Nima Maghooli

Research Assistant at Advanced Robotics and Automated Systems (ARAS) Laboratory | Hi-Tech Robotic Solutions

CONTACT INFORMATION

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EDUCATION

- **M.Sc. in Mechanical Engineering (majoring in Dynamics and Control),** Sep 2020 - Present
  K. N. Toosi University of Technology Tehran, Iran
  - Thesis title: Data-Driven Modeling and Controller Design with Implementation for Tendon-Driven Continuum Robots (TDCRs) using Vision-Based Deep Reinforcement Learning,
  - Seminar title: Learning-Based Modeling & Control for TDCRs,
  - GPA: 18.87 (out of 20), Rank: 1^{st},
  - Supervisor: Prof. S. Ali A. Moosavian.

- **B.Sc. in Mechanical Engineering,** Sep 2015 - Sep 2020
  University of Tehran Tehran, Iran
  - Internship: Mapna Turbine Engineering and Manufacturing Company (TUGA),
  - GPA for the last two semesters (43 units): 17.78 (out of 20),
  - GPA: 15.24 (out of 20),
  - Supervisor: Dr. Tara Farizeh.

RESEARCH AND TEACHING EXPERIENCE

- **Research Assistant (K. N. Toosi University of Technology)**
  - Advanced Robotics and Automated Systems Laboratory (Sep 2021 - Present)
- **Teaching Assistant (K. N. Toosi University of Technology)**
  - Advanced Robotics (Control of Robots), Prof. S. Ali A. Moosavian (Spring 2022, Spring 2023)
    Kinematics, Kinetics/Dynamics, Planning, Position Control, Force & Impedance Control
  - Advanced Dynamics, Prof. S. Ali A. Moosavian (Fall 2021, Fall 2022)
    Classical Dynamics, Motion of Celestial Bodies, Analytical Dynamics, Stability Analysis
- **Teaching Assistant (Scientific Association of Mechanical Engineering, University of Tehran)**
  - MATLAB & Simulink Workshop (Jun 2020)
    Control System Design and Optimization for Linear & Nonlinear Dynamic Systems

RESEARCH INTERESTS

- Data-Driven and Intelligent Control
- Vision-Based Sensing for Closed-Loop Control
- Deep Reinforcement Learning Application for Learning-Based Control
- System Identification and Parameters Estimation
- Dynamics Modeling, Simulation, and Implementation of Robotic Systems

PUBLICATIONS

- **N. Maghooli**, F. S. Tabatabaee-Nasab, and S. Ali A. Moosavian, "Self-Tuning Robust Tracking Control for Autonomous Underwater Vehicles," 2022 10th RSI International Conference on Robotics and Mechatronics (ICRoM), Tehran, Iran, 2022, pp. 279-284, doi: 10.1109/ICRoM57054.2022.10025058. [Link]
- **N. Maghooli**, M.Bajelani, S. A. Khallilpour, HD Taghirad, and S. Ali A. Moosavian, "Optimal Modified Transpose Jacobian Control for Robotic Systems", [to be submitted]
- **N. Maghooli**, O. Mahdizadeh, S. Shekari, and S. Ali A. Moosavian, "Data-Driven Modeling for Tendon-Driven Continuum Robots using Black-Box Identification", [in preparation]
- **N. Maghooli**, O. Mahdizadeh, S. Shekari, and S. Ali A. Moosavian, "Modified Direct Inverse Control for Tendon-Driven Continumm Robot", [in preparation]
- **N. Maghooli**, M.Bajelani, O. Mahdizadeh, S. Shekari, and S. Ali A. Moosavian, "Position Control for Tendon-Driven Continuum Robots using Vision-Based Deep Reinforcement Learning", [in progress]

SKILLS SUMMARY

- **CAE:** MATLAB-Simulink (Advanced), ADAMS (Intermediate), ROS (Basic)
- **CAD and CAM:** CATIA (Advanced), LaTeX (Intermediate), Prezi (Basic)
- **Programming Languages:** Python (Intermediate), C++ (Basic), HTML (Basic)
- **Languages:** Persian (Native), English (Rather Fluent, IELTS Test will be taken on Summer 2023)

HONORS AND AWARDS

- **Rank in M.Sc.**
  - 1st out of 30 students of Mechanical Engineering (Dynamics and Control), K. N. Toosi University of Technology, 2023.

COURSES

- Advanced Robotics (19.5/20)
- Reinforcement Learning (20/20)
- Artificial Intelligence & Expert Systems (20/20)
- Automatic Control (19.1/20)
- Advanced Engineering Mathematics (20/20)
- Fuzzy Logic & Neuro-Fuzzy Control (Volunteer)
- Nonlinear Control (19/20)
- Advanced Control Systems (18.5/20)
- Advanced Dynamics (18.5/20)
- Robotics (18.5/20)
- Computer-Aided Design (17/20)
- System Identification (Volunteer)

ACADEMIC PROJECTS

- **Dynamics Modeling, Planning and Control for 5-DoF Rail-Mounted Industrial Robot** [Link]
  - Advanced Robotics, Instructor: Prof. S. Ali A. Moosavian — Spring 2021

    Analytical Modeling (Forward & Inverse Kinematics, Jacobian, and Kinetics/Dynamics Model), Path Planning, Control System Design for Trajectory Tracking (PID, IDC, TJ, MTJ, SMC, MRAC), and Force Interaction with Environment (IC, OIC, MIC)
- **Performance Comparison of FLC & PID Controllers for 3R Spatial Robotic Arm** [Link]
  - Artificial Intelligence & Expert Systems, Instructor: Dr. Esmaeil Najafi — Spring 2022

    Coding GA-PSO Hybrid Evolutionary Algorithm for finding the Optimal Gains for PID Controller, and Optimal Membership Functions Parameters and Rule-Base for Fuzzy Logic Controller

- **Agent Navigation in Discrete Environments by Reinforcement Learning Algorithms** [Link]
  - Reinforcement Learning, Instructor: Dr. S. Hossein Khasteh — Spring 2022
    Implementation of Dynamic Programming, Monte Carlo, and Temporal Difference (Q-Learning & SARSA) Algorithms for the Agent Navigation in Discrete Environments
- **Data-Driven Modeling for Tendon-Driven Continuum Robot as a MIMO System** [Link]
  - System Identification, Instructor: Dr. Mahdi Aliyari-Shoorehdeli (Volunteer Student) — Fall 2021
    Dynamics Modeling for TDCR using Linear & Nonlinear Identification techniques for MIMO Systems, such as ARX, ARMAX, OE, BJ, NARX, ANFIS, and MLP Neural Network
- **Design and Optimization of Fuzzy Logic Controller for Tendon-Driven Continuum Robot** [Link]
  - Fuzzy Logic & Neuro-Fuzzy Control, Instructor: Prof. Ali Ghaffari (Volunteer Student) — Fall 2021
    Optimization of Membership Functions Parameters and Rule-Base for FLC by GA-PSO Algorithm and Replacing the Designed Controller with Adaptive Neuro-Fuzzy Inference System (ANFIS) for Computational Cost Reduction
- **PID Controller Design for Ball & Beam System Actuated by the Servo-Motor** [Link]
  - Automatic Control, Instructor: Dr. Tara Farizeh — Fall 2019
    Control System Design, Gain Tuning, and Optimization by MATLAB-Simulink Toolboxes
- **Analytical Kinematics & Dynamics/Kinetics Modeling and Verification** [Link]
  - Robotics, Instructor: Dr. Kambiz Ghaemi Osgouie — Spring 2020
    Analysis and Sketching of the PUMA-560 Manipulator (6-DoF) by CATIA and MATLAB

VOLUNTEER AND EXECUTIVE EXPERIENCE

- **Member of Conference Organising Committee** — May 2017
  - The Conference of Future of Electric Vehicles, Challenges and Opportunities, Department of Mechanical Engineering, University of Tehran.

REFERENCES

- **Prof. S. Ali A. Moosavian** — Professor
  Department of Mechanical Engineering, K. N. Toosi University of Technology — Tehran, Iran
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  - Phone: (+98 21) 84063-238
- **Prof. Mansour Nikkhah Bahrami** — Retired Professor
  Department of Mechanical Engineering, University of Tehran — Tehran, Iran
  - Email: mbahrami@ut.ac.ir
  - Phone: (+98 21) 61114-009
- **Dr. Tara Farizeh** — Assistant Professor
  Department of Mechanical Engineering, University of Tehran — Tehran, Iran
  - Email: tara.farizeh@ut.ac.ir
  - Phone: (+98 21) 44608-604
- **Dr. Rahele Rostamian** — Guest Postdoctoral Researcher
  Department of Chemistry, University of Zurich — Zurich, Switzerland
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