**Lab Assignment #3 – Use CNNs to solve object recognition problems**

Due Date: Sunday 11:59pm, Week 10

Purpose: The purpose of this Lab assignment is to:

* Design and implement CNN networks to solve object recognition problems:
* Practice TensorFlow Data API and feature engineering capabilities
* Practice CNN architecture
* Practice the design and implementation of CNNs
* Practice the use of TensorFlow to implement CNNs

References: Read textbook, chapter 13, 14, TensorFlow documentation, reference articles, and the lecture slides. This material provides the necessary information that you need to complete the exercises.

Be sure to read the following general instructions carefully:

- This assignment must be completed individually by all the students.

- See the naming and **submission rules** at the end of this document

- You will have to **provide a demonstration video for your solution** and upload the video together with the solution on eCentennial through the assignment link. See the **video recording instructions** at the end of this document.

**Exercise 1**: **Using Data API - Loading and Preprocessing Data with TensorFlow**

Using TensorFlow Data API, load data and perform the necessary preprocessing steps for the HYPE-Retention dataset:

* Loading data
* Converting categorical features to numerical
* Transformations
* Standardization

Note that all these tasks should be done after data cleaning.

(3 marks)

**Exercise 2**: **Facial Recognition for Differentiating Specific Features – Using CNNs**

Using TensorFlow, design and develop a CNN model for **differentiating people with mask and those without mask**. Use the dataset of images uploaded on the Assignment 3 folder. Follow the steps given in the referenced article also uploaded on the Assignment 3 folder.

Analyze the accuracy of the model and point out some of the pitfalls.

Your output should **display the results of image classification in a friendly format**.

(7 marks)

**Evaluation:**

|  |  |
| --- | --- |
| **Functionality:**   * Correct implementation of requirements as specified in exercises. * Code demonstration and brief explanation in a short video | 70%  10% |
| **Design and Naming**:   * correct design of classes and methods similarly to class examples * Correct use of naming guidelines for classes, variables, methods. Good use of comments. Correct naming of jupyter notebooks, project zip file and demonstration video. | 15%  5% |
| **Total** | 100% |

You must **name your Jupyter notebook files** according to the following rule:

**YourFullname\_COMP258Labnumber\_Exercisenumber**.

Example: **JohnSmith\_COMP258Lab3\_Ex1**

Provide your **student number and full name as a comment** at the top of your code for each exercise.

**Submission rules:**

Submit your solution as a **zip file** that is named according to the following rule:

**YourFullname\_COMP258Labnumber.zip**

Example: **JohnSmith\_COMP258Lab3.zip**

Use 7-zip to compress files (<https://www.7-zip.org/download.html>).

Name the video as **YourFullName\_COMP258Lab3\_demonstration\_video.mp4 and** submit the video together with your solution (zip file).

**Demonstration Video Recording**

Please record a short video (max 3-4 minutes) to demonstrate your assignment solution. You may **use the Windows 10 Game bar** to do the recording:

1. Press the Windows key + G at the same time to open the Game Bar dialog.

2. Check the "Yes, this is a game" checkbox to load the Game Bar.

3. Click on the Start Recording button (or Win + Alt + R) to begin capturing the video.

4. Stop the recording by clicking on the red recording bar that will be on the top right of the program window.

(If it disappears on you, press Win + G again to bring the Game Bar back.)

You'll find your recorded video (MP4 file), under the Videos folder in a subfolder called Captures.

Name the video as **YourFullName\_COMP258Lab3\_demonstration\_video.mp4 and** submit the video together with your solution (zip file).