

# Soheil Habibian

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## RESEARCH INTERESTS

Robot learning • human-robot collaboration • artificial intelligence • robotics.

## EDUCATION

**Virginia Polytechnic Institute and State University (Virginia Tech)**, Blacksburg, VA 2020–Present

Ph.D. Candidate, Mechanical Engineering

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

Relevant Coursework: Advanced Machine Learning, Deep Learning Specialization (DeepLearning.AI), Reinforcement Learning, Human-Robot Interaction, Robotics Kinematics and Mathematical Foundation (PennX).

**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

Python, PyTorch, TensorFlow, PyBullet, git, Unity, Robot Operating System (ROS), SPSS, MATLAB/Simulink, SolidWorks, ABAQUS, MasterCam, LabVIEW,  $\LaTeX$ , Linux

## RESEARCH EXPERIENCE

**Graduate Research Assistant**, Virginia Tech, Blacksburg, VA

Dec 2020–Present

*Collaborative Robotics Lab*

- Constructed an interactive learning-from-demonstration approach enabling robots to utilize saliency-based communication via augmented reality to convey learning progress to users.
- Developed a communicative supervised learning framework to help novice robot users enhance robot teaching through imitation learning.
- Implemented a representation learning approach with recurrent neural networks, enabling robots to transfer their learning for collaboration with unseen human partners.
- Created a Bayesian-based optimization approach to encourage human participation in robot teams by incorporating fairness and legibility into subtask allocations.
- Developed an active preference-based learning algorithm for efficient and transparent robot learning.

**Reserach Intern**, Honda Research Institue, 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

Nov 2011–Jul 2017

*Advanced Mobile Robotics Lab*

- 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. A. Mehta, **S. Habibian**, and D. P. Losey, “Waypoint-based reinforcement learning for robot manipulation tasks,” 2024. **[under review]**
- S. Habibian**, A. A. Valdivia, L. H. Blumenschein, and D. P. Losey, “A review of communicating robot learning during human-robot interaction,” 2023. **[under review]**
- 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*, 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*, 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*, vol. 8, no. 1, 2021.

#### REFEREED CONFERENCE PROCEEDINGS

- 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

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

- |                                                                                        |           |
|----------------------------------------------------------------------------------------|-----------|
| ▪ <b>Full Scholarship</b> , Bucknell University                                        | 2017–2019 |
| Full-tuition scholarship with stipend to incoming master’s students.                   |           |
| ▪ <b>Summer Research Fellowship</b> , Bucknell University                              | 2018      |
| A merit-based award to the top graduate research proposal.                             |           |
| ▪ <b>3rd Place Award</b> , Rescue Robot League, RoboCup Competition, Japan             | 2017      |
| ▪ <b>2nd Place</b> , Rescue Robot League, RoboCup Competition, Germany                 | 2016      |
| ▪ <b>Best-in-Class Exploration</b> , Rescue Robot League, RoboCup Competition, Germany | 2016      |
| ▪ <b>1st Place</b> , Rescue Robot League, RoboCup Competition, China                   | 2015      |

	<ul style="list-style-type: none"> <li>▪ <b>2nd Place</b>, Rescue Robot League, RoboCup Competition, Brazil</li> <li>▪ <b>Best-in-Class Mobility</b>, Rescue Robot League, RoboCup Competition, Brazil</li> <li>▪ <b>1st Place</b>, Rescue Robot League, RoboCup Competition, Mexico</li> </ul>	<p>2014</p> <p>2014</p> <p>2012</p>
<b>PROFESSIONAL AFFILIATIONS &amp; ACTIVITIES</b>	<p><b>Technical Committee Member</b>, IranOpen RoboCup Competitions Co-organized competitions for objective performance evaluations of rescue robot teams.</p> <p><b>Engineering Director</b>, Advanced Mobile Robotics Lab Organized projects and supervised trainee students to design and implement mobile robots.</p> <p><b>Reviewer</b></p> <ul style="list-style-type: none"> <li>▪ IEEE International Conference on Intelligent Robots and Systems (IROS)</li> <li>▪ ACM/IEEE International Conference on Human-Robot Interaction (HRI)</li> <li>▪ IEEE International Conference on Robotics and Automation (ICRA)</li> <li>▪ IEEE-RAS International Conference on Soft Robotics (RoboSoft)</li> <li>▪ IEEE Robotics and Automation Letters (RA-L)</li> <li>▪ International Journal of Advanced Robotic Systems</li> <li>▪ Journal of Intelligent &amp; Robotic Systems</li> <li>▪ Robotics and Autonomous Systems</li> <li>▪ Artificial Intelligence Review</li> <li>▪ Journal of Field Robotics</li> <li>▪ Robomech Journal</li> </ul>	<p>2015–2017</p> <p>2014–2017</p>
<b>TEACHING EXPERIENCE</b>	<p><b>Teaching Assistant</b>, Virginia Tech, Blacksburg, VA</p> <ul style="list-style-type: none"> <li>▪ Mechanical Design Lab</li> </ul> <p><b>Teaching Assistant</b>, Bucknell University, Lewisburg, VA</p> <ul style="list-style-type: none"> <li>▪ Mechanical Design</li> <li>▪ Manufacturing Processes</li> <li>▪ Renewable Energy Conversion</li> </ul>	<p>Fall 2020 – Spring 2021</p> <p>Fall 2017 – Spring 2019</p>
<b>CAMPUS ACTIVITIES</b>	<p><b>Community Outreach Assistant</b>, Pulaski Youth Center Outreach Program, Virginia Tech</p> <p><b>Engineering Counselor</b>, Summer Engineering Camp Program, Bucknell University</p> <p><b>International Orientation Assistant</b>, International Student Orientation, Bucknell University</p> <p><b>Journal Management Assistant</b>, Bertrand Library, Bucknell University</p>	<p>2021</p> <p>2019</p> <p>2018</p> <p>2018</p>