Ali Karimzade

Robotics Engineer

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SUMMARY OF QUALIFICATIONS

- MEng candidate at the University of Ottawa, honing expertise in robotics and applied AI.
- Currently spearheading a project on 3D mapping and efficient navigation using TurtleBot 3 and RGBD depth cameras.
- Accomplished in collaborative project management, adept with Git and Docker.
- Directed a groundbreaking thesis project to optimize robotic manipulators using deep reinforcement learning.
- Specialized in SLAM, path planning, and manipulator control within the robotics domain.
- Experienced lab instructor, skilled at demystifying complex robotics concepts.
- Proven track record of innovation and leadership in interdisciplinary teams.

EDUCATION

• Master of Engineering, Mechanical Engineering (Robotics)

University of Ottawa, Ontario **September 2022 - Present**

- **Academic Projects:** - Currently working on a cutting-edge project involving 3D mapping and navigation optimization using TurtleBot 3 and RealSense depth cameras. The aim is to enhance robotic navigation efficiency through advanced mapping techniques.
- **Relevant Courses:** - Biomechanics of Movements - Digital Signal Processing - Applied Artificial Intelligence - Mechatronics - Machine Learning for Adaptive and Intelligent Control Systems - Robotics - Instrumentation Techniques (Audited) - Adaptive Signal Processing (Audited)
- **Overall GPA:** 3.73(as of now)

• Bachelor of Science, Mechanical Engineering (Robotics)

University of Isfahan, Isfahan **September 2016 - October 2020**

- **Bachelor's Thesis:** Using Deep Reinforcement Learning Algorithms to Control Robotic Manipulators
  Supervisor: Dr. Karimpour **Grade: 20/20**
- **Relevant Courses:** - Computer Programming - Dynamics - Dynamics of Mechanics - Mechanical Vibration - Automatic Control - Robotics - Artificial Intelligence and Expert Systems - Simulation of Dynamic Systems and Control - Digital Image Processing (Audited)
- **Overall GPA:** 3.46

SKILLS

• Technical Skills

- **Robotics:** - SLAM (Simultaneous Localization and Mapping) - Path Planning - Manipulator Control - Motion Planning - Pick and Place
- **Digital Signal Processing:** - FIR and IIR Filters - FMCW Radars - Recursive Least Squares - Adaptive Prediction - Antenna Beamforming
- **Control Systems:** - Lead-Lag and PID Controllers - State-Space Controllers - Optimal Control - Reinforcement Learning - Self-Tuning Regulators
- **Machine Learning:** - Support Vector Machine (SVM) - Random Forests - Dimensionality Reduction - CNN (Convolutional Neural Networks) - RNN (Recurrent Neural Networks) - Reinforcement Learning
- **Computer Vision:** - Noise Filters - Spectral Analysis - Object Classification
- **Embedded Systems:** - Raspberry Pi - NVIDIA Jetson TX1 - Arduino

• Software Skills

- **Robotics:** - Robot Operating System (ROS) - Gazebo - MoveIt - MuJoCo - OpenSim - LabVIEW

- **Machine Learning:** - TensorFlow - PyTorch - scikit-learn
- **Computer Vision:** - OpenCV - Matlab Image Processing Toolbox
- **Operating Systems:** - Ubuntu - Windows - Debian

• Programming and Markup Languages

- **Programming:** - Python - JavaScript - C++ - Java
- **Markup:** - LaTeX - XML - YAML - JSON - HTML - CSS

• Soft Skills

- **Quick Learner:** Constantly keen to learn more, especially in my area of interest.
- **Teamwork:** Proficient in collaborative projects, adept at using Git and Docker for efficient DevOps in teams.

RESEARCH INTERESTS

- **Reinforcement Learning** for Autonomous Robotic Systems, particularly in the context of Sequential Decision and Optimal Control.
- **Computer Vision** for Object Recognition and Tracking in Robotics, with a focus on improving the perception capabilities of autonomous robots.

RELEVANT WORK EXPERIENCE

• Teacher Assistant in Robotics

Laboratory Instructor — University of Ottawa, Ontario **MAY 2023 - Present**

- Proficiently taught working with robots: TurtleBot3, OpenManipulator, Simulation of KUKA LBR iiwa.
- Effectively instructed ROS 1&2, Gazebo simulation for control, manipulation, and navigation tasks.
- Demonstrated expertise in teaching MoveIt for pick and place and motion planning.
- Instructed SLAM and path planning with Navigation Stack and Nav 2 for autonomous mobile robots.

• Robotics Researcher

Research Team Member — University Of Isfahan, Isfahan **JAN 2019 - JAN 2021**

- Reconstruction of a homemade 3 DOF robot and servo motor drivers connection to Advantech PCI cards.
- Operation of the robot with ROS and its simulation in the Gazebo software.
- Development of a controller and motion planner for it in the ROS environment.

• Computer Vision Engineer

Internship — Novinilya Company, Isfahan **JUN 2019 - AUG 2019**

- Examination of the surface quality of the parts on the mass production at the plants.
- Object recognition with embedded boards like Jetson TX1 and industrial Basler cameras in the company's R&D team.

ACADEMIC PROJECTS

• Artificial Intelligence

- Twin Delayed DDPG (TD3) algorithm implementation for the Ant robot in MuJoCo (in Gym library) to run forward.
- Evolutionary algorithms Implementation, including the Differential Evolution Algorithm (DE) and the Multi-Verse Optimizer (MVO).
- Implementation of DDPG and TD3 algorithms in my B.Sc. thesis to push objects to their desired goal in a simulated environment with the help of hindsight experience replay paper.
- Implementation of deep Q-Networks in a four-player fruit-eating game for an Al competition.
- Using K-means and KNN in Scikit-Learn for the Classification of cities' weather as dry or humid using unlabeled data

• Image Processing and Computer Vision

- Implementation of the AlexNet architecture for image classification on the MNIST and CIFAR-10 datasets.
- Designing filters in the frequency and spatial domain in both OpenCV and MATLAB.
- Android software development to recognize chosen cap colors and program an Arduino board to sort plastic bottle caps.

• Robotics

- Currently developing 3D maps using REALSENSE RGBD cameras with TurtleBot3 for homes and offices.
- Developed a line-following robot using an Android phone and Arduino for image processing.
- Simulated and controlled KUKA LBR iiwa in Gazebo using ROS controllers, implemented motion planning with MoveIt for pick and place tasks, and gained hands-on experience with the robot at Isfahan University of Technology (IUT).

• Digital Signal Processing

- Implemented a noise canceling system using time domain multichannel FIR causal Wiener method for precise source extraction from acoustic mixtures.
- implemented a next frame video predictor utilizing the Wiener-Hopf solution, successfully reducing power in residual prediction error and enhancing video compression efficiency.
- FMCW radar simulation for autonomous vehicles to detect objects' movement within 300 meters.

• Systems and Controls

- Designing a PID controller for a simulated 3-DOF robot in ROS (used in the B.Sc. thesis).
- Using LabVIEW for the implementation of keyboard-based control with PID control.
- Torque control of servomotors, system identification, and PID/lead-lag controller design with MATLAB.

LANGUAGES

• Persian

- **Native**

• English

- **IELTS Academic:** 6.5 Overall **DEC 2021**

REFERENCES

• Dr. Hossein Karimpour

- **Professor, Department of Mechanical Engineering, University of Isfahan, Isfahan**
- **Bachelor's Thesis Supervisor**
- **Tel:** +98(313)793-5603

• Dr. Amirhossein Monjazeb

- **Professor, Faculty of Engineering, University of Ottawa, Ontario**
- **Master's Project Supervisor**
- **Tel:** +1(613)266-1854