Using Mask R-CNN for Weapons Detection
Author: Nantawat Samermit

Executive Summary:

Problem:

Weapons-based homicide is a frightening situation, compounded if it happens at our homes. WIth the successful market-penetration of IoT home-surveillance systems such as Ring and Google Nest, there is a larger-than-ever capability to give advance notice should an assailant approach a house with the intent to harm. Before that notice can be sent, the surveillance system must be able to identify the weapon from a picture (more realistically a video).

Exploratory Research Question:

Can I train and test a convolutional neural network to identify two types of weapons being held in someone's hand with just a small set of pictures?

Methods:

1. Acquire Kaggle dataset: https://www.kaggle.com/ankan1998/weapon-detection-dataset
2. Use Google Colab for GPU processing: https://colab.research.google.com/
3. Create a data generator for Mask R-CNN
4. Use a pre-trained MSCOCO dataset to compensate for small weapons dataset: https://github.com/matterport/Mask_RCNN/releases/download/v2.0/mask_rcnn_coco.h5
5. Use Mask R-CNN, a regional convolutional neural network, to learn on the training and validation set, limited to 10 epochs of learning. Mask R-CNN: https://github.com/matterport/Mask_RCNN.git
6. Evaluate using Mean Average Precision Error

Results:

Yes, even with a relatively small collection of pictures, learning can be applied for object identification. However the evaluation metric on the validation set is very poor at roughly 14%.

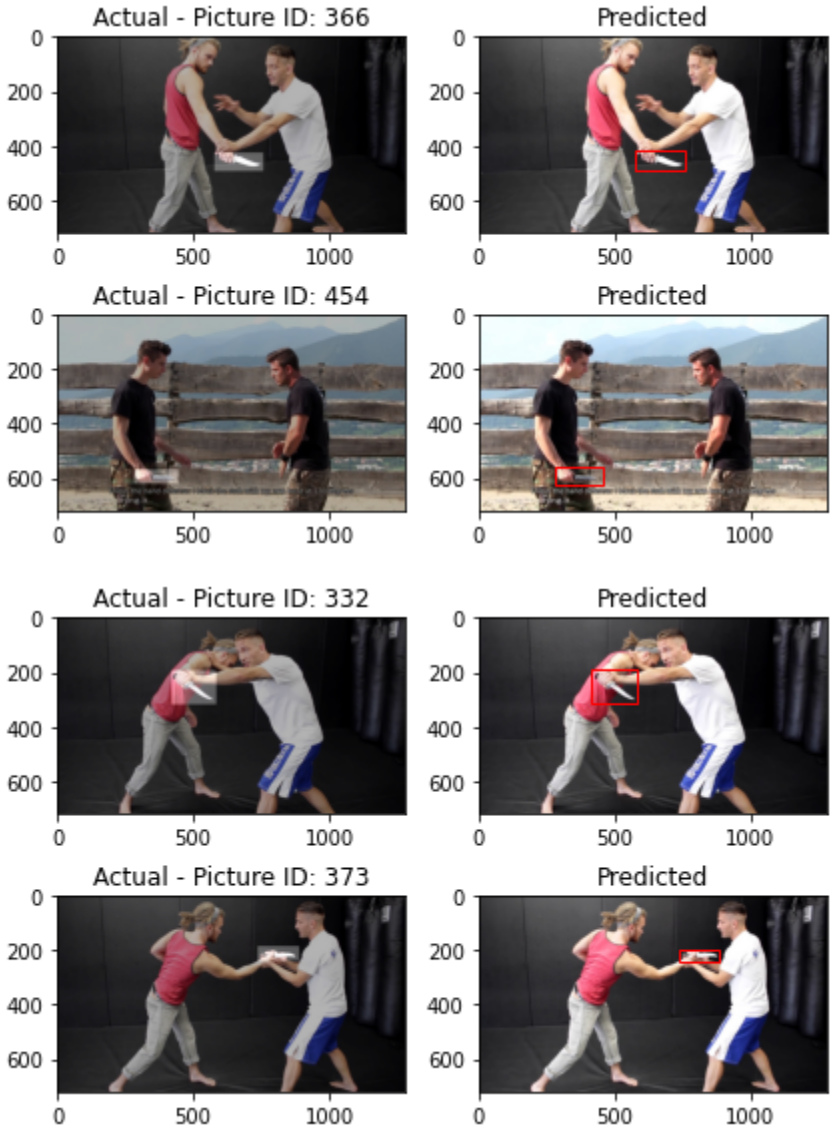
Ideas for Further Research:

- Debug MAPE evaluation function - listed two possible bugs
- Time the prediction process, and use that metric to compare to other CNN models to find out which is the fastest prediction model for object identification.

Using Mask R-CNN for Weapons Detection
Author: Nantawat Samermit

Visualizations from the project:

Accurate Predictions:



Using Mask R-CNN for Weapons Detection
Author: Nantawat Samermit

Erroneous Predictions: