PRACTICAL ASSIGNMENT

Module
[CV Essential]

Module Code
AI43003FP

Duration
8 hours

Title: Perform Computer Vision (CV) data collection, AI training and inference

Tools, Equipment and Materials:

- Computer with Internet access
- Documentation & Presentation Software

Instructions:

1. You are to perform CV data collection, AI training and inference of a case study individually.

2. Analyse and explore the case study provided.

3. There are two parts to this assignment. Part 1: Build an Image Classifier. With reference to the AI project cycle, perform data collection, training and inference of an image classifier CV assignment. Part 2: Object Detection.

4. AI project cycle – Problem scoping, Data acquisition, Data exploration, Modelling, Evaluation and Deployment.

Deliverables:

You have to submit one complete set of items and present the assignment to demonstrate the application to the Lecturer upon completion of the assignment.

You have to zip and submit one set of items consists of

a. Python code,
b. Presentation slides.
c. There should be only one submission per person.
d. Ensure that the following contents are included in the presentation slide.

1	Cover slide including project title and student name.
2	Problem statement using 4Ws problem canvas.
3	Part 1: Build an image classifier.
4	Part 2: Object Detection.

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CV Essential Scenario

Classification of Singapore Traffic Road Sign

KPMG released a benchmark report in mid-2020, naming Singapore as the top country in the world in terms of development of self-driving cars, as reflected in the government's policy-making and legislation efforts to encourage use of autonomous vehicles.

Self-driving car promises to revolutionalize transportation and mobility in the world. But it must first be able to transport people and goods efficiently from point to point and does so in a safe manner. In order to be safe, self-driving cars need to be able to detect and classify traffic road signs.

In Singapore, there is a range or traffic road signs serving various purposes. They range from the green directional signs that tell drivers about upcoming expressway exits, to warning signs that indicate potential elements of danger ahead, such as pedestrian crossings and school zones.

In this project, you are tasked to develop a simple Traffic Sign Recognition (TSR) as a proof-of-concept to classify Singapore's road signs. This Traffic Sign Recognition system must use Convolutional Neural Networks (CNN) for the recognition of the signs.

Instruction to students:

Please answer ALL the questions. You may refer to online documentation (e.g. keras, pandas, etc) for help on syntax. No copying of codes wholesale is allowed.

Note: Use a random_state = 42 where appropriate

The assignment will require the following steps:

Part 1: Build an Image Classifier

1. Problem scoping.
   1.1. Defining problem statement using 4Ws (Who, What, Where, Why) problem canvas from the project scenario.

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2. Data acquisition and Data exploration.
   2.1. Importing various modules.
   2.2. Preparing the data.
      2.2.1. Collect relevant data.
      2.2.2. Perform image pre-processing and data augmentation.
      2.2.3. Split it into train, validate, and test datasets.
      2.2.4. Normalize the data.
3. Modelling.
   3.1. Create the model - Build a model based on convolutional neural network.
   3.2. Train the model.
4. Evaluation and Deployment.
   4.1. Evaluate the model.
   4.2. Visualizing predictions on validation set.
   4.3. Plot the learning curve and confusion matrix.

Part 2: Object Detection

5. Adjust the sliding window parameters.
6. Select image for object detection.
7. Generate object detection result.

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