Practice Exercises

Instructions :

For each of the questions below, you need to implement Python code as concise as possible, using numpy and pandas. The goal is to get understanding of the two libraries, which will be used extensively in future implementations. You can work alone or in groups of 2. Submit either a jupyter notebook with the implementations. Any dependencies other than numpy and pandas, mention as a comment in the first cell of the notebook. The best implementations will be shared as solutions with the class.

Basic Introduction to Numpy I :

1. Initialize a vector of length 100 randomly using a uniform distribution. Make sure the value of each cell lies between 0 and 1.
2. Use numpy to calculate the mean and mode of the array.
3. Print the first 10 and the last 10 elements of the array.
4. Reverse the array (use numpy functions)
5. Sort the list in descending order.

Introduction to Numpy II :

1. Initialize a 2d array of size 10 x 5, with random values drawn uniformly between 1 and 10. (call it **M**)
2. Calculate the determinant of the array
3. Check if inverse of the matrix exists, if yes, calculate the inverse
4. Randomly initialize a column vector of size 5. Lets name it **v**.
5. Calculate the dot product between **M** and **v**
6. Sort the array M along the first axis (row), along the second axis (column) and on flattened array. In case of flattened array, transform the output from 1-d to 2-d again of same size (10 x 5).

1. Normalize the feature values, assuming every column is a single feature, and rows are the instances.

Introduction to Pandas :

1. Import the given csv into a dataframe. Make sure the headers are imported as column headers.
2. For every student, calculate the percentage of marks and store in a new column called ‘percentage’.
3. Bin the percentage of each student into grades such that :
    a. Percentage above 90 equals grade A
    b. Percentage between 85 to 90 equals grade A-
    c. Percentage between 75 to 85 equals grade B

    d. Percentage between 70 to 75 equals grade B-
    e. Percentage between 60 to 70 equals grade C
    f. All others are F
4. Get the list of top 3 performers per subject, and overall
5. Plot the distribution of grade vs number of students.
6. Do the same as in 5, but with male students and female students separately. Plot both in a single figure.