

# BHARGAV SOOTHRAM

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## EDUCATION

**University of Maryland, College Park, MD**

**May 2023**

*Master of Engineering, Robotics*

Selected Coursework: Computer Vision, Foundations of Deep Learning, Numerical Optimization

**Mahindra University, Hyderabad, India**

**May 2019**

*Bachelor of Technology, Mechanical Engineering*

## SKILLS

*Programming Languages:* Python, C++, MATLAB

*Frameworks and Tools:* Pytorch, OpenCV, ROS, Git, Google Cloud Platform

## EXPERIENCE

**Engineer, Data Science**

**Aug 2019 - May 2021**

*Mahindra & Mahindra, Pune, India*

- Developed Mahindra Truck and Bus Division's first big-data telematics framework on Google Cloud Platform, processing and analyzing data from 6,000+ vehicles.
- Processed data using Python and Cloud Functions, applying estimation methods like the Kalman filter to handle data gaps. Developed efficient vectorized code for large-scale data processing and analysis.
- Implemented a "wisdom of crowds" approach using regression models of vehicle KPIs (torque, air flow, etc.) to identify anomalous behavior with 80% accuracy.
- Automated report generation in Tableau via SQL queries to BigQuery. Observed a reduction in vehicle downtime by about 15% due to this project.

## PROJECTS

**Numerical Optimization** | [Github](#)

- Developed a custom autograd framework inspired by Pytorch, enabling automatic differentiation with forward and backpropagation functionalities.
- Implemented various optimization algorithms from scratch, including Gradient Descent, Nesterov's Method and Barzilai Borwein Method.
- Implemented Proximal and Lagrangian methods to tackle non-differentiable, constrained optimization problems.

**3D Reconstruction and Scene Rendering: Structure From Motion and NeRF** | [Github](#)

- Simultaneously reconstructed 3D scene (Mapping) and extracted camera pose (Localization) from camera correspondences using (Non) Linear triangulation - (Non) Linear PnP - Bundle Adjustment pipeline.
- Developed a Python implementation for the original NeRF paper by Mildenhall et al. using PyTorch.

**Boundary Detection and Object Recognition** | [Github](#)

- Implemented the Pb-lite boundary detection method which incorporates texture properties of images and surpasses traditional techniques in performance.
- Developed and fine-tuned ResNet, ResNeXt, and DenseNet architectures for object recognition on the CIFAR-10 dataset. Achieved a maximum test accuracy of 90% with the ResNeXt model.

**Human Detection Module** | [Github](#)

- Developed a C++ package that uses YOLOv3 to detect and localize humans in the robot frame.
- Implemented Agile Iterative Process with Doxygen documentation and unit testing using Gtest.
- Ensured code quality through continuous integration using TravisCI and code coverage using Coveralls.

**AutoPano** | [Github](#)

- Created seamless panoramas by stitching images using traditional feature point methods. Employed cylindrical reprojections for efficient handling of large image sets.

**Lane Detection** | [Github](#)

- Detected lanes and estimated road curvature using probabilistic Hough Transforms and sliding-window approach. Improved image contrast through histogram equalization.