold increase in processing speed over the initial version.

Designer of a Trader Bot — *QDM*
04/2019 - 01/2020 — *Tehran, Iran*

Engineered a Metatrader trading bot with a technical strategy, incorporating a **Deep Q Network** in **PyTorch**. Utilized a socket connection for data streaming and applied the algorithm on historical data spanning 2007-2019 in Metatrader. Documented a version on this Medium blog and this Github repo.

Instructor *Aras Academy*
06/2021 - 09/2021 *Tehran, Iran*
Presented **an Introduction to Reinforcement Learning** at Aras Academy's 2021 summer school, basing the syllabus on Sutton's book, "Reinforcement Learning: An Introduction."

Embedded System Engineer *Raiwan*
12/2017 - 06/2019 *Tehran, Iran*

- Developed **Inner Hospital Communication** boards with **STM32 F1** microcontrollers, incorporating audio signal transportation via **RS485** protocol, and implemented audio recording and playback on digital boards. Enabled efficient real-time communication between nurses and patients, successfully deployed in over 2 hospitals.
- Designed **Taxi Payment Device** frame via CNC and worked on the device's **ESP32** integration.

Robotic Researcher *KN2C Robotic Lab*
05/2015 - 09/2017 *Tehran, Iran*

- Led the electronics team in KN2C's SSL, enhancing robot performance by designing, soldering, and maintaining Xmega and ST processor boards for motor control and precise **PID** calibration. Fostered collaboration with mechanical and software teams to integrate system improvements.
- Boosted ball detection precision by implementing a **Kalman Filter** in **C++**, leveraging the Armadillo library.
- Crafted a real-time GUI in C# using Visual Studio for simultaneous condition monitoring of all robots, enhancing strategic decision-making.

Teaching Assistant
I served as a Teaching Assistant in some courses:

- **Deep Neural Networks**: *Spring 2022*, working with Dr. Reshad Hosseini
- **Reinforcement Learning**: *Fall 2021*, working with Prof. Majid Nili Ahmadabadi
- **System Identification**: *Spring 2020*, working with Prof. Babak Nadjar Araabi
- **Pattern Recognition**: *Fall 2022 , Fall 2019 , Fall 2017*, working with Prof. Hamid Abrishami Moghaddam

Notable Projects

- Dockerized a **face recognition system** in videos using **Flask** and **deepface** library for identifying individuals by comparing faces with reference images, handling video processing, face embedding, matching, and output generation for applications like surveillance. Project link.
- Led the web crawling of the Soroush app for the Big Data Course's final project, utilizing **Selenium** for data extraction and **Kafka** for transmission. Facilitated team collaboration for data analysis, with all contributions and code housed in our GitHub repository.
- Applied an image captioning application using **Resnet18** and **LSTM** models in **PyTorch**.
- Localized Anki robot in a **Gazebo** environment using **particle filter** and **EKF** algorithms.
- Led sentiment analysis of mobile phone reviews on Digikala for a Social Network course project, developing a metric to quantify device opinions. Spearheaded website crawling with **Selenium** and crafted the analysis network. Code available in this repository.
- Implemented an Adaptive Neuro-Fuzzy Inference System (**ANFIS**) algorithm in **Pytorch** for EEG signal classification, facilitating video game control through brain activity.
- Developed a gym environment with a Deep RL **A3C** agent to optimize station power settings and maximize coverage area while minimizing conflicts.

- Conducted a comprehensive data analysis on surgical outcomes for various medical centers and procedures. Assessed performance, compared surgery types, and provided insights to enhance medical service quality.
- In this project, we aimed to implement the encoder part of a **transformer** network and use it for a translation application (English to Persian). This was one of the projects of the Deep Learning course.
- In this project, we aimed to predict accurate acceleration, velocity, and position values using GPS and an accelerometer. We implemented a **Kalman Filter** to filter the sensor values and estimate the device's velocity. I used an **Arduino DUE** to collect the data and applied the filter in **MATLAB**. This project was the final assignment of the Instrumentation course.
- I implemented a Luenberger observer observer and an state feedback controller in **Matlab** for the modern control course.
- In this project, we aimed to implement a SegNet neural network for **semantic segmentation**. This was one of the projects of the Deep Learning course.

Honors & Certificates

The National University Entrance Exam for M.Sc. degree in AI: Ranked 28th(top 0.2%)
National University Entrance Exams in Mathematics: Ranked 888th(top 0.7%)
Iran Open RoboCup: Ranked 5th in 2016's Small Sized League (SSL)
Snake League: Ranked 3rd in 2019's Snake League in Nasir Cup
Certificate in Database Principles and SQL Server: Link to the certificate
Certificate in Django Web Framework: Link to the certificate

Skills

Programming Python(Advanced), C(Advanced), C++(Intermediate), Matlab(Intermediate), Java(Intermediate)
Frameworks Pytorch(Advanced), Tensorflow(Advanced), MLflow (Intermediate), ROS (Familiar), Simulink(Familiar)
Libraries Numpy, Pandas, Matplotlib, Plotly, Selenium, OpenCV
Hardware Keil, Stm32Cube, ARM, XMega, Arduino, Altium, Soldering
Databases SQL, InfluxDB, MongoDB
Misc Git, Linux, Docker, Software Testing, GTest , Bash Scripting, REST API, Confluence, Jira, Django

Education

University of Tehran Tehran, Iran
MS in Artificial Intelligence and Robotics; ***GPA: 18.86/20*** *Sep. 2019 - Jan. 2022*

- Thesis: An earthquake early warning system using smartphones as sensors
- Supervisors: Prof. Hadi Moradi, Dr. Mahmoud Reza Hashemi, Dr. Ali Moradi
- Notable Courses: Deep Neural Network in Speech signals and Machine Vision, Reinforcement Learning, Big Data, Data Analysis, Artificial Intelligence

K. N. Toosi University of Technology Tehran, Iran
BS in Electrical Engineering (major in Control Engineering); ***GPA: 17.4/20*** *Sep. 2014 - Jan. 2019*

- Thesis: Fault detection in gas turbine
- Supervisor : Dr. Mahdi Aliyari
- Notable Courses: Pattern Recognition, Digital Control, Signal and Systems

References

Dr. Mahdi Aliyari-Shoorehdeli Associate Professor, Control and Mechatronics Engineering, K. N. Toosi University of Technology, Tehran, Iran
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Dr. Reshad Hosseini Assistant Professor, Department of Electrical and Computer Engineering, Cofouder of Hara AI company, UT, Tehran, Iran

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