

# Vikas Nataraja

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## EDUCATION

### Master of Science, Electrical and Computer Engineering

University of Colorado, Boulder

May 2020

GPA - 3.51/4.0

### Bachelor of Engineering, Electrical & Telecommunication Engineering

Visvesvaraya Technological University, India

June 2018

GPA - 3.6/4.0

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## WORK EXPERIENCE

### Professional Research Assistant at LASP - Boulder, CO

December 2019 - Present

- Building a new convolutional neural network architecture based on PSPNet (ResNet-50) and UNet in Keras to retrieve cloud optical thickness from camera images as part of the [NASA ORACLES](#) mission.
- Surpassed current state-of-the-art methods (preliminary) by 22% and **publishing a paper** highlighting the work behind data masking, new neural network optimizations and architectural changes.

### 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

September 2018 – May 2020

- Designed an Extended Kalman Filter and software drivers for sensors in C and C++ in Linux for attitude determination of satellite to achieve pointing knowledge within  $\pm 2^\circ$  and pointing accuracy within  $\pm 10^\circ$ .
- Led the team's software efforts in implementing coding standards and helped create a new Git workflow distribution and will be **publishing a paper** at the SmallSat 2020 Conference.

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## ACADEMIC PROJECTS

### TAMER-ER: Augmenting TAMER with Expression Recognition - CU Boulder

Spring 2020

- Developed a reinforcement learning model with Variational AutoEncoder to augment facial expressions to TAMER to enhance agent belief and increase human-robot interactional experience recall.
- Achieved on-par performance with TAMER and fine-tuned facial classification performance using encoder-decoder (unsupervised learning) models in OpenAI Gym environments.
- Tools/Technology Used: Python, dlib, Pandas, TensorFlow/Keras, Git, OpenAI

### Fully Autonomous RC-sized Vehicle - CU Boulder

Fall 2019

- Developed an autonomous vehicle where I worked on LiDAR and camera-driven perception as well as motion planning optimization using Follow-the-Gap path planning algorithm.
- 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), Pandas, 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

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## TECHNICAL SKILLS & COURSEWORK

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

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

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