

## **Project Description**

The project that our group intends to continue for this class is a robotic arm that uses computer vision to organize items on a desk. As of the end of last semester, we successfully completed building a 3D printed arm with servos at critical joints in order to enable flexible motion. We also connected a Raspberry Pi to said servo motors to drive the arm. Currently, the arm only moves based on pre-coded movements and/or keyboard controls. For this semester, we intend to finish implementing the computer vision portion of the project and integrating the hardware with that CV software. For the camera processing, we are currently using OpenCV for simple object detection. Moving forward, we need to figure out some inverse kinematics implementation that would allow the robot to calculate servo angles from the camera data. For this process, we would likely use numpy or some similar math library to implement any inverse kinematics. Finally, we would likely use ROS2 or some similar framework in order to tie everything together. If we are able to complete these things with ample time, we would look into implementing other use cases.

We think this project is appropriate for this class due to its difficulty, opportunity to expand on topics we are interested in, and overall coolness. During our initial discussions on project topics, robotics came up quickly as a point of interest for us. In our first semester, we decided on a simple robotic arm due to its versatility and relative simplicity. However, due to our lack of extensive robotics experience (and some shipping problems), the hardware posed a much larger challenge than we had originally thought. On the software side, we see this project as a great way to extend our knowledge from classes like AI, Operating Systems, and Algos. Based on the limited time we were able to spend on the software at the end of last semester, we are confident that this project will be a significant enough challenge for the four of us. However, now that the hardware is built and working, we also expect to hit less roadblocks in this semester's development. Additionally, we expect the majority of the work to be more familiar to us, since we all have much more extensive experience in programming than building robotics hardware. Finally, after all the work we put in last semester, we are all very interested in seeing this second half of the project through to produce a more complete end product.