University of Victoria | Graduate Studies

# Notice of the Final Oral Examination for the Degree of Master of Science

of

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B.Tech (Uttar Pradesh Technical University, India, 2011)

## "Object Detection in Refrigerators using Tensorflow"

Department of Computer Science

Tuesday, December 11, 2018
10:00 A.M.
Engineering Office Wing
Room 430

Supervisory Committee:
Dr. Hausi Müller, Department of Computer Science, University of Victoria (Supervisor)
Dr. Alex Thomo, Department of Computer Science, UVic (Member)

External Examiner:
Dr. Michael McGuire, Department of Electrical and Computer Engineering, UVic

Chair of Oral Examination:
Dr. Rogério de Sousa, Department of Physics and Astronomy, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

## Abstract

Object Detection is widely used in many applications such as face detection, detecting vehicles and pedestrians on streets, and autonomous vehicles. Object detection not only includes recognizing and classifying objects in an image, but also localizes those objects and draws bounding boxes around them. Therefore, most of the successful object detection networks make use of neural network based image classifiers in conjunction with object detection techniques. Tensorflow Object Detection API, an open source framework based on Google's TensorFlow, allows us to create, train and deploy object detection models.

This thesis mainly focuses on detecting objects kept in a refrigerator. To facilitate the object detection in a refrigerator, we have used Tensorflow Object Detection API to train and evaluate models such as SSD-MobileNet-v2, Faster R-CNN-ResNet-101, and R-FCN-ResNet-101. The models are tested as a) a pre-trained model and b) a fine-tuned model devised by fine-tuning the existing models with a training dataset for eight food classes extracted from the ImageNet database. The models are evaluated on a test dataset for the same eight classes derived from the ImageNet database to infer which works best for our application. The results suggest that the performance of Faster R-CNN is the best on the test food dataset with a mAP score of 81.74%, followed by R-FCN with a mAP of 80.33% and SSD with a mAP of 76.39%. However, the time taken by SSD for detection is considerably less than the other two models which makes it a viable option for our objective.

The results provide substantial evidence that the SSD model is the most suitable model for deploying object detection on mobile devices with an accuracy of 76.39%. Our methodology and results could potentially help other researchers to design a custom object detector and further enhance the precision for their datasets.