

Abhinav Modi

✉ abhinav.modi888@gmail.com |  [abhinavmodi16](https://github.com/abhinavmodi16) |  [abhi1625.github.io](https://github.com/abhi1625) | 🏠 8402 49th Avenue, College Park, MD

EDUCATION

University of Maryland(UMD), College Park
Masters of Engineering in Robotics

GPA: **3.86/4.0**
Aug. 2018 - May 2020

Birla Institute of Technology and Science(BITS), Pilani, India
Bachelors of Engineering(Hons.) in Mechanical Engineering

GPA: **7.53/10(3.18/4)**
Aug. 2014 - May 2018

Relevant Coursework: Perception for Autonomous Robots, Decision making for Robotics, Software Development for Robotics, Computer Processing of Pictorial Information, Robot Learning

TECHNICAL SKILLS

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|------------------------------|---|
| Areas of Interest | Object tracking, Multi-view geometry, Localization, SLAM, Deep Reinforcement Learning, Decision Making for Autonomous Systems |
| Modeling and Analysis | Solidworks, MSc ADAMS, Simulink, MATLAB, V-REP, Gazebo |
| Software development | Agile development, Automated/Manual Unit testing, Google Mock/Test framework |
| Softwares & Tools | C++, ROS, Python, Linux, Tensorflow, TFLite, PyTorch, OpenCV, Git, Numpy, LaTeX |

RESEARCH EXPERIENCE

Geometric Algorithms for Motion, Modeling and Animation(GAMMA) Labs, UMD
Research Assistant under Prof. Dinesh Manocha

Jan. 2020 - Present

- Used PyGame to develop a heterogeneous traffic environment to simulate aggressive driving behaviours like over-speeding, weaving and erratic lane changes.
- Analysed two approaches based on spectral graph theory and vertex centrality to classify driver behaviors based on vehicle trajectories.

Autonomous Micro Aerial Vehicle(AMAV) Team, UMD
Research Assistant under Prof. Derek Paley

Dec. 2018 - Feb. 2020

- Working with Intel's depth and stereo modules to develop vision algorithms for path planning and obstacle avoidance on micro UAVs.
- Won the 7th edition of the VFS MAV Student Challenge, at the University of Pennsylvania, PA in May 2019.

Perception and Robotics Group, UMD
Research Assistant under Prof. Yiannis Aloimonos

Aug. 2018 - Dec. 2019

- Performed neural network compression for a pipeline which predicts dense depth, optical flow and camera pose. Implemented network distillation and model quantization across different network architectures for comparison.
- Successfully reduced the memory footprint of the model by 94% and the inference time by 90% using Tensorflow and TFLite frameworks in python.

PROJECTS

- **Optical Flow based Obstacle Avoidance** Compared traditional Gunnar Farneback method and deep learning based Spatial Pyramid Network for real time obstacle avoidance on micro UAVs using optical flow. ([link](#))
- **Flying through Gaps:** Developed a Gaussian-Mixture-Model(GMM) based vision feedback system to autonomously fly a quadrotor through a window of known dimensions but unknown position and orientation. ([link](#))
- **Visual Odometry:** Estimated 3D trajectory of a stereo camera(Duo3D) by computing sparse optical flow using Kanade-Lucas-Tomasi(KLT) tracker. ([link](#))
- **Attitude Estimation:** Compared madwick and unscented kalman filters(UKF) to estimate orientation of a 6-DoF IMU against ground-truth vicon data. ([link](#))
- **Kids Next Door:** Developed a software package using ROS and C++ to simulate a mobile manipulator robot Tiago++ for pick and place operations. ([link](#))
- **Human Obstacle Detection:** Designed a software module to utilize a pretrained YOLOv3 network to detect and localize humans in a robot's reference frame. ([link](#))

LEADERSHIP EXPERIENCE

Graduate Teaching Assistant

Jan. 2020 - Present

Perception for Autonomous Robotics - ENPM673, University of Maryland

- Helping students to learn various software packages to implement projects related to multi-view geometry, image segmentation, motion processing and object recognition.
- Assisting Dr Mohammed Charifa(course instructor) in developing course material and grading student submissions.