**Folder Structure**

Steps and instructions on running these executables are found in the How to Runsection below:

**yolov5**

classifier\_yolov5.py and unity\_yolov5.py are found in the yolov5 folder, which must be unzipped.

**sorter gui**

This folder contains the Unity project, and must be unzipped and opened in Unity.

**Videos**

This folder contains separate videos for each of the components of the project.

**darknet**

This folder contains the darknet executable.

**integrated\_system.mkv**

This is the video depicting the entire system.

**How to Run**

**What you need:**

1. Have python installed on your system: various methods, depending on your operating system.
2. Have Conda installed on your system: <https://conda.io/projects/conda/en/latest/user-guide/install/index.html>.

**NOTE**: cloning the environment provided in this submission will only work on a Linux system. Manual installation is required for other operating systems.

**Darknet Setup (optional):**

**NOTE**: this part of the project may or may function of your computer as you must correctly set the darknet library to your path.

You will need a Cuda compiler, Cudnn and a Cuda GPU driver. The Cuda drive should come with your GPU if you have correctly configured your machine after purchase. The Cudnn library requires you to create an account on nvidia. This is your choice; I will only provide the links steps below. \*\*This is assuming you are using a Linux OS\*\*

Before you start, you will need to create a conda environment. Refer to Yolov5 (below) steps 2 and 3 only. Once this is setup you may proceed.

1. Clone the repository: git clone <https://github.com/AlexeyAB/darknet.git> and refer to installation steps in the github repository.
2. Download cudnn <https://developer.nvidia.com/cudnn>
3. You will need a version of cuda: <https://developer.nvidia.com/cuda-downloads>
4. Inside the submission folder you will see a directory called darknet, go into it and move yolov4-tiny-custom.cfg into your cfg folder on your computer.
5. Inside the submission folder you will see a directory called darknet, go into it and move yolov4-tiny-custom\_final.weights into your folder on your computer where darknet is.
6. Finally unzip the data directory in the onedrive and replace the data folder in your darknet with the one here.
   1. Enter the data directory
   2. Open test.txt, train.txt and data.yml. Replace all instances of /home/flynn/482\_project/darknet/data with your path to the folder.
7. To run enter: sudo ./darknet detector demo data/taco.data cfg/yolov4-tiny-custom.cfg yolov4-tiny-custom\_final.weights -c 0

In the end your folder structure should look like this:

|-- darknet

| | yolov4-tiny-custom\_final.weights

| |-- data (this is the one provided in the Onedrive)

| |-- cfg (contains yolov4-tiny-custom.cfg )

| | ... remaining files

Note that the command: sudo ./darknet detector demo data/taco.data cfg/yolov4-tiny-custom.cfg yolov4-tiny-custom\_final.weights -c 0 must be executed in | -- darknet and not in any subfolders.

**Unity GUI (Required):**

To run the GUI, unzip the sorter\_gui.zip, and open the sorter\_gui folder in Unity. Press the play button and the app will wait for a socket connection from Python, described in the next section.

**Yolov5 (Required):**

You will need a **Linux** operating system do the following:

1. Navigate inside the yolov5.zip by unzipping the file
2. You will see a file called yolov5\_env.txt inside the yolov5 folder. Enter the following command: conda env create --file yolov5\_env.txt --name yolov5\_env
3. Then activate the environment you just created from the text file: conda activate yolov5\_env.
4. Then enter pip install –r requirements.txt
5. Download tensorflow: pip install tensorflow
6. Now you can run python classifier\_yolov5.py OR python unity\_classifier.py. If you decide to run these, you will need to adjust the path inside these scripts.
   1. **For only yolov5**, open the file named classifier\_yolov5.py. Go to line 30 and replace with your path. For example, weights = "/home/thisUser/thisFolder/yolov5/runs/train/exp23/weights/best.pt"

To run navigate to the yolov5 folder and type: python classifier\_yolov5.py

* 1. **For the integrated system**, *you must first open unity* (refer to the unity steps before proceeding). Open the file named unity\_classifier.py. Go to line 26 and replace it with the correct path. For example, weights = "/home/thisUser/thisFolder/yolov5/runs/train/exp23/weights/best.pt”. Do this again on line 32. For example, model\_classifier = tf.keras.models.load\_model('/home/thisUser/482\_thisFolder/yolov5/my\_model.h5'). You will also need to change line 47 to your computers IP address. You can find your IP address by typing hostname -I.

To run navigate to the yolov5 folder and type: python unity\_yolov5.py

If you encounter any problems, refer to the GitHub page of yolov5: https://github.com/ultralytics/yolov5