

Siddarth Venkatraman

🌐 HyperPotatoNeo | 📍 Montreal

Education

Mila, Université de Montréal

PhD in Machine Learning

Sep. 2023 - Present

Carnegie Mellon University

MS in Robotics, GPA 4.17/4.0

Aug. 2021 - Jun. 2023

Manipal Institute of Technology

BTech in Computer Science, GPA 8.91/10

Jun. 2017 - Jun. 2021

Experience

Researcher, CMU Argo AI Center for Autonomous Vehicle Research (Advised by Dr. Jeff Schneider)

Pittsburgh, PA

Working on Deep Reinforcement Learning for motion planning and control of autonomous vehicles.

Nov. 2021 - Present

- Implemented a novel algorithm that does online planning with temporally-abstract dynamics models and skill models learnt with offline data collected from a noisy expert. Matches state of the art performance of Online RL methods on the NoCrash benchmark in the Carla simulator.
- Used previously described skill learning method to beat state of the art methods in challenging d4rl offline RL benchmarks antmaze and franka-kitchen. Accepted paper in ICML 2023.
- Improved upon skill learning method described above by using vector quantization for the latent skills to learn discrete skills having high mutual information with the policy action output. Submitted first author publication to the 5th L4DC conference.
- Demonstrated the effect of stochastic bias due to entropy regularization in SAC policies trained in Carla. Third Author in ICRA 2023 submitted paper that proposes solving this issue with an alpha (entropy term coefficient in SAC) conditioned Q-function.

Research Intern, Caltech (Advised by Dr. Yisong Yue)

Pasadena, CA

Used data driven techniques to aid motion planning and control of a Segway Robot in simulation

Dec. 2020 - Apr. 2021

- Implemented behaviour cloning of a slow expert MPC optimizer to control a segway robot in simulation.
- Trained a control policy to produce a trajectory to be used for warm-starting an OSQP solver for MPC.
- Resulted in up to 5x speed as compared to warm-starting using the previous timestep solution when the optimization objective is suddenly changed.
- Implemented a meta LSTM model that used gradients from a differentiable cost function to optimize a trajectory. Required fewer iterations(3X) to optimize than the OSQP solver, with a tradeoff in success rate (reduction of 20%).

Research Intern, NASA Jet Propulsion Laboratory

Pasadena, CA

Designed, implemented and tested a Machine Learning heuristic for use in motion planning of Mars Rovers.

May. 2020 - Aug. 2020

- Developed a deep network to predict Mars Rover trajectories with high probability of rover clearance failure which is quantified by the ACE (Approximate Clearance Evaluation) score.
- Integrated the above model with a tree based planner in the ROS navigation stack of the rover.
- Method significantly improved upon key metrics as compared to the base navigation stack used in the Perseverance rover. Improvement found in planning cycle time (4x reduction), path inefficiency (8% reduction) as well as overall mission success rate (9% increase).

AI division Member, Project Manas

Manipal, India

Used data driven techniques to aid motion planning and control of a Segway Robot in simulation

Jan. 2018 - Apr. 2020

- Trained and deployed models for lane and obstacle detection, built the perception stack of a robot for the Intelligent Ground Vehicle Competition (IGVC) 2019. Our team achieved first place in the competition, held at University of Oakland, Michigan.
- Developed and deployed various perception modules for the team's autonomous car including lane detection, object detection as part of the Mahindra Rise Prize challenge.

Publications

- [1] Benjamin Freed, Siddarth Venkatraman, Guillaume Adrien Sartoretti, Jeff Schneider, Howie Choset. Learning Temporally AbstractWorld Models without Online Experimentation. ICML 2023
- [2] Shreyansh Daftry, Neil Abcouwer, Tyler Del Sesto, Siddarth Venkatraman, Jialin Song, Lucas Igel, Amos Byon, Ugo Rosolia, Yisong Yue, Masahiro Ono. MLNav: Learning to Safely Navigate on Martian Terrains. IEEE Robotics and Automation Letters 7, 5461–5468 (2022). (Also accepted and presented at ICRA 2022)
- [3] Neil Abcouwer, Shreyansh Daftry, Siddarth Venkatraman, Tyler Del Sesto, Olivier Toupet, Ravi Lanka, Jialin Song, Yisong Yue, Masahiro Ono. Machine Learning Based Path Planning for Improved Rover Navigation in 2021 IEEE Aerospace Conference (50100) (2021), 1–9.
- [4] Shivam Agarval* & Siddarth Venkatraman*. Deep Residual Neural Networks for Image in Audio Steganography (Workshop Paper) in 2020 IEEE Sixth International Conference on Multimedia Big Data (BigMM) (2020), 430–434. (Co-First Author)
- [5] Conor Igoe, Swapnil Pande, Siddarth Venkatraman, Jeff Schneider. Multi-Alpha Soft Actor-Critic: Overcoming Stochastic Biases in Maximum Entropy Reinforcement Learning. ICRA 2023

Technical Skills

Programming Python, Matlab, C++, Java

Relevant Frameworks PyTorch, Tensorflow, ROS, OpenCV

Experienced Domains Machine Learning, Robotics, Computer Vision, Optimal Control

Relevant Courses

10-701	Introduction to Machine Learning (PhD)
16-811	Math Fundamentals for Robotics
10-725	Convex Optimization
10-703	Deep Reinforcement Learning
16-720	Computer Vision