# Abhishek Balasubramaniam

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## Summary:

- **Machine learning researcher with 4+ years' experience in deploying machine learning models.**
- **Open source & community enthusiast.**
- **Experience in developing embedded, IoT, deep-tech and R&D products.**

## Experience:

- **ADAS/ AI summer Intern – Qualcomm Inc | May 2021 – Aug 2021**
  - Worked on python performance evaluation framework for machine learning network on Qualcomm Soc.
- **Graduate Teaching Assistant – Colorado State University| Jan 2021 – Present**
  - GTA for ECE 452 Computer Architecture and Organization taught by Dr Sudeep Pasricha consisting of 54 students.
  - This role includes preparing assignments, resolving doubts and queries of students, and grading.
- **Graduate Research Assistant – Colorado State University| Jan 2019 – Present**
  - Optimizing deep learning models using pruning, quantization, knowledge distillation, encoding and decoding
  - Deployed on Jetson Tx2, Drive Px2, AWS sagemaker, AWS EC2, AWS Lambda, PaperSpace platforms.
  - Technologies used - Keras, TensorFlow, CUDA, and cluster environments.
- **CAVS Technical Advisor - CSU Vehicle Innovation Team| Sep 2019 – Jan 2020**
  - Design and improving the CAVS system performance for prototype of Level 2 Autonomous Vehicle.
- **Co-Founder and Machine Learning Architect - Cambionix Innovations | Oct 2017 – Jun 2019**
  - Worked on machine learning based automation and industrial automation
  - Designed and integrated innovative solution to enhance the performance of existing mechanical devices.

## Publication:

- Balasubramanian, A., & Pasricha, S. (2022). "Object Detection in Autonomous Vehicles: Status and Open Challenges." arXiv preprint arXiv:2201.07706.
- B. Abhishek, K. Keshav, S. Gautham, D. V. R. R. Samuel, and S. R. Nair, "Low-cost ROS based semi-autonomous drone with position and altitude lock," 2017 IEEE ICPCSI, Chennai, 2017, pp. 2109-2112.
- B. Abhishek, S. Gautham, D. Varun Rufus Raj Samuel, K. Keshav, U. P. Vignesh and S. R. Nair, "ROS based stereo vision system for autonomous vehicle," 2017 IEEE ICPCSI, Chennai, 2017, pp. 2269-2273.
- Abhishek Balasubramaniam, Shyam Nair, Allen Frederick I. A. "Arachnidan 6 Wheeled All Terrain Explorer Equipped with a 7 DOF Robotic Arm", 20th International Mars Society Convention, Mars Society, USA

## Selected projects:

These are some of the selected projects. Please refer **here** for more

**Object Detection Model Compression for Resource constraint platform:** Recreated the SSD Mobilenetv2 object detection model using TensorFlow and Keras. Worked on custom training, pruning, quantization and search algorithms for model compression. The mAP of base model is 0.70. The pruned model mAP is 0.66 with 30% reduction in model size.

**ROS Based Stereo Vision System for Autonomous Navigation:** A stereo vision-based autonomous navigation system using deep learning model for object detection and tracking using TensorFlow and Keras. Nvidia Jetson TX2 was used for deploying and testing the model.

**Unmanned aerial vehicle with position and altitude lock with GPS based navigation system:** An ROS based drone with altitude and position lock in which we used neural network for controls. We used RPI and Arduino controller for controlling the drone's rotors. The drone can maintain a constant altitude during hovering and a constant position for monitoring or surveillance.

**University Rover Challenge:** I was responsible for designing the technical aspects such as navigation, remote control, autonomous navigation, wireless communication, and perception of the prototype of a Martian rover for the competition "University Rover Challenge 2014". We secured 10th place out of the 36 finalists, and we secured 2nd place out of 8 finalists from India

**Communities:** ROS Community | Pycon India | Mars society | TensorFlow Community | Stack overflow

## Education:

**Colorado State University –** Master of Science in Computer Engineering | 2019 – Present

**Hindustan Institute of Technology** – Bachelor of Technology in Mechatronics | 2013 – 2017

## Technical Skills:

### General-purpose programming:

C++, Java, Python, JavaScript, SystemC, OpenMP

### Machine learning Packages / Libraries:

TensorFlow, Pytorch, CUDA, Keras, SciPy, TensorRT, Cudnn, Cublas, Pycuda, OpenCV, PIL, SciKit-Learn

### Cloud platforms:

**AWS:** EC2, Lambda, SageMaker, Deep Learning AMI, Deep Learning Containers, Deep Lens, Elastic Inference.
**Others:** Azure, Paper Space, Google Collab, Digital Ocean, Oracle Cloud, RoboFlow.

### Robotics Software and Hardware platform:

**Software:** Robot Operating System, Arduino, QT, MATLAB, Arduino.
**Platforms:** Nvidia Jetson TX2, DrivePX2, Intel Tank, RPI.

### Other Tools:

Mongo DB, MariaDB, Jupyter, NumPy, pandas, matplotlib, CVAT, php, QNX, RTLinux.

**Achievements:** Top 10 best engineering services start-up in India 2018 by Silicon India Magazine | 20th and 21st Mars Society Convention Track Speaker | 17th place in University Rover Challenge 2015 at Mars Society, USA | Finalist in the competition "Robotryst 2013" conducted by Robosapiens at IIT DELHI.