Week1 - Introduction to Python and NumPy

DS3010: Introduction to Machine Learning Lab

Timing: 02:00 PM to 04:45 PM Max Marks:

Instructions

1. Submit one .ipynb file containing all answers. The name should be [student_name] _[rollno]_[lab].ipynb
2. Write the questions in separate text blocks before the answers.
3. Outputs for all sub-questions should be given and the code should be executable.
4. Write justifications for your choices where needed.
5. Ensure that all plots include clear labels and legends for better interpretation.
6. Use of generative AI tools (such as ChatGPT, Gemini, etc.) is strictly prohibited. Any submission found to contain AI-generated or plagiarized content will receive a score of zero, and disciplinary action.

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1. **Basics of Python**
   (a). Print the sum of a current number and a previous number in a user input list.
   (b). Print the multiplication tables for numbers 11 to 20, up to 10 multiples each.
   (c). Generate the first 15 terms of a Fibonacci sequence.
   (d). Check whether a given year is a leap year. A year is a leap year if it is divisible by 4, except for years that are divisible by 100 but not by 400. Print 'Yes, the given year is a leap year' or 'No, the given year is not a leap year' as output.
   (e). Check if a user-entered string contains any digits using a for loop. If the string contains digits, print the total number of digits. Otherwise, print 'No digits contained'.
2. **Python data structures**
   (a). Create an empty dictionary named customer_transactions.
   (b). Add records for 3 customers to the dictionary

$$'Ankit' : [1200, 5200, 75]$$

$$'Amit' : [4500, 13000, 25]$$

$$'Ravi' : [200, 150, 10000]$$

   (c). Display the transaction history for each account holder in a well-formatted way, clearly showing their name followed by their three transactions.
   (d). Compute and print the total transaction volume for each account holder.

(e). Identify and print the customer with the highest total transaction value.

(f). A transaction is considered suspicious if it's greater than 10,000 or less than 100. Use a dictionary comprehension to create a new dictionary named suspicious_customers that includes customers who have at least one suspicious transaction.

3. **Basics of NumPy**

(a). Create a 2D NumPy array A of shape (4, 3) with values from 1 to 12. Print the array, its shape, size, and data type.

(b). From the array A, extract and print:

- The second column.
- A subarray containing the first two rows and last two columns.

(c). Reshape A into a (3, 4) array B. Create another array C of the same shape filled with the value 5. Perform element-wise addition, subtraction, multiplication, and division.

(d). For array B, calculate and print the row-wise and column-wise sum.

(e). Add the 1D array [10, 20, 30, 40] to each row of B. Count how many elements in B are greater than 6. Print how many elements in B are greater than 6 and Replace all elements in B that are less than 6 with 0.

4. **Basics of Matplotlib**

Given the following data for two cities' monthly average temperatures:
months = [Jan,Feb, Mar, Apr, May, Jun],
city1_temp = [22, 25, 28, 30, 35, 40],
city2_temp = [18, 20, 25, 27, 30, 32].

(a). Plot a line chart showing both cities' temperatures across the months.

(b). Add proper labels for axes, a title, and a legend.

(c). On a separate plot, draw a bar chart comparing both cities' temperatures in May and June only.