Read all the instructions for this COURSEWORK.

This coursework is divided into two sections.

- **Section A**: Each member of the group is required to complete this task independently. Subsequently, each member must submit their completed work to one person in your group. Then he/she will then compile the completed tasks from all members into the final project file for submission on Moodle.
- **Section B**: All members should do this task independently. Following individual completion, the group must collectively determine and submit the most appropriate solution, taking into consideration the contributions and efforts of all members.

- You may import all the necessary libraries at the start of the project. Importing the libraries again would affect on the performance of your project.
- You can use any function from the following libraries only, to solve the tasks in Section A & B:

  SKlearn, Pandas, Numpy, Matplotlib, SKimage

  If any other library was used by the instructor during lab sessions, you may provide its reference (e.g., lab 4, lab 5) and can use it.
- Use minimum computational power (efforts) to achieve all the tasks.

Submission Requirements:

1. Moodle Submission (Mandatory): The project file must be submitted via Moodle. Submissions through any other platform will not be accepted.
2. Email Confirmation (Record Purposes): A copy of the same project file uploaded to Moodle must also be emailed to me, with your group members included in the Cc field. This is for record-keeping purposes.

   Email id: yasir.hafeez@nottingham.edu.my

Only one file, named in the format "Group_<name of group>.ipynb", is to be submitted per group. This file must contain all sections from every group member, presented in sequential order according to the name sequence provided in the group list.

Important: A penalty of up to 15% of the total marks will be applied for any failure to comply with these submission requirements.

Peer-Assessment: To ensure the comprehensive participation of all members in the coursework, particularly Section B, and to prevent any submission delays, each member from every group is required to submit a peer-assessment form. Detailed instructions for this assessment are available in the "Peer_assessment_instructions.pdf" document on Moodle.

Policy Regarding the Use of AI Tools: The utilization of any Artificial Intelligence (AI) tool is strictly prohibited for the purpose of solving or generating any portion of a solution for assigned tasks. This includes, but is not limited to, the complete or partial generation of code, text, analyses, or any other deliverables required for coursework. The group may be called for an interview if the use of AI is detected.

Section A:

Part A. (Using Mark down to include the "### Name of member" before his task is included in the project file.)

For the dataset "partA.csv" , using DecisionTree and MLP to train and test the model. Use "new_input_dataset" and "new_output_dataset" for cross validation. Note: Label; "in_" is for input, and "out_" is for output

1. Apply decision tree regression model to find the MSE for this dataset? Where applicable use appropriate diagrams to explain the results.

   Marks: 1.5

2. For MLP hidden layer size = (256, 128), maximum iteration= 500, random state = 42. Find the MSE for test and train dataset?

   Marks: 1.5

3. Cross validate the data using K-folds cv=10, for both models.
   Note: cross_val_score() from sklearn.model_selection, but it only supports 1D targets, so you'll need to use a wrapper if you're working with multi-output regression.

   Marks: 3

Part B. (Using Mark down to include the "### Name of member" before his task is included in the project file.)

Total Marks: 5 (in the following you may find the marks distribution for each task).

You have images dataset in the folder "Images". You should only use the image with your group name and extract your own name spelling out of it by using the slicing technique learnt during Lab session 4.

Extract your First name (first letter should be capital) and Last name (first letter should be capital) as per group list. Display it as per the following example

For example

i. First name : Yasir

(Marks: equal size = 0.5, correctly sliced = 1, correct rotation = 1)

ii. Last name: Hafeez

(Marks: equal size = 0.5, correctly sliced = 1, correct rotation = 1)

If following is the output: (as the size in the output is not equal therefore 1 mark is deducted).

```
My name is Yasir Hafeez, and I am slicing the image Group_Z.png to extract my name
```

Section B:

Total 14 Marks

For the following dataset “partB.csv”:

1. You need to predict the number of casualties based on features like weather conditions, road surface, and lighting conditions.

   Marks: 1.5
2. Use Decision Tree Regression to predict the number of casualties based on features like weather conditions, road surface, 1st Road Class, Type of Vehicle, and lighting conditions.

   Marks: 1.5
3. Use Neural Network to predict the number of casualties based on features like weather conditions, road surface, 1st Road Class, Type of Vehicle, and lighting conditions.

   Marks: 1.5
4. K-Fold: Cross-Validate (10 folds) each model (above three).

   Marks: 1+1+1
5. Where are the errors (inaccuracy) incurred with the neural network? i.e., slight casualties vs serious casualties.

   Marks: 2

   Discuss each result from the above five (5) tasks. Use appropriate diagrams where applicable to support your opinion.

   [Marks 2 .5+ 2 (based on the correct results of five completed tasks)]