VIRAJ PARIMI

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EDUCATION

Massachusetts Institute of Technology (MIT) — Cambridge, MA
Doctor of Philosophy in EECS — Present
Relevent 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
Relevent 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.
- Working on combining multi-agent planning approaches with learning methods including generative models for drones, manipulators and underwater autonomous vehicles

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

Safe Multi-Agent Navigation guided by Goal-Conditioned Safe Reinforcement Learning
V. Parimi, M. Feng, B. Williams 2024
NeurIPS - Intrinsically Motivated Open-Ended Learning (IMOL)
CoRL - Learning Effective Abstractions for Planning (LEAP)

Diffusion-Guided Multi-Arm Decentralized Motion Planning
V. Parimi, A. Gomez, H. Chen, A. Hoffman, B. William 2024
NERC

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

Task-driven Risk-bounded Hierarchical Reinforcement Learning Based on Iterative Refinement
V. Parimi, S. Hong, B. Williams 2024
AAAI Spring Symposium

Towards efficient and scalable planning: Learning search heuristics gor multi-agent planning frameworks
A, Misra, V. Parimi, M. Agarwal, Z. Rubinstein, S. Smith 2023
CoRL - Learning Effective Abstractions for Planning (LEAP)

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 $\sim$ 800 applicants)	2018
FICCI Scholarship, CMU	2018
GSoC Internship	2018
Dean's List, IIIT-Delhi	2017
Secured 99.7^{th} percentile among 1.5 million students in JEE Mains Examination	2015

ACTIVITIES

Reviewer August 2022 - Present
Artificial Intelligence Journal (AIJ)
IROS
CoRL - LEAP
AAAI - GenPlan
ICAPS

Graduate Research Assistant August 2021 - Present
Model-Based Embedded and Robotics Systems Group - MIT CSAIL Research Group

Teaching Assistant August 2022 - December 2022
Principles of Autonomy and Decision Making - MIT

Graduate Research Assistant August 2019 - August 2021
Intelligent Coordination and Logistics Laboratory - CMU Research Group

RISS Admissions Committee January 2020 - March 2020
CMU

Undergraduate Researcher August 2017 - May 2019
Laboratory for Computational Social Systems - IIIT-Delhi Research Group

Undergraduate Researcher August 2016 - May 2019
Precog - IIIT-Delhi Research Group

Teaching Assistant August 2017
Advanced Programming - IIITD

INVITED TALKS

Planning under Uncertainty for Joint-Task Execution October 2020
NASA HOME STRI Pittsburgh, PA

Computationally Scalable Bayesian Inference Framework June 2020
Rapid Flow Technologies Pittsburgh, PA

Analysis of DSRC accuracy for pedestrian localization October 2018
Hi-tech Robotics Systemz Ltd. Delhi, India

SKILLS

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