# Vanshil Shah

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## EDUCATION

**University of Pennsylvania**                                                            Aug. 2021 - May 2023

M.S.E. Robotics                                                                                              GPA: 4/4

*Courses*: Machine Learning, Theoretical Deep Learning, Learning in Robotics, Geometric Computer Vision, Deep Learning for Vision, Advanced Robotics, Convex Optimization

**Nirma University**                                                                                   Aug 2015 - May 2019

B.E. in Mechanical Engineering                                                                        GPA: 8.1/10

## PUBLICATIONS

Prashant Kumar*, Sabyasachi Sahoo*, **Vanshil Shah**, Vineetha Kondameedi, Abhinav Jain, Akshaj Verma, Chiranjib Bhattacharyya, Vinay V. **"DSLR : Dynamic to Static LiDAR scan Reconstruction using adversarially trained autoencoder"**(*Proceedings of the AAAI Conference on Artificial Intelligence 2021*)

## WORK EXPERIENCE

**Ford Motors, Autonomous Vehicles LLC**                                               May 2022 - August 2022

Localisation and Mapping intern, Perception Team                                      Dr. Punarjay Chakravarthy

- Deployed a pipeline based on Neural Radiance fields for synthetic data generation.
- Experimented with slot attention based neural radiance fields for disentagling backgorund and foreground
- Achieved comparable performance of image reconstruction metrics like PSNR,LPIPS and SSIM on both real world and simulated dataset*[Project Report][Slides]*

**Indian Institute of Science(IISc), Bangalore**                                          Nov 2019 - Sept 2020

Research Intern, Machine Learning Lab | Collaboration: Ati Motors                              Sabyasachi Sahoo

- Integrated Google Cartographer SLAM algorithm with our model DSLR for improving navigation in a dynamic setting.
- Devised a novel dataset generation pipeline to create a first of its kind LiDAR based static-dynamic frame dataset.
- Achieved *4 times better reconstruction* on Chamfer Distance over state of the art baselines.

**Robert Bosch Center for Cyber Physical Studies(RBCCPS),** Bangalore        June 2019 - Nov 2019

Perception Team, MBZIRC 2020 | Collaboration: TCS Innovation Labs                     Dr. Raghu Krishanpuram

- Benchmarked visual SLAM algorithms for facilitating quad copter autonomy in degraded environments  *[Video]*

## PROJECTS

**Segmentation and Object Detection**

- **SOLO:** Implemented the network proposed in paper: *Segmenting Objects by Location* to predict instance segmentation masks over 3 categories(Vehicle, People and Animals) on COCO dataset                            *Github*
- **Faster RCNN:** Implemented a 2-stage RCNN based object classifier. This involved training the first stage Region Proposal Network and second stage regressor, and classifier. MAP achieved: 0.76                            *Github*
- **YOLO:** Implemented YOLO-v1 to predict bounding boxes and classes for detecting People, Vehicles and Traffic Lights. MAP achieved: 0.46                                                                                   *Github*

**Geometric computer vision**

- **Multi view stereo reconstruction**: Implementation of two-view stereo and multi-view stereo algorithms for dense 3d reconstruction                                                                                     *Github*
- **2 view Structure from Motion**: Implemented the SFM algorithm using SIFT features and 8-point algorithm in tandem with RANSAC for robust camera pose estimation                                                         *Github*

**Localization and Estimation**

- **Particle filter based SLAM:** Integrated the inertial orientation and odometry with a 2D LIDAR scan to build the occupancy grid map of the environment while localising the robot using a particle filter               *Github*
- **Orientation tracking with inertial data:** Implemented a Quaternion based Unscented Kalman Filter(UKF) to track 3D orientation from Gyroscope and Accelerometer data                                                     *Github*

**Real time 7 DOF robot manipulation framework**

- Developed a modular library for facilitating manipulation of Franka Panda arm.                               *Github*

## TECHNICAL SKILLS

**Languages**: Python, C/C++, MATLAB
**Software Tools**:ROS, Git, Docker, LaTex, OpenAI Gym, Gazebo,CARLA,Cmake
**Libraries**: PyTorch, Sklearn, NumPy, pandas, Matplotlib, OpenCV