

# Preeti Ramaraj

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## Research Interest

I study human-robot teaching interactions. Specifically, I am looking at non expert teaching interactions with Interactive Task Learning (ITL) robots in a situated interaction setting. My goal is to build interaction mechanisms in an ITL robot that leverage natural human interaction patterns and help the human build a better mental model of the robot. Towards this, I am currently focusing on systematically developing, exploring, and evaluating alternative approaches for robot strategies that can potentially improve robot task teaching by avoiding errors and inefficiencies leading to more efficient and effective interaction.

## Education

### University of Michigan

Ph.D. in Computer Science and Engineering

January 2017 – August 2023

Advisor: Prof. John Laird

Committee: Prof. Chris Quintana, Prof. Joyce Chai, Prof. Nikola Banovic, Dr. Shiwali Mohan

### University of Michigan

Master of Science in Computer Science and Engineering

September 2015 – April 2017

Relevant Coursework: Advanced Artificial Intelligence, Ethics for Robotics, Natural Language Processing, Human Learning and Memory, Statistical Methods

### University of Mumbai

Bachelor of Engineering (Computer Engineering)

August 2008 – May 2012

Relevant Coursework: Human Computer Interaction, Neural Networks and Fuzzy Logic, Artificial Intelligence

## Publications

### Conference Papers

1. **Preeti Ramaraj**, Charles L. Ortiz, Jr., & Shiwali Mohan (2021). Unpacking Human Teachers' Intentions for Natural Interactive Task Learning. In *30th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN 2021)*. August 2021.

### Workshop & Consortia Papers

1. Preeti Ramaraj (2021). Robots that Help Humans Build Better Mental Models of Robots. In *Companion of the 2021 ACM/IEEE International Conference on Human-Robot Interaction (HRI '21 Companion)*. March 2021.
2. Preeti Ramaraj (2021). Robots that Help Humans Build Better Mental Models of Robots. In *Proceedings of the Thirty-Fifth AAAI Conference on Artificial Intelligence*. February 2021.
3. **Preeti Ramaraj**, Matt Klenk and Shiwali Mohan (2020). Understanding Intentions in Human Teaching to Design Interactive Task Learning Robots. In *RSS 2020 Workshop: AI & Its Alternatives in Assistive & Collaborative Robotics: Decoding Intent*. July 2020.
4. **Preeti Ramaraj**, Saurav Sahay, Shachi H. Kumar, Walter Lasecki & John E. Laird (2019). Towards using transparency mechanisms to build better mental models. In *ACS 2019: 7<sup>th</sup> Goal Reasoning Workshop*. Cambridge, MA. August 2019.
5. **Preeti Ramaraj** and John E. Laird (2018). Establishing Common Ground for Learning Robots. In *RSS 2018: Workshop on Models and Representations for Natural Human-Robot Communication*. Pittsburgh, PA. June 2018.

### Posters

1. Preeti Ramaraj. Building ITL robots that help humans build a better mental model of itself. Microsoft Research AI Breakthroughs Workshop 2020.
2. **Preeti Ramaraj**, Saurav Sahay, Shachi H. Kumar, Walter Lasecki & John E. Laird. Exploring Transparency Mechanisms for Identification of Interaction Failures in Human-Robot Interaction. CRA-W Grad Cohort Workshop, Chicago IL, 2019.

## Projects

1. **Mining Insights from Hardware Errata Documents** September 2016 – December 2016  
Used errata documentation to identify interesting patterns and conclusions about product bugs, such as common sources of errors. Created a database of over 2,000 different ARM errata and experimented with natural language processing methods ranging from Word2Vec, non-negative matrix factorization and recurrent neural networks.
2. **Motivated Learning – Replication project** January 2016 – April 2016  
Replicated project based on the study specified in "*Graham, J., Starzyk, J. A., Ni, Z., He, H., Teng, T. H., & Tan, A. H. (2015, July). A comparative study between motivated learning and reinforcement learning. In 2015 International Joint Conference on Neural Networks (IJCNN)(pp. 1-8). IEEE.*" to test the hypothesis that Motivated Learning earns a higher average reward than Reinforcement Learning in the custom dynamic environment specified. The hypothesis was replicated successfully.
3. **Index-based Load Optimization in MySQL** September 2015 – December 2015  
Implemented a drop-and-rebuild-indexes scheme around a load operation to automate this operation to improve performance of loading huge data into databases in MySQL
4. **ANFIS based Spam Filtering Model for Social Networking Websites** August 2011 – May 2012  
Developed a method in which an adaptive neuro fuzzy inference system (ANFIS) that incorporates the advantages of both the neural networking concepts and fuzzy logic was used to identify spam messages on social networking websites. The paper describing this method was published in IJCA (International Journal of Computer Applications) - April 2012 Edition.

## Experience

1. **Palo Alto Research Center (Part-time Intern – Intelligent Systems Lab)** October 2020 – April 2021  
**Mentors:** Dr. Shiwali Mohan, Dr. Charles L. Ortiz, Jr., and Dr. Matt Klenk  
I am currently working on applying SharedPlans to build a human-centred interaction model in an ITL agent.
2. **Palo Alto Research Center (Intern – System Sciences Lab)** May 2020 – August 2020  
**Mentors:** Dr. Shiwali Mohan and Dr. Matt Klenk  
I worked on constructing a taxonomy based on Collaborative Discourse Theory (CDT) to organize human teaching intentions in a human-robot teaching interaction. I designed and conducted a human participant study (N=10) through semi-structured interviews to validate and extend this taxonomy.
3. **Intel Labs (Research Intern – Anticipatory Computing Lab)** May 2018 – September 2018  
**Mentor:** Dr. Saurav Sahay  
I implemented language and visual transparency mechanisms in the Rosie agent and conducted a user study to test the efficacy of these mechanisms in helping non-expert users identify errors that arise when teaching new tasks.
4. **Microsoft (Software Engineer)** July 2012 – July 2015
  - Instrumental in shipping of Release Management for Visual Studio 2013. Took end-to-end ownership of the front-end for the configuration tools for server and deployment agent using WPF and C#
  - Contributed to releases in the Dynamics Marketing team. Pilot-tested TDD in individual execution to increase Code-Coverage to 100%. Conducted TDD workshop for the team to push for team-wide adoption.
  - As a part of Microsoft Reference Management Center (MRMC) team in the Marketing space, owned October '14 release involving system upgrade from CRM 2011 to CRM 2013 online and creating Power BI reports for the customers and business stakeholders on time despite changing data requirements resulting in smooth transition from current solution.
  - End-to-end ownership of migration of 'JADE' application (data warehouse for Microsoft's consulting business) to the internal Singularity hardware platform. Worked on SQL Server 2012 Proof-of-concept to adopt the SQL 2012 Always On feature in JADE.
  - Ownership of test phase of release in the Products and Services space involving upgrade of message server from Windows 2003 to Windows 2008 Server R2. Involved in design and scenario discussions, responsible for end-to-end testing for a v1 project, LinkGen. Owned a sprint release and delivered test case execution and daily status reports on time despite resource constraints.
5. **Microsoft (Intern – Software Development Engineer)** June 2011 – August 2011  
I implemented the Central Data Dictionary – an anytime accessible Azure-based web application in which users can refer to the business descriptions and the various metadata of Warehouse database objects and cube measures.

## Awards & Honors

1. HRI Pioneer 2021
2. AAI Doctoral Consortium Cohort 2021

## Teaching

1. Graduate Student Instructor Fall 2019, Winter 2020  
Data Structures and Algorithms (EECS 281)

## Skills

**Programming:** C#, Python, JAVA, C++, SQL, SML (Soar Markup Language)

**Web Technologies:** HTML, Bootstrap, JavaScript, WCF Services, WPF

**Tools:** Visual Studio, R, MATLAB, Eclipse, Microsoft SQL Server, MySQL, Microsoft Azure, IIS Server, Team Foundation Server, Power BI, Git

**Languages:** English (Native), Hindi (Fluent), Tamil (Fluent), Marathi (Proficient)

## Professional Activities

### Academic Talks

1. **A Systematic Study of Robot Strategies towards Improved Interaction in ITL** May 2022  
42<sup>nd</sup> Soar Workshop, Ann Arbor, MI
2. **Building robots that help humans build better mental models of robots** June 2021  
41<sup>st</sup> Soar Workshop, Ann Arbor, MI
3. **Exploring Transparency Mechanisms for Identification of Interaction Failures in HRI** May 2019  
39<sup>th</sup> Soar Workshop, Ann Arbor, MI
4. **Learning Instructor Expectations in ITL Agent Interaction** May 2018  
38<sup>th</sup> Soar Workshop, Ann Arbor, MI
5. **How can Rosie tell me what it can do for me?** June 2017  
37<sup>th</sup> Soar Workshop, Ann Arbor, MI
6. **Understanding Agent Knowledge through Conversation** June 2016  
36<sup>th</sup> Soar Workshop, Ann Arbor, MI

### Conference Organization

1. **Program Chair:** HRI Pioneers 2022
2. **Programme Committee/Reviewer:** SpLU-RoboNLP 2021, IJCAI 2021, SpLU-RoboNLP 2019, UIST 2019
3. **Technical Chair:** Eighth Annual Conference on Advances in Cognitive Systems (August 2020)
4. **Poster Chair:** Michigan AI Symposium – AI for society at University of Michigan (Fall 2019)
5. **Conference Staff:** Michigan AI Symposium – AI and Society at University of Michigan (Fall 2018)

### Service and Volunteering Activities

1. **Michigan AI Symposium – AI and Society**, University of Michigan November 2018  
Led an unconference session for the topic: "AI in everyday life: What is our role as researchers in defining how and the purposes for which AI systems can be used?"
2. **Michigan AI Blog**, University of Michigan Fall 2018 – Fall 2020  
Editor, Curator and Maintainer of blog site  
Created the Michigan AI blog and helped curate and edit blog posts from contributors in the AI lab.
3. **ECSEL+ (Ensemble of Computer Science and Engineering Ladies +)** July 2017 – June 2019  
Co-Chair
  - Led the group that aims to provide community and support aimed at women and gender minorities
  - Introduced the Inclusivity initiative, to provide opportunities for current graduate students in CSE department to learn to contribute positively to department climate
  - Organized Young Women Professional Roundtables, for current graduate members to meet visiting women professionals
4. **Lunch and lab with a Graduate Student**, University of Michigan Fall 2015, Fall & Winter 2016-2018  
Graduate Student Mentor  
Met with total 21 undergraduate students to discuss graduate studies, potential research opportunities and the application process
5. **Explore Graduate Studies in CSE**, University of Michigan September 2017  
Volunteer  
Provided 1:1 writing feedback on graduate school application personal statements for participants at the workshop
6. **eVidyaloka** June 2013- December 2013, January 2014 – April 2014  
Volunteer Teacher
  - Taught a class of 20 7<sup>th</sup>-8<sup>th</sup> grade students – English grammar
  - Taught a class of 20 5<sup>th</sup>-6<sup>th</sup> grade students – Basic computer skills
7. **BootCamp Committee**, MACH IT, Microsoft January 2013 – June 2013  
Lead
  - Led the internship on-boarding process – organizing technical brown-bag sessions and new employee orientations

- Led the FTE on-boarding process for new hires and incorporated process improvements to events such as the new-hire Bootcamp and LEAP that had direct impact to business