Nima Maghooli

Roboticist and Intelligent Control System Design Engineer at Sina Robotics and Medical Innovators Co., Ltd
Graduate Research Assistant at Advanced Robotics and Automated Systems (ARAS) | Hi-Tech Robotic Solutions

AFFILIATIONS AND CONTACT INFORMATION

Academic Affiliation: Center of Excellence in Robotics and Control, Advanced Robotics and Automated Systems.

Industrial Affiliation: Sina Robotics and Medical Innovators Co., Ltd, Iran Advanced Clinical Training Center.

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EDUCATION

- **M.Sc. in Mechanical Engineering (Dynamics and Control),** Sep 2020 - Sep 2023
  K. N. Toosi University of Technology Tehran, Iran
  - Thesis title: Intelligent Control System Design with Implementation for Tendon-Driven Continuum Robots using Vision-Based Deep Reinforcement Learning [Demo],
  - Seminar title: Learning-Based Modeling and Control for Soft Robotic Systems,
  - GPA: 18.87 (out of 20), Rank: 1st,
  - 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: 15.24 (out of 20), GPA for the last two semesters (43 units): 17.78 (out of 20),
  - Supervisor: Dr. Tara Farizeh.

WORK EXPERIENCE

- **Roboticist and Intelligent Control System Design Engineer,** Feb 2024 - Present
  Sina Robotics and Medical Innovators Co., Ltd Tehran, Iran
  - 1st Project: Deriving Kinematics, Jacobian, and Dynamics Analytical Models with respect to Remote Center of Motion (RCM) for Hybrid Serial-Parallel Robotic Telesurgery System. [Link]
  - 2nd Project: Design and Implementation of Adaptive-IDC Control System for Master-Slave Robotic Telesurgery System for Minimally Invasive Surgery Applications. [In Progress]

RESEARCH AND TEACHING EXPERIENCE

- **Graduate Research Assistant (Advanced Robotics and Automated Systems)**
  - Learning-Based Control System Design for Continuum, Serial and Parallel Robots (Sep 2021 - Present)
- **Graduate Teaching Assistant (K. N. Toosi University of Technology)**
  - Advanced Robotics, Instructor: Prof. S. Ali A. Moosavian (Spring 2022, Spring 2023)
    Kinematics, Dynamics, Planning, Position Control, Force & Impedance Control
  - Advanced Dynamics, Instructor: 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

- Haptic Master-Slave Robotic Systems
- Medical Robotics and Robotic Surgery
- Robot Learning and Learning-Based Control
- Data-Driven and Intelligent Control Systems
- System Identification and Parameters Estimation
- Sim-to-Real Transfer in Deep Reinforcement Learning

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. [Published Paper]
- **N. Maghooli**, O. Mahdizadeh and S. A. A. Moosavian, "Intelligent Model-Free Control for Tendon-Driven Continuum Robotic Arms," 2023 11th RSI International Conference on Robotics and Mechatronics (ICRoM), Tehran, Iran, 2023, pp. 606-613, doi: 10.1109/ICRoM60803.2023.10412410. [Published Paper]
- **N. Maghooli**, O. Mahdizadeh, M. Bajelani, and S. Ali A. Moosavian, "Adjusted MTJ Control Strategy using Deep Reinforcement Learning for Tendon-Driven Continuum Manipulators", [Submitted Paper]
- **N. Maghooli**, O. Mahdizadeh, and S. Ali A. Moosavian, "Adaptive Shape Control for Continuum Robotic Arms based on Distinct Force Distribution Strategy", [In Progress]

SKILLS SUMMARY

- **CAE:** MATLAB-Simulink (Advanced), ADAMS (Intermediate), ROS 2 (Basic)
- **CAD and CAM:** CATIA (Advanced), LaTeX (Intermediate), Prezi (Basic)
- **Programming Languages:** TwinCAT (Intermediate), Python (Intermediate), C/C++ (Basic)
- **Languages:** Persian (Native), English (Fluent) [The IELTS exam has been booked for May 2024.]

HONORS AND AWARDS

- **Rank in M.Sc.**
  - 1st out of 50 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 (Audited)
- 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 (Audited)

ACADEMIC PROJECTS

- **Modeling and Learning-Based Control for 3-RRS Parallel Robot** [Link]
  - Research Project, Supervisor: Prof. S. Ali A. Moosavian — Spring 2024

    Deep Reinforcement Learning Application for 3-RRS Parallel Robot Real-time Control and Sim-to-Real Transfer by ADAMS and MATLAB-Simulink

- **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 Dynamics Models), Path Planning, Control System Design for Trajectory Tracking (PID, IDC, TJ, MTJ, SMC, MRAC), and Force Interaction with the 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 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 (Audited Course) Fall 2021
    Dynamics Modeling for Tendon-Driven Continuum Robot 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 (Audited Course) 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 Servo-Motor** [Link]
  - Automatic Control, Instructor: Dr. Tara Farizeh Fall 2019
    Control System Design, Gain Tuning, and Optimization by MATLAB-Simulink
- **Analytical Kinematics & Dynamics 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. [Link]

REFERENCES

- **Prof. S. Ali A. Moosavian** [Professor]
  Department of Mechanical Engineering,
  K. N. Toosi University of Technology,
  Email: moosavian@kntu.ac.ir
- **Prof. Mansour N. Bahrami** [Retired Professor]
  Department of Mechanical Engineering,
  University of Tehran,
  Email: mbahrami@ut.ac.ir
- **Dr. Tara Farizeh** [Assistant Professor]
  Department of Mechanical Engineering,
  University of Tehran,
  Email: tara.farizeh@ut.ac.ir
- **Dr. Rahele Rostamian** [University Lecturer]
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  University of Tehran,
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