

Homework 09 – Vision

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Note: this set of homework solutions is incomplete

0 Outline

- 1 Logistics
- 2 Reading
- 3 Theory
- 4 Practice

1 Logistics

Assigned: Wed Apr 03, 2019
Due: Wed Apr 10, 2019
Format: PDF uploaded to eLearning

2 Reading

1. Read the following papers on multiple object detection and object based image segmentation

Faster R-CNN: towards real-time object detection with region proposal networks
<https://arxiv.org/abs/1506.01497>

Mask R-CNN
<https://arxiv.org/abs/1703.06870>

3 Theory

None

4 Practice

Previous homework assignments provided you confidence in your ability to train classification networks and an understanding that training takes a long time with modest resources (unfortunately). This homework assignment will use pre trained models. On the downside, this robs you of the opportunity for you to develop your own data – network – loss – training pipeline, but on the upside you don't have to deal with training large networks on large datasets.

2. Image classification. Understand and run the code in

Transfer learning with TensorFlow

https://github.com/tensorflow/hub/blob/master/examples/colab/image_feature_vector.ipynb
https://colab.research.google.com/github/tensorflow/hub/blob/master/examples/colab/image_feature_vector.ipynb

This example includes using an ImageNet pre trained model from TensorFlow Hub to map from input images to features (encoder), then using a linear classifier (decoder) to map from features to classes. The linear classifier is trained as part of the examples.

3. Pixel classification (semantic segmentation). Understand and run the code in

DeepLab: deep labelling for semantic image segmentation

<https://github.com/tensorflow/models/tree/master/research/deeplab>

DeepLab demo

https://colab.research.google.com/github/tensorflow/models/blob/master/research/deeplab/deeplab_demo.ipynb

MIT driving scene segmentation

https://colab.research.google.com/github/lexfridman/mit-deep-learning/blob/master/tutorial_driving_scene_segmentation/tutorial_driving_scene_segmentation.ipynb

The 1st reference provides links that describe the network, the 2nd reference is a basic implementation and the 3rd reference builds off the 2nd reference and adds additional features and insight.

4. Multiple object detection. Understand and run the code in

Object detection

https://colab.research.google.com/github/tensorflow/hub/blob/master/examples/colab/object_detection.ipynb

Additionally, review TensorFlow's object detection API

Object detection

https://github.com/tensorflow/models/tree/master/research/object_detection

https://github.com/tensorflow/models/blob/master/research/object_detection/g3doc/detection_model_zoo.md

5. Object segmentation. Understand and run the code in

Mask R-CNN for object detection and segmentation

https://github.com/matterport/Mask_RCNN