

Mohammad Hossein Fakouri

Robotic Control, Dynamic Simulation, and Learning-Based Manipulation | PhD Applicant

Tehran, Iran

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Research Interests

Robotic Systems: Robot manipulation, industrial robotics, cable-driven robots, rehabilitation robotics, sensor-based robotic systems, human-robot interaction.

Control and Dynamics: Nonlinear robot control, robust and adaptive control, computed torque control, dynamic modeling, trajectory tracking under disturbances and uncertainty.

Learning-Based Robotic Control: Deep reinforcement learning, residual reinforcement learning, demonstration-informed reinforcement learning, learning-enhanced control, simulation-to-deployment workflows.

Research Profile

Mechanical Engineering M.Sc. graduate specializing in robotic control, dynamic simulation, and learning-enhanced control under uncertainty. Thesis work developed a planar 3-DOF cable-driven robotic system controlled using Computed Torque Control and residual Deep Deterministic Policy Gradient reinforcement learning, with validation under external disturbances and parametric uncertainties. Current research interests focus on model-based and data-driven robot control, robust manipulation strategies, demonstration-informed learning, and simulation-to-deployment workflows for robotic systems.

Education

Kharazmi University

M.Sc. in Mechanical Engineering – Robotics and Control

Tehran, Iran
2021 – 2025

- **GPA:** 17.53/20
- **Thesis:** *Modeling and Control of a Cable-Driven Lower-Limb Rehabilitation Robot Using Reinforcement Learning*
- **Supervisor:** Dr. Ali Keymasi Khalaji

University of Guilan

B.Sc. in Mechanical Engineering

Rasht, Iran
2015 – 2020

- **GPA:** 15.09/20

Research Experience

Model-Based and Residual Reinforcement Learning for Robotic Control

M.Sc. Thesis Researcher, Kharazmi University

Tehran, Iran
2022 – 2025

- Developed and simulated a planar 3-DOF cable-driven robotic system for lower-limb rehabilitation trajectory tracking using three active cables.
- Derived kinematic and dynamic equations using Lagrangian and Hamiltonian formulations.
- Built and validated 2D and 3D multibody simulation models using MATLAB/Simulink, Simscape Multibody, and MSC ADAMS.
- Implemented a hybrid control architecture combining Computed Torque Control with residual Deep Deterministic Policy Gradient reinforcement learning.
- Used the residual DDPG agent as a learning-based compensation layer for tracking errors caused by external disturbances and parametric uncertainties.
- Designed randomized disturbance and model-uncertainty scenarios to evaluate controller robustness and tracking performance.
- Achieved approximately 40% lower trajectory-tracking error compared with baseline Computed Torque Control in simulation.
- Analyzed cable configuration and trajectory feasibility to maintain valid actuation using three active cables along the planned motion.

Research Outputs

Manuscript in Preparation

- M. H. Fakouri and A. Keymasi Khalaji, "Residual Deep Reinforcement Learning-Based Computed Torque Control for a Cable-Driven Lower-Limb Rehabilitation Robot under Disturbances and Parametric Uncertainties." *Manuscript in preparation.*

Academic Projects

Sensor-Based Ball and Beam Control System

Rasht, Iran
2021

Academic Hardware Control Project

- Built an Arduino-based ball-and-beam setup using ultrasonic distance sensing and servo actuation.
- Designed and tuned a PID controller for real-time ball-position stabilization.
- Implemented sensor-based feedback control on a physical experimental setup.

Skills and Expertise

Programming and Scripting: MATLAB, Python, C/C++ for Arduino, LaTeX, Git/GitHub

Robotics and Control: Dynamic and kinematic modeling, Jacobian analysis, trajectory planning, Computed Torque Control, PID control, Sliding Mode Control, Feedback Linearization, Adaptive Control

Learning-Based Control: Deep Deterministic Policy Gradient, residual reinforcement learning, learning-based compensation under disturbances and parametric uncertainties

Simulation and CAD: Simulink, Simscape Multibody, MSC ADAMS, SolidWorks

Data Analysis and Experimental Validation: Tracking-error analysis, disturbance rejection evaluation, parametric uncertainty testing, simulation result visualization

Sensing and Embedded Control: Ultrasonic distance sensing, servo actuation, Arduino-based feedback control, basic sensor-feedback processing

Software and Documentation: ROS 2 fundamentals, Microsoft Office Suite, academic writing, technical documentation

Manufacturing: Manual lathe operation, basic machining, mechanical part fabrication and modification

Professional Experience

Shahid Tamjidi Marine Industries Organization

Iran

Mechanical Engineer

Aug. 2018 – Jun. 2019

- Designed, modified, and drafted 3D models of mechanical components, including flanges and shafts, using SolidWorks.
- Supported mechanical design and documentation tasks for marine industry applications.

Saipa Group

Iran

Quality Control Intern

Jun. 2019 – Sep. 2019

- Assisted the quality control department in industrial inspection workflows and quality assurance procedures for automotive parts.

Caspian Manual Machinery Group

Iran

Manual Lathe Operator Trainee

Oct. 2017 – Jun. 2018

- Gained hands-on experience in manual lathe operation, machining, and basic mechanical part fabrication and modification.

Selected Coursework

Advanced Dynamics: 20/20; Seminar: 19/20; Advanced Robotics: 19/20; Advanced Control: 18.8/20; Nonlinear Vibrations: 18/20.

Languages

Persian: Native

English: TOEFL iBT scheduled for June 2026

References

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