

COS40007 Artificial Intelligence for Engineering

Week 5 Studio Activities

ILO	Understand Deep Learning using TensorFlow and Kears.
Aim	<ul style="list-style-type: none"> Learn what CNN (Convolutional Neural Network) is Learn how to label object image data using the labelling tool Learn how to train a CNN model using labelled data and use it for classification and Object detection
Resources	<p>Books:</p> <ol style="list-style-type: none"> Prosisie, Jeff. Applied machine learning and AI for engineers. " O'Reilly Media, Inc.", 2022. Raschka, Sebastian, Yuxi Hayden Liu, and Vahid Mirjalili. Machine Learning with PyTorch and Scikit-Learn: Developed machine learning and deep learning models with Python. Packt Publishing Ltd, 2022. <p>Web Resources:</p> <ol style="list-style-type: none"> https://www.geeksforgeeks.org/convolutional-neural-network- cnn- in-machine-learning/ https://github.com/labelmeai/labelme https://www.geeksforgeeks.org/residual-networks-resnet- deep- learning/
Requirements for to be marked as complete	Demonstrate the data you labelled to your tutor to access your data labelling quality.

Note: It is recommended that students use Google Collab or other free GPU computing environments to complete activities 2-4 of this studio.

Studio Activity 1: Class labelling

In this studio activity, we will learn how to generate ground truth information by annotating our desired class. We will learn how to annotate image data at

- 1) Image level so your classification algorithm will classify the entire image
- 2) Object level so your classification algorithm will identify your targeted object (e.g., car, people) in the image file

Rust dataset

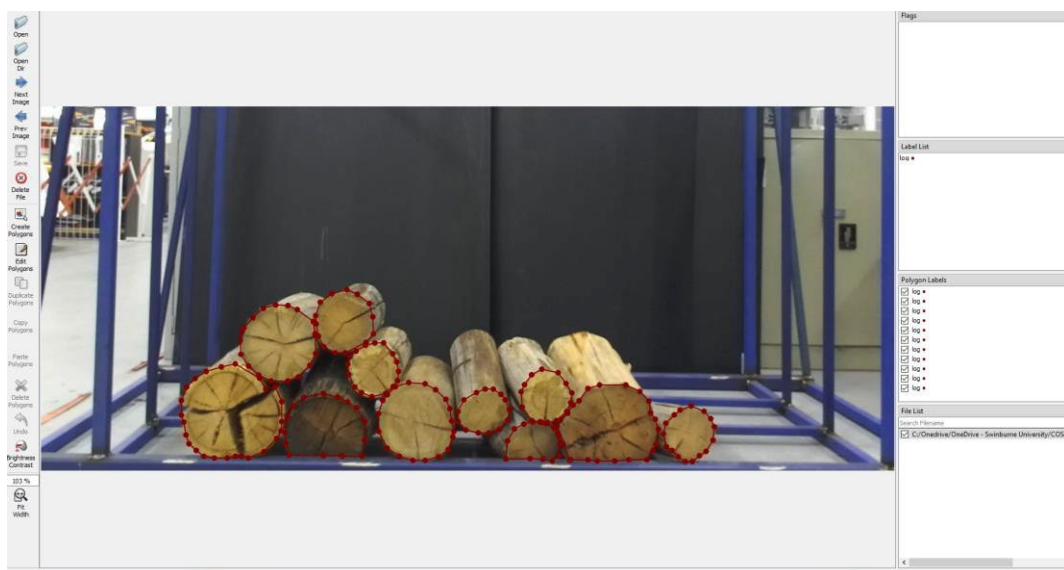
- Our image classification problem aims to determine whether a structural asset image contains rust (corrosion) or not.
- The image dataset of this is located here: [Corrosion-dataset](#). However, data are not labelled (rust/ no rust)
- Some examples of labelling or annotation of rust and no-rust are provided here: [Corrosion](#).
- Based on the example labels, you are required to label (or it is called an annotation) the data located in [not labelled](#).
- Randomly label 10 unlabeled images from [not labelled](#). And label them by placing them in two folders, 'rust' or 'no rust'.

Log dataset

As part of your Studio 1 activity, you should install labelme on your machine. It is a Python-based image annotation tool. More details are [here](#).

The image dataset for the wooden log is located in [log-images](#). A sample labelme annotation can be found in the [log-labelled](#). You can copy this folder to your local machine.

- To open the labelme GUI from your command line, type 'labelme. '
- Now, open the folder [log-labelled](#) from "labelme " (using Open Directory). You should see the annotation for the wooden log in one image and explain how it is done using polygonal annotation.





- Next, you will need to perform a similar annotation task on wooden logs for the images located in the log-images folder.
- Randomly select five images and annotate all the logs in those images using polygonal annotations. Get help from your tutor if you are unsure how to annotate.

Studio Activity 2: Develop your custom CNN for image classification

Follow this [tutorial](#) to learn how to develop and train your CNN model on a test dataset. The *minst* dataset is used for this. Try to create and run this code in your environment.

Studio Activity 3: Transfer Learning with ResNet for Image Classification

Follow this [tutorial](#) to learn how to utilise a pre-trained model to train with your data and develop a deep learning model. Cat and dog images are used for classification in this dataset. Try to create and run this code in your environment.

Studio Activity 4: Recursive CNN for object detection

Follow this [tutorial](#) to learn how to utilise a CNN for object recognition using a pre-trained convolutional neural network (CNN) model. For this dataset, kangaroo images are used as target objects. Try to create and run this code in your environment.

Next Steps:

In this studio, you have learned how to label image data and how to utilise different deep neural networks for image classification and object recognition. In the portfolio assessment task, you will use the type of data that we labelled in this studio to develop CNN for image classification (in our case, rust and no rust for image classification and wooden logs for object recognition). Please follow the specifications for the portfolio task. The assessment Task for Week 5 can now be attempted and submitted via Canvas.