Vikas Nataraja

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EDUCATION

Master of Science, Electrical Engineering *May 2020*

University of Colorado, Boulder *GPA - 3.45/4.0*

Bachelor of Engineering, Electrical & Telecommunication Engineering *Aug 2014 - June 2018*

Visvesvaraya Technological University, India *GPA - 3.6/4.0*

WORK EXPERIENCE

Graduate Research Assistant at LASP - *Boulder, CO* *December 2019 - Present*
- Implementing a **research paper** by Masuda et al. by building a convolutional neural network based on PSPNet (ResNet-50) in Keras to retrieve cloud optical thickness from sky-view camera images.
- Developing an end-to-end pipeline and **publishing a research paper** to pre-process the images, encode masking pixels, train the model and predict an optical thickness value for different regions of the cloud.

Software Engineering Intern at Allvision IO - *Pittsburgh, PA* *Summer 2019*
- Developed convolutional neural network models with AWS EC2 instances in Linux using TensorFlow for detection and recognition of license plates using camera and LiDAR data from an autonomous vehicle.
- Achieved an AP score of 0.78 using Faster R-CNN and 0.69 using SSD, both performed using transfer learning and evaluated on COCO detection metrics using AWS S3 for model storage.

Lead Software Engineer at Maxwell CubeSat - *Boulder, CO* *August 2018 – Present*
- Designing Extended Kalman Filter and software drivers for sensors in C and C++ in Linux for attitude determination of satellite to achieve pointing knowledge within ±2° and pointing accuracy within ±10°.
- Led the team's software efforts in implementing coding standards and helped create a new Git workflow.

ACADEMIC PROJECTS

Curiosity-Driven Reinforcement Learning – *CU Boulder* *Spring 2020*
- Developing a reinforcement learning model with an intrinsic reward function to improve state space exploration to collaborate seamlessly with humans during the execution of a task.
- Implementing the framework in an OpenAI gym simulation environment that uses human facial expressions and social cues to improve policy and reward shaping.
- *Tools/Technology Used:* Python, C++, ROS, TensorFlow/Keras, Git

Fully Autonomous RC-sized Vehicle - *CU Boulder* *Fall 2019*
- Developed an autonomous vehicle to potentially compete in the F1Tenth competition where I worked on perception, motion planning and racing line optimization.
- Designed perception algorithms using 2D RPLiDAR and RealSense cameras for vision and depth perception on an Nvidia TX2 GPU using ROS with OpenCV.
- *Tools/Technology Used:* Python (OpenCV), C++, TensorFlow/Keras, ROS, CUDA, Git

AV Lane Switching using Monocular RGB Camera Data - *CU Boulder* *Spring 2019*
- Developed a convolutional neural network model using UC Berkeley DeepDrive dataset in Python to enable autonomous vehicle decisions including lane switching using camera (RGB) data only.
- Created Decision Trees, Random Forests, Logistic Regression and Gradient Boosting machine learning models to establish a baseline which achieved an accuracy of 82%.
- *Tools/Technology Used:* Python (Scikit-Learn, OpenCV), TensorFlow, Git

Pedestrian Detection and Tracking for Autonomous Vehicles - *CU Boulder* *Spring 2019*
- Developed object tracking algorithms to detect and follow pedestrian movement across a steady video stream from a camera of an autonomous vehicle.
- Designed a Histogram of Oriented Gradients with contour matching model for human detection and Kalman Filter for tracking using Python to find and predict pedestrian movement in a video stream.
- *Tools/Technology Used:* Python (OpenCV, HOG), MATLAB (Computer Vision System Toolbox), Git

TECHNICAL SKILLS & COURSEWORK

Tools & Programming Skills: Python, C, C++, MATLAB, Git, AWS, GCP

OS & Environments: TensorFlow/Keras, Linux, ROS, GPU (CUDA)

Relevant Courses: AV Challenge, Computer Vision, Machine Learning, Human-Robot Interaction