COS40007 Artificial Intelligence for Engineering

Week 6 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/
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 environments to complete activities in this studio.

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

Studio Activity 1: Object detection using YOLO v5

Follow this tutorial to understand how to develop a YOLO v5 model to detect custom objects. In this scenario, we detect issues or anomalies, such as potholes on the road. Try to create and run this code on your environment.

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

Follow this tutorial to understand how to use YOLOv5 to detect multiple objects in images using the same model. This tutorial used four types of road sign detection using the YOLO v5 model.

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

Follow this tutorial to understand how to use a YOLO v5 for real-time object detection. In this example, 61 different traffic sign detection models were developed to identify such signs 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, YOLO only accepts bounding box annotation. You can create your labelled data in YOLO annotation format in several ways.

Option 1: You can convert your labelme annotation file to YOLO format using labelme2YOLO

Option 2: You can use the YOLO annotation tool to label your data

Option 3: You can use the paid version of the software Roboflow to do any annotation, including YOLO annotation

Studio Activity 5: Evaluation of Object Detection

See this tutorial on how Intersection over Union (IoU) measures the quality of detected objects. Here is a good example of how you can implement IoU using Pytorch.

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

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