Pranav Shah

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Education:

- **University of Pennsylvania, School of Engineering and Applied Sciences, GRASP, Philadelphia, PA.** (Aug 2021 – May 2023)
  Master's, MSE Robotics GPA: 3.94 / 4.0
  Awarded ***Outstanding Research Award*** by University of Pennsylvania.
  Relevant Course Work: Learning in Robotics, Advanced Robotics (Path Planning, State estimation and Control of UAVs), Machine Perception, Machine Learning, Deep Learning, Control and Optimization for Application in Robotics
- **Veermata Jijabai Technological Institute (V.J.T.I.), Mumbai, India** (July 2016 – Sep 2020)
  Bachelor of Technology (B.Tech) – Electronics Engineering CGPA: 9.29 / 10.00

Skills:

- Programming: Python, C++, PyTorch, MATLAB, PostgreSQL, C, Embedded C, Robot Operating System (ROS)
- Tools: AutoCAD, Git, LaTeX, MATLAB, Simulink, Docker, Distrobox, Arduino, Drake, Excel, NI Multisim
- Product Development: Laser cutting, electronic circuit design, PCB designing, CNC milling, machining processes.

Work Experience:

- ***Research Engineer*****, GRASP Lab, University of Pennsylvania** (May 2021 – Current)
  Project 1: Migration of open-source library from ROS1 to ROS2
- Collaborating with a cross-functional team to migrate the open-source library of Kumar Robotics for drones from ROS1 to ROS2.
- Skills involved: C++, ROS1, ROS2, ROS1 bridge, Docker, Distrobox
  Project 2: Path Planning and Control of swarm of mini drones
- Developed a simulator using Python for a *swarm* of mini *drones* which can fly in proximity in an indoor environment.
- Implemented a Hamiltonian path planning algorithm along with a PID controller for swarm of drones.
  Project 3: Motion planning of multi-agent micro- robots
- Developed a simulator for a *swarm of micro-scaled robots*, designing local – rules for a de-centralised *multi-agent* system using *Python*.
- Designed a macro-scaled prototype of the micro-bot to analyze the dynamics of the robot.

- ***Data Scientist*****, Loylty Rewardz Management Pvt. Ltd**. (Mumbai, India) (Dec 2020 – June 2021)
- Developed *Machine Learning* models to perform customer segmentation and predict future propensities for effective marketing.
- Programmed *PostgreSQL* scripts for database management, data analysis and automating several monthly report processes.

- ***Intern*****, Larsen and Toubro (L&T) Electrical and Automation** (Mumbai, India) (May 2019 – July 2019)
  Designed and simulated the *electronic circuit* and *control* algorithm for a Solar PV Grid Tied Inverter using *MATLAB/Simulink*.

Project Experience:

- **SICK Lidar TiM 10K Challenge** (1st Prize Winners) (Oct 2022 – Apr 2023)
- Designed and developed an autonomous solution for the public space sanitation industry, along with a team of 5 which is one of the 20 teams shortlisted in the USA.
- Skills involved: ROS, path planning, control, mechanical product design, mechatronics, electronic circuit design, perception.

- **Chance constrained multi-agent non-linear Model Predictive Control** (Nov 2022 – Dec 2022)
- Formulated a non-linear model predictive control (NMPC) for a differential drive robot to perform decentralized path planning.
- Built the project in ROS 2, simulated in Gazebo environment, and used 'drake' as the mathematical framework to solve the optimization.
- Concepts explored: Model Predictive Control (MPC), Linear Quadratic Regulator (LQR) and Iterative LQR (iLQR)

- **Attention-based Networks for Human Trajectory Prediction** (Nov 2022 – Dec 2022)
  Designed and trained a *Transformer neural network* (using *PyTorch*) to predict a human's trajectory on the TrajNet dataset.
- **Ensemble Kalman Filter** (Apr 2022 – May 2022)
  Developed an Ensemble *Kalman filter* using a Neural Network (using *PyTorch*) which combined the filter outputs of an Error State Kalman filter, Complementary filter and Unscented Kalman Filter.
- **Autonomous VIO-based Quadcopter** (Jan 2022 – May 2022)
  Implemented the path planning (A* algorithm), trajectory generation (minimum-snap trajectory), geometric controller and visual-inertial odometry (VIO) based state estimation and *localization* (sensor fusion of IMU data and stereo-images) for a UAV.
- **Simultaneous Localization and Mapping (SLAM)** (Mar 2022)
  Implemented a mapping and localization algorithm with a particle filter using data from IMU and LiDAR sensor.
- **Franka Panda Robot arm manipulation** (Dec 2021)
- Used *kinematics* concepts to control and maneuver a Franka Panda *robotic arm* to perform tasks in a dynamic environment.
- Implemented a graph based path planning algorithm, RRT, to obtain a path for the 7 DOF robotic arm.

- **Semi-autonomous mobile robot** (Aug 2021 – Dec 2021)
  Designed and developed a semi-autonomous mobile robot with multiple sensing systems to interact and perform complex tasks in a dynamic environment.