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My project originally was set to be writing a research paper on Human-Robot Verbal Interaction with a basis of machine learning. However, after discussing with my mentor, we decided it would be more beneficial to my learning (and more fun) to create an actual product to demonstrate what I’ve learned while studying machine learning. My mentor is working with the recycling plant on campus to create a sorting system for the stream of incoming recyclables. My project, now, is to make a classification model to help an automation system sort the recyclables into glass, paper, plastic, cardboard, metal, and trash. This system will help the recycling center become more autonomous for faster and cheaper processing of waste which will help to make our campus a more environmentally friendly community.

Machine learning is a quickly growing field of study due to its far-reaching potential applications. My study of machine learning is focused on classification models and a large part of what I’ve learned so far is that these models require a lot of nurturing because they are so customizable. Every dataset has its own unique configuration that best optimizes the model for accurate predictions. The recycling center on campus has been in contact with my mentor, Joewie, to better their sorting system. He has been working on an algorithm for robotic grasping using reinforced learning. I plan to integrate my model with Joewie’s work to create a program that will be implemented into the recycling center’s automation system.

Since this project is centered around creating a classification algorithm, the goal of my work is to make this algorithm as accurate as possible when testing on data it’s never seen before. Through my research on machine learning, I found that comparing trainings using the F1 metric yields the best information on how changing the model’s set up effects the accuracy of the model itself. This score is basically a weighted average of the precision and recall metrics so its values range from 0 to 1, 1 being the asymptotic best return value. My experiments so far have consisted of making educated assumptions for how to change the parameters of the model’s sequential, compile, and fit functions. Once my model achieves a consistent accuracy of 80% on it’s test set, I will begin implementing it with the lab’s Sawyer robot to test its application on a physical environment.

My work so far has been all computational. I have been using the python language along with TensorFlow 2.0 which includes the Keras functionalities. TensorFlow is a machine learning platform which facilitates writing scripts that utilize machine learning for various applications. The Keras implementation allows for extensive customization which is needed for the optimization work I am doing. I have been writing and testing my model within Google CoLab for easy access to cloud-based datasets and my own data stored within Google Drive. The dataset I’ve been using to train the model is not optimal for the specific environment the finished product will be performing in so I will soon be going to the recycling center to create my own dataset using data from the actual environment. Once I have finished optimizing the model within CoLab I will export the code to a .py file and perform testing using the lab’s Sawyer robot to verify its success within a physical environment.

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| Week of 10/28/19 | Create new dataset at recycling center |
| Week of 12/02/19 | Finish initial optimization of model |
| Week of 01/13/19 | Test model with Sawyer(’s cameras) |
| Week of 02/03/19 | Integrate model with Joewie’s program |
| Week of 03/23/19 | Test and optimize integrated program |
| Week of 04/27/19 | Test integrated program at center |
| Week of 05/11/19 | Deliver final product to recycling center |