Abhinav Modi

abhi1625@umd.edu | abhinavmodi16 | abhi1625.github.io| 8402 49th Avenue, College Park, MD

EDUCATION

University of Maryland, College Park GPA: **4.0/4.0**
Masters of Engineering in Robotics *Aug. 2018 - May 2020*

Birla Institute of Technology and Science(BITS), Pilani, India GPA: **7.53/10(3.18/4)**
Bachelors of Engineering(Hons.) in Mechanical Engineering *Aug. 2014 - May 2018*

Relevant Coursework: Computer Processing of Pictorial Information, Perception for Autonomous Robots, Control of Robotic Systems, Decision making for Robotics, Software Development for Robotics

TECHNICAL SKILLS

Areas of Interest	Deep Learning, Computer Vision, Data Structures and Algorithms, Image Processing, SLAM, Deep Convolution Neural Networks(CNNs)
Modeling and Analysis	Solidworks, MSc ADAMS, Simulink, MATLAB
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

Perception and Robotics Group, University of Maryland *Aug. 2018 - Present*
Research Assistant under Prof. Yiannis Aloimonos

- 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.

Autonomous Micro Aerial Vehicle(AMAV) Team *Dec. 2018 - Present*
Research Assistant under Prof. Derek Paley

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

PROJECTS

- **Attitude Estimation:** Compared madgwick and unscented kalman filters(UKF) to estimate orientation of a 6-DoF IMU against grouund-truth vicon data.(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)
- **Edge Detection using Pb-Lite:** Edge detection in images with texture reduction using "Probability of Boundary" method by performing k-means clustering on texture, brightness and color gradient maps.(link)
- **Visual Odometry:** Estimated 3D trajectory of a stereo camera(Duo3D) by computing sparse optical flow using Kanade-Lucas-Tomasi(KLT) tracker.
- **Structure from Motion**: Simultaneous 3D map generation and camera pose estimation using image sequences from a monocular camera.
- **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.
- **Advanced Lane Detection:** Developed a pipeline to mimic turn prediction system in self-driving cars, using histogram of lane pixels.
- **Trajectory Tracking**: Implemented Geometric and Model Predictive based controllers in MATLAB and C++ for online trajectory tracking on quadrotors.

LEADERSHIP EXPERIENCE

Inspired Karters, Formula Student Team, BITS Pilani *Feb. 2016 - Feb. 2017*
Team Captain

- Established a new team structure for a team of 50 students from multiple disciplines to incorporate a KTM 390 engine, smaller wheels (10"), and a full body aero-package, all for the first time in the history of the team.
- Successfully raised INR 150,000 as a team in only one month's time, amounting to INR 7,50,000 during the whole year.