



Michael S. Lee

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Education

- Carnegie Mellon University, PhD in Computer Science, specialized in Robotics** Feb 2024
Advisers: Prof. Reid Simmons, Prof. Henny Admoni Pittsburgh, PA
Thesis (Explainable AI): Improving the Transparency of Agent Decision Making to Humans using Demos
- Carnegie Mellon University, Master of Science in Robotics** Aug 2018
Advisers: Prof. Red Whittaker, Prof. Nathan Michael (CTO at Shield AI) Pittsburgh, PA
Thesis: Radiation Source Localization using a Gamma-ray Camera
- Princeton University, BSE in Mech. & Aero. Eng., Minor in Computer Science** May 2016
Advisers: Prof. Robert Stengel, Prof. Nathan Michael Princeton, NJ
Thesis: Modeling Uncertainty in Stereo Vision for Precise and Robust State Estimation

Highlighted Research Experience

Carnegie Mellon University

Improving the Transparency of Agent Decision Making to Humans using Demonstrations Aug `18 – Feb `24

- Published at top AI, ML, and robotics conferences (e.g. AAAI, IROS, HRI), workshops (e.g. ICML), and journals (Frontiers in Robotics and AI, THRI). Selected into two doctoral consortiums (AAAI, HRI).
- Developed algorithms for teaching AI policies to humans using informative demonstrations, toward increased understanding and accurate prediction of AI behavior by humans in unseen scenarios.
- Modeled human learning using inverse reinforcement learning and Bayesian filtering (e.g. particle filter).
- Built online user studies using Python & Flask; conducted four experiments with 750+ human participants.
- Our demonstration-based teaching model reduces the suboptimality of human predictions of AI behavior by 64% over the baseline of directly providing the AI's reward function.

Representative Publications

- M. Lee**, R. Simmons, H. Admoni, *Closed-loop Teaching via Demonstrations to Improve Policy Transparency*, International Joint Conference on Artificial Intelligence (**IJCAI**), 2024. Under review.
- M. Lee**, *Making AI Policies Transparent to Humans through Demonstrations*, Association for the Advancement of Artificial Intelligence (**AAAI**) Doctoral Consortium, 2024.
- M. Lee**, H. Admoni, R. Simmons, *Closed-loop Reasoning about Counterfactuals to Improve Policy Transparency*, **ICML** Workshop on Counterfactuals in Minds and Machines, 2023.
- R. Zhang, **M. Lee**, S. Chen, *Leveraging Contextual Counterfactuals Toward Belief Calibration*, **ICML** Workshop on Counterfactuals in Minds and Machines, 2023.
- M. Lee**, H. Admoni, R. Simmons, *Reasoning about Counterfactuals to Improve Human Inverse Reinforcement Learning*, IEEE International Conference on Intelligent Robots and Systems (**IROS**), 2022.
- M. Lee**, H. Admoni, R. Simmons, *Machine Teaching for Human Inverse Reinforcement Learning*, Frontiers in Robotics and AI Journal, 2021.
- M. Lee**, *Self-Assessing and Communicating Manipulation Proficiency Through Active Uncertainty Characterization*. Pioneers Workshop at ACM/IEEE Conference on Human-Robot Interaction (**HRI**), 2019

Technical Skills

Experimental design, Statistical Analysis, Machine Learning, Python, C++, ROS, Flask, Web development

Additional Research Experience

Carnegie Mellon University

Radiation Source Localization using Gamma Camera (R. Whittaker, N. Michael) Aug 2016 – Aug 2018

- Developed a gamma radiation map representation and a source localization algorithm that can pinpoint gamma radiation sources within 0.6% of environment dimensions in 27% less time and 16% less distance.

Physically-assisted Navigation of the Elderly and Visually-Impaired (Ralph Hollis) Jun – Aug 2016

- Implemented voice-controlled ROS SMACH state machines for a dynamically stable ballbot toward hand-assisted leading of the elderly and the visually impaired using speech and force-based communication.

Predicting Feature-Based Visual Odometry Failure using Saliency (Nathan Michael) Jun – Aug 2015

- Characterized three classes of sparse visual odometry failures (lack of texture, exposure change, motion blur) through a suite of visual metrics that extracted relevant saliency information from incoming images.
- Trained a random forest classifier to anticipate and label imminent visual odometry failures in support of robust visual state estimation and autonomous UAV flight.

NASA (Jet Propulsion Laboratory)

Estimating Forest Biomass using Quadcopter (Roland Brockers, Stephan Weiss, Adam Wolf) Jun – Aug 2014

- Collected forest microclimate data using a custom sensor suite onboard a quadcopter, and developed interactive ecology maps over Google Earth based on the completed surveys.
- Extracted correlations between microclimate data and first-order estimates of forest biomass based on tree diameters estimated from stereo images.

Leadership & Service

Reviewer

- ICRA (2024), ICAPS Explainable Planning Workshop (2023), IROS (2022), RSS Pioneers (2022-23), AAAI Undergrad Consortium (2022), AAAI Fall Symposium (2021), HRI Pioneers Workshop (2020-24)

Undergraduate AI Mentorship, Mentor Jan 2019 – May 2023

- Provided guidance on relevant coursework and experiences for graduate school through monthly meetings.
- Mentored three undergraduates (e.g. Vignesh Rajmohan: Google X intern, now co-founder Pivot Robotics)

Teaching Assistant (Carnegie Mellon University) Jan – May 2020, 2021

- Created/graded assignments, advised projects for two classes: human-robot interaction, computer vision.

Robotics Institute Summer Scholars Admissions Committee, Reviewer Feb – Mar 2017, 2019

- Reviewed a subset of 680+ applicants for the Summer Scholars program, an eleven-week research experience for 30 undergraduates hosted by the Robotics Institute at Carnegie Mellon University.

RISS Working Papers Journal Committee, Managing Editor Jun – Dec 2015

- Managed the journal comprising research papers written by the 2015 Robotics Institute summer scholars, increasing the visibility of the summer program and the research completed by the student scholars.

Princeton Robotics Club, Quadcopter Control Subteam Leader Sep 2013 – Jun 2015

- Co-led a team of eight students in building a quadcopter from scratch and implementing controls for flight.

Outdoor Action Orientation Program, Week-long Backpacking Trip Leader Jan 2014 – Jun 2015

Honors & Awards

AAAI Doctoral Consortium, Member 2024

- One of 30 PhD students selected to present/discuss work with peers and senior scholars in the field of AI.

HRI Pioneers Workshop, Member 2019

- One of 19 PhD students selected to present/discuss work with peers and senior scholars in the field of HRI.

National Defense Science and Engineering Graduate (NDSEG) Fellowship, Finalist 2018