

# AFAGH (AVA) MEHRI SHERVEDANI

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## EDUCATION

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- PhD, Electrical and Computer Engineering** 2019 - Present(Dec 2024)  
University of Illinois Chicago, USA.
- Bachelor of Science, Electrical Engineering** 2013 - 2018  
Sharif University of Technology, Tehran, Iran.

## SKILLS

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- Programming Languages/API** Python (TensorFlow, Keras, PyTorch, OpenCV, Jupyter NB, Google Colab), Google Cloud, MATLAB/Simulink, C/C++, SQL
- Robotic Platforms** ROS (Robotic Operating System), UR10e Robot (Universal Robots), AlphaBot Robot (Waveshare), NAO Robot (Aldebaran Robotics), Baxter Robot (rethinkrobotics), Raspberry Pi, IMU, RFT Sensor, Microsoft Kinect, Turtlebot3, Gazebo

## WORK EXPERIENCE

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- Intern Supervisor, UIC, ECE Department, Chicago, IL** July. 2023 - Aug 2023
- Defined and assigned two different projects on robotics for two junior undergraduate students. Supervised and taught problem-solving, teamwork, and time management to them. (Kinect Camera, Baxter Robot, Keras, Tensorflow, Python, Google Colab, Jupyter NB)
- Undergrad Research Project Supervisor, UIC, ECE Department, Chicago, IL** Jan. 2022 - May 2022
- Coached a team of four undergraduate students. Taught principals of neural networks, LSTMs, object-oriented programming, and interactive Python programming to the team. Guided the team to utilize LSTMs in a ***haptic-ostensive action recognition*** task. (Keras, Tensorflow, Python, Google Colab, Jupyter NB)
- Intern, Emory University, Alphanumeric Lab, Department of Biomedical Informatics, Atlanta, GA** Summer 2021
- Developed signal processing algorithms in Python to extract ECG signal data points from colored ECG images. This work will be open-sourced. (OpenCV, Python)
  - Converted pre-developed signal processing algorithms from MATLAB to Python. (MATLAB, Python)
- Teaching Assistant, UIC, ECE Department, Chicago, IL** Aug. 2019 - Present
- Taught ECE 350 Principles of Automatic Control
- Intern, Maharban Company, Tehran, Iran** Summer 2016
- Developed an algorithm based on graph theory to minimize the required time for automatic cyclic check of logical control sequences. (MATLAB)

## RESEARCH EXPERIENCE

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- Research Assistant, Robotics Lab, ECE Department, UIC, Chicago, IL.** Aug. 2019 - Present
- Developed and enhanced a data-driven NN agent acting as a human in a ***goal-oriented multi-modal task***; developed a ***data augmentation*** module to balance the data-set, devised ***additional input features*** for the network, and improved the overall ***classification accuracy*** from  $\sim 23\%$  to  $\sim 70\%$ . (PyTorch, Python)
  - Developed a ***deep Q-learning algorithm*** to have an assistive robot as a DQN agent, learning the optimal policy for a ***goal-oriented multi-modal task*** while communicating with a pre-trained AI (NN) agent and evaluated the agent by having ***human subjects*** interact with it; enhanced the performance by warming up the agent in an ***imitation learning cycle***, developed a ***DA classifier*** by deploying and fine-tuning ***Sentence-BERT*** language model for evaluation phase and utilized ***Google Cloud Speech-to-Text API*** for evaluation phase. (PyTorch, Python, Google Cloud)

- Collaborated in developing a framework to have the robot arm as an active collaborator in a physical collaboration with human for carrying an object; developed a **LDA model for online human intent recognition**, improved the **object localization/pose estimation** module by engineering and constructing an aruco board compatible with the object manipulated in the task; optimized the **accuracy of localization/pose estimation** by developing and training a neural network which gets the measurements of each individual marker in the board and estimates the pose of the entire board, and implemented and delivered the **kinematics measurement** module by utilizing the IMU-mpu9255. (UR10e Robot, Raspberry Pi, IMU-mpu9255, RFT Sensors, Aruco markers, Camera Calibration, ROS, OpenCV, Python)

## PUBLICATIONS

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### Published

- **A. Mehri Shervedani et al.**, “Evaluating Multimodal Interaction of Robots Assisting Older Adults”, ICSR 2022 Workshop on Evaluating Social Assistive Robots in Healthcare, 14th International Conference on Social Robotics, Florence, Italy, 2022.
- **A. Mehri Shervedani, S. Li, N. Monaikul, B. Abbasi, B. Di Eugenio, M. Žefran**, “An End-to-End Human Simulator for Task-Oriented Multimodal Human-Robot Collaboration”, IEEE RO-MAN 2023, Busan, South Korea, Aug 2023.

### Submitted

- **A. Mehri Shervedani, S. Li, N. Monaikul, B. Abbasi, B. Di Eugenio, M. Žefran**, “Learning Multimodal Interaction Manager for Assistive Robots from Human-Human Data”, LangRob Workshop, 2023 CORL, Atlanta, GA, USA, Nov 2023.
- **Z. Rysbek, S. Li, A. Mehri Shervedani, M. Žefran** “Proactive Robot Control for Collaborative Manipulation Using Human Intent”, IEEE ICRA 2024, Yokohama, Japan, May 2024.
- **K. Kodthalu Shivashankara, A. Mehri Shervedani, R. Sameni**, “A Synthetic Electrocardiogram (ECG) Image Generation Toolbox to Facilitate Deep Learning-Based Scanned ECG Digitization”, IEEE Access (2023).

### Ready to Submit

- **A. Mehri Shervedani, S. Li, N. Monaikul, B. Abbasi, B. Di Eugenio, M. Žefran**, “Multimodal Reinforcement Learning for Robots Collaborating with Humans”.
- **Z. Rysbek, KH. Oh, A. Mehri Shervedani, T. Klemenči, B. Di Eugenio, M. Žefran** “Robots Taking Initiative in Collaborative Object Manipulation: Lessons from Physical Human-Human Interaction”.

## COURSE PROJECTS

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### Machine Learning

- Designed an image compressor that utilizes a competitive learning algorithm.
- Developed a character-level text generation LSTM to generate human names.
- Implemented back-propagation algorithm from scratch to solve a multi-class classification problem.

### Reinforcement Learning

- Implemented Q-learning algorithm from scratch to maximize an agent’s reward in a gold-mining  $n \times n$  grid environment.

### Robotics/Algorithm

- Implemented Bug1 and Bug2 algorithms and applied them to Turtlebot3 robot to achieve a certain goal in a maze world in Gazebo simulation environment.
- Assembled, configured and programmed AlphaBot robot to follow a path.

### Artificial Intelligence

- Implemented breadth-first search, iterative deepening depth-first search, A\* search, and iterative deepening A\* search algorithms to find the solution to any given board position for the 15 puzzle.
- Solved a Markov decision process problem for a generic grid world using value iteration and modified policy iteration algorithms.

### Dynamic Programming

- Solved real-world dynamic programming problems such as subset-sum, maximum span, and shortest path and applied.

### **Optimization/Control**

- Designed an Inerter-based dynamic vibration absorber in MATLAB/Simulink and optimized it using mixed  $H_2$ - $H_\infty$  optimization and developing linear matrix inequality method. (MATLAB, Simulink)

### **HONORS AND AWARDS**

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- UIC Electrical and Computer Engineering Graduate Student Award, 3000\$ grant awarded to top admitted graduate students. September 2019
- Ranked top 1% of participants in Universities National Entrance Exam, Iran. June 2013

### **EXTRA-CURRICULAR ACTIVITIES**

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#### **Reviewer**

- IEEE International Conference on Robotics and Automation (ICRA 2024)
- IEEE Access Journal, 2023

#### **Organizer**

- **Vice-Chair** of Water and Energy Nexus Event, The 13th Seminar of Electrical Engineering Department, Sharif University of Technology, Tehran, Iran. Jun 2015 - Mar 2016
- **Cultural Vice** of Water Event, an event on water problems in Iran, “Sharif Green Society” and “University of Tehran Zista group”, Sharif University of Technology and University of Tehran, Tehran, Iran. Oct 2015
- Active member of ”Sharif Green Society”, Sharif University of Technology, Tehran, Iran. 2014 - 2018