"Taking Computer Science From Labs and Conferences to People"

Name: Sai Siddartha Maram Email ID: msaisiddartha1@gmail.com | word count: 999

"Congratulations! Paper accepted at **ACM Multimedia 2020**" was the subject of the email which reflected that walking the extra mile to pursue independent research, beyond the realm of my curriculum, was fruitful. Having **papers accepted at IEEE GLOBECOM 2020, ACM Multimedia,** and **IEEE ICACCP** motivated me to further work on Machine Learning and Deep Learning. This interest helped me bag the position of a **Research Scholar** at the much-coveted **GeorgiaTech**, Atlanta. I also filed a **patent** for a Computer Vision-based prototype for the widespread problem of physical abuse. This again illustrates my passion for pursuing research in ML to create an impact in people's lives. This resonates with Oxford's vision of being a research university and affecting people's lives positively.

Dr. Anil Kumar at IIM-A introduced me to applications of deep learning and its potential impact on people's life. Here my team built a Computer Vision-based surveillance system to protect crops from animal vandalism. We developed and deployed lightweight object detection architectures in IoT modules. Our work affected farming families in the region of Gujarat. We implemented the Paul Viola and Michel Jones paper 'Rapid Object Detection using a Boosted Cascade of Simple Features' to develop a Haar Cascade suitable for detecting cattle. Tackling detection problems through this algorithm which took only edge and pixel intensities as features were less fruitful as even the slightest change in orientation of cattle proved to be a failure. We noticed we needed to incorporate more features for detection, for which we applied transfer learning on the Faster_RCNN model trained on a cattle dataset we had developed and achieved an mAP of 93%. Our work was featured in Times of India (Biggest English Daily in India) and also received the Best Undergraduate Research Project at TEAMC 2018.

Practical experience in ML combined with a research aptitude helped me get noticed and selected as an Intern by Mr. Balaji (CEO Invento Robotics) in my sophomore year's summer break. The robots at Invento had limited hardware that did not allow the deployment of dense neural networks. Initial developers had used Cloud services for recognition and detection activities. This stack was highly dependent on internet bandwidth and was time-consuming. I was able to achieve a **60% faster** performance over the existing stack by choosing to train and deploy a less dense neural network making it suitable for embedded systems on Invento's flagship robot 'Mitra'. Post my undergraduate, I re-joined Invento to develop navigation algorithms for Invento's COVID-19 Robotic Fleet which included UV-disinfection robots, COVID Patient engagement robots, and Tele-Medicine Robots. Our work was featured across major news outlets. My paper on Navigation and Generating Schedules for Autonomous UV Disinfection for Invento's Robots is currently under review at **IEEE Robotics and Automation Society Magazine** January 2021 edition.

I shared my paper at IEEE ICACCP-19 with Prof. Yi-Chang (James) Tsai, who then offered me a **Research Scholar position** at GeorgiaTech, Atlanta. One of my novel research outcomes as a result of this internship was that I managed to develop a 2D image and 3D LiDAR point cloud registration algorithm by using a **data structure** called **KD-Tree**. This leads to enhanced performance compared to existing work on huge LiDAR point clouds. By thresholding the LiDAR point clouds retro intensity values, I was able to accurately estimate the health of all traffic signs over the entire length of any interstate. Implementing clustering techniques such as HDBSCAN for GPS points instead of the conventional K-Means and DBSCAN allowed to eliminate computations on bogus LiDAR points making runtime quicker. My summer work including automatic traffic sign identification using Neural Networks using both 2D images and 3D point clouds helped the Transportation Lab at GeorgiaTech win the High Impact Research Nationally award at AASHTO.

For the spring of 2020, I was a **Visiting Research Scholar** at the **Indian Institute of Science, Bangalore** under [Prof. Yogesh](#) dealing with Computer Vision techniques on drone feed. Here, I developed algorithms to determine image similarity and reduce computational cost on object detection models. During this internship, my team has developed object detection models which work over shuffled color schemes. This development was done to aid the ongoing research trend of performing object detection on encrypted images. With the rise in COVID-19, I was part of the 'GoCoronaGo' application development at IISc. Here we built a privacy-respecting contact tracing application. Unlike regular contract tracing applications that work on the edge computing device, we built a centralized contact tracing application, which works on generating network graphs. Treating the problem as a graph makes it easier to query N-hop neighbors for every vertex making it rapid to identify and quarantine people. This app is currently being used by all the students in IISc and has also been featured in multiple leading media outlets across the country.

During the national lockdown, I have been able to submit papers of my **independent** research to **ACM Multimedia** 2020 (workshop) and **IEEE GLOBECOM** 2020. My research here focused on using machine learning and computer vision techniques to establish a structure for sparse and unstructured cricket broadcast data. Our literature review on Event segmentation in cricket broadcast, suggests our results are the current state of the art in terms of time taken to generate highlights for cricket matches. Our event segmentation technique using cricket domain knowledge allows us to determine accurate metadata corresponding to each event. I have been following work from Oxford on Video analytics and Supporting Decision making interpreting images over the last few years at CVPR and NIPS. I can't wait to pursue further research under labs on those lines at Oxford. As the founding member of a non-profit social-media page 'Grow', which has a reach of 10,000+ students I regularly brainstorm ideas with students and Professors. The adrenaline in these discussions helps me see myself as a Doctoral Student, part of research labs, and continue in academia to pursue research for overcoming challenges through technology and ensure that research results are not confined to journals and conferences but reach the masses.