Preeti Ramaraj

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Research Interest

I study human-robot teaching interactions. Specifically, I study 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 humans build a better mental model of the robot. Towards this, I am currently focused 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, Statistical Methods, Human Learning and Memory, Natural Language Processing, Artificial General Intelligence

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: 7th 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
   My collaborators and I proposed ITL robot design requirements based on a bidirectional qualitative analysis of an interactive teaching study, and informed by a computational theory of collaborative interactions, SharedPlans. This work was accepted for publication at RO-MAN 2021.
2. **Palo Alto Research Center (Intern – System Sciences Lab)** May 2020 – August 2020
   Mentors: Dr. Shiwali Mohan and Dr. Matt Klenk
   I constructed 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. AAAI 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. **Interactive Task Learning** November 2022
   Presented on behalf of my advisor Dr. John Laird at the AFOSR: Computational Cognition and Machine Intelligence Program Review, Arlington, VA
2. **A Systematic Study of Robot Strategies towards Improved Interaction in ITL** May 2022
   42nd Soar Workshop, Ann Arbor, MI
3. **Building robots that help humans build better mental models of robots** June 2021
   41st Soar Workshop, Ann Arbor, MI
4. **Exploring Transparency Mechanisms for Identification of Interaction Failures in HRI** May 2019
   39th Soar Workshop, Ann Arbor, MI
5. **Learning Instructor Expectations in ITL Agent Interaction** May 2018
   38th Soar Workshop, Ann Arbor, MI
6. **How can Rosie tell me what it can do for me?** June 2017
   37th Soar Workshop, Ann Arbor, MI
7. **Understanding Agent Knowledge through Conversation** June 2016
   36th Soar Workshop, Ann Arbor, MI

Conference Organization

1. **Program Chair:** HRI Pioneers 2022
2. **Programme Committee/Reviewer:** HRI Pioneers 2023, SpLU-RoboNLP (2021,2019), IJCAI 2021, 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. **Curator for RealScientists** June 2019
   Curated for RealScientists twitter account for a week discussing my PhD research and answering follower questions about HRI and AI research
2. **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?"
3. **Michigan AI Blog,** University of Michigan Fall 2018 – Fall 2020
   Editor, Curator and Maintainer of blog site
   Created the Michigan AI blog and curated and edited blog posts from contributors in the AI lab.
4. **ECSEL+ (Ensemble of Computer Science and Engineering Ladies +)** July 2017 – June 2019
   Co-Chair
   - Led the group that aims to provide community and support for 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
   - Organized practice talks for students so that they could get relevant feedback for their prelim, dissertation or conference talks from a diverse audience.
5. **Lunch and lab with a Graduate Student**, University of Michigan Fall 2015, Fall & Winter 2016-2018
   Graduate Student Mentor
   Met with 21 undergraduate students across semesters to discuss graduate studies, potential research opportunities and the application process
6. **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

7. **eVidyaloka** June 2013- December 2013, January 2014 – April 2014
   Volunteer Teacher
   - Taught a class of 20 7th-8th grade students – English grammar
   - Taught a class of 20 5th-6th grade students – Basic computer skills
8. **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