For this checkin, we also require you to write up a reflection including the following:

- **Introduction:**

  With the advent of e-commerce and its increasing user population, large companies with shipping services like Amazon and FedEx require various systems to understand their flow of packages for pipeline analysis and optimization. One important process is counting the number of packages flowing through a particular pipeline, such as a delivery loading window or warehouse storage. Counting packages can be tedious and prone to error when done manually. Thus, we want to leverage deep-learning to create an efficient and accurate computer vision solution for automated package counting. This idea originated from Jorge, who worked on a similar problem at a company for a particular client. The client provided footage of a truck being manually loaded with packages and requested a 90% accuracy for the amount of packages being loaded. Jorge originally faced the problem with a more traditional computer vision solution, however he believes that we can get better performance from using deep-learning methods. We thought this was an interesting problem to tackle with the unique data from provided footage, so we all agreed in working on this project. We will be exploring solutions to this problem by researching and augmenting Faster R-CNN for bounding box prediction and the SORT algorithm for the package counting.

- **Challenges:** What has been the hardest part of the project you've encountered so far?

  The toughest challenge in the project is finding a way to track packages. For tracking, we are analyzing options such as Deep Sort, although we have also seen options where distances of the box centroids are compared in each frame.

- **Insights:** Are there any concrete results you can show at this point?

  Yes, so far we have a model that detects the bounding boxes in the videos. Examples of results are in the following google drive: https://drive.google.com/drive/folders/1ytCFCQgIlOaKJtKzUTBluCXUDdCOtXd2?usp=sharing

820_1 is the video containing the training examples and 920_1 is a test video containing new data.

    - How is your model performing compared with expectations?
      Box detection performs acceptably well. With less than 1000 examples, the model captures most of the boxes in the test set. However, the model confuses people passing under the camera with boxes. We believe that with more diverse training examples this problem will be solved
- **Plan:** Are you on track with your project? Yes.
    - What do you need to dedicate more time to?
      One of the parts that take more time is labeling some video frames to have a better detection model. Besides, we consider that the tracking model and refining it will take more effort than the detection model.
    - What are you thinking of changing, if anything?