Object Detection using Raspberry Pi

Ranga Chadalavada
(rangach@Stanford.edu) | CS 230 Deep Learning

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
and evaluated them by running them on Raspberry Pi

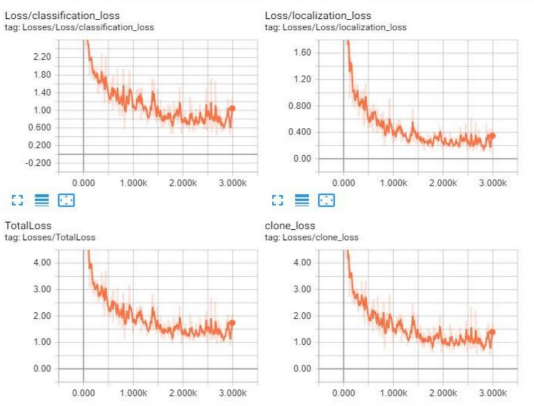
Results

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

Model	Time to Process	Issues
ssd_mobilenet_v1_coco	6.91 sec	
ssd_mobilenet_v2_coco	7.93 sec	Memory overrun
ssd_mobilenet_v1_fpn_coco	67.56	Memory overrun
faster_rcnn_nas_coco	--	Memory insufficient

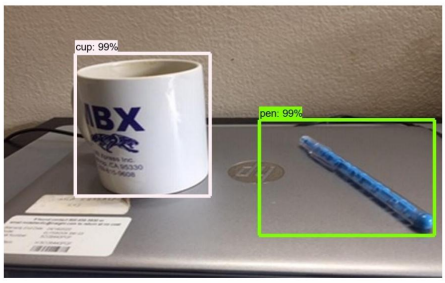
Additional Training

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



Final Result

After training the model was detecting the additional 'Pen' class



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

References

https://tensorflow-object-detection-api-tutorial.readthedocs.io/en/latest/