Application for Master of Science in Applied Information Science (Technion) & Master of Science Information Systems (Cornell) with a Concentration in Connective Media

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

"Congratulations on getting your **research paper accepted** at **IEEE ICACCP** 2019" was the email which reflected that walking an extra mile for **research**, beyond the realm of my curriculum and interning at Invento Robotics was fruitful. Having a paper accepted at IEEE ICACCP which has a mere **acceptance rate of 26%** motivated me to further work on Computer Vision. This work helped me bag the position of a **Research Intern** at the much coveted **Georgia Institute of Technology**, Atlanta. I also filed a **patent** for an IoT and Computer Vision prototype for the problem of sexual abuse which illustrates my motivation for pursuing research to create a global impact strongly resonating with the Connective Media program at Cornell Tech. I would like to delve deeper into bringing out research in Computer Vision and Artificial Intelligence in a way more accessible to the people of New York and the rest of the world for which I am seeking admission at Cornell and Technion dual degree with a concentration in Connective Media.

I utilized the summer break of my freshman year to **intern** at SRISTI-UNICEF under the able guidance of Dr.Anil Kumar Gupta at the **National Innovation Foundation, Government of India**. At SRISTI I **lead** a team of interns into developing an android application for farmers for yield management using Google's firebase as its backend. Apart from the challenge of developing the application, we were able to make the application easily usable for farmers despite having minimal education or no knowledge of using applications. This was my first taste of UI/UX and how user knowledge and feedback are critical in the development of an application. Cornell's Connective media program has a strong emphasis on making products user-friendly and I look to pick up courses from the Human/Social topics offered in this course to gain a better understanding in this vertical. **Empathizing with farmers**, we noticed another intricate problem they faced which is animals vandalizing crops. We started exploring Computer Vision solutions to deal with this problem. To start off my team **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_Resnet model trained initially on the COCO dataset. I used my **academic merit scholarship** at Thapar Institute of Engineering and Technology to rent AWS servers for training neural networks. After training and comparing results over tuned hyperparameters, we **published** our results at TEAMC 2018, an undergraduate research paper conference, where we won the **Best Research Paper.**

My urge to convert my research papers into products for communities in India helped me get selected as a summer intern from a pool of bright undergraduate researchers by Mr. Balaji Vishwanathan (**CEO Invento Robotics**) in my sophomore year's summer break. Limited hardware on Invento's robots did not allow the deployment of dense neural networks and hence initial developers had used Cloud services for object detection. This stack was highly dependent on internet bandwidth was time-consuming. I was able to achieve a **60% faster** performance than the previously established stack by choosing to train and **deploy** a less dense neural network architecture 'tiny-yolo' for detection making it suitable for embedded systems on Invento's flagship robot 'Mitra'. 'Mitra' is currently used for navigation by travelers at the

Indira Gandhi International Airport, New Delhi, India and uses detection algorithms that I had developed during this internship.

My experience with Computer Vision algorithms on ROS at Invento paved the path for my next **research paper**. We developed algorithms for establishing navigation on robots using Neural Network outputs and communicating them via ROS framework through various nodes of a robot we developed. We **published** the performance of our algorithm at **IEEE ICACCP 2019** where we **won the Best Research Paper (**[Neural Network and ROS based Threat Detection and Patrolling Assistance: Sai Siddartha, Tanuj, Sachin, IEEE ICACCP 2019](#)**)** under the computer vision and robotics category. This research was carried out in order to provide better surveillance after the dreaded URI attacks in India.

The New York Times quotes sexual abuse shot up by 22% in the city of New York and much more globally. The team of undergraduate researchers I am currently leading ('Team Impact') at Thapar, wanted to explore technical solutions to this problem. We developed a **cognitive textile** that used computer vision for the **first time** to tackle such abuse against women by analyzing live camera feed through cameras embedded in it. This IoT and AI prototype has been filed for an Indian **Patent (**A personal safety device and method thereof) bearing application number 201911005811 and is an **accepted entry** at the prestigious **Sir James Dyson Design Challenge**. This patent is a reflection of my vision of amalgamating technology and research for solving real-world problems. Cornell's Connective Media Course offers courses on HCI, through which I look to learn how to bring my skills in computer vision into a more human-centric form which could benefit the city of New York and the world.

I shared my paper at IEEE ICACCP 2019 with Prof. Yi-Chang (James) Tsai, who then offered me a Computer Vision **summer research internship** (funded) at **GeorgiaTech, Atlanta**. During this internship, I applied the concept of perspective transform suitable for United States interstate roads for traffic sign depth estimation through a **single 2D image**. I was able to **reduce memory consumption by 50%** than the regularly used triangulation method which requires two images. One of my novel **research outcome** 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 research lab back then was the city of Atlanta, and I am really excited about how I could bring out my research experience in Atlanta to New York where transportation infrastructure is more complex and interesting. I believe using LiDAR to asses the infrastructure of various roadway assets would bring valuable inputs to the New York State Department of Transportation.

For the spring of 2020, I will be interning as a **Research Intern** at the prestigious **Indian Institute of Science, Bangalore** under [Prof. Yogesh Simmhan](#) dealing with computer vision techniques on drone feed for monitoring the structural health of buildings in urban environments. Cornell through history has been a place where research meets empathy and compassion and it has impacted millions of lives around the globe. An admit at Cornell's Connective Media program will give me an opportunity of working with a diverse peer group under the able guidance of elite professors and undertake research in AI and develop solutions for global problems. I see myself as a part of research labs in the industry or spin off a company to pursue research for overcoming challenges through technology and ensure that research results are not confined to journals and conferences but reach masses to augment the way they live.