

Maithili Patel

PHD · ROBOTICS · GEORGIA INSTITUTE OF TECHNOLOGY

✉ maithili@gatech.edu | 🏠 maithili.github.io | 📄 maithili | 🐦 @MaithiliPatel31

Research Interests

My interest lies in Artificial Intelligence towards robot autonomy, specifically enabling robots to understand and assist humans in open environments. My research spans the fields of Deep Learning, Human Robot Interaction, and touches upon XAI, commonsense reasoning, activity-recognition and smart home sensing.

Education

GEORGIA INSTITUTE OF TECHNOLOGY · *PhD, Robotics (Interactive Comp.)* · GPA 4/4 2021 - 2026

Advised by Prof. Sonia Chernova

UNIVERSITY OF MICHIGAN · *MSE, Mechanical Engineering (Robotics)* · GPA 3.98/4 2017 - 2019

Focus areas : Robot Navigation · Motion Planning · Kinematics and Dynamics · Automated Vehicles

INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY · *B.Tech, Mechanical Engineering* · GPA 8.99/10 2013 - 2017

Graduated with Honors, holding a Minor in Computer Science and Engineering

Publications

JOURNAL

- A Survey of Semantic Reasoning Frameworks for Robotic Systems, W. Liu*, A. Daruna*, M. Patel**, K. Ramachandrani**, S. Chernova
Robotics and Autonomous Systems (RAS), 2022

CONFERENCE

- Predicting Routine Object Usage for Proactive Robot Assistance, M. Patel, A. Prakash, S. Chernova
Conference on Robot Learning (CoRL), 2023
- Proactive Robot Assistance via Spatio Temporal Object Tracking, M. Patel, S. Chernova
Conference on Robot Learning (CoRL), 2022

WORKSHOP

- Longitudinal Proactive Robot Assistance, M. Patel
HRI Pioneers, 2023 workshop
- Understanding In-home Routines through Spatio-temporal Object Tracking for Proactive Assistance, M. Patel, S. Chernova
ICRA, 2022 workshop - Prediction and Anticipation Reasoning in Human Robot Interaction

Academic Activities

- Serving as **Student Volunteer Chair** for Conference on Robot Learning, 2023 November 2023
- Selected for the **HRI Pioneers workshop** at the ACM/IEEE International Conference on Human Robot Interaction (HRI), 2023. March 2023

- Co-organized the **Semantic Scene Understanding for Human Robot Interaction workshop** at the ACM/IEEE International Conference on Human Robot Interaction (HRI), 2023. *March 2023*
- Selected for the **Google CS Research Mentorship Program** to receive mentorship from a Googler and network with other participants to further my career in computing *2022-2023*
- Selected for participation in **RPL Summer School, 2022, Stockholm, Sweden**, fully funded and organized by the Division of Robotics, Perception and Learning at KTH Royal University, Sweden *June 2022*

Academic Experience

GRADUATE RESEARCH ASSISTANT · *Robot Autonomy and Interactive Learning Lab, Georgia Institute of Technology*
 Advisor: Prof. Sonia Chernova

Proactive Robot Assistance via Spatio-Temporal Object Tracking *Aug 2021 - Present*

- Conducting research on Longitudinal Proactive Assistance, towards equipping robots with proactive behaviors rooted in a comprehensive understanding of the daily routines and necessities of their users.

GRADUATE RESEARCHER · *The Laboratory for Progress, University of Michigan*
 Advisor: Prof. Chad Jenkins

Planning over affordance wayfields *Jan 2019 - Apr 2019*

- Explored null-space subsumption architecture to create planners over potential-based affordance representations achieve constrained manipulation tasks. Demonstrated pick and place on a coffee mug without spilling its contents, using OpenRAVE to simulate and visualize.

Potential Field guided RRTs for motion planning *Jan 2019 - Apr 2019*

- Created a hybrid motion planner based on RRT and potential field based gradient descent and achieved greater obstacle-clearance and faster convergence compared to a vanilla RRT.

Manipulation over Mobile Robot Platform *Jan 2018 - Apr 2018*

- Implemented capability for a Fetch robot to open doors using MoveIt package on ROS platform, and integrated it into a mobile manipulation pipeline based on a behavior tree structure.

Industry Experience

ALLEN INSTITUTE FOR AI (AI2) · *Research Intern, Mosaic* *May 2023 - Present*
Mosaic at AI2, led by Prof. Yejin Choi, conducts research on Commonsense Reasoning in AI systems.

- Formulated the problem of goal inference from visual observations of partially complete tasks.
- Developing a method involving commonsense reasoning with language models and visual grounding models for video understanding.

TOYOTA RESEARCH INSTITUTE · *Software Engineer, Automated Mapping Platform* *Jan 2021 - July 2021*
At TRI, the research arm of Toyota, I worked on a mapping project with the Autonomous Driving team.

- Made improvements to the algorithms used to probabilistically infer object changes in a SLAM-based map over time.
- Developed a validation toolkit for evaluating metric accuracy of feature-based maps against a reference, and evaluating precision-recall over detected changes between an old and new map.
- Helped the Women and Allies ERG host Women's History Month to spread awareness and support women's progress.

VEONEER · Algorithm Engineer

June 2019 - Jan 2021

Veoneer, formerly Zenuity, develops AD and ADAS software. I worked on Motion Planning and Localization teams based in US.

- Tested mapping and localization by simulating worst-case scenarios, and improved lane curvature calculation.
- Implemented code to identify roadside barriers in HD-maps and extracting a polygon representation of free space.
- Initiated and ran a Journal Club for the team to gain and share domain knowledge through literature discussions.

ZENUITY · Intern, Decision & Control

May 2018 - Aug 2018

- Improved path-tracking performance of the lateral dynamics controller in simulation and on vehicle.
- Identified challenges of autonomous parking in an indoor parking structure and created prototypes of decision trees for high-level behaviour planning and kinodynamic A* based motion planning.

Teaching And Mentorship

ROBOT AUTONOMY AND INTERACTIVE LEARNING (RAIL) LAB · Mentor

Fall 2022

- Mentoring Amirtha Varshini (M.S. C.S.) and Aswin Prakash (M.S. C.S.) in the RAIL lab at Georgia Institute of Technology through research in semantic robotics towards in-home assistance

HELEN SCHOLARS PROGRAM (NCWIT) · Mentor

Fall 2021-Present

- Mentoring an undergraduate student towards professional and personal development as a part of a pilot scholarship program by the National Center for Women & Information Technology (NCWIT)

GRADUATE STUDENT INSTRUCTOR · University of Michigan, Ann Arbor

Received honorable mention for **2020 Richard and Eleanor Towner Prize** for Outstanding GSIs

- **Mobile Robotics** with Prof. Maani Jadidi Winter 2019
Graduate-level course focusing on probabilistic methods in robotics like Bayesian methods and Graphical formulations, for perception and SLAM
- **Introduction to Autonomous Robotics** with Prof. Chad Jenkins Fall 2018
Graduate-level course on Autonomous Robotics focusing on planning, covering path planning, manipulation and controls

TEACHING ASSISTANT · Indian Institute of Technology, Bombay

- Biology : Qualitative and quantitative models in life systems and applications of engineering in biology Fall 2014

Skills

Languages: Python · C++ · LaTeX

Platforms/Tools: PyTorch · Tensorflow · ROS · Pytorch Lightning

Interests

- Dancing and teaching Brazilian Zouk
- Avid traveller; Spent a semester abroad in Denmark & traveled across 16 European countries
- Other hobbies: Rock climbing, Tennis, Reading