COMSATS University Islamabad, Lahore Campus

Course Title:	Machine Learning	Course Code:	CSC668 - PCS 716
Resource Person:	Dr. Muhammad Sharjeel	Marks:	10

Assignment 1: **Due Date/Time: Wednesday, 18th September, 23:59**

Submission: Upload the assignment solution to your GitHub account (private repository).

Instructions:

- Upload your code both as notebook (.ipynb) and python script (.py) on Github.
- Complete all tasks in the same file.
- The name of both files should be your-roll-number_assignment1 (e.g., fa24-rcs-001_assignment1)
- Late submissions: 5% penalty per day for 3 days after due date.

The aim of this assignment is to install and setup Python and learn to perform some basic operations.

Task 0: Python Installation

0.1 Anaconda is an open-source distribution of Python programming language for scientific computing. Installing Anaconda will automatically install Python and the necessary packages for development and analysis. Go to the official Anaconda page. Download the installer compatible with your system to install a fresh copy of Anaconda. Run the installer and follow the instructions there.

0.2 Verifying Installation

To test your installation, open Command Prompt or Anaconda Prompt and run the command

conda list

For a successful installation, a list of installed packages appears.

Task 1: Lists, Dictionaries, Tuples

1.1. Creaye a list: nums = [3, 5, 7, 8, 12], make another list named 'cubes' and append the cubes of the given list 'nums' in this list and print it.

1.2. Create an empty dictionary: dict = {}, add the following data to the dictionary: 'parrot': 2, 'goat': 4, 'spider': 8, 'crab': 10 as key value pairs.

1.3. Use the 'items' method to loop over the dictionary (dict) and print the animals and their corresponding legs. Sum the legs of each animal, and print the total at the end.

1.4. Create a tuple: A = (3, 9, 4, [5, 6]), change the value in the list from '5' to '8'.

1.5. Delete the tuple A.

1.6. Create another tuple: B = ('a', 'p', 'p', 'l', 'e'), print the number of occurrences of 'p' in the tuple.

1.7. Print the index of 'l' in the tuple.

Task 2: Numpy

Use built-in functions of numpy library to complete this task.

List of functions available here (https://numpy.org/doc/1.19/genindex.html)

$$A = \begin{matrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \end{matrix}$$

z = np.array([1, 0, 1])

2.1 Convert matrix A into numpy array
2.2 Use slicing to pull out the subarray consisting of the first 2 rows and columns 1 and 2. Store it in b which is a numpy array of shape (2, 2).
2.3 Create an empty matrix 'C' with the same shape as 'A'.
2.4 Add the vector z to each column of the matrix 'A' with an explicit loop and store it in 'C'.

Create the following:
X = np.array([[1,2],[3,4]])
Y = np.array([[5,6],[7,8]])
v = np.array([9,10])
2.5 Add and print the matrices X and Y.
2.6 Multiply and print the matrices X and Y.
2.7 Compute and print the element wise square root of matrix Y.
2.8 Compute and print the dot product of the matrix X and vector v.
2.9 Compute and print the sum of each column of X.

Task 3: Functions and Loops
3.1 Create a function 'Compute' that takes two arguments, distance and time, and use it to calculate velocity.
3.2 Make a list named 'even_num' that contains all even numbers up till 12. Create a function 'mult' that takes the list 'even_num' as an argument and calculates the products of all entries using a for loop.

Task 4: Pandas
Create a Pandas dataframe named 'pd' that contains 5 rows and 4 columns, similar to the one given below:

C1	C2	C3	C4
1	6	7	7
2	7	9	5
3	5	8	2
5	4	6	8
5	8	5	8

4.1 Print only the first two rows of the dataframe.
4.2 Print the second column.
4.3 Change the name of the third column from 'C3' to 'B3'.
4.4 Add a new column to the dataframe and name it 'Sum'.
4.5 Sum the entries of each row and add the result in the column 'Sum'.

4.6 Read CSV file named 'hello_sample.csv' (the file is available in the class Google Drive shared folder) into a Pandas dataframe.
4.7 Print complete dataframe.
4.8 Print only bottom 2 records of the dataframe.
4.9 Print information about the dataframe.
4.10 Print shape (rows x columns) of the dataframe.
4.11 Sort the data of the dataFrame using column 'Weight'.
4.12 Use isnull() and dropna() methods of the Pandas dataframe and see if they produce any changes.