

# Prateek Arora

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**Research Interests:** Computer Vision, Deep Learning, Perception; SLAM, 3D Mapping, Localization.

## EDUCATION

### University of Nevada, Reno, NV

PhD in Computer Science and Engineering

Aug 2020 – Present

### University of Maryland (UMD), College Park, MD

Master of Engineering in Robotics

Aug 2018 – May 2020

### GGSIU University, New Delhi, India

Bachelors in Electrical and Electronics Engineering

Jul 2012 – May 2016

## EXPERIENCE

### Perception and Robotics group, UMD

Research Assistant

Aug 2018 – Dec 2019

under *Prof. Yiannis Aloimonos*

- Designed a hardware sensor and compute suite for estimating Visual Inertial Odometry, which is compact and light enough to be mounted on nano-sized quadrotor (130 mm).
- Implemented trajectory tracking on quadrotor (equipped with pixhawk and odroid) using cascaded proportional-integral-derivative controller on position and velocity.

### Indraprastha Institute of Information Technology (IIIT), Delhi, India

Research Associate

Jul 2017 - Jul 2018

under *Prof. P.B. Sujit* and *Prof. Sanjit Kaul*

- Worked on traffic light detection in Indian traffic environment and system integration of software stack (ROS based) of the self driving car at IIIT-D named [Swarath](#).
- Developed lane cost algorithm to replace binary cost map and integrated it with Open Motion Planning Library.

## PUBLICATIONS

- Mobile Manipulation-based Deployment of Micro Aerial Robot Scouts through Constricted Aperture-like Ingress Points: *Prateek Arora*, Christos Papachristos: **IROS 2021** [[Video](#)]
- Environment Reconfiguration Planning for Autonomous Robotic Manipulation to overcome Mobility Constraints: *Prateek Arora*, Christos Papachristos: **ICRA 2021** [[Video](#)]
- Launching a Micro-Scout UAV from a Mobile Robotic Manipulator Arm: *Prateek Arora*, Christos Papachristos: **AeroConf 2021** [[Paper](#)]
- Mobile Manipulator Robot Visual Servoing and Guidance for Dynamic Target Grasping: *Prateek Arora*, Christos Papachristos: **ISVC 2020** [[Paper](#)] [[Video](#)]

## COURSE PROJECTS

### Computer Vision and Deep Learning

- **Camera Calibration:** Implemented camera calibration pipeline (based on the work of Zhang et al.) to obtain intrinsic camera parameters and estimating radial camera distortion.
- **Deep Homography Net, [Supervised](#) and [Unsupervised](#):** Implemented deep CNN to estimate homography between two images using TensorFlow.
- **Structure from Motion (or SLAM):** Reconstructed 3D scene and simultaneously computed camera pose using multiple views from a single camera.
- **SFM using Deep learning:** Improved accuracy of an unsupervised learning framework for monocular structure from motion (paper: [SFM\\_Learner](#))

### Hands On Autonomous Aerial Robotics (ROS)

- **Pose estimation:** 3D pose estimation of Custom fiducial marker in real-time in order to land a quadrotor on it.
- **Attitude Estimation:** Implemented *Madgwick* and *Unscented Kalman Filter* to estimate orientation of a 6-DoF IMU.
- **Stereo Visual Odometry:** Estimated 3D trajectory of a quadrotor equipped with a stereo camera using optical flow.
- **Flying through gaps:** Implemented *Gaussian Mixture Model* to detect colored windows and used it as a feedback to autonomously navigate a drone through it.

### Mobile Base Manipulator Arm

- **Structural inspection planner:** This work considers the problem of finding a feasible path that respects the constraints of mobile manipulator system to provide complete coverage of a 3D structure and reconstruct it.

## SKILLS

**Computer Languages:** Python, C++, Matlab, HTML5/CSS,  $\text{\LaTeX}$

**Operating System:** Linux, Windows

**Softwares/Libraries:** ROS, Gazebo, Tensorflow, PyTorch, Git, Jupyter, Eagle, Inventor