

Siddharth Singh

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EDUCATION

University of Pennsylvania

M.S. Electrical Engineering

Philadelphia, PA

May 2020

JSS Academy of Technical Education

B.S. Mechanical and Automotive Engineering

Noida, India

August 2017

KEY SKILLS & RELEVANT COURSES

- **Programming and Scripting Languages :** Python, C , C++
- **Platforms and Libraries :** MATLAB, ROS, Adams MSC , Numpy/Scipy/Scikit/Pytorch
- **Courses:** Advanced topics in Machine Perception, Advanced Robotics, Autonomous Vehicles, Control In Robots, Applied Machine Learning, Introduction to Machine Learning, Statistics for Data Science, C++ for C Programmers, Algorithms and Data Structures, Numerical Optimization

EXPERIENCE

PRECISE Center, University of Pennsylvania

November 2018 - Present

Research Assistant, Guide: Professor Rahul Mangharam

- **Project :** Development of 1/10th scale autonomous vehicles using Jetson TX2 and multimodal sensor suit.[Link]
- Improved the vehicle's capabilities by implementing a perception pipeline for free space detection and grid mapping.
- Achieved safe obstacle avoidance using MPC for trajectory generation and tracking via IPOPT optimization techniques.[Link]

Robotics Research Center, Hyderabad

June 2017 - July 2018

Motion Path Planning Intern

- **Project :** Autonomous Vehicles Development in collab. with Mathworks and Intel.**Drive by wire demonstration link**
- Developed software stack for realtime Model Predictive Speed Control framework coupled with a RRT* based planner.
- Demonstrated better performance on varying surface gradient & friction along with lateral dynamic approximation.[Link]

Sensagrate, Arizona

June 2019 - August 2019

Perception Intern

- **Project:** ASU Blueprint; an initiative to develop smart city infrastructure using LiDAR and camera sensors.
- Improved the performance of the model during inference by eliminating background and stationary pointclouds.
- Enhanced training and inference by implementing data augmentation, cloud upsampling and clustering techniques.
- Implemented probabilistic and semantic mapping from visual information for better tracking.

GRASP Laboratory, University of Pennsylvania

April 2019 - Present

Research Assistant, Guide: Professor Kostas Daniilidis ,Funding Organization : Honda Research Institute

- **Project:** Developing curiosity based Reinforcement learning models for multi-agent systems for exploration.
- Incorporated memory and curiosity in models for faster convergence and exploration. Explored the impact of different metrics for curiosity measure.(collaboration: Dr. Vijay Balasubramanian, Penn Physics & Astronomy).
- **Project:** RoboNet: A visual foresight based learning system for prediction and planning (collaboration: RAIL, UC Berkley).
- Demonstrated generalization capabilities of video prediction algorithms across varied and unseen robots using a new multi-institutional dataset of robot actions.
- Applied state space augmentation during training to help generalize across robots for zero shot and few shot learning.

Publications

- S. Dasari, F. Ebert, S. Tian, S. Nair, A. Xie, B. Bucher, **S. Singh**, K. Schmeckpeper, S. Levine, C. Finn. **RoboNet: Learning and Generalizing across Robots through Large-Scale Visual Prediction and Planning.** CoRL, 2019.
- Matthew O' Kelly, Dhruv Kartik, Hongrui Zheng, Joe Auckly **Siddharth Singh**, et al. **F1/10: An open-source 1/10th scale platform for autonomous racing and reinforcement learning.** NeurIPS Demo 2019
- Adarsh Modh, **Siddharth Singh**, et al. **Gradient Aware-Shrinking Domain based Control Design for Reactive Planning Frameworks used in Autonomous Vehicles.** Advances in Robotics 2019 [LINK]

Academic Projects and Other Achievements

- **Quadrotor trajectory planning and control :** End to end framework for autonomous quadrotor navigation including pose estimation via VIO and optical flow, extended kalman filters and minimum snap trajectory generation and tracking.
- Undergraduate college basketball captain and SAE Baja Racing vice captain.