MOHAMMADREZA DINDARLOO

Robotic Researcher at Edinburgh Centre for Robotics

CONTACT INFORMATION

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EDUCATION

PhD in Dependable and Deployable AI for Robotic (CDT-D2AIR), 2025 - Present
The University of Edinburgh,

M.Sc. in Electrical Engineering, 2021 - 2024
K.N. Toosi University of Technology,
Thesis title: Development of a Graph-Based Unified Optimization Framework for Robot Calibration and State Estimation [PDF],
Advisor: Prof. Hamid D. Taghirad, Co-Advisor: Prof. Philippe Cardou,

B.Sc. in Electrical Engineering, 2017 - 2021
K.N. Toosi University of Technology,
Thesis title: Design and Implementation of a Comprehensive Data Acquisition System(DAQ) for Real-Time Applications in ARASH:ASiST Eye Surgery Training Robot,

RESEARCH INTERESTS

- **Applied AI for robotics:** VLA and VLM/LLM methods for scalable skill learning, transfer across embodiments, and higher success in novel tasks.
- **Applied hybrid ML–control:** Learning dynamics/models from data and integrating them with MPC/RL to improve accuracy, efficiency, and robustness.
- **Medical robotics:** Calibration and model-/learning-based control for MIS robots, with haptics and shared teleoperation to improve accuracy and safety.

RESEARCH EXPERIENCE

Research Assistant at ARAS, Surgical Robots Lab (SR Lab) 2018-2025

- Unified Graph-Based Kinematic Calibration Algorithm for Surgical Robots **[Github]** **[Paper]**
  - Developed SE(3)-based kinematic calibration for DIAMOND and ARASH:ASiST surgical robots
  - Implemented a ROS node for real-time communication and NTP synchronization server [Github]
  - Collected and published visual–inertial–kinematic data via TagSLAM [Github]
- Real-Time Multi-Robot Data Acquisition System & Control System **[Paper]**
  - Developed STM32F7-based DAQ with isolated I/O, encoders, serial protocols, and Ethernet
  - Configured UDP multi-DAQ communication via Matlab RTOS for dual-core ARASH:ASiST robot
  - Implemented IDC/PID controllers in Matlab Simulink for ARASH:ASiST, DIAMOND, and ARASCam
- IR-Tracked CT Navigation for Elbow Surgery with 3D Simulation **[Github]**
  - Collaborated on a custom stereo IR-tracker for real-time surgical registration and navigation [Github]
- ARASH:ASiST Preclinical Electrical & Mechanical Evaluation

- Initiated preclinical tests on the ARASH:ASiST robot to assess electrical and mechanical performance
- Collaborated closely with surgeons to integrate clinical insights into evaluation procedures.

Research Assistant at ARAS, Parallel and Cable-Driven Robots Lab (PACR Lab) 2018-2025

- Graph-Based Self-Calibration Technique for Cable-Driven Robots with Sagging Cable **[Github]** **[Paper]**
  - Developed a graph-based simultaneous localization and self-calibration technique for deployable CDPRs
  - Verified the proposed method using a Finite Element approach in RecurDyn software
  - Developed a C++ and Python-based framework for implementation utilizing GTSAM and SymForce
- Graph-Based Visual-Kinematic Fusion and Monte Carlo Initialization for CDPRs **[Github]** **[Paper]**
  - Collaborated in the development of a graph-based visual-kinematic fusion utilizing SVO and factor graph
  - Collected an open-source visual-inertial and kinematic dataset for state estimation and calibration
- A Novel Cable-Driven Robot Kineto-Static State Estimation **[Github]** **[Paper]**
  - Developed CDPR module for kineto-static estimation; sag compensation eliminated force sensors
- Arastronaut Indoor/Outdoor Positioning System **[Github]** **[Paper]**
  - Developed a real-time ESP32 positioning module integrating IMU, UWB, pressure, and compass sensors
  - Set up a UDP-based web GUI for programming, sensor calibration, and data visualization
- Embedded System Development for Kamal-Ol-Molk Painter Robot **[Github]**
  - ESP32 based wireless embedded board using Altium for Kamal-Ol-Molk 3DoF cable planer robot

SELECTED PUBLICATIONS

- **M. R. Dindarloo**, A. Hassani, A. Sharifi, S. A. Khalilpour, P. Cardou and H. D. Taghirad, "Graph-Based Kinetostatic State Estimation in Cable-Driven Parallel Robots," *2025 7th International Conference on Cable-Driven Parallel Robots (CableCon 2025)*, [PDF].
- **M. R. Dindarloo**, A. S. Mirjalili, S. A. Khalilpour, R. Khorrambakht, Stephan Weiss, and H. D. Taghirad, "A Graph-Based Self-Calibration Technique for Cable-Driven Robots with Sagging Cable," *2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2024)*, [PDF].
- M. Vakili, A. S. Mirjalili, **M. R. Dindarloo**, Ali. Sharifi, and H. D. Taghirad, "Arastronaut: An Open Source UWB/IMU Hardware and Software for Indoor Positioning," *2024 12th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM 2024)*, [PDF].
- D. A. Nejad, A. Sharifi, **M. R. Dindarloo**, A. S. Mirjalili, S. A. Khalilpour, and H. D. Taghirad, "Control of Cable Driven Parallel Robots Through Deep Reinforcement Learning," *2024 12th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM 2024)*, [PDF].
- A. Sharifi, M. Vakili, **M. R. Dindarloo**, A. S. Mirjalili, S. A. Khalilpour, B. Tavassoli, and H. D. Taghirad, "Graph-Based Simultaneous Localization and Calibration for Planar Cable-Driven Parallel Robots," *2024 12th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM 2024)*, [PDF].
- R. Khorrambakht, H. Damirchi, **M. R. Dindarloo**, A Saki, S. A. Khalilpour, H. D. Taghirad, and Stephan Weiss, "Graph-Based Visual-Kinematic Fusion and Monte Carlo Initialization for Fast-Deployable Cable-Driven Robots," *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2023)*, [PDF].

- **M. R. Dindarloo**, A. S. Mirjalili, R. Khorrambakht, S. A. Khalilpour, P. Cardou and H. D. Taghirad, "Kinematic Calibration of a Spherical Parallel Robot," *2023 11th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM 2023)*, [PDF].
- A. Rashvand, R. Heidari, M. Motaharifar, A. Hassani, **M. R. Dindarloo**, M. J. Ahmadi, K. Hashtrudi-Zaad, M. Tavakoli, H. D. Taghirad, "An observer-based responsive variable impedance control for dual-user haptic training system," *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022)*, [PDF].
- M. M. Kalantari, R. Khorrambakht, **M. R. Dindarloo**, S. A. Khalilpour, H. D. Taghirad, P. Cardou, "Marker Correspondence Initialization in an IR Motion Capturing System," *2022 10th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM 2022)*, [PDF].
- A. Hassani, **M. R. Dindarloo**, R. Khorrambakht, A. Bataleblu, R. Heidari, M. Motaharifar, S. F. Mohammadi, H. D. Taghirad, "On The Dynamic Calibration and Trajectory Control of ARASH: ASiST," *2022 8th IEEE International Conference on Control, Instrumentation and Automation (ICCIA 2022)*, [PDF].
- A. Hassani, **M. R. Dindarloo**, R. Khorambakht, A. Bataleblu, H. Sadeghi, R. Heidari, A. Iranfar, P. Hasani, N. S. Hojati, A. Khorasani, N. KhajeAhmadi, M. Motaharifar, H. Riazi-Esfahani, A. Lashay, S. F. Mohammadi, H. D. Taghirad, "Kinematic and dynamic analysis of ARASH:ASiST Toward micro positioning," *2021 9th IEEE RSI International Conference on Robotics and Mechatronics (ICRoM 2021)*, [PDF].

WORK EXPERIENCE

- Medical Robotics Engineer at Farabi Eye Hospital, Tehran University of Medical Sciences — 2019-2025
  - Developing eye surgery training systems in collaboration with eye surgeons — Part-time
- Robotics Engineer at ARASRobot, K. N. Toosi University of Technology — 2020-2025
  - Designing control and electrical systems and algorithms for robotic platforms — Full-time

TEACHING EXPERIENCES

- **Nonlinear Control System, Linear Control System, Industrial Control System, Robotics** - Instructor: Prof. Hamid D. Taghirad [Scholar]
- **Signals and Systems** - Instructor: Dr. Lotfollah Beygi [Webpage]
- **Engineering Economics** - Instructor: Dr. Amirhossein Nikoofard [Scholar]

SKILL AND PROFICIENCY

- **Programming Languages**: Python, C/C++, MATLAB, Maple
- **Embedded Systems**: ROS, STM32CubeMX, Raspberry Pi, Arduino
- **Software**: Altium Designer, Simulink, RecurDyn, MuJoCo
- **Languages**: Persian, English (TOEFL iBT: 91/120 - R: 23, L: 24, S: 21, W: 23).

REFERENCES

- **Prof. Hamid D. Taghirad**
  Professor, Director of the Advanced Robotics and Automated System (ARAS), Faculty of Electrical Engineering, K.N. Toosi University of Technology, Tehran, Iran.
  Email: taghirad@kntu.ac.ir
- **Prof. Philippe Cardou**
  Professor, Robotics Laboratory, Department of Mechanical Engineering, Laval University, Québec, Canada.
  Email: pcardou@gmc.ulaval.ca