Motivation
The motivation was to run a Neural Network on a device costing less than $100 like Raspberry Pi and be able to do object detection.

Objective
- Familiarization with Raspberry Pi and understand its capabilities
- Understand object detection and theory behind it
- Evaluate and select an existing model based on Raspberry Pi’s capabilities
- Enhance the existing model to detect additional classes by retraining it.

Methodology
Downloaded already trained models (on 90 classes) from [https://github.com/tensorflow/models/research/object_detection/g3doc/detection_model_zoo.md](https://github.com/tensorflow/models/research/object_detection/g3doc/detection_model_zoo.md) and evaluated them by running them on Raspberry Pi.

Results
Tested 4 models from the Tensorflow model zoo and selected ssd_mobilenet_v1_coco based on the results.

<table>
<thead>
<tr>
<th>Model</th>
<th>Time to Process</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>ssd_mobilenet_v1_coco</td>
<td>6.51 sec</td>
<td>Memory overrun</td>
</tr>
<tr>
<td>ssd_mobilenet_v2_coco</td>
<td>7.93 sec</td>
<td>Memory overrun</td>
</tr>
<tr>
<td>ssd_mobilenet_v1_fpn_coco</td>
<td>67.56 sec</td>
<td>Memory overrun</td>
</tr>
<tr>
<td>faster_rcnn_resnet_coco</td>
<td>~</td>
<td>Memory Insufficient</td>
</tr>
</tbody>
</table>

Additional Training
Selected the “Pen” class for additional training on the model. 150 images were labelled and split into training (110) and test (15) sets. The training was done for 3000 iteration to achieve a loss between 1 and 2 on a Windows PC.

Conclusion
- Raspberry Pi is good for running a medium sized neural network (probably not for training)
- Tensorflow’s frozen graph model is a good mechanism for implementing transfer learning onto Raspberry Pi

Final Result
After training the model was detecting the additional ‘Pen’ class.

References