Ali Rabiee

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Summary

PhD student and University Fellow specializing in Reinforcement Learning, Computer Vision, and Signal Processing. Experienced in Sim2Real applications and brain-computer interfaces. Research focuses on autonomous and shared autonomy systems, human-in-the-loop intelligent agents, and medical robotics. Currently leading NSF/NIH-funded projects in human-centered AI for assistive and rehabilitation robotics.

Education

Ph.D. In Electrical Engineering (Medical Robotics and BCI systems) 2023 - Present
University of Rhode Island *Kingston, RI, US*

- Thesis: Human-Inspired Vision-Based Reaching and Grasping in Assistive Robotic Arms
- GPA: 3.90/4.00

M.S. In Computer Engineering (Artificial Intelligence and Robotics) 2020 - 2022
Sharif University of Technology *Tehran, Iran*

- Thesis: Portfolio Formation Using Deep Learning
- GPA: 4.00/4.00

B.S. In Electrical Engineering (Control Systems) 2015 - 2020
K. N. Toosi University of Technology *Tehran, Iran*

- Thesis: Design and Fabrication of a Novel and Inexpensive Fire Alarm System
- GPA: 3.52/4.00

Research Experience

Graduate Research Assistant (Ph.D.) Kingston, RI, United States
Translational Neurorobotics Lab, University of Rhode Island *2023 - Present*

- Developed autonomous reach-to-grasp systems for assistive robotics using reinforcement learning algorithms including DQN, TD, TRPO, PPO, and integrated robot vision for precise object manipulation.
- Designed and implemented multimodal frameworks for shared autonomy and human-in-the-loop systems by combining biosignal processing, computer vision, and reinforcement learning techniques to create adaptive, human-centered control strategies.
- Applied imitation learning techniques, such as inverse reinforcement learning, to improve shared autonomy systems in human-robot collaboration scenarios.
- Developed and tested robotic control systems in ROS (Robot Operating System), creating simulation environments for Sim2Real applications to transfer reinforcement learning models from simulated tasks to real-world assistive robotics platforms.
- Implemented Kalman filters for rehabilitation robots to improve state estimation, motion tracking, and stability.
- Authored and co-authored scientific papers for publication in peer-reviewed journals and conferences.
- Led data collection, experiment design, and analysis throughout the research lifecycle, presenting findings at seminars and conferences.
- Supported grant writing and research proposal development for NSF/NIH-funded projects.
- Assisted in the peer review process for papers in related fields, contributing to scientific discourse.

Graduate Research Assistant (M.S.) Tehran, Iran
Digital Signal Processing Laboratory (DSPL), Sharif University *2020 - 2022*

- Specialized in time-series analysis for financial applications, utilizing deep learning techniques with traditional signal processing approaches.
- Developed and implemented deep learning models, including LSTM and GRU architectures, for stock market prediction and financial time-series analysis.
- Designed deep reinforcement learning agents for automated trading bots.
- Published academic papers based on improvements in financial forecasting and algorithmic trading methodologies.

Work Experience

Machine Learning Engineer Tehran, Iran

HARA AI *2021 - 2022*

- Developed a car damage detection and cost estimation algorithm for insurance companies to improve claims automation efficiency.
- Implemented various computer vision techniques for various vehicle analyses, including model and color detection, and precise damage assessment.
- Implemented and optimized custom deep learning models and image processing algorithms, improving accuracy in identifying diverse vehicle parts and precisely classifying damage types.
- Presented project progress and results to stakeholders, demonstrating the system's potential for reducing manual assessment time and improving consistency in damage evaluation.

Teaching Assistant Tehran, Iran

Sharif University of Technology

- Assisted in the instruction of undergraduate/graduate-level courses in AI, Machine Learning, and Deep Learning.
- Delivered tutorials, lab sessions, and study materials to improve students' understanding of complex AI concepts.
- Designed and graded exam and quiz questions to assess students' understanding of course material.
- Collaborated to improve course content and instruction quality.

Publications (🎓Google Scholar)

Journal Articles

- Rabiee A, Ghafoori S, Beyer R, Abiri R. amplification of limited user inputs for high-dimensional manipulation tasks using human guided deep RL, *(In process)*
- Ghafoori S, Rabiee A, Jouaneh M, Abiri R. A novel seamless magnetic-based actuating mechanism for end-effector-based robotic rehabilitation platforms, *(In process)*
- Rabiee A, Ghafoori S, Cetera A, Besio W, Abiri R. A Comparative Study of Conventional and Tripolar EEG for High-Performance Reach-to-Grasp BCI Systems. IEEE Transactions on Biomedical Engineering, *Under review in IEEE Transactions on Biomedical Engineering*
- Dezhkam A, Manzuri MT, Aghapour A, Karimi A, Rabiee A, Shalmani SM. A Bayesian-based classification framework for financial time series trend prediction, *Published in The Journal of Supercomputing, March 2023*

Conference Papers

- Rabiee A, Ghafoori S, Bai X, Ostadabbas S, Abiri R. STREAMS: An Assistive Multimodal AI Framework for Empowering Biosignal Based Robotic Controls, *under review in IEEE International Conference on Robotics and Automation (ICRA) 2025.*
- Rabiee A, Ghafoori S, Cetera A, Abiri R. Wavelet Analysis of Noninvasive EEG Signals Discriminates Complex and Natural Grasp Types, *IEEE Engineering in Medicine and Biology Society 2024*
- Ghafoori S, Rabiee A, Cetera A, Abiri R. Bispectrum Analysis of Noninvasive EEG Signals Discriminates Complex and Natural Grasp Types, *IEEE Engineering in Medicine and Biology Society 2024*
- Cetera A, Rabiee A, Ghafoori S, Abiri R. Classification of Emerging Neural Activity from Planning to Grasp Execution using a Novel EEG-Based BCI Platform, *IEEE Engineering in Medicine and Biology Society 2024*

Preprints

- Abiri R, Rabiee A, Ghafoori S, Cetera A. Toward human-centered shared autonomy AI paradigms for human-robot teaming in healthcare, *arXiv preprint, 2024*

Grants

- US National Science Foundation (NSF) 2023. Award ID: 2245558.
- National Institute of General Medical Sciences of the National Institutes of Health (NIH). Grant number P20GM103430.

Technical Skills

Programming: Python, C++, MATLAB, SQL
Machine Learning & AI: TensorFlow, PyTorch, Scikit-learn, Keras, Reinforcement Learning, OpenAI Gym
Robotics: ROS, MoveIt, PyBullet, Gazebo, PID Controllers, kinematics
Computer Vision: Object Detection & Recognition (YOLO, Semantic Segmentation), SLAM, 3D Vision & Pose Estimation, Multi-View Geometry, Image Processing (OpenCV, PIL)
Data Analysis & Visualization: NumPy, Pandas, Matplotlib, Seaborn, Plotly, SKLearn, SciPy
Tools: Git, GitHub, Docker, Streamlit
Hardware: Sensor fusion, Microcontroller programming (Arduino, Raspberry Pi)

Sample Projects

- **Adaptive Robotic Control for Users with Severe Impairments using DRL**
  Developed a system that optimizes mapping from low-DoF inputs to high-dimensional robotic actions, enabling intuitive control for users with severe impairments. It uses adaptive goal prediction and reinforcement learning to guide actions in real-time, seamlessly blending user input with autonomous assistance. GitHub Link
- **STREAMS (Self-Training Robotic End-to-end Adaptive Multimodal Shared autonomy)**
  Developed a deep reinforcement learning framework that combines environment data and noisy user input to produce smooth, stable end-effector trajectories for assistive robots. GitHub Link
- **Kinova RL: a ROS package for Shared Control Deep Reinforcement Learning**
  This ROS package implements a shared control Deep Reinforcement Learning (DRL) system for robotic manipulation using a Kinova robotic arm. The system integrates visual input from a camera, head motion data from an IMU sensor, and a trained DQN (Deep Q-Network) agent to control the robot's actions. GitHub Link
- **YOLO-ROS: Object Detection and Gripper Control Integration**
  This ROS package integrates YOLO object detection with a robotic arm control system, utilizing Kinova gripper finger positions and head position feedback for automating grasp and release actions. The detected objects are processed and published along with segmentation masks and image annotations. GitHub Link
- **Dual-Mode Robotic Arm Control with GUI and IMU Integration**
  This project integrates a graphical user interface (GUI) with an inertial measurement unit (IMU) sensor to provide dual-mode control of a robotic arm. Users can choose to control the robotic arm by clicking on cursor buttons in the GUI or by using the IMU sensor to move the cursor for button selection. GitHub Link
- **Real-time Face Orientation Detection**
  Developed a real-time video processing application that detects human faces and determines the orientation of the head for robot control applications. GitHub Link
- **Panorama Creation via Harris Corner Detection and Image Stitching**
  This project involves the creation of panoramic images by detecting key interest points in multiple images using the Harris corner detector. After identifying these points, the project matches them between images and computes the homography to accurately align and stitch the images together, resulting in panoramic views. GitHub

Certifications

- **Docker & Kubernetes**, *Udemy, Sep 2024,* Certificate
- **Human Subject Research**, *CITI Program, Jan 2023,* Certificate
- **Responsible Conduct of Research CITI**, *CITI Program, Jan 2023,* Certificate
- **Getting and Cleaning Data**, *Johns Hopkins University, Coursera, Feb 2021,* Certificate

Honors & Awards

- **First-year Doctoral Fellowship winner** at University of Rhode Island, 2022
- **Ranked 1st** in Cumulative GPA among my peers for masters' degree, Tehran, Iran, 2022
- **Ranked 1st** in National University Entrance Exam for M.S. of Computer Engineering, Tehran, Iran, 2020
- **Finalist** in 25th Scientific Olympiads for University Students in 2020, Tehran, Iran
- **Ranked among top 10 students** in Cumulative GPA among undergraduate students at K. N. Toosi University, Tehran, Iran, 2019
- **Selected member** of Scientific Association for Electrical Engineering at K. N. Toosi University, Tehran, Iran, 2018
- **Ranked 817th** among more than 200,000 participants in National University Entrance Exam for B.S. degree, Tehran, Iran, 2015