**Journal Report 0**

**Summer:**

My summer ideas revolved around utilizing blockchain technology, biomedical applications, and robotic engineering. The foundation for all these projects lay in utilizing some sort of artificial intelligence, like machine learning and computer vision.

For the blockchain project, I thought about utilizing machine learning to optimize file sharing and storage for hospital record systems. My main inspiration from this project was through the rapid news of cyberattacks and Fairfax County being a victim. This was personable and I wanted to pursue novel technology like building a blockchain. I chose not to pursue this project because of its complexity and my lack of knowledge. This is a project that I want to pursue in college but not now. There is too steep of a learning curve and I feel that, as a school research project, I would not be able to make significant progress.

For the biomedical application, I was planning on revitalizing my previous projects of a lyme disease web-application. This application was able to detect whether or not a given image of a rash was the result of Lyme Disease. The possible improvement I had in mind for the school year was being able to identify distinct rashes. In other words, I hoped to create a model that not only knows lyme disease-related rashes, but also others like poison ivy or a simple mosquito bite. I chose not to pursue this project because of the privacy of this data and extraneous effort to acquire the data needed. Previously, my dataset consisted of web-scraped images that were then manually annotated by an NIH official. However, with my goal of finding different types of rashes, I feel that the manual labor for the NIH official and myself would be too extensive just to create a dataset.

For the robotic engineering project, I am still interested and hoping to pursue this project if possible. This idea revolves around creating a jumping rover. There are many specifications of this type of rover available online. The main goal would be to get the jumping nature of the rover built. The biggest challenge will most likely be in the physical limitations of the rover as we will not be using an industrial piston. This is a challenge that I would like to pursue, but further research and discussion is necessary. The partner I have been discussing this with is Paul Hwang and he is in the engineering lab.

**8/9/23**

I gave my SHIP Presentation talk. This summarized my summer internship at the NIST Center for Neutron Research (NCNR). I gave a talk on my project to an audience of 50 people that ranged from industry professionals working at the NCNR to family members supporting the SHIP students at the NCNR. I was able to train and analyze a series of unsupervised machine learning models in forecasting control system data given by the NCNR.

**8/21/23**

I introduced myself and proposed some vague ideas for my senior research project. As a class, we discussed the flexibility of the lab and how the year would work.

**8/23/23**

I spent my time today brainstorming and flushing out my ideas in detail. The two ideas that I thought were the best are given below:

My first project idea is to improve the unsupervised machine learning model for forecast precision of Closed Cycle Refrigeration control systems at the NCNR. Furthermore, I aim to implement supervised machine learning to classify known anomalies in the dataset on this trained model.

* Motivation: Interned at NIST Center for Neutron Research over summer and my project revolved around utilizing machine learning for anomaly detection in Closed Cycle Refrigerators (CCR). I had a great time with my mentor Paul Kienzle and wanted to further develop the product so that it could be used by the professionals, hopefully, within the next 5 years.
* So far, I have created an unsupervised machine learning model (random forest, temporal convolutional network, and transformer) to forecast “normal behavior.”
  + <https://github.com/Ryandpark2006/NCNR/tree/main>

The second idea I had was a virtual closet that utilizes AR.

* Motivation: Ever since I was in the 3rd grade, I wanted a tool where I could easily put on clothes virtually. This tool would allow me to “put” these virtual renderings on, enabling me to see how it would look and whether or not it would fit on me.
* Research:
  + <https://github.com/vipenti/3D-Human-Body-Generator>
  + <https://github.com/cameronking4/Clothware.io>