Mohammad Malekiabyaneh

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• LinkedIn • GitHub • Website

RESEARCH INTERESTS

- Mechatronics, Robotics, Machine Learning, Deep Learning, Computer Vision, Image Processing

EDUCATION

B.Sc. in Mechanical Engineering — **2020-2025**
K. N. Toosi University of Technology — Tehran, Iran
- Major in **Mechatronics**
- **GPA**: 3.85/4 (18.03/20) via 140 credits, Last 2 years: 3.81/4 (18.02/20)

Diploma in Physics and Mathematics — **2017-2020**
Navvab Safavi High School — Tehran, Iran
- GPA: 19.66/20

RESEARCH & WORK EXPERIENCE

Machine Learning Intern, Nasir Driving Simulator — **Apr 2024 - Present**
Simulation of a Deep Learning–Based Hazard-Zone Detection and Warning System for Open-Pit Mining Trucks under Varying Weather and Speed Conditions (B.Sc. Thesis) (GitHub)
- Developed a CARLA-based real-time safety system (ADAS) for open-pit mining trucks with dynamic yellow/red hazard zones and on-screen and audible warnings
- Used CARLA semantic segmentation with y-aware ground-plane calibration, inverse-perspective mapping (IPM), and a polynomial bounding-box height model, and fused these models via an adaptive Kalman filter to estimate truck-to-truck distance, ego and relative speed, Time-To-Collision (TTC), Time Headway (THW), braking distance, and relative angle
- Trained a ResNet-18 weather classifier achieving 98.3% test accuracy and integrated weather-aware friction and braking distance adjustments to dynamically scale vehicle danger zones
- Implemented an interactive head-up display (HUD) with live risk charts, CSV/video logging, and manual four-click danger-zone calibration

SKILLS

- *Programming Languages*: Python, C++, MATLAB
- *Artificial Intelligence:* Neural Networks, Segmentation, Detection, Classification, Regression
- Mechanical Engineering: Mechatronics, Robotics, Control Systems, Sensor Fusion
- *Tools and Libraries:* PyTorch, TensorFlow, Keras, OpenCV, NumPy, Pandas, Matplotlib, scikit-learn
- *Tools & Software:* Git/GitHub, Altium Designer, Excel, Word, PowerPoint, CARLA, LaTeX
- *Development boards:* Arduino, ESP32, Raspberry Pi
- *Web Development:* HTML, CSS
- Operating systems: Windows, Linux
- *Languages:* Persian (Native), English (Full professional)

HONORS AND AWARDS

- Ranked in the top 5% of mechanical engineering students at K. N. Toosi University — Sep 2024
- Qualified for Direct Master's Admission as an Exceptional Talented Student (NODET) — Sep 2024
- Scholarship from Pardis Technology Park (PTP) as a top talented student — Aug 2024
- Ranked within the top 1.5% in the Iranian University Entrance Exam — July 2020

SELECTED PROJECTS

- **Autonomous Agricultural Robot Navigation and Object Detection** (GitHub)
  - Developed an autonomous robot equipped with a camera for pathfinding using PID control and the Artificial Potential Field algorithm for obstacle avoidance
  - Designed an image processing algorithm to detect robot position via color-coded markers
  - Collected and annotated a dataset of healthy and rotten bananas using Roboflow, and trained a classification model achieving over 98% precision and recall
  - Designed a control panel for real-time monitoring and TCP/IP communication with the robot
- **Vehicle Detection and Counting System Using YOLO and SORT Tracker** (GitHub)
  - Developed a real-time vehicle detection and counting system using YOLOv10n and the SORT algorithm, achieving ~90% accuracy for multiple vehicle types and pedestrians
  - Integrated interactive video control for traffic processing and visualized results with Matplotlib
- **Smart Hospital** (GitHub)
  - Led the Image Processing team in developing an autonomous robot to navigate in hospital environments, utilizing an ESP32 camera and Arduino IDE
  - Implemented a real-time object detection system using Aruco markers and OpenCV
  - Enhanced robot navigation precision by tuning the PID control system
- Developed a CNN model in Keras to estimate the steering angle from an image of a steering wheel, achieving an error rate of less than 10%. The project utilized an ESP32-CAM Dev board for image capture and an MPU6050 IMU sensor for measuring corresponding steering angles. (GitHub)
- Developed a neural network (MLP) to diagnose fatty liver disease based on medical attributes like age, blood sugar, and pressure with 89.3% accuracy using TensorFlow and Keras (GitHub)
- Classified Fashion MNIST dataset into 10 categories using CNN with 92.2% accuracy (GitHub)
- Developed a real-time feedback control system (closed-loop) to maintain the position of a ball on a horizontal rod using STM32 and PID controllers (GitHub)
- Designed and implemented a control system for an inverted pendulum using dynamic modeling, state-space analysis, and a PID controller in MATLAB (GitHub)
- Implemented a C++ program to calculate rise and slope in various types of beams (GitHub)
- Developed a truss analysis system (GitHub) and a 4x4 Tic Tac Toe game (GitHub) using C++ and object-oriented programming (OOP), Computer Programming in C++ course

TEACHING ASSISTANT

Teaching Assistant for Computer Programming in C++ **Sep 2023 - Jan 2024**

Mechanical Engineering Department, K. N. Toosi University of Technology

- Conducted teaching and exercise-solving classes, and designed and graded assignments/exams

SELECTED COURSES

- Neural Networks (19/20)
- Computer Programming in C++ (20/20)
- Automatic Control (17.5/20)
- Introduction to Mechatronics (19/20)
- Measurement and Control Systems (18.5/20)
- Dynamics (20/20)
- Dynamics of Machines (18.5/20)
- Mechanical Vibrations (20/20)
- Vehicle Dynamics (18.6/20)
- Introduction to Biomechanics (16.5/20)

Online Courses and Training:

- Machine Learning and Deep Learning
- Reinforcement Learning
- Image Processing
- Advanced Python Programming
- Advanced C++ Programming
- Advanced MATLAB Programming

EXTRACURRICULAR ACTIVITIES AND INTERESTS

- Bodybuilding (Professional), Table Tennis (Professional), Entrepreneurship and Leadership