

Soheil Habibian

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RESEARCH INTERESTS

machine learning • artificial intelligence • robot learning • human-robot collaboration.

EDUCATION

Virginia Polytechnic Institute and State University, Blacksburg, VA 2020–2024

Ph.D., Mechanical Engineering (AI & Robotics)

Dissertation: Exploring Communication-Driven Robot Learning for Human-Robot Collaboration

Relevant Coursework: Advanced Machine Learning, Deep Learning Specialization, Udacity Generative AI Program, Reinforcement Learning, Advanced Computer Vision, Human-Robot Interaction, Data Structures and Algorithms.

Bucknell University, Lewisburg, PA 2017–2020

M.Sc., Mechanical Engineering

Thesis: Analysis and Control of Fiber-Reinforced Elastomeric Enclosures

Qazvin Azad University, Qazvin, Iran 2009–2015

B.S., Mechanical Engineering

Honors Thesis: Design and Implementation of a Tele-operative Response Robot

SOFTWARE SKILLS

Programming Languages: Python, C++, MATLAB, R

ML/AI: PyTorch, TensorFlow, Keras, Hugging Face, Scikit-learn, Active Learning, Imitation Learning, Deep Learning, Reinforcement Learning, Computer Vision, Generative AI, Transfer Learning

Development Tools: PyBullet, Gymnasium, MuJoCo, Unity, ROS, OpenCV, SolidWorks, ABAQUS, Mastercam, Arduino, LabVIEW

Other Technical Skills: GitHub, L^AT_EX, Linux, SPSS, Amazon Mechanical Turk

RESEARCH EXPERIENCE

Visiting Researcher, Purdue University, West Lafayette, IN Nov 2024–Present

- Assisting students and researchers in the RAAD Lab with implementing learning and control algorithms on a Franka Emika robotic arm.

Graduate Research Assistant, Virginia Tech, Blacksburg, VA Dec 2020–Aug 2024
Collaborative Robotics Lab

- Developed an LLM-based proxy human model using retrieval-augmented generation to optimize the pre-training of robot agents for adaptive human-robot collaboration.
- Architected a saliency-based supervised learning model to enhance bi-directional communication via augmented reality in interactive robot learning scenarios.
- Developed a learning-from-demonstrations imitation learning algorithm to use haptics to enhance robot learning from human feedback.
- Implemented a representation learning approach with recurrent neural networks to transfer learning to collaborate with unseen users in long-term interactions.
- Created a Bayesian optimization approach for incorporating fairness and legibility in human-robot teams.
- Developed an online preference-based learning algorithm for efficient and transparent robot learning.

Research Intern, Honda Research Institute, San Jose, CA Jan 2023–May 2023
Human Factors and Ergonomics Group

- Developed an experimental framework to analyze human cognitive states during human-automation interactions in hybrid mobility environments.
- Created and validated tools to optimize system performance based on predicted human states.

Graduate Research Assistant, Bucknell University, Lewisburg, PA Aug 2017–Jan 2020
Integrated Design Manufacturing Robotics Lab

- Developed a dynamic lumped-parameter model and a finite element model to study the practicality of a fiber-reinforced soft robotic actuator for use in robotic arms.
- Developed a controller-based trajectory following algorithm for the soft actuator.
- Conducted workspace analysis for a module of multiple soft actuators using FEA.

Undergraduate Researcher, Qazvin Azad University, Qazvin, Iran
Advanced Mobile Robotics Lab

Nov 2011–Jul 2017

- Managed projects and led an engineering team of 10+ to design and develop mobile response robots for real-life rescue missions.
- Designed and implemented a compact 7-DoF robot arm for dexterous mobile manipulation.
- Designed and implemented a tele-operative response robot for hazardous environments.
- Developed a lightweight throwable two-wheeled robot for reconnaissance missions.

JOURNAL PUBLICATIONS

S. Habibian, A. A. Valdivia, L. H. Blumenschein, and D. P. Losey, “A review of communicating robot learning during human-robot interaction,” *International Journal of Robotics Research*, 2024.

A. A. Valdivia, **S. Habibian**, C. A. Mendenhall, F. Fuentes, R. Shailly, D. P. Losey, and L. H. Blumenschein, “Wrapping Haptic Displays Around Robot Arms to Communicate Learning,” *IEEE Transactions on Haptics*, vol. 16, no. 1, pp. 57-72, 2023.

S. Habibian, A. Jonnavittula, D. P. Losey, “Here’s What I’ve Learned: Asking Questions that Reveal Reward Learning,” *ACM Transactions on Human-Robot Interaction*, vol. 11, no. 4, pp. 1-28, 2022.

S. Habibian, D. P. Losey, “Encouraging Human Interaction with Robot Teams: Legible and Fair Subtask Allocations,” *IEEE Robotics and Automation Letters*, vol. 7, no. 3, pp. 6685-6692, 2022.

M. Dadvar, **S. Habibian**, “Contemporary Research Trends in Response Robotics,” *ROBOMECH Journal*, vol. 9, no. 9, 2022.

S. Habibian, B. B. Wheatley, S. Bae, J. Shin, K. W. Buffinton, “Evaluation of Two Complementary Modeling Approaches for Fiber-Reinforced Soft Actuators,” *ROBOMECH Journal*, vol. 9, no. 12, 2022.

S. Habibian, M. Dadvar, et al., “Design and Implementation of a Maxi-Sized Rescue Robot (Karo) for Rescue Missions,” *ROBOMECH Journal*, vol. 8, no. 1, 2021.

REFEREED CONFERENCE PROCEEDINGS

S. A. Mehta, **S. Habibian**, and D. P. Losey, “Waypoint-based reinforcement learning for robot manipulation tasks,” in *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2024.

S. Parekh, **S. Habibian**, “RILI: Robustly Influencing Latent Intent,” in *Proceedings of IEEE/RSJ International Conference on Intelligent Robots and Systems*, Kyoto, Japan, 23-27 October, 2022.

K. W. Buffinton, B. B. Wheatley, **S. Habibian**, J. Shin, B. H. Cenci, and A. E. Christy, “Investigating the Mechanics of Human-Centered Soft Robotic Actuators with Finite Element Analysis,” in *Proceedings of IEEE International Conference on Soft Robotics*, New Haven, CT, 15 May - 15 July, 2020.

THESIS AND DISSERTATION

S. Habibian, “Communication-Driven Robot Learning for Human-Robot Collaboration,” *Dissertation submitted to the Faculty of the Virginia Polytechnic Institute and State University*, 2024.

S. Habibian, “Analysis and Control of Fiber-Reinforced Elastomeric Enclosures (FREEs),” *Master’s thesis submitted to the Department of Mechanical Engineering of Bucknell University*, 2019.

CONFERENCE & WORKSHOP PRESENTATIONS

“Encouraging Human Interaction with Robot Teams: Legible and Fair Subtask Allocations,” *IEEE International Conference on Robotics and Automation*, London, United Kingdom, 29 May - 2 June, 2023.

“Leveraging Roles in Robot Teams to Encourage Human Participation,” *Southeast Controls Conference*, Blacksburg, VA, 29-30 November, 2021.

“Finite Element Analysis of Fiber Reinforced Elastomeric Enclosures,” *Toyota Research Institute Workshop*, Ann Arbor, MI, 16-17 January, 2019.

HONORS & AWARDS	<ul style="list-style-type: none"> ▪ Best Application Paper Award, IEEE Transactions on Haptics 2024 ▪ Awarded Runner Up, Walter O'Brien Research Symposium, Virginia Tech 2024 Received honorable mention for outstanding research presentation. ▪ Full Scholarship, Bucknell University 2017–2019 Full-tuition scholarship with stipend to incoming master's students. ▪ Summer Research Fellowship, Bucknell University 2018 A merit-based award to the top graduate research proposal. ▪ 3rd Place Award, Rescue Robot League, RoboCup Competition, Japan 2017 ▪ 2nd Place, Rescue Robot League, RoboCup Competition, Germany 2016 ▪ Best-in-Class Exploration, Rescue Robot League, RoboCup Competition, Germany 2016 ▪ 1st Place, Rescue Robot League, RoboCup Competition, China 2015 ▪ 2nd Place, Rescue Robot League, RoboCup Competition, Brazil 2014 ▪ Best-in-Class Mobility, Rescue Robot League, RoboCup Competition, Brazil 2014 ▪ 1st Place, Rescue Robot League, RoboCup Competition, Mexico 2012
PROFESSIONAL AFFILIATIONS & ACTIVITIES	Technical Committee Member , IranOpen RoboCup Competitions 2015–2017 Co-organized competitions for objective performance evaluations of rescue robot teams.
	Engineering Director , Advanced Mobile Robotics Lab 2014–2017 Organized projects and supervised trainee students to design and implement mobile robots.
	Reviewer <ul style="list-style-type: none"> ▪ IEEE International Conference on Intelligent Robots and Systems (IROS) ▪ ACM/IEEE International Conference on Human-Robot Interaction (HRI) ▪ IEEE International Conference on Robotics and Automation (ICRA) ▪ IEEE-RAS International Conference on Soft Robotics (RoboSoft) ▪ ACM Transactions on Human-Robot Interaction (THRI) ▪ IEEE Robotics and Automation Letters (RA-L) ▪ International Journal of Advanced Robotic Systems ▪ Journal of Intelligent & Robotic Systems ▪ Robotics and Autonomous Systems ▪ Artificial Intelligence Review ▪ Journal of Field Robotics ▪ ROBOMECH Journal Journal ▪ Nature Machine Intelligence
TEACHING EXPERIENCE	Teaching Assistant , Virginia Tech, Blacksburg, VA Fall 2020 – Spring 2021 <ul style="list-style-type: none"> ▪ Mechanical Design Lab
	Teaching Assistant , Bucknell University, Lewisburg, VA Fall 2017 – Spring 2019 <ul style="list-style-type: none"> ▪ Mechanical Design ▪ Manufacturing Processes ▪ Renewable Energy Conversion
CAMPUS ACTIVITIES	Community Outreach Assistant , Pulaski Youth Center Outreach Program, Virginia Tech 2021
	Engineering Counselor , Summer Engineering Camp Program, Bucknell University 2019
	International Orientation Assistant , International Student Orientation, Bucknell University 2018
	Journal Management Assistant , Bertrand Library, Bucknell University 2018