

Background

- The OSU Seed Lab tests the viability of thousands of Tall Fescue Grass daily by soaking the embryos in a Tetrazolium solution.
- Manually cutting seeds is a labor-intensive and inefficient process, so an automated cutting device will be a great tool for the lab.



Tall Fescue grass seed soaked in TZ solution

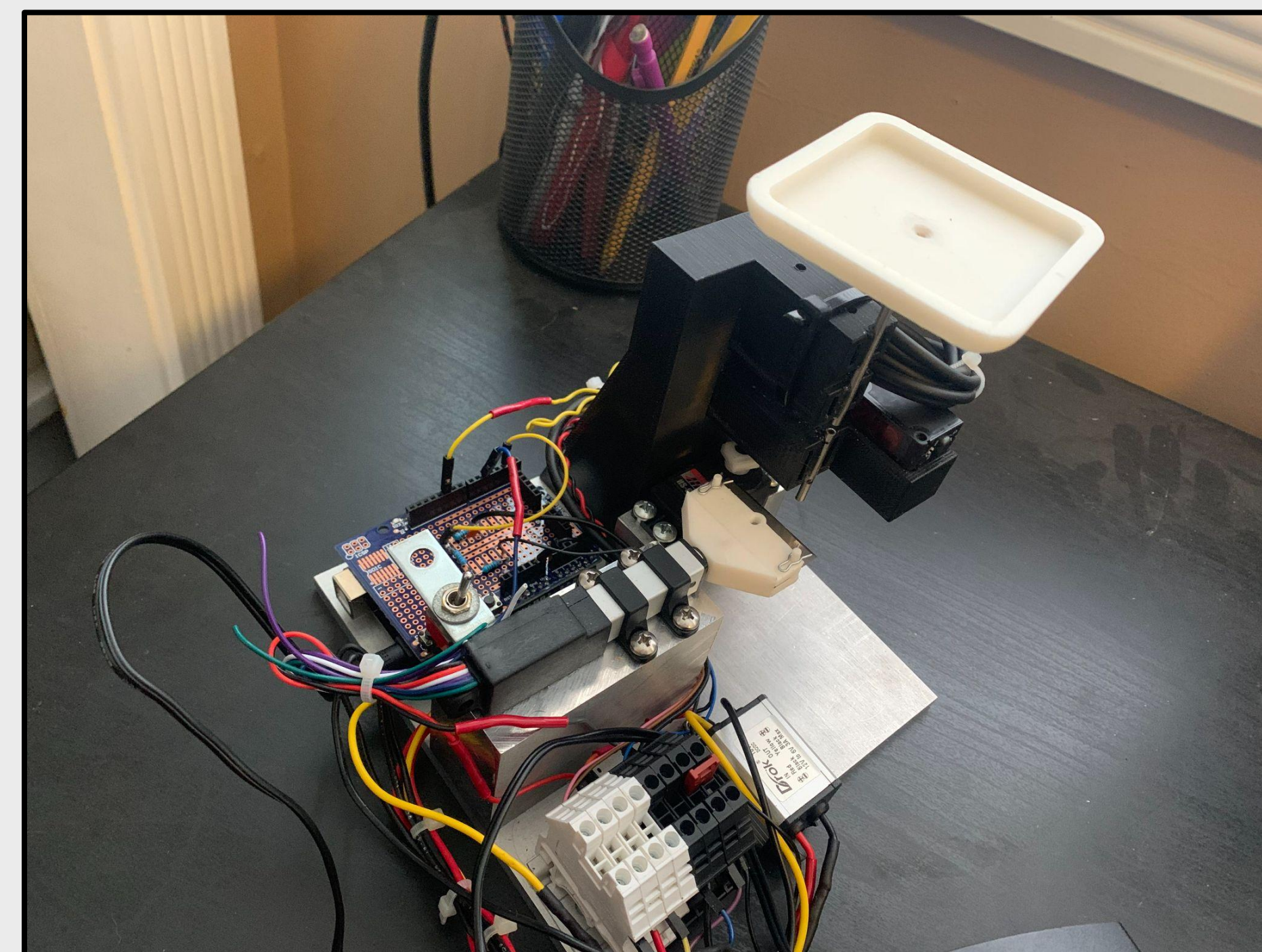
Project Requirements

Processing Speed	250 seeds in 21 minutes
Orientation success rate	80% correct orientation
Weight of product	20 lbs
Cutting Success rate	> 80%

Automated Grass Seed Cutter

Team Members:

- Project Lead** - Nathan Spidell
Design Lead - Brandon Moreno & Cole Katzler
Manufacturing Lead - Blake Brisbine & Anice Teel

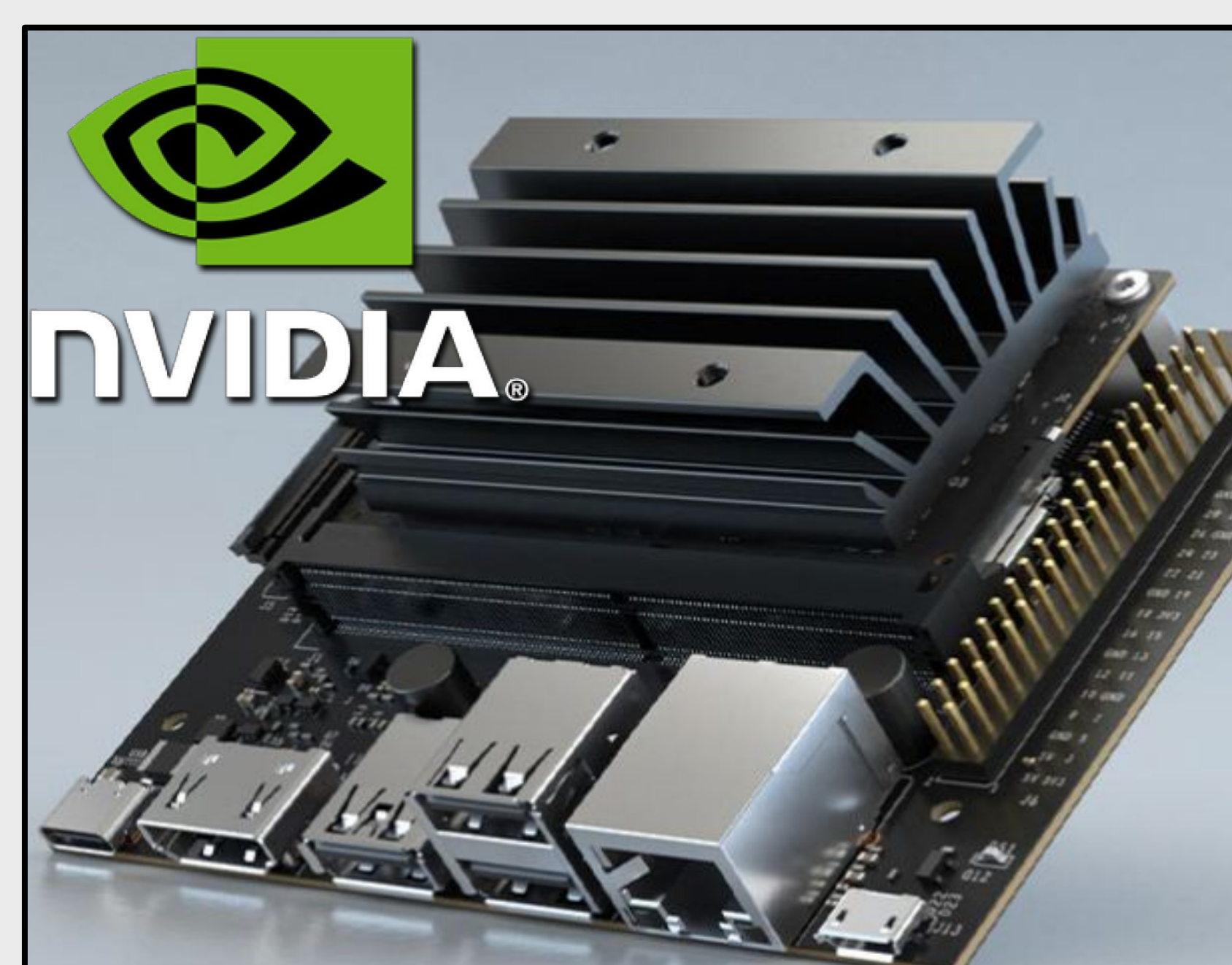


Previous Approach

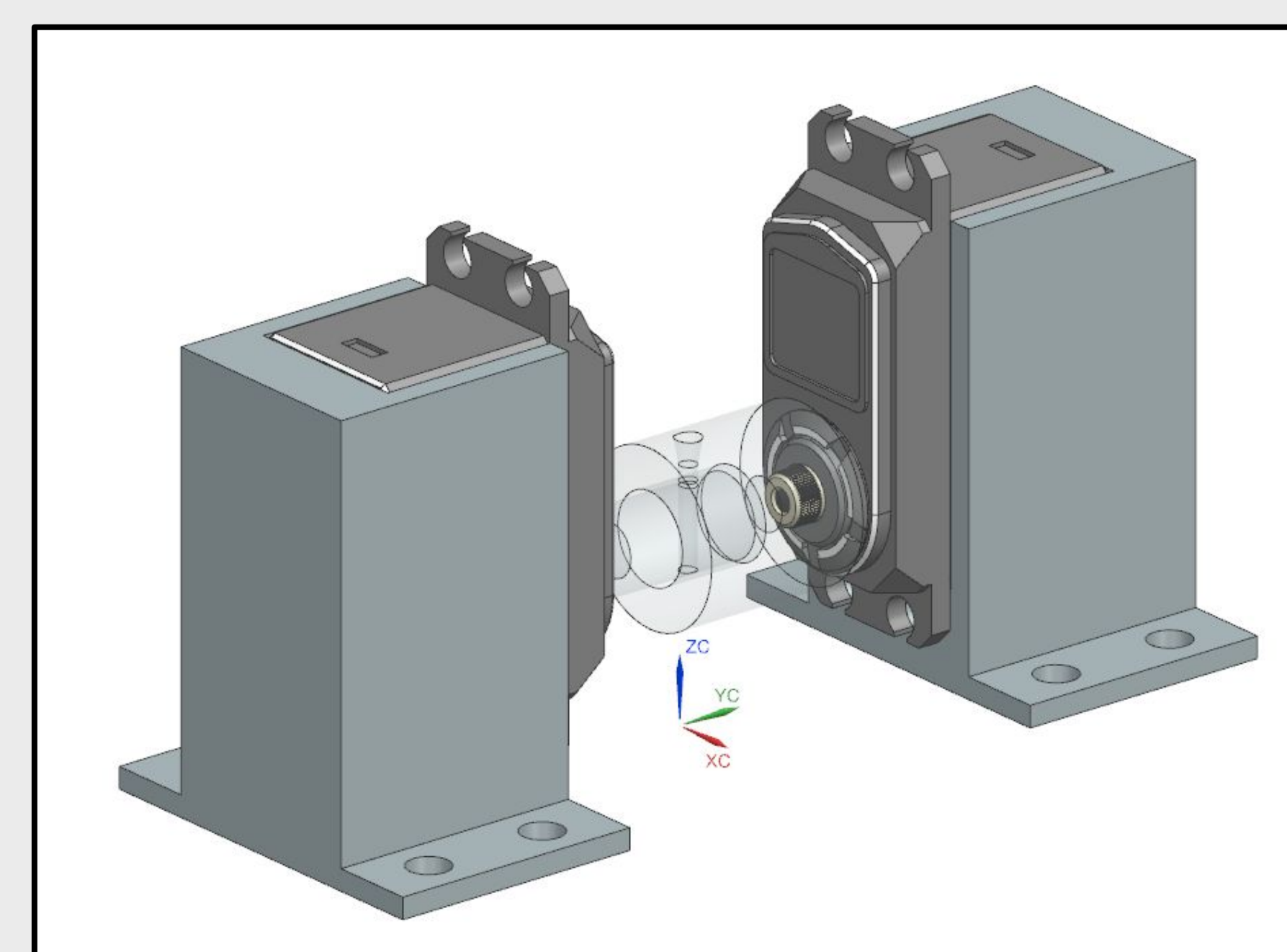
- Previous seed cutter prototype only automates the cutting and ejection actions
- Needs an operator to manually load each seed down the chute
- No consistent way to cut different sized seeds, as they would frequently fall down the chute upside down or get stuck inside
- Low efficiency when cutting an entire sample of seeds at once

Identifying Seed Orientation

- In order to cut seed at the correct location relative to its embryo, it must be sorted into the correct orientation
- AI image recognition system powered by a NVIDIA Jetson Nano will capture an image of each seed and send data to Arduino to orientate it correctly
- Cylindrical chambers will either drop the seed down the chute, or flip its orientation and then drop it down the chute to be cut



NVIDIA Jetson Nano



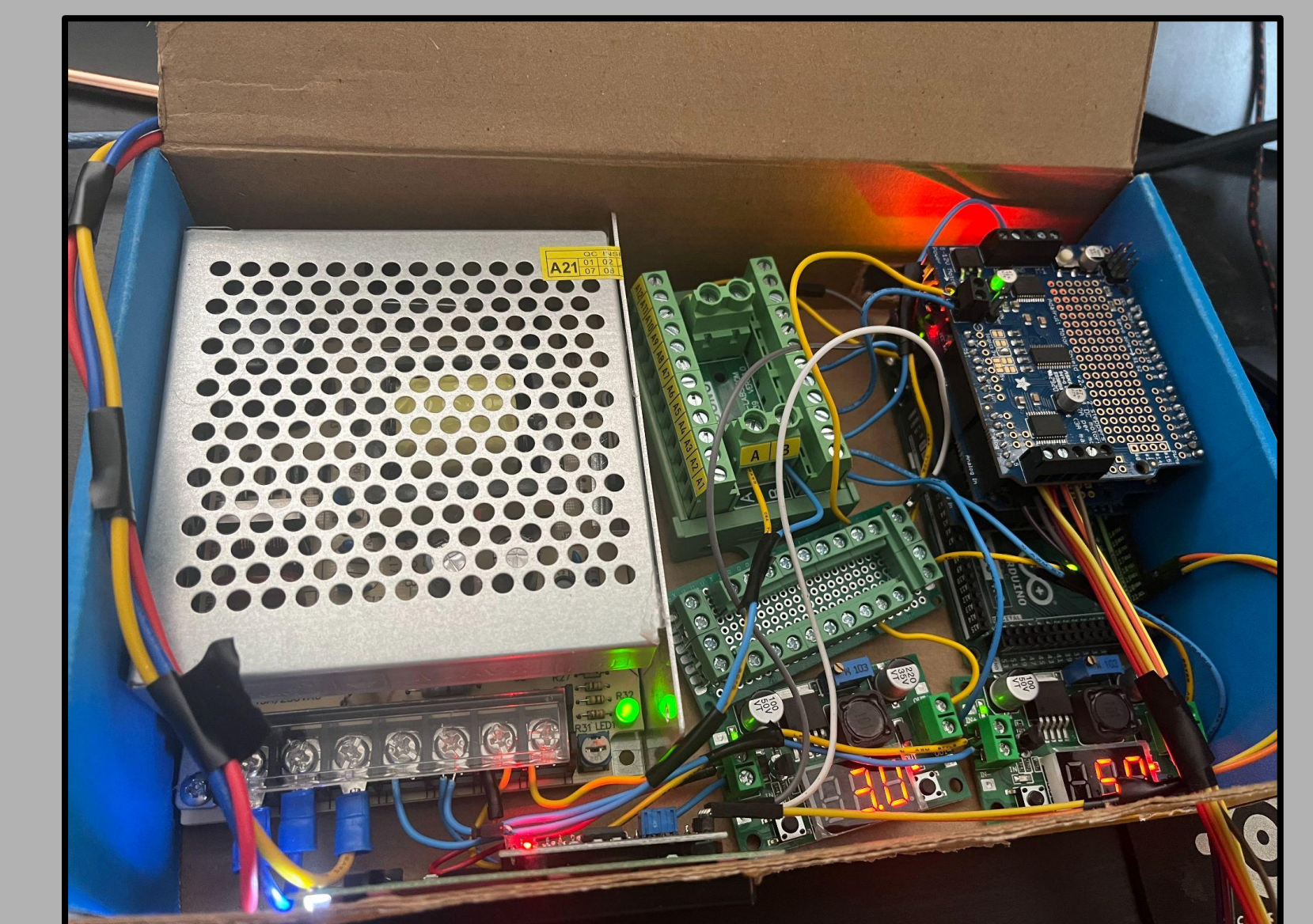
Orientation Chambers



Seed Labeling Tool

Designing the Mechatronic System

- Arduino Mega with two Adafruit motor shields and a servo shield is used to drive all subsystems.
- Industrial photoelectric sensor and USB webcam are used to detect seed presence and orientation to determine proper motor actions.



System Overview

- Seeds loaded into vibratory sifter
- As a single seed moves out of sifter, photo sensor will turn off sifter
- Seed moves along conveyor where camera records an image and determines its orientation
- Orientation chamber will correct it and drop it down the chute
- Once the seed is constrained at the bottom of the chute, a blade attached to a linear actuator will cut it
- Ejection system will separate the embryo and the rest of the seed

Project Advisors

- Course Instructor:** Dr. Sarah Oman
Oregon State Seed Lab: Daniel Curry and Yea-ching Wu
Technical Advisors: Dr. Joseph Davidson and Christopher Sullivan
Undergraduate Computer Science Students: Ashwin Subramanian and Malhar Damle