So, over the summer, Omkar Bhalerao and I spent a month at MIT for the Beaver Works Summer Institute. We actually ended up in the same class: Remote Sensing for Crisis Response. In that class, we learned a LOT of Python packages that can help us extract geospatial data (e.g. osmnx (Open Street Map), shapely, etc.) and imagery (OpenCV, as a prominent example), in order to be able to coordinate a disaster response. All of this learning would lead up to the final project, which involved the simulation of a hurricane, and our job was to come up with evacuation plans, where to send resources and supplies, and how to analyze the state of the hurricane / the damage it has done. A key lesson I learned from this program is that in the real world, while individual effort may be nice, collaboration is really key to handling overwhelming cases like coordinating a disaster response to a hurricane. I personally enjoyed living in the MIT dorms, getting to meet people from all over the U.S. (there was even a guy from Switzerland!) and my roomate, and just knowing that what I’m learning actually makes a social impact on the world.

Therefore, this program has been transformational to the point where I would like to change my senior research idea. Originally, my idea was about simulating the solar system and finding the optimal trajectory for a space shuttle to get from one planet to another, minimizing the amount of fuel used. However, while that’s a nice idea to work on, I feel like that idea wasn’t reflective on my true passion and character. Disaster response is a concern I’d like to be deeply invested in, and so I’ve came up with two potential ideas. I’m still trying to decide between the two, and I’d like some of the senior directors to give me feedback to tell me which idea would be more feasible for me to accomplish, since I would like to prioritize feasibility for my project.

My first idea stems from one of the activities we did in the online course for Remote Sensing for Crisis Response. Basically, we had the opportunity to play around an app where we looked at images and checked off what we could detect from the image damage-wise (e.g. is there flooding in the photo? Is there structural damage? etc.), and I thought “Hmmm...well, wouldn’t it be a nice idea if a computer could automate that process for you?” Therefore, the first idea I would like to speak out is that, given an image as an input, have a computer be able to detect what is on the image given damage-wise, just like we did on the app. I may think about using tools like Convolutional Neural Networks, or even just written-by-human algorithms that can detect for certain types of damage. The user interface I would plan on designing would have a space for someone to input an image, and then have the computer detect if there’s any damage involved in the photo. In the grand scheme of things, this would be useful for the Civil Air Patrol, which takes many photos by plane (aerial photography) in an attempt to assess damage. Once the Civil Air Patrol has its collections of images, then CAP would insert all the image into the user interface, and see which photos contain damaged areas, and then use metadata from those images to extract the locations of where those photos were taken.

My second idea stems from the Massachusetts Task-Force field trip. We learned about mesh networking where data could be sent really fast. What (I think) is related to that is 5G technology, and essentially my second ideas is basically: given an input of a city, what is the optimal configuration of 5G nodes, that maximizes coverage, and minimizes the amount of nodes that have to be installed. Unfortunately, compared to 4G, 5G uses a much lower wavelength signal, and so I’d love to investigate the optimal placement of these 5G nodes so that they will minimize interfering the aesthetics of a city.