COS40007 Artificial Intelligence for Engineering

Week 5 Studio Activities

ILO	Understand Deep Learning using PyTorch and YOLOv5.
Aim	• Learn how to do image classification using YOLO • Learn how to train a custom object detection model • Learn how to do real-time object detection tracking
Resources	Books: 1. Prosise, Jeff. Applied machine learning and AI for engineers. " O'Reilly Media, Inc.", 2022. 2. Raschka, Sebastian, Yuxi Hayden Liu, and Vahid Mirjalili. Machine Learning with PyTorch and Scikit-Learn: Develop machine learning and deep learning models with Python. Packt Publishing Ltd, 2022. Web Resources: 1. https://github.com/ultralytics/yolov5 2. https://pyimagesearch.com/2022/06/20/training-the-yolov5-object-detector-on-a-custom-dataset/ 3.
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 CoLab or other free GPU computing environment to complete activities of this studio.

Requirements: Pytorch and YOLOv5 environment setup. We will mostly use YOLO v5 and pytorch is essential to install YOLO om your environment.

Studio Activity 1: Object detection using YOLO v5

Follow this tutorial to understand how you can develop YOLO v5 model to detect custom object. In this scenario we are detecting issues or anomalies which is potholes on the road. Try to create and run this code on your own environment.

Studio Activity 2: Detection of more than one object using YOLO v5

Follow this [tutorial](#) to understand how you can use YOLOv5 to detect more than one object in images using the same model. This tutorial used 4 types of road sign detection using YOLO v5 model.

Studio Activity 3: Real-time object detection using YOLO v5 model

Follow this [tutorial](#) to understand how you can use a YOLO v5 for real-time object detection. In this example 61 different traffic sings detection model was developed that can identify such sings in real-time.

Studio Activity 4: Data labelling options for YOLO

So far you have used data labelling using labelme. In labelme you can do polygonal annotation. However, for YOLO it only accept bounding box annotation. There are several ways you can create your labelled data in YOLO annotation format.

Option 1: You can convert your labelme annotation file to YOLO format using [labelme2YOLO](#)

Option 2: You can use [YOLO annotation tool](#) to label your data

Option 3: You can use paid version of the software [Roboflow](#) to do any kind of annotation including YOLO annotation

Studio Activity 5: Evaluation of object detection

See this [tutorial](#) How Intersection over Union (IoU) is used to measure the quality of detected object. This is a [good example](#) of how you can implement and IoU using Pytorch

Next Steps:
In this studio you have learned how to use advanced deep learning model such as YOLO object recognition. In the portfolio assessment you will use YOLO v5 model for detecting custom objects.

The assessment Task for Week 6 now can be attempted and submitted via Canvas