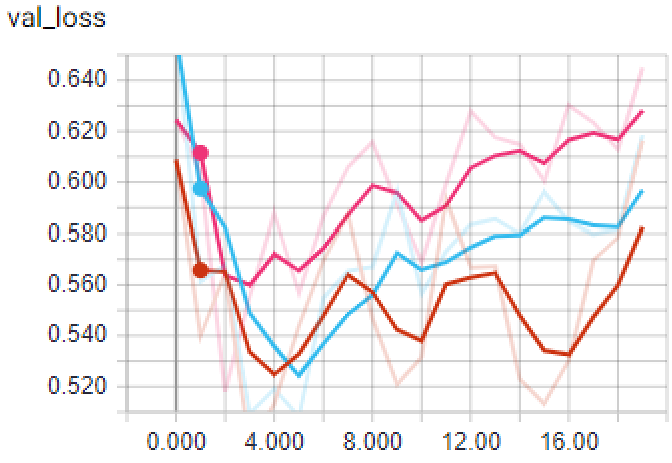
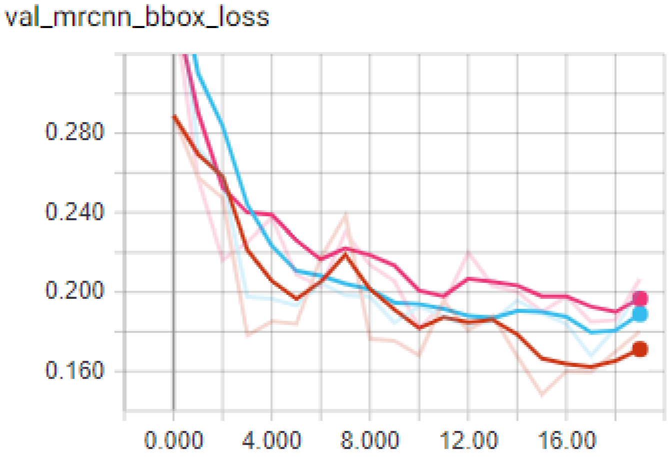
1. Problem statement

I completely changed my model compared to the one from deliverable 2, as I found a framework that included everything that I needed. Instead of a single CNN network to determine if an image contains a handgun or not, I am using a framework called Mask-RCNN (https://github.com/matterport/Mask_RCNN) that puts a bounding box and a mask on any detected handgun in an image. It works similarly to YOLO and uses 2 neural network stages. The first one generates regions where one of the input classes might be in the input image. Then, a second stage predicts the object's class, a bounding box and a mask. Both stages are connected to a backbone, which is a FPN style NN that consists of a bottom-up pathway (generates a feature pyramid map). For now, the model can predict handguns in a static image, but struggles in a video stream (OpenCV2). I have determined that the model is overfitting and it is mostly since I only trained it on 100 annotated images. However, I plan on adding more and hopefully improve the results. Here are my current overall, class, mask and bounding box losses on my validation set. However, my best run was with a training dataset of only 40 images, which is unusual. The blue line was with 80 training images and the pink line, 100 images. The best run outperforms all other runs in all categories except the class prediction. Its minimal overall loss is at epoch 16.

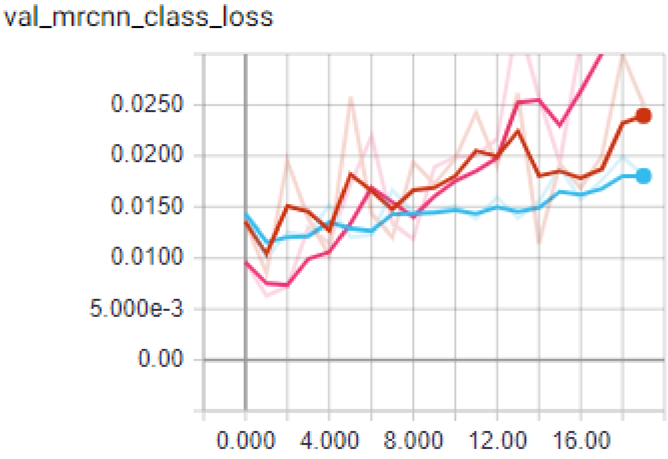
Graph 1.1 Overall Validation Loss



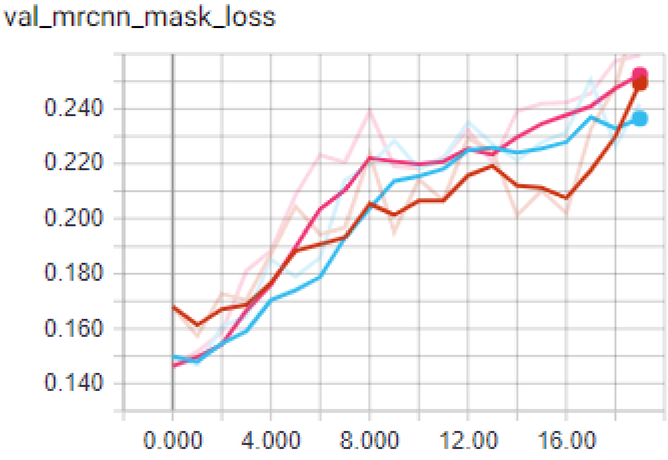
Graph 1.2 Bounding Box Validation Loss



Graph 1.3 Class Validation Loss



Graph 1.4 Mask Validation Loss



2. Final Demonstration Proposal

Initially, I planned on using a website to showcase my product using a ReactJS frontend because I used the framework extensively during my internship this summer. However, I do not think that I have the time, as I must refine my model so that it could hopefully work on a video stream. I plan on simply turning on my laptop’s webcam using open-cv2 to demo my project and use a PowerPoint presentation to explain my project, if possible. If I have the time, I will implement the application on a website.