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Hamid Osooli

Education

2024–present **Ph.D.**, *Aerospace Engineering*, AI & Robotics, University of Illinois Urbana-Champaign (UIUC)
Advisor: Dr. H. Tran
Courses: **Statistical Reinforcement Learning, Using LLMs, Topics in LLM Agents, Formal Methods in AE Robotics**, GPA: 4.0/4.0

2021–2024 **M.Sc.**, *Computer Science*, AI & Robotics, University of Massachusetts Lowell (UML)
Thesis: **A Multi-Robot Task Assignment Framework for Search and Rescue with Heterogeneous Teams**, Advisor: Dr. R. Azadeh
Courses: **Algorithms, Reinforcement Learning, Deep Learning, Deep Learning for NLP (LLMs), Fundamentals of Robotics, Human-Robot Interaction**, GPA: 3.78/4.0

2017–2019 **M.Sc.**, *Aerospace Engineering*, Flight Dynamics and Control, K. N. Toosi University of Technology (KNTU)
Thesis: **An Integrated Control Algorithm for Camera and Flying Object Movement based on Game Theory**, Advisor: Prof. J. Roshanian
Courses: **Advanced Control, Optimal Control, Nonlinear Control, Game theory, Dynamic systems modeling**, GPA: 16.21/20

2011–2016 **B.Sc.**, *Mechanical Engineering*, Solid Mechanics, University of Kashan
Thesis: **Making a Robot Inspired by the Human Eye, Grade: 20/20**, Advisor: Dr. M. Irani rahaghi
Courses: **Automatic Control and lab, Robotics and lab, Dynamic systems simulation and control**

2011–2013 **B.Sc.**, *Information Technology Engineering*, Isfahan University of Technology
After four semesters I changed my major and university (no degrees earned)
Courses: **Computer programming and lab, Advanced programming and lab, Digital design and lab**

Skills

- **Programming:** Python, C, C++, Java, MATLAB, HTML, LaTeX
- **Robotics:** ROS/ROS 2, Robotic Eye (author and maintainer), Duckiebot (DB-J), Turtlebot 4, Sensor fusion
- **API/Tools:** PyTorch, TensorFlow, scikit-learn, YOLO, OpenCV, Git, SQL
- **Mechanical Design:** Autodesk Inventor, Solid Works, CATIA
- **Simulation:** Simulink, 20-sim, Adams, Ansys Gambit & Fluent
- **Web developing:** HTML, PHP, Drupal CMS, Joomla CMS

- **Image/Video Editing:** Adobe Photoshop, Adobe Premiere

Experience

Research

Aug 2024 – Present
Research Assistant, *Dr. Huy Tran*, Lab for Intelligent Robots and Agents (LIRA), Urbana, IL, United States

Robotics
Tasks: Designed a grid following behavior for the Turtlebot 3 robots using a PID controller for odometry, Vicon, and Qualysis motion capture systems in ROS 2 (Ubuntu 22, ROS 2 Humble); Designed a ROS 2 publisher node for the Qualysis motion capture system; Extended the grid following behavior to multiple robots through parallel commands in Python over different `ROS_DOMAIN_IDs` and `ROS_NAMESPACE`.

Multi-Agent Reinforcement Learning
Tasks: Implemented Counterfactual Policy Gradient (COMA) from scratch; Added Difference Rewards Reinforce (Dr. Reinforce) algorithm to the epymarl library; Added Disentangling Successor Features (DISSC) algorithm to the epymarl library.

Aug 2024 – Dec 2024
Teaching Assistant, *Prof. Timothy Bretl*, AE 483 - Autonomous Systems Lab, Urbana, IL, United States

Transformed 3D tracking data from the Qualysis motion capture system for drone applications; Calculated inertial parameters to enhance drone performance and stability; Designed and tuned a Linear Quadratic Regulator (LQR) controller for optimized drone control; Improved drone accuracy through Root Mean Square Error (RMSE) analysis; Implemented both offline and online observers for real-time drone monitoring and control.

Aug 2021 – Aug 2024
Graduate Research Assistant, *Dr. R. Ahmadzadeh*, Computer Science Department, University of Massachusetts Lowell, Lowell, MA, United States

Legible Co-Adaptation of Wearable Devices for As-Needed Assistance of Arm Motion; Funded by the National Science Foundation (NSF, Amount: $538,000)
Tasks: Controlling the Myopro exoskeleton using (continuing) dyna-actor-critic, **Designed and 3D printed a pressure sensor holder for the Myopro exoskeleton by Autodesk Inventor**, Modeling the interaction between the user and Myopro exoskeleton using **Locally Weighted Projection Regression (LWPR), K-Nearest Neighbors (KNN), Support Vector Regression (SVR), Gaussian Process Regression (GPR), eXtreme Gradient Boosting (XGBoost), Multi Layer Perceptron (MLP)** methods, leveraging built-in **sEMG sensors** and fusing the data from APDM **IMU sensors**.

Trust Network Emergence Amongst Resource-Constrained Human-Agent Teams; Funded by DEVCOM Army Research Lab (ARL, Amount: $1,500,000)
Tasks: Developed a **multi-robot task assignment** framework; Designed, conducted, and recorded the **real-world experiments on ROS 2 with Turtlebot 4**; Developed a **multi-agent search and rescue with Q-learning** framework; Performed experiments on agent's competency in **belief space**; Devised a **game theory hierarchical algorithm** and presented the work at the Northeast Robotics Colloquium (NERC 2022), **Implemented the following Reinforcement learning algorithms from scratch:** Sample-Average Algorithm, Gradient Bandit algorithm, Value Iteration Algorithm, First-visit Monte Carlo prediction, off-policy Monte Carlo control with weighted importance sampling, Episodic Semi-gradient SARSA, Episodic Semi-gradient, n-step SARSA, Q-Learning, Double Q-Learning, REINFORCE, REINFORCE with Baseline, One-step Actor Critic, Actor Critic with Eligibility Traces (episodic & continuing) for discrete and continuous actions, Distributed Q-learning, Dyna-Actor-Critic, Deep Q Network (DQN)

Dec 2019 – Mar 2020 **Senior Research Fellow**, *Dr. M. Ravandi*, Mechanical Engineering Department, K. N. Toosi University of Technology, Tehran, Iran

A feasibility study on methods regarding inspection of subsea assets, in order to make a Remotely Operated Vehicle (ROV) similar to Halfwave ARTEMIS

Tasks: *Doing research on relevant methods, Writing technical reports,* ***Designing a CAD model for concrete coated pipes****, Making a test specimen of the pipes*

Nov 2018 – Dec 2019 **Researcher**, *Dr. A. H. Nikoofard*, Electrical Engineering Department, K. N. Toosi University of Technology, Tehran, Iran

Hardware implementation of Game theory on Eye Robot movements

Tasks: *Devising Game theoretical control algorithms for Eye Robot, Coding the methods in MATLAB, Implementation of algorithms on Eye Robot, Presentation of the work in scientific papers*

Sep 2018 – Jul 2019 **M. Sc. Thesis**, *Prof. J. Roshanian*, Aerospace Engineering Department, K. N. Toosi University of Technology, Tehran, Iran

An integrated control algorithm for camera and flying object movement on the basis of Game theory

Tasks: *Devising game theoretical control algorithms to control flying object and the mounted camera simultaneously, Simulating the methods in MATLAB, Presentation of the work in scientific papers, Providing a defence presentation*

Jan 2018 – Jul 2018 **M. Sc. Seminar**, *Prof. J. Roshanian*, Aerospace Engineering Department, K. N. Toosi University of Technology, Tehran, Iran

Applications of Game theory in Aerospace Problems

Tasks: *Doing research on relevant methods, Writing a report, Providing a defence presentation*

Jun 2016 – Sep 2017 **Researcher**, *Dr. M. Irani rahaghi*, Robotics Laboratory, Mechanical Engineering Department, University of Kashan, Kashan, Isfahan, Iran

Programming and control of Eye Robot

Tasks: *Coding the control methods in MATLAB, Presentation of the work in scientific papers*

Sep 2015 – Jun 2016 **B.Sc. Final Project**, *Dr. M. Irani rahaghi*, Mechanical Engineering Department, University of Kashan, Kashan, Isfahan, Iran

Making a robot inspired by the human eye

Tasks: *Computer aided design of the robot body inspired by the human eye and extra-ocular muscles, 3D printing of the robot, Developing a MATLAB toolbox (XL_320 Toolbox) for the servomotors to communicate with the controller board via MATLAB, Writing a technical report*

Work

May 2023 – Aug 2023 **Robotics Supervisor**, *PeARL lab*, University of Massachusetts Lowell, Lowell, MA, US

Tasks: *Mentoring a group of K-12 students for controlling a humanoid robot through visual input and implement depth estimation and tracking algorithms.*

Jul 2020 – Aug 2021 **Data scientist**, *Dr. F. Vesali*, PANTOhealth, Berlin, Germany

Tasks: *Accelerating simulation codes for the interaction of rail vehicle pantograph and catenary, Developing big-data state-space model simulation in MATLAB, Python and C++ and speed comparison, Writing technical reports*

Mar 2020 – Jul 2020 & Feb 2021 – Jul 2021
Teaching Assistant (TA), *Dr. M. Farrokh*, Aerospace Engineering Department, K. N. Toosi University of Technology, Tehran, Iran
Algorithms and Computer Programming in Python
Tasks: *Solving class assignment problems for students, Proof reading the students assignment codes and papers*

Jul 2017 – Sep 2017
English Language Teacher, BSCL, Beinolmelal Specialized Centre of Language, Kashan, Isfahan, Iran
Tasks: *Teaching English language to pre-intermediate and intermediate level students*

Jul 2016 – Aug 2016
Mechanical Engineering Intern, *Prof. A. Ghorbanpour Arani*, Copper World Company, Kashan, Isfahan, Iran
Tasks: *Collaboration with staff, Computer aided design of the broken parts, Writing technical reports*

Jan 2014 – Jan 2016
Website Administrator, Parsa Language School, Kashan,Isfahan, Iran
Tasks: *Design of website by Drupal and students information system by PHP, Customizing the website for the school, Management of the students database*

Publications

- **Releaf: An Efficient Method for Real-time Occlusion Handling by Game Theory**, MDPI Sensors, **Special issue:Feature Papers in Intelligent Sensors 2024**
  Hamid Osooli, Nakul Joshi, Pranav Khurana, Amirhossein Nikoofard, Zahra Shirmohammadi, Reza Azadeh
- **Investigating the Generalizability of Assistive Robots Models over Various Tasks**, The 21st International Conference on Ubiquitous Robots **(UR 2024)**
  Hamid Osooli, Christopher Coco, Johnathan Spanos, S. Reza Ahmadzadeh
- **Design of Fuzzy Logic Parameter Tuners for Upper-Limb Assistive Robots**, The 21st International Conference on Ubiquitous Robots **(UR 2024)**
  Christopher Coco, Johnathan Spanos, Hamid Osooli, S. Reza Ahmadzadeh, [Best WIP Paper Award Finalist]
- **Influence of Team Interactions on Multi-Robot Cooperation: A Relational Network Perspective**, IEEE International Symposium on Multi-Robot & Multi-Agent Systems **(MRS 2023)**
  Yasin Findik*, Hamid Osooli*, Paul Robinette, Kshitij Jerath, S. Reza Ahmadzadeh, [35% acceptance rate]
- **A Multi-Robot Task Assignment Framework for Search and Rescue with Heterogeneous Teams**, The 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems **(IROS 2023 Multi-Agent Learning Workshop)**
  Hamid Osooli, Paul Robinette, Kshitij Jerath, S. Reza Ahmadzadeh
- **Design and Evaluation of a Bioinspired Tendon-Driven 3D-Printed Robotic Eye with Active Vision Capabilities**, The 20th International Conference on Ubiquitous Robots **(UR 2023)**
  Hamid Osooli, Mohsen Irani Rahaghi, S. Reza Ahmadzadeh
- **Game Theory for Eye Robot Movement: Approach and Hardware Implementation**, 27th Iranian Conference on Electrical Engineering **(ICEE 2019)**
  Hamid Osooli, Amir Hossein Nikoofard, Zahra Shirmohammadi

- **Making a robot inspired by the human eye (in Persian)**, The 25th International Conference of the Iranian Society of Mechanical Engineers **(ISME 2017)** Hamid Osooli, Mohsen Irani Rahaghi

Service

Peer Review

- **The Journal of Supercomputing**, Springer, (3 Papers)
- **Mathematical Problems in Engineering**, Hindawi, (3 Papers)
- **IEEE International Conference on Robotics and Automation**, ICRA, (3 Paper)
- **IEEE/RSJ International Conference on Intelligent Robots and Systems**, IROS, (2 Papers)
- **International Conference on Ubiquitous Robots**, UR, (3 Papers)
- **IEEE Conference on Decision and Control**, CDC, (2 Papers)

Awards, Honors

- **Our poster** was an *award finalist* in Ubiquitous Robots (UR) 2024, Jul, 2024
- **Robotic Ophtalmotrope (Eye Robot)** was appreciated as a *Praiseworthy Initiative* in Khayyam International Invention and Innovation Festival, May, 2021
- **Ranked 4'th in M.Sc. studies**, 2020
- **XL_320 Toolbox** earned the Personal Best Downloads Level 1 badge in MATLAB File Exchange, Nov 1, 2019
- **On-time MSc Thesis Defence and Graduation** The first and only defence after 4 semesters, among all 50 Aerospace Engineering students who were admitted in Fall 2017, Aug 1, 2019
- **Graduate Scholarship** Ministry of Science, Research and Technology, Iran, 2017-2019
- **Undergraduate Scholarship** Ministry of Science, Research and Technology, Iran, 2011-2016
- **Khwarizmi award** in the local section, 2008, for the Magnetic Bicycle Idea
- **Ranked 2'nd in the city**, 2006, in Computer Olympia
- **14 medallions** in Taekwondo Kiu-rogi
- **2 medallions** in Taekwondo Poomsae
- **Membership** in Kashan selected Taekwondo players team, 2005-2010

Certifications

- **Khayyam International Invention/Innovation Festival, May 15, 2021, Certificate of Appreciation and Participation**
- **Responsible Conduct of Research Course**, CITI Program, Dec 2021
- **Social and Behavioral Research**, CITI Program, Dec 2021
- **Machine Learning**, By Dr. Andrew Ng, Stanford University, Coursera
- **Writing in the Sciences**, By Dr. Kristin Sainani, Stanford University, Coursera

- **Game Theory**, By Prof. Matthew O. Jackson, Prof. Kevin Leyton-Brown, Prof. Yoav Shoham, Stanford University, The University of British Columbia, Coursera
- **Control of Mobile Robots**, By Prof. Magnus Egerstedt, Georgia Institute of Technology, Coursera
- **Computer Vision Basics**, By Dr. Junsong Yuan, Radhakrishna Dasari, University at Buffalo & The State University of New York, Coursera
- **"The Complete Python 3 Course: Beginner to Advanced"**, By Joseph Delgadillo, Nick Germaine, Udemy
- **"Tensorflow 2.0: Deep Learning and Artificial Intelligence"**, By The Lazy Programmer, Udemy
- **"27'th Iranian Conference on Electrical Engineering"**, (ICEE 2019), Yazd University, Paper Presentation
- **25'th Annual International Conference on Mechanical Engineering**, (ISME 2017), Iranian Society of Mechanical Engineers, Paper Presentation
- **Taekwondo Kiu-rogi Referee**, 2014
- **Taekwondo 3'rd Dan Black Belt**, 2011, Iran Taekwondo Federation

Languages

- **English:** Highly Proficient
- **Persian:** Highly Proficient (Native)
- **Arabic:** Intermediate
- **German:** Beginner

Teaching Experience

- **Algorithms and Computer Programming in Python**, Teaching Assistance (TA), Spring 2020 and 2021
- **English Language**, Language school teacher, Private lecturing, 2017-2018
- **Computational Fluid Dynamics (CFD)**, Private lecturing, 2015
- **Automatic Control**, Private lecturing, 2015
- **Mechanical Vibrations**, Private lecturing, 2014
- **Computer Programming in C**, Private lecturing, 2013
- **Taekwondo**, Senior instructor, 2008-2009 and 2014