COS40007 Artificial Intelligence for Engineering

Portfolio Assessment-4: "Deep learning using Tensorflow and Keras'"

Due: by Friday of Week 6 (06/09/2024 23:59 PM) in Canvas

Aim

The aim of this task is for you to demonstrate your understanding of developing CNN model using tensorflow and keras.

Task 1: Develop CNN and Resnet50

This is the structural asset dataset that you used in Studio 5. You have labelled some rust and no rust in your studio activities. The completely labelled data is located in Corrosion. You can use this dataset similar to cat-dog dataset of studio 5, activity 3.

Now you use this labelled dataset to

1) First randomly take out 10 rust and 10 no rust images for testing (We call this as Test Set). So, your training set will not contain these 20 images. yes
2) Develop a simple CNN model similar to minst classification but train with the provided corrosion data with class "rust" and "no rust" (that excludes Test Set). Once the model is trained and saved test with your Test dataset and measure the accuracy (using correct classification of 20 images in the test set)
3) Now develop a more complex CNN, Restnet50 and train with the same dataset as in step 2 and test with Test dataset and measure the accuracy (using 20 images in the test set)

Note: To complete the training process early you can use 10 epochs. This will may not give you the best model but this is okay for this assessment.

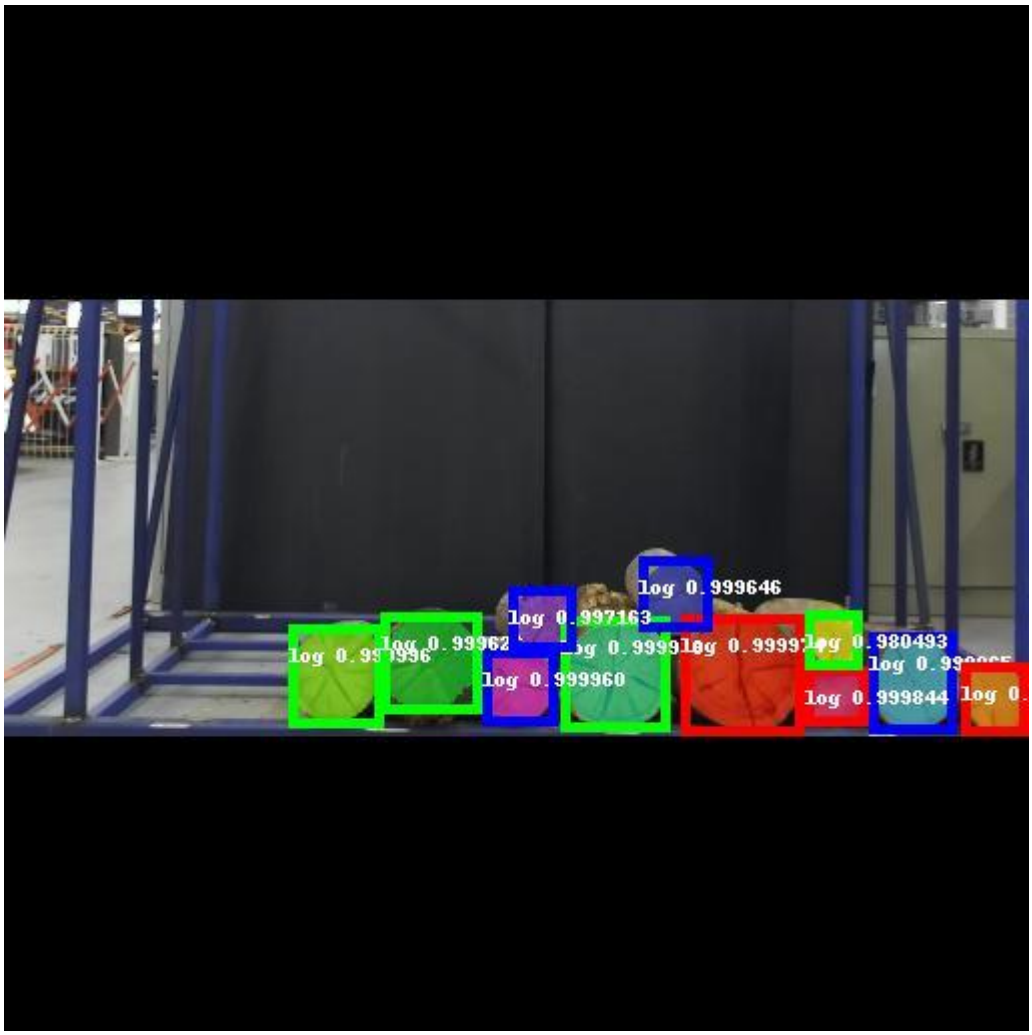
Task 2: Develop Mask RCNN for detecting log

This is the wooden log dataset that you labelled in Studio 5. You have labelled some log in your studio activities. A complete labelled version is available in log-labelled . You can use this dataset to identify log similar to kangroo dataset in Studio 5, activity 4.

Now you use this labelled dataset to

1) First randomly take out 10 images for testing (We call this as Test Set)
2) Develop a Mask RCNN model using the labelled log as training data (excludes test set). Note that you may need to convert the labelme annotation to coco annotation for the purpose of training mask RCNN. Here is a reference link: https://github.com/fcakyon/labelme2coco

3) Test the model with Test set and generate images of detected log objects along with confidence score. For example, the test outcome of one image will look like similar to the following image. You will need to use OpenCV to produce such image



4) Write a python program that count number of detected logs in each output image (Log counting)

Task 3: Extending log labelling to another class.

In Studio 5, Activity 1 you labelled log in 10 images. Can you update the labels of those 10 images using labelme and replace the label of the logs the are broken as detected_log. Then save the updated label for all 10 images.

Submission

Create a folder and place your

1) Labelled 10 images of Log dataset along with the annotation json file generated by labelme.
2) Test outcome images of your CNN model in a folder named “cnn_test”
3) Test outcome images of your Resnet50 model in a folder named “resent50_test”
4) Test outcome images of your Masked RCNN model in a folder named “rcnn_test”
5) The source code/notebook of your all CNN models in a folder named “code”

The portfolios assessment submission should also contain a document (word or pdf) with the following

- Your name and Student number
- The studio class you attend (for example you attend Studio 1-1 then write Studio 1-1)
- Test outcome of 20 images for CNN model (a table containing true class and predicted class and final overall accuracy)
- Test outcome of 20 images for RestNet50 model (a table containing true class and predicted class and overall accuracy)
- A screenshot of outcome for one image for Mask RCNN model
- A screenshot of outcome of your labelled image that contains log and detected_log

Marking criteria

- CNN model development and testing [2 marks]
- RestNet50 model development and testing [2 marks]
- Mask RCNN model development and testing [3 marks]
- Log counting task [1 mark]
- New Class labelling task [1 mark]
- Clean source code with comment and documentation [1 mark]

Total **10 marks**