

# VIRAJ PARIMI

Email: [vparimi@mit.edu](mailto:vparimi@mit.edu) ◊ (412) 626-1630 ◊ <http://people.csail.mit.edu/vparimi>

## EDUCATION

---

- Massachusetts Institute of Technology (MIT)** Cambridge, MA  
Doctor of Philosophy in EECS Present  
*Relevant Coursework:* Algorithms for Inference, Robotic Manipulation,  
Computational Sensorimotor Learning, Theory of Computation
- Carnegie Mellon University (CMU) - School of Computer Science** Pittsburgh, PA  
Master of Science in Robotics | GPA: 4.08/4 August 2021  
*Relevant Coursework:* Computer Vision, Mathematical Fundamentals for Robotics,  
Graduate Artificial Intelligence, Statistical Techniques in Robotics,  
Planning and Decision Making in Robotics, Mechanics of Manipulation
- Indraprastha Institute of Information Technology (IIIT)** Delhi, India  
Bachelor of Technology in Computer Science and Engineering (Honors) | GPA: 8.96/10 May 2019  
*Relevant Coursework:* Statistical Machine Learning, Deep Learning,  
Advanced Operating Systems, Graph Theory, Numerical Methods, Computer Graphics  
Natural Language Processing, Network and Systems Security, Parallel Programming

## EXPERIENCE

---

- MERS** Cambridge, MA  
Research Assistant August 2021 - Present
- Developed a multi-agent task and motion planner for multiple manipulators working in compact spaces performing tasks such as CAD assembly.
  - Working on safe skill learning by combining multiple hybrid-constraint concurrent automata with safety constraints and frame a formalism which can be deployed in manipulators working in shared environments.
- Motional** Boston, MA  
Intern June 2023 - August 2023
- Developed a lateral contingency MPC framework and demonstrated it in open-loop and closed-loop
  - Improved driving performance of the vehicle when posed with unexpected scenarios
- NASA HOME STRI** Pittsburgh, PA  
Research Assistant August 2019 - August 2021
- Developed a robust multi-agent planner by combining timeline-based planning and hierarchical task planning frameworks and deployed the planner in a test-bed designed to mimic deep space habitats.
- RISS** Pittsburgh, PA  
Research Scholar June 2018 - August 2018
- Developed a computationally scalable bayesian sequential learning framework for time-series forecasting with up to **4 orders of magnitude speed improvement** compared to other benchmarks.
- Precog** Delhi, India  
Data Analytic Intern May 2017 - September 2017
- Devised data analytic tool for National Bomb Data Center (NBDC) working under National Security Guards (NSG) to generate analysis based on historic data.
  - Assembled tool that automates whole process from input stage to output stage where useful insights are passed upon user request.

## PUBLICATIONS

---

### Multi-Agent Constrained Reinforcement Learning

V. Parimi, M. Feng, B. Williams

2024

*In Review*

### Multi-Agent Vulcan: An Information-Driven Multi-Agent Path Finding Approach

V. Parimi, J. Olkin, B. Williams

2024

*International Conference on Intelligent Robots and Systems (IROS) - Oral Pitch*

### Towards efficient and scalable planning: Learning search heuristics for multi-agent planning frameworks

A. Misra, V. Parimi, M. Agarwal, Z. Rubinstein, S. Smith

2023

*CoRL - Learning Effective Abstractions for Planning (LEAP)*

### Task-driven Risk-bounded Hierarchical Reinforcement Learning Based on Iterative Refinement

V. Parimi, S. Hong, B. Williams

2024

AAAI Spring Symposium

### T-HTN: Timeline based HTN Planning for Multiple Robots

V. Parimi, Z. Rubinstein, S. Smith

2022

ICAPS, Hierarchical Planning

### T-HTN: Timeline based HTN Planning for Multi-Agent Systems

V. Parimi

2021

Master's Thesis, CMU

### On the Vulnerability of Community Structure in Complex Networks

V. Parimi, A. Pal, S. Ruj, P. Kumaraguru, T. Chakraborty

2021

Principles of Social Networking, Springer

### Hierarchical Bayesian Framework for Bus Dwell Time Prediction

I. Isukapati, C. Igoe, E. Bronstein V. Parimi, S. Smith

2020

IEEE Transactions on Intelligent Transportation Systems

### Analysis of DSRC accuracy for pedestrian localization

A. Lakshman\*, V. Parimi\*, S. Smith

2018

RISS 2018 Working Paper Journal

## SELECTED PROJECTS

---

### Automatic Reward Densification

MIT | May 2022

Prof. Pulkit Agrawal

- Implemented a system that is able to leverage classical planning over human specified PDDL models to automatically increase the density of robotic tasks with sparse, goal-based reward

### Catching a Ping Pong Ball with an iiwa

MIT | November 2021

Prof. Russ Tedrake

- Programmed the kinematics of a Kuka iiwa using Drake to catch a ping pong ball with a ping pong paddle
- Applied finite-state machine (FSM) techniques to model the paddle's trajectory off equations of motion of projectiles while in a pre-initial-contact mode, while we switched to a PD controller with offset stabilization in the post-initial-contact mode

### Sampling-based Planning in Discrete Space

CMU | November 2020

Prof. Maxim Likhachev

- Proposed a hierarchical decomposition algorithm where we discretize the continuous sample space of PRM/RRT algorithms in order to provide tighter completeness guarantees.
- Demonstrated the performance improvement of the proposed approach for 6-link robotic arm.

## Lossy Compression using Neural Networks

CMU | May 2020

[Prof. Zico Kolter](#)

- Formulated quantization techniques to generate discrete latent space representations among image and text based autoencoder models without significant performance implications.
- Showcased that incorporating commit-loss to the learning process improved the compression ratio of both image and text based models while maintaining the quality of reconstructions.

## COTTON

IIIT-Delhi | November 2018

[Prof. Vivek Kumar](#)

- Developed a light-weight work-stealing runtime for async-finish task parallelism which was energy efficient without incurring significant impact on the performance.
- Used different power saving drivers in combination with `cpufreq` to change the CPU frequency based on some task based heuristics.

## Understanding Vulnerability of Communities in Complex Networks

IIIT-Delhi | May 2018

[Prof. Tanmoy Chakraborty](#) & [Prof. Ponnurangam Kumaraguru](#)

- Identified vulnerable nodes in communities defined in a complex network by investigating several global and community centric properties to observe their effects on underlying community structure of the network.
- Proposed a hierarchical greedy heuristic based approach with a novel task based extrinsic evaluation strategy to measure its robustness.

## Autoencoder based Recommender System

IIIT-Delhi | November 2017

[Prof. Angshul Majumdar](#)

- Engineered a new recommender system for GitHub where users are suggested with relevant repositories to contribute towards based on profiles while leading a group of 2.
- Applied similar technique to single-celled RNA-seq data and showed better gene expression recovery compared to other alternatives.

## Advanced Application for Social Media Analytics (AASMA).

IIIT-Delhi | November 2016

[Prof. Ponnurangam Kumaraguru](#)

- Collaborated with a team of 7 people to extend a tool launched by CERC Lab by incorporating sentiment model along with improvements in efficient data handling and depiction using redis queue for real-time utilization by more than 75 agencies.

## Smart Glasses

IIIT-Delhi | April 2015

[Prof. Alexander Fell](#)

- Created a prototype to help blind people understand text and allow them to identify people they know.
- Selected as top 10 projects of the year and was showcased at the Delhi Mini-Maker Faire.

## HONORS

---

Qualcomm Fellowship India - Finalist	2022
Full scholarship from advisors at CMU	2020
Robotics Institute Summer Scholar (35 selected from ~ 800 applicants)	2018
FICCI Scholarship, CMU	2018
GSoC Internship	2018
Dean's List, IIIT-Delhi	2017
Secured 99.7 <sup>th</sup> percentile among 1.5 million students in JEE Mains Examination	2015

## ACTIVITIES

---

<b>Reviewer</b>	August 2022 - Present
Artificial Intelligence Journal (AIJ)	
IROS	
<b>Graduate Research Assistant</b>	August 2021 - Present
<a href="#">Model-Based Embedded and Robotics Systems Group</a> - MIT CSAIL Research Group	

<b>Teaching Assistant</b> Principles of Autonomy and Decision Making - MIT	August 2022 - December 2022
<b>Graduate Research Assistant</b> <a href="#">Intelligent Coordination and Logistics Laboratory</a> - CMU Research Group	August 2019 - August 2021
<b>RISS Admissions Committee</b> CMU	January 2020 - March 2020
<b>Undergraduate Researcher</b> <a href="#">Laboratory for Computational Social Systems</a> - IIIT-Delhi Research Group	August 2017 - May 2019
<b>Undergraduate Researcher</b> <a href="#">Precog</a> - IIIT-Delhi Research Group	August 2016 - May 2019
<b>Teaching Assistant</b> Advanced Programming - IIITD	August 2017

## INVITED TALKS

---

<b>Planning under Uncertainty for Joint-Task Execution</b> <a href="#">NASA HOME STRI</a>	October 2020 Pittsburgh, PA
<b>Computationally Scalable Bayesian Inference Framework</b> <a href="#">Rapid Flow Technologies</a>	June 2020 Pittsburgh, PA
<b>Analysis of DSRC accuracy for pedestrian localization</b> <a href="#">Hi-tech Robotics Systemz Ltd.</a>	October 2018 Delhi, India

## SKILLS

---

<b>Programming Languages</b>	Python, C, C++
<b>Tools and Technologies</b>	ROS, Pytorch, Keras, HCLIB, CUDA, Git OpenCV, Docker
<b>Languages</b>	English (Fluent), Hindi (Native), Telugu (Native)