Lab-1 (Brushing up the Python Programming)
CSL7670 - Fundamentals of Machine Learning

NOTE:

1. This assignment contains 16 problems.
2. Objective of this assignment is to brush up on the programming skills required for ML. Please submit a detailed jupyter notebook or Google Colab and Python codes.
3. Prepare appropriate inputs or input files as required.
4. **Deadline:** August 14, 2023, 10:30 PM.

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1. **Lists and Loops:** Write a Python function that takes a list of integers as input and returns the sum of all even numbers in the list.
2. **List Comprehension:** Given a list of words, create a new list containing the length of each word using list comprehension.
3. **NumPy Array Operations:** Given two NumPy arrays arr1 = np.array([1, 2, 3]) and arr2 = np.array([4, 5, 6]), perform element-wise multiplication and store the result in a new array.
4. **NumPy Array Slicing:** Given a NumPy array data = np.arange(1, 21), use array slicing to extract elements from index 5 to index 15.
5. **Data Visualization with Matplotlib:** Using Matplotlib, create a line plot to visualize the trend of a stock's closing price over ten days (random data can be used).
6. **Data Cleaning with Pandas:** Given a Pandas DataFrame with a column containing missing values, write a Python function to replace those missing values with the mean of that column.

7. **Pandas DataFrame Filtering:** Using Pandas, filter a DataFrame to only include rows where the 'age' column is greater than 30 and the 'gender' column is 'female'.

8. **Pandas Grouping:** Given a DataFrame with columns 'Country' and 'Population', use Pandas to group the data by 'Country' and calculate the average population for each country.

9. **Data Visualization with Seaborn:** Using Seaborn, create a box plot to visualize the distribution of ages for different 'Species' in a DataFrame.

10. **Data Manipulation with Pandas:** Given a Pandas DataFrame containing columns 'Sales' and 'Expenses', create a new column 'Profit' that calculates the profit as 'Sales' minus 'Expenses'.

11. **Dictionary Manipulation:** Given a dictionary phonebook containing names as keys and phone numbers as values, write a function to find and return the name(s) of the person(s) with the maximum phone number(s).

12. **Functions and Recursion:** Write a recursive Python function to calculate the factorial of a given positive integer.

13. **File Handling:** Read a text file named "data.txt" that contains one number per line. Write a Python script to calculate the sum of all the numbers and print the result.

14. **Object-Oriented Programming:** Create a class Rectangle with attributes width and height, and methods to calculate the area and perimeter. Test the class by creating objects and performing calculations.

15. **Numpy Array Manipulation:** Create a 3×3 identity matrix using NumPy and then convert it into a 1D array.

16. **Data Visualization with Matplotlib:** Using Matplotlib, create a bar chart to compare the average scores of students in three different subjects.

End of Paper