Shen Li

shenli@mit.edu | https://shenlirobot.github.io/ | Google Scholar | GitHub

RESEARCH VISION AND INTERESTS

Human-robot interaction, learning from human feedback, assistive robotics. My research focuses on personalizing robot assistance using human feedback, such as choices, response times, and movements, with applications such as robot-assisted dressing and collaborative industrial assembly.

EDUCATION

Massachusetts Institute of Technology Cambridge, Massachusetts, USA
Ph.D. in Autonomous Systems Aug. 2019 – present
Advisor: Prof. Julie Shah

Carnegie Mellon University Pittsburgh, Pennsylvania, USA
M.S. in Robotics Aug. 2015 – May 2017
Advisors: Prof. Siddhartha Srinivasa and Prof. Stephanie Rosenthal

The Pennsylvania State University University Park, Pennsylvania, USA
B.S. in Computer Science and B.S. in Psychology, both with High Distinction Aug. 2011 – May 2015

PUBLICATION OVERVIEW

I have published 4 peer-reviewed journal papers, 12 peer-reviewed conference papers, and 2 peer-reviewed workshop papers (1 best student paper award) in top robotics, AI, and ML venues, such as IJRR, RA-L, RSS, CoRL, HRI, ICRA, IROS, and NeurIPS. My three main research contributions, highlight my interdisciplinary expertise across robotics, machine learning, psychology, and control theory, as represented by:

1. **Efficient Preference Learning: Interpreting cognitive processes using psychological models.**
   - **Shen Li***, Yuyang Zhang*, Zhaolin Ren, Claire Liang, Na Li, Julie A. Shah. "Enhancing Preference-based Linear Bandits via Human Response Time." *Advances in Neural Information Processing Systems (NeurIPS)* (2024) (Oral presentation, acceptance rate: 0.39 %) [PDF]

2. **Safe Physical Robot Assistance: Anticipating human behavior using robust control theory.**
   - **Shen Li***, Theodoros Stouraitis*, Michael Gienger, Sethu Vijayakumar, and Julie A. Shah. "Set-based State Estimation with Probabilistic Consistency Guarantee under Epistemic Uncertainty." *IEEE Robotics and Automation Letters (RA-L)* (2022) (Impact factor: 5.2). [PDF]
   - **Shen Li**, Nadia Figueroa, Ankit Shah, and Julie A. Shah. "Provably Safe and Efficient Motion Planning with Uncertain Human Dynamics." *Robotics: Science and Systems (RSS)* (2021) (Acceptance rate: 27 %). [PDF]

3. **Efficient Robot Coordination: Interpreting human intentions using reinforcement learning.**
   - Vaibhav V. Unhelkar*, **Shen Li***, and Julie A. Shah. "Semi-Supervised Learning of Decision-Making Models for Human-Robot Collaboration." *Conference on Robot Learning (CoRL)* (2020) (Oral presentation, acceptance rate: 5 %). [PDF]
   - Vaibhav V. Unhelkar*, **Shen Li***, and Julie A. Shah. "Decision-Making for Bidirectional Communication in Sequential Human-Robot Collaborative Tasks." *ACM/IEEE International Conference on Human-Robot Interaction (HRI)* (2020) (Acceptance rate: 23.6 %). [PDF]

AWARDS AND HONORS

- **Best Student Paper Award** – *Learning Meets Model-based Methods for Manipulation and Grasping Workshop at IEEE/RSJ International Conference on Intelligent Robots and Systems 2023*, for the paper "Temporal Logic Imitation: Learning Plan-Satisficing Motion Policies from Demonstrations."
- **NeurIPS Outstanding Reviewer Award** – Top 8 % of reviewers   2021
- **Phi Kappa Phi Honor Society**   2014
- **B.S. with High Distinction in Computer Science and Psychology** – Penn State   May 2015
- **Dean's List** – Penn State   Aug. 2011 – May 2015

PEER-REVIEWED JOURNAL ARTICLES   (* denotes equal contribution or alphabetical ordering)

J4 Ankit Shah, Pritish Kamath, **Shen Li**, Patrick Craven, Kevin Landers, Kevin Oden, and Julie A. Shah. "Supervised Bayesian Specification Inference from Demonstrations." *The International Journal of Robotics Research (IJRR)* (2023) (Impact factor: 9.2).
[PDF]

J3 **Shen Li***, Theodoros Stouraitis*, Michael Gienger, Sethu Vijayakumar, and Julie A. Shah. "Set-based State Estimation with Probabilistic Consistency Guarantee under Epistemic Uncertainty." *IEEE Robotics and Automation Letters (RA-L)* (2022) (Impact factor: 5.2).
[PDF], [Video], [MIT News], [MIT Instagram], [MIT Technology Review Brazil]

J2 Ankit Shah, **Shen Li**, and Julie A. Shah. "Planning With Uncertain Specifications (PUnS)." *IEEE Robotics and Automation Letters (RA-L)* (2020) (Impact factor: 3.7).
[PDF], [Video], [MIT News]

J1 Rosario Scalise*, **Shen Li***, Henny Admoni, Stephanie Rosenthal, and Siddhartha S. Srinivasa. "Natural Language Instructions for Human–Robot Collaborative Manipulation." *The International Journal of Robotics Research (IJRR)* (2018) (Impact factor: 6.134).
[PDF], [Dataset]

PEER-REVIEWED CONFERENCE PAPERS   (* denotes equal contribution or alphabetical ordering)

C12 **Shen Li***, Yuyang Zhang*, Zhaolin Ren, Claire Liang, Na Li, Julie A. Shah. "Enhancing Preference-based Linear Bandits via Human Response Time." *Advances in Neural Information Processing Systems (NeurIPS)* (2024) (Oral presentation, acceptance rate: 0.39 %).
[PDF], [Slides], [Poster], [Code], [Talk at the conference]

C11 Yanwei Wang, Nadia Figueroa, **Shen Li**, Ankit Shah, and Julie A. Shah. "Temporal Logic Imitation: Learning Plan-Satisficing Motion Policies from Demonstrations." *Conference on Robot Learning (CoRL)* (2023) (Oral presentation, acceptance rate: 6.5 %).
[PDF], [Webpage], [Code], [PBS NewsHour]

C10 **Shen Li**, Nadia Figueroa, Ankit Shah, and Julie A. Shah. "Provably Safe and Efficient Motion Planning with Uncertain Human Dynamics." *Robotics: Science and Systems (RSS)* (2021) (Acceptance rate: 27 %).
[PDF] [Webpage], [Code], [Videos], [Talk at the conference], [Slides], [Poster], [MIT CSAIL News], [MIT Instagram], [MIT Horizon], [The Next Byte Podcast]

C9 **Shen Li***, Daehyung Park*, Yoonchang Sung*, Julie A. Shah, and Nicholas Roy. "Reactive Task and Motion Planning under Temporal Logic Specifications." *IEEE International Conference on Robotics and Automation (ICRA)* (2021) (Acceptance rate: 43.59 %).
[PDF], [Video], [Slides]

C8 Vaibhav V. Unhelkar*, **Shen Li***, and Julie A. Shah. "Decision-Making for Bidirectional Communication in Sequential Human-Robot Collaborative Tasks." *ACM/IEEE International Conference on Human-Robot Interaction (HRI)* (2020) (Acceptance rate: 23.6 %).
[PDF], [Video], [Talk at the conference], [ZDNet news]

C7 Vaibhav V. Unhelkar*, **Shen Li***, and Julie A. Shah. "Semi-Supervised Learning of Decision-Making Models for Human-Robot Collaboration." *Conference on Robot Learning (CoRL)* (2020) (Oral presentation, acceptance rate: 5 %).
[PDF], [Video]

C6 **Shen Li** and Julie A. Shah. "Safe and Efficient High Dimensional Motion Planning in Space-Time with Time Parameterized Prediction." *IEEE International Conference on Robotics and Automation (ICRA)* (2019) (Acceptance rate: 45 %).
[PDF], [Poster]

C5 Tariq Iqbal, **Shen Li**, Christopher Fourie, Bradley Hayes, and Julie A. Shah. "Fast Online Segmentation of Activities from Partial Trajectories." *IEEE International Conference on Robotics and Automation (ICRA)* (2019) (Acceptance rate: 45 %).
[PDF], [Video], [Poster], [PBS NewsHour (from 2:58)]

C4 Ankit Shah, Pritish Kamath, **Shen Li**, and Julie A. Shah. "Bayesian Inference of Temporal Task Specifications from Demonstrations." *Advances in Neural Information Processing Systems (NeurIPS)* (2018) (Acceptance rate: 20.78 %).
[PDF], [Webpage], [Video], [Poster]

C3 Changjoo Nam, Huao Li, **Shen Li**, Michael Lewis, and Katia Sycara. "Trust of Humans in Supervisory Control of Swarm Robots with Varied Levels of Autonomy." *IEEE International Conference on Systems, Man, and Cybernetics (SMC)* (2018).
[PDF]

C2 **Shen Li***, Rosario Scalise*, Henny Admoni, Siddhartha S. Srinivasa, and Stephanie Rosenthal. "Evaluating Critical Points in Trajectories." *IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)* (2017).
[PDF]

C1 **Shen Li***, Rosario Scalise*, Henny Admoni, Stephanie Rosenthal, and Siddhartha S. Srinivasa. "Spatial References and Perspective in Natural Language Instructions for Collaborative Manipulation." *IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)* (2016) (Acceptance rate: 47 %).
[PDF], [Slides], [CMU SEI blog]

PEER-REVIEWED WORKSHOP PAPERS   (* denotes equal contribution or alphabetical ordering)

W2 Yanwei Wang, Nadia Figueroa, **Shen Li**, Ankit Shah, and Julie A. Shah. "Learning Plan-Satisficing Motion Policies from Demonstrations." *Learning Meets Model-based Methods for Manipulation and Grasping Workshop at IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (2023) (Best Student Paper).
[PDF]

W1 **Shen Li***, Rosario Scalise*, Henny Admoni, Stephanie Rosenthal, and Siddhartha S. Srinivasa. "Perspective in Natural Language Instructions for Collaborative Manipulation." *Model Learning for Human-Robot Communication Workshop at Robotics: Science and Systems (RSS)* (2016).
[PDF], [Slides], [Poster]

THESES

T1 **Shen Li**. (2017). "Automatically Evaluating and Generating Clear Robot Explanations." *Master's thesis, Carnegie Mellon University.*
[PDF]

RESEARCH AND DEPLOYMENT EXPERIENCE

MIT Museum Permanent Exhibits   Jan. 2022 – Sept. 2022

- Deployed three permanent robot exhibits at the MIT Museum, visited by over 300,000 people since its October 2022 opening, including MIT affiliates, local residents, international visitors, adults, and children. The robotic systems operate daily.
  - Sandwich-making demo, based on paper C8 (HRI'20). [Video]
  - Dinner table demo, based on J2, (RA-L'20). [Video]
  - Physical movement demo, based on paper C11, (CoRL'22). [Video]
- Led planning, management, and execution of project milestones, coordinating with ∼5 academic researchers and ∼5 museum technical staff to ensure successful, timely delivery.
- Trained 10 museum docents to operate and present the exhibits, effectively communicating advanced robotics research to diverse audiences, including both adults and children.

Interactive Robotics Group, MIT   July 2017 – Aug. 2019
Research Specialist, supervised by Prof. Julie Shah

- Aligned two research projects with sponsor goals by presenting and discussing progress and robot demonstrations with sponsors and visitors.
- Collaborated with academic researchers and sponsor engineers across ∼6 projects using three robotic platforms to translate research into impactful robot demonstrations.
- Conducted independent research on motion planning, culminating in a publication C6 (ICRA'19).

Advanced Agent-Robotics Technology Lab, CMU   May 2017 – July 2017
Extern, supervised by Prof. Katia Sycara

- Implemented an algorithm enabling human operators to control a swarm of robots performing foraging tasks with varying levels of autonomy, facilitating research on human trust in robotic systems. This work contributed to a subsequent publication C3 (SMC'18).

TEACHING AND MENTORING CERTIFICATIONS

MIT Kaufman Teaching Certificate Fall 2024

- Completed eight 2-hour interactive workshops, developing teaching skills in identifying learning outcomes, backward course design, fostering student community and belonging, designing formative assessments, implementing active learning, scaffolding, providing feedback, cultivating a growth mindset, and effective grading practices.
- Applied the teaching skills gained through these workshops to create a full syllabus for my course "Machine Learning from Human Feedback." View my syllabus here.
- Delivered two 10-minute microteaching lessons on human preference models and online machine learning, incorporating active learning and scaffolding techniques, and provided peer feedback during microteaching sessions.

MIT Certificate in Research Mentoring Summer 2024

- Completed three interactive 2-hour workshops, gaining mentoring skills in aligning expectations, assessing understanding, effective communication, fostering DEI, promoting independence, cultivating ethical behavior, and supporting professional development.
- Crafted a mentoring philosophy and strategic plan. View my mentoring statement here.

MENTORING EXPERIENCES

- Jessica Wu, MIT Undergraduate, now a MEng student at MIT Summer 2021
  Project: Meta Reinforcement Learning for Assistive Robotics.
- Ngoc (Nicole) La, MIT Undergraduate, now a Ph.D. student at MIT Fall 2020 – Spring 2021
  Project: Apprenticeship Learning to Schedule from Human Experts.

SELECTED MEDIA COVERAGE

- "A robot guide dog, a machine arm, and software that humanizes voice. What do they have in common?" MIT Technology Review Brazil — Aug. 2023
- "Artificial intelligence, robotics, gene sequencing is on view at the brand new MIT Museum. A place where the latest scientific advancements fill galleries, but only really work with your input." PBS NewsHour — Jan. 2023
- "Robots dress humans without the full picture: MIT researchers design a robot that has a trick or two up its sleeve." MIT News, MIT Instagram — Apr. 2022
- "Climate Change AI, Robots Getting You Dressed, Drones Evacuating Nursing Homes." The Next Byte Podcast — Aug. 2021
- "Getting dressed with help from robots." Robotics and Automation News — Aug. 2021
- "MIT robot could help people with limited mobility dress themselves - It allows for "safe impacts" in order to dress a person more efficiently." Engadget — July 2021
- "MIT's newest robot can help elderly people get dressed." Fast Company — July 2021
- "Programming robots to put jackets on people is harder than it looks." TechCrunch — July 2021
- "Getting dressed with help from robots." MIT CSAIL News, MIT Instagram — July 2021
- "MIT work raises a question: Can robots be teammates with humans rather than slaves?" ZDNet news — Apr. 2020
- "Showing robots how to do your chores: By observing humans, robots learn to perform complex tasks, such as setting a table." MIT News — March 2020
- "The robots are coming. Will they work with us?" PBS NewsHour — Dec. 2018

INVITED TALKS

- "Personalization in Human-Robot Collaboration via Human-in-the-Loop RL"   Jan. 2023
  Prof. Na Li's Group, Harvard University
- "Safe Robot-assisted Dressing"   Apr. 2022
  Prof. Dana Kulic's Group, Monash University
- "Safe Human-Robot Interaction in Personal Care"   Sept. 2021
  MIT Horizon, [Video]

ACADEMIC REVIEW ACTIVITIES

- **Journal Reviewer**: IEEE Robotics and Automation Letters (RA-L), Autonomous Robots (AuRo), IEEE Transactions on Robotics (T-RO), ACM Transactions on Human-Robot Interaction, Frontiers in Robotics and AI, IEEE/CAA Journal of Automatica Sinica.
- **Robotics Conference Reviewer**: Robotics: Science and Systems, IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), ACM/IEEE International Conference on Human-Robot Interaction (HRI), IEEE-RAS International Conference on Humanoid Robots (Humanoids), International Symposium on Robotics Research (ISRR), IEEE International Conference on Robot and Human Interactive Communication (RO-MAN).
- **ML/AI Conference Reviewer**: International Conference on Artificial Intelligence and Statistics (AISTATS), Conference on Neural Information Processing Systems (NeurIPS), International Conference on Machine Learning (ICML), International Conference on Learning Representations (ICLR), AAAI Conference on Artificial Intelligence (AAAI).

REFERENCES

- Prof. Julie Shah
  - Department Head and H.N. Slater Professor
  - Department of Aeronautics and Astronautics
  - Massachusetts Institute of Technology
  - julie_a_shah@csail.mit.edu
  - send.Shah.4595077710@interfoliodossier.com

- Prof. Dylan Hadfield-Menell
  - Bonnie and Marty (1964) Tenenbaum Career Development Assistant Professor
  - Department of Electrical Engineering and Computer Science
  - Massachusetts Institute of Technology
  - dhm@csail.mit.edu
  - send.HadfieldMenell.442F6B68CE@interfoliodossier.com

- Prof. Nadia Figueroa
  - Shalini and Rajeev Misra Presidential Assistant Professor
  - Department of Mechanical Engineering and Applied Mechanics
  - University of Pennsylvania
  - nadiafig@seas.upenn.edu
  - send.Figueroa.ABE6D5EB85@interfoliodossier.com

- Prof. Vaibhav Unhelkar
  - Assistant Professor
  - Department of Computer Science
  - Rice University
  - vaibhav.unhelkar@rice.edu
  - send.Unhelkar.57EE6C3183@interfoliodossier.com