भारतीय सूचना प्रौद्योगिकी संस्थान गुवाहाटी
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY GUWAHATI

Artificial Intelligence Lab (CS 236), B.Tech
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Practice Assignment - 3

Part 1: Pandas

1. Create a DataFrame **df** with columns '**Std_Name', 'Roll_no',** and **'CPI'**. Write a code to create a new DataFrame containing only rows where the value in column **'CPI'** is greater than **60**. Also calculate the overall **mean, median, and standard deviation**.
2. Suppose you have a DataFrame **'IIIT_Library'** with columns **'Subjects', 'Book_Authors',** and **'No_of_Books'**. Write a code to calculate the total number of books for each subject across all Book authors.
3. Write a Python program to read an image and save the image as a matrix to a .csv file using Pandas. Then import Excel data from the .csv file excluding the last row and last column.
4. Suppose you have a DataFrame **dirty_data** with columns **'Name', 'Age', 'Salary".** Write a code to remove rows where the **'Age'** column is **less than 18** or the **'Salary'** column is negative.
5. Given a DataFrame **time_df** with column **'TimeStamp' in DateTime** format, write a code to create a new column **'Hour'** containing the hour component of each timestamp.

Part 2: Numpy Application

1. Create two matrices, P and Q, each of size 106 x 104 with random values. Perform the following.
    a. Matrix multiplication $P.Q^T$ using loops in Python.
    b. Vectorized matrix multiplication to compute $P.Q^T$
    c. Calculate the speedup for operations a) and b):

        Speed up = t1 / t2

2. Given a 2D NumPy array "arr", extract the second column and the last row.
3. From a 2D array of 5*6, find the frequency of repeated numbers in the array.
4. Solve a system of linear equations Ax = b using NumPy, where A is a random coefficient matrix, and b is a random vector.
5. In a mathematics class, students took a quiz, and their scores are recorded as follows:

    85,92,75,85,90,92,85,75,85,92,75,85,90,92,85,75,85,92

    Among these scores, what is the frequency of the score of 85?
