

# Mahimana Bhatt

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## OBJECTIVE

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Seeking full-time opportunities in the field of computer vision, deep learning in robotics and autonomous systems.

## EDUCATION

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- **Worcester Polytechnic Institute** Worcester, MA  
*Master of Science in Robotics Engineering (Thesis); GPA: 4.0* Aug. 2019 - May 2021
- **Shri Govindram Seksaria Institute of Technology and Science** Indore, India  
*Bachelors of Engineering in Electronics and Telecommunication; GPA: 3.73(7.95/10.0)* Aug. 2014 - May 2018

## COURSES

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Deep Learning for Advanced Robot Perception, Deep Learning, Computer Vision, Machine Learning, Robot Dynamics, Robot Control, Foundation of Robotics, Directed Research - Visual SLAM, DeepLearning.AI TensorFlow Developer Specialization

## SKILLS

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**Languages:** C++, Python, Java

**Software Skills:** Matlab, Robotics Operating System (ROS), TensorRT, JavaFX, CMake

**Software Libraries:** OpenCV, Point Cloud Library(PCL), Keras, Scikit-Learn

**Framework:** Tensorflow, PyTorch

**Hardware Skills:** Ouster OS0 Lidar, Nvidia Jetson Nano, Intel RealSense D435i, Raspberry Pi3

**OS:** Linux, Windows

**DevOps:** Jira, Docker

**Version Control:** Git

## EXPERIENCE

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- **Research Intern** May 2020 - Present  
*Institute for Human and Machine Cognition (IHMC), Robotics Lab* Pensacola, FL
  - Developed software stack for **3D reconstruction and mapping** from point clouds from Ouster OS0 lidar on a **UGV** from **Army Research Laboratory** dividing the environment into voxels using **Octrees**
  - Optimized the algorithm to construct an Octree in real-time as point clouds are received from Lidar and visualize the Octree using 3D meshes.
  - Currently developing additional layers in the octree data structure to store per voxel information for eg. object detection, semantic segmentation, etc under the supervision of **Dr. Matthew Johnson** and **Dr. Robert Griffin**.
- **Embedded Software Developer** July 2018 - June 2019  
*Addverb Technologies* Noida, India
  - **Vehicle Tracking System:** Achieved an accuracy of 5cm for an asset tracking system using Kalman filter and Triangular approximation based on ultra wide-band technology and successfully commissioned the project in a warehouse for tracking forklifts.
  - **Crate Localization System:** Successfully developed and deployed a system to localize a broad wire crate in a large open-air warehouse using Bluetooth BLE 4.0.

## PROJECTS

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- **Monocular Depth Estimation(WPI)** Sept. 2020
  - Implementing unsupervised learning based architecture MonoDepth for monocular depth estimation using Tensorflow framework.
  - Using the KITTI dataset for training, exploring options to tweak in architecture to improve estimation.

- **3D Object Position Estimation using Object Detection**(NASA SRC) *Mar. 2020*
  - Trained SSD Mobilenet using object detection API in Tensorflow on an annotated dataset to detect rocks, cubesat, volatiles, rover, etc. in the simulation.
  - Estimated the 3D position of the detected object using projection matrices and disparity from a stereo camera.
  - Developed a noise image elimination system using background subtraction and epipolar geometry.
- **Speed Estimation using Optical Flow and Deep Learning**(WPI) *Mar. 2020*
  - Trained a 2D CNN based 10 layers deep network on optical flow images extracted from Comma.AI speed challenge dataset to estimate the speed of the vehicle.
  - Used data augmentation by writing a custom generator to increase training data and got a validation loss of 0.05.
  - Deployed the model on **Nvidia Jetson Nano** by compressing it using TensorRT.
- **Image to Image Translation using GAN**(WPI) *Jan. 2020*
  - Implemented CycleGAN and VAE based GAN - UNIT to perform image to image translation.
  - Trained for summer to winter image translation and vice versa using Pytorch framework on the Yosemite dataset.
  - Tweaked with the architecture of CycleGAN to improve image generation for the task.
- **Stereo Visual Odometry**(WPI) *Jan. 2020*
  - Estimated the 3D location of the robot using KITTI dataset stereo images to extract FAST features, compute disparity image using epipolar geometry.
  - Implemented the Lavenberg-Marquardt algorithm for inlier detection for 3D to 2D motion estimation.
- **3D Object Reconstruction using Point Cloud**(WPI) *Aug. 2019*
  - Implemented Iterative Closest Point algorithm to stitch overlapping RGB-D point clouds received from Intel Realsense camera.
- **Rubik's Cube Detection**(WPI) *Aug. 2019*
  - Detected Rubik's Cube in real-time video using classical computer vision techniques such as optical flow, good features to track
  - Implemented the nearest neighbor algorithm for predicting undetected parts of the cube due to occlusion.

## COMPETITIONS

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- **NASA Space Robotics Challenge (WPI):** *Mar. 2020*
  - Lead and contributed to the development of software applications to localize resources in simulation environment of MARS on the Gazebo.
  - Integrated RTabMap package with the stereo camera for SLAM.
  - Developed noisy image elimination algorithm to achieve good localization and avoid drift.
  - Developed a 3D object location estimation system to locate resources and various objects in simulation to score points.
- **E-Yantra Robotics Competition:** *Mar. 2016*
  - Achieved all India 10th position in E-Yantra Robotics Competition (e-YRC) organized by the **Indian Institute of Technology(IIT), Bombay**.
  - Built an autonomous picking robot that can traverse from its current location to its destination following the shortest path.
  - Localized the robot using color marker-based pixel tracking and implemented the A-star shortest path algorithm for the traversal of the robot using OpenCV.

## POSITIONS OF RESPONSIBILITY

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- **Chief Technical Officer - SGSITS Robotics Club:** *Aug. 2016 - July 2017*

Responsible for the transformation of capital be it monetary or intellectual into technology in furtherance of the clubs objectives and keeping the club updated with recent technological advancements.

## TEACHING EXPERIENCE

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- **Tutor for ECE 2305 (Intro. to Comm. and Network) under Prof. Alexander Wyglinski:** *Feb. - May.2020*