

# Barathwaj Anandan

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## Education

### Carnegie Mellon University - School of Computer Science

Pittsburgh, PA

MASTER OF SCIENCE IN ROBOTIC SYSTEMS DEVELOPMENT | QPA: 3.89

August 2019 - May 2021

**Coursework:** Computer Vision, Machine Learning, Geometry Vision, Computer Graphics, Visual Recognition

### PSG College of Technology

Coimbatore, India

BACHELOR OF ENGINEERING IN ROBOTICS AND AUTOMATION | CGPA: 8.3

June 2018

**Coursework:** Neural Networks, Vision Systems and Image Processing, Artificial Intelligence for Robotics, C++ and Data Structures

## Experience

### IntelinAir, Makers of AgMRI

Champaign, IL

COMPUTER VISION ENGINEER (INTERN)

May 2020 - August 2020

- Built an efficient object Detection model based on Faster RCNN for counting the number of kernels on a corncob.
- Developed an Instance Segmentation pipeline based on Mask RCNN to determine the quality of individual kernels.
- Worked on the deployment of the above Objection Detection model using MobileNetV2 Backbone into an iOS device using coreML.
- Achieved a mean IoU of 89% and kernel count accuracy of 93%.

### Carnegie Mellon University - Cylab | General Motors

Pittsburgh, PA

SHORT TERM SCHOLAR

Jan'18 - May'18, Nov'18 - April'19

- Built a robust simulator based on OGRE 3D Engine using C++, simulating different sensors like Camera, LIDAR etc.
- Implemented algorithms to simulate the effects of weather conditions, traffic signals and pedestrian on Ego vehicle.
- Built an XML parser tool based on ArcGIS and OpenStreetMap to populate roads of any city for realistic environment simulation.

### International Institute of Information Technology | Alog Tech

Hyderabad, India

RESEARCH INTERN

June-July 2018

- Modelled different 3D Warehouse maps for testing Navigation Algorithms using Google Sketchup.
- Developed the object detection Pipeline for the autonomous warehouse cart based on TensorFlow Obstacle Detection API.

## Projects

### Apartment Package Delivery with UAV | CMU-Capstone | Website

Sept 2019 - December 2020

- Built a drone to deliver packages to apartment balconies autonomously.
- Implemented a Real Time Obstacle detection system based on YOLO, trained using self annotated custom dataset.
- Worked on the package tracking pipeline to track the package and platform in real time.
- Developed the manipulation system for the drone using Electro Magnets in simulation and Real world.

### Monocular Video Depth Estimation

November - December 2020

- Experimented with a depth estimation pipeline to produce geometrically consistent depth Maps from a monocular video.
- Modified the pipeline to replace classical SfM by deep learning based methods for accurate pose estimation.
- Used RAFT Optical Flow Estimation algorithm to mask out the dynamic objects in the frames to improve pose estimation.

### 3D Computer Graphics - Rasterization, Ray Tracing and Animation

September - December 2020

- Build an SVG Rasterizer with features like Super sampling, Bilinear and Trilinear Filtering, Mipmap generation, Alpha Compositing.
- Implemented Geometry Processing algorithms like Linear subdivision, Catmull-Clark subdivision, Mesh simplification.
- Developed a Ray Tracing pipeline which includes Ray Intersection, Bounding Volume Hierarchy Construction, Shadow Ray, Infinite Environment lighting, Indirect illumination, mirror and glass materials implementation.
- Worked on various animation functions like Spline Interpolation, Forward and Inverse Kinematics, Skinning.

### GANs for Data Augmentation with Pytorch

CMU | December 2019

- Developed and validated performance of a Deep Convolutional Generative Adversarial Network for Data Augmentation.
- Generated over 2000 Artificial training data from the Stanford cars dataset.
- Built a CNN Image classifier using the generated data to augment the original dataset to prove that the augmentation works.

### Single View and Multi View Geometry

CMU | October 2019

- Performed eight-point and seven-point algorithms to estimate Fundamental Matrix.
- Computed epipolar correspondences to obtain 3D Reconstruction of a given scene.
- Optimized reconstruction leveraging RANSAC and Bundle Adjustment.
- Detected Vanishing points from Single View based on Manhattan world Assumption.

## Skills

**Programming** C++, Python, MATLAB, HTML, CSS

**Tools** Pytorch, ROS, OpenCV, Numpy, Eigen, PyGUI, Git, SolidWorks, Blender, Docker, AWS, SageMaker