KARTIK RAMACHANDRUNI

4^{th} year PhD student in Robotics, Georgia Tech
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SUMMARY

I am a 4^{th}-year Robotics Ph.D. student working with Prof. Sonia Chernova in the RAIL lab. I am working on developing semantic reasoning techniques for user-assistive robots to learn organizational preferences, such as object placement and arrangement preferences, from passive observation rather than explicit task instructions or demonstrations. My broader research interests include employing user interaction to resolve goal uncertainty in assistive tasks, user-adaptive task planning for human-robot collaboration, and robot imitation learning from video demonstrations.

EDUCATION

Ph.D. Student, Robotics *2021-Present*
School of Interactive Computing, Georgia Tech
Advisor: Sonia Chernova GPA: 4.0/4.0

B.Tech, Mechanical Engineering (ME) *2014-18*
Indian Institute of Technology (IIT) Jodhpur
GPA: 9.59/10.0

PROFESSIONAL EXPERIENCE

Student Researcher (Summer Internship) *Summer of 2023*
Google Cerebra

Graduate Research Assistant *2021-Present*
School of Interactive Computing, Georgia Tech

Robotics Researcher *2018-2021*
TCS Research & Innovation Labs, Bangalore

Undergraduate Researcher *2015-18*
Indian Institute of Technology (IIT) Jodhpur

RESEARCH PROJECTS

User-personalized Object Rearrangement Without User Instruction or Demonstration *2022-Now*
RAIL Lab, Georgia Tech *Prof. Sonia Chernova*

- Developed ConSOR, a user-personalized object rearrangement framework to assist users in human-organized environments without any user goal specification by leveraging contextual cues from partially arranged environments (e.g., a half-empty kitchen cabinet or a fridge half-filled with groceries). (*IROS 2023*)
- Currently developing an object rearrangement framework to model novel rearrangement preferences by integrating contextual cues from passive observations of partially arranged environments, with the aim of generalizing to previously unseen objects and households. (*Ongoing*)

UHTP: User-aware Hierarchical Task Planning Framework for Communication-Free, Mutually-Adaptive Human-Robot Collaboration *2021-2022*
RAIL Lab, Georgia Tech *Prof. Sonia Chernova*

- Developed UHTP or User-aware Hierarchical Task Planner for human-robot collaborative manipulation tasks that minimizes overall task execution time while allowing the human and robot to adapt to each other's action preferences without explicitly communicating with one another.
- Conducted an in-person user study to validate the proposed planning framework in which participants worked together with a JACO 7-DOF robotic arm to assemble power drills. (*ACM THRI 2023*)

Self-supervised Imitation learning framework from video demonstrations *2018-2020*
TCS Research & Innovation Labs *Dr. Swagat Kumar*

- Designed a imitation learning framework for learning robot policies from video demonstrations. The key contribution of this framework is a novel feature extractor that generates view-invariant feature representations from video frames which can be used as a latent state representation for a Reinforcement Learning (RL) agent. (*ICRA 2020*)

INTERNSHIP PROJECTS

Detecting Decision Uncertainty in Black-Box UI Automation agents *Summer of 2023*
Google Cerebra *Dr. William Bishop*

- Formulated the research problem of agent decision uncertainty in UI Automation tasks due to extrinsic factors such as under-specified task goals or un-afforded actions within the plan and created a taxonomy of extrinsic uncertain scenarios in UI automation.
- Proposed a novel uncertainty detection technique for Large Language Model (LLM) based agents based on in-context learning and chain-of-thought prompting. I benchmarked the performance of this framework against prior work by evaluating on a custom dataset of extrinsic uncertain scenarios in UI automation.

RESEARCH PUBLICATIONS

· **K. Ramachandruni**, M. Zuo, and S. Chernova, "ConSOR: A Context-Aware Semantic Object Rearrangement Framework for Partially Arranged Scenes," in *IEEE IROS*, 2023 (*Paper*)
· **K. Ramachandruni***, C. Kent*, and S. Chernova, "UHTP: A User-Aware Hierarchical Task Planning Framework for Communication-Free, Mutually-Adaptive Human-Robot Collaboration," in *ACM Transactions on Human-Robot Interaction*, 2023.
· W. Liu*, A. Daruna*, M. Patel**, **K. Ramachandruni****, and S. Chernova, "A Survey of Semantic Reasoning Frameworks for Robotic Systems," in *RAS*, 2022 (*Paper*)
· **K. Ramachandruni**, M. Vankadari, A. Majumder, S. Dutta and S. Kumar, "Attentive task-net: Self supervised task-attention network for imitation learning using video demonstration," in *IEEE ICRA*, 2020. (*Paper*)
· **K. Ramachandruni**, S. Jaiswal and S. V. Shah, "Vision-based control of UR5 robot to track a moving object under occlusion using Adaptive Kalman Filter," in *ACM Advances in Robotics*, 2019. (*Paper*)

TEACHING EXPERIENCE

BridgeUP STEM Program 2023, 2024: Volunteered and taught in the Bridge-up STEM program to introduce basic AI concepts to select female high-school students from various schools across Atlanta.
TA for CS 6601 (2023): Worked as a GTA for the Introductory Grad AI course at Georgia Tech and conducted extra classes for undergraduate AI students on course-relevant research in robotics.

PROFESSIONAL SERVICE

Reviewer for: International Conference on Human-Robot Interaction (HRI) 2024, IEEE Transactions on Robotics (T-RO) 2024, IEEE Conference on International Conference on Intelligent Robots and Systems (IROS), President's Undergraduate Research Awards (PURA) 2023.

ACADEMIC ACHIEVEMENTS

Board of Governors Prize, 2018: Best academic performance in graduating class of 2018 of B.Tech. ME program, IIT Jodhpur
Academic Distinction Award, 2015-18: Best academic performance in Semesters I-VII among B.Tech. ME students, IIT Jodhpur

LEADERSHIP AND TEAM ROLES

Placement Lead, ME branch *2017-18*
Student Career Development and Placements cell, IIT Jodhpur

Student Mentor, Racers IITJ *2017-18*
SAE Baja India 2018 team of IIT Jodhpur

Manufacturing Lead, Racers IITJ *2016-17*
SAE Baja India 2017 team of IIT Jodhpur

RELATED COURSEWORK/SKILLS

· Graduate courses: Intro to Artificial Intelligence, Machine Learning, Computer Vision, Intro to Deep Learning, Evaluation of Human-Integrated Systems, Human-Robot Interaction, Intro to Robotics Research, Introduction to Graduate Algorithms
· Software experience: Python (including OpenCV, Numpy, Tensorflow, Pytorch), ROS (including Gazebo, MoveIt)
· Robot experience: Kinova JACO, UR5, Fetch mobile manipulator