

# Abhinav Modi

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## EDUCATION

**University of Maryland, College Park**  
*Masters of Engineering in Robotics*

GPA: **4.0/4.0**  
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:** Computer Processing of Pictorial Information, Perception for Autonomous Robots, Control of Robotic Systems, Decision making for Robotics, Software Development for Robotics

## TECHNICAL SKILLS

<b>Areas of Interest</b>	Deep Learning, Computer Vision, Data Structures and Algorithms, Image Processing, SLAM, Deep Convolution Neural Networks(CNNs)
<b>Modeling and Analysis</b>	Solidworks, MSc ADAMS, Simulink, MATLAB
<b>Software development</b>	Agile development, Automated/Manual Unit testing, Google Mock/Test framework
<b>Softwares &amp; Tools</b>	C++, ROS, Python, Linux, Tensorflow, TFLite, PyTorch, OpenCV, Git, Numpy, LaTeX

## RESEARCH EXPERIENCE

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

Aug. 2018 - Present

- 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**  
*Research Assistant under Prof. Derek Paley*

Dec. 2018 - Present

- 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

- Optical Flow based Obstacle Avoidance** Compared traditional Gunnar Farneback method and Spatial Pyramid network to compute dense optical flow for real time obstacle avoidance on micro [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.
- Structure from Motion:** Simultaneous 3D map generation and camera pose estimation using image sequences from a monocular camera.
- Visual Odometry:** Estimated 3D trajectory of a stereo camera(Duo3D) by computing sparse optical flow using Kanade-Lucas-Tomasi(KLT) tracker.
- Attitude Estimation:** Compared madgwick and unscented kalman filters(UKF) to estimate orientation of a 6-DoF IMU against ground-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.[\(link\)](#)
- Travelling Salesman Problem:** Implemented a 2-approximation greedy algorithm using minimum spanning trees to find tours for the metric-TSP problem.[\(link\)](#)
- Deep Q-learning for MountainCar-v0:** Trained a deep Q-learning network for the discrete action space mountain car problem in OpenAI gym.[\(link\)](#)

## LEADERSHIP EXPERIENCE

**Inspired Karters, Formula Student Team, BITS Pilani**  
*Team Captain*

Feb. 2016 - Feb. 2017

- 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.