EE 524 Machine Learning Lab

Assignment 1

09 August 2021

1. Print 'Hello World!'

2. User input two numbers a and b. Perform the following algebraic operations $c = a + b$, $d = a - b$, $e = a * b$, $f = \frac{a}{b}$ and $g = a\%b$ and print their results.

3. Find the factorial of a number 'num' and print the result.

4. Take two user inputs a and b. Write a program to print all the prime numbers in the interval [a,b].

5. Take two user inputs a and b and find their Lowest Common Multiple(LCM).

6. Create a list of length n = 15. Sort the array in descending order and print the sorted List as well as the sorted indices. Use the bubble sort algorithm.

7. Repeat the previous program for sorting in ascending order. Use numpy array instead of list.

8. Print a matrix $M \epsilon R^{mxn}$ having random values in the given range [-2, 5]. m and n are to be given as user input.

9. Write a program to multiply two random matrices $M_1 \epsilon R^{mxn}$, $M_2 \epsilon R^{nxp}$(Don't use built-in functions). Compare the result obtained with the built-in function.

10. Write File operations :

    - Generate a set of n= 100 random points X = x_i, $i = 1, \ldots$ n, $x_i \epsilon R^{10}$.
    - Write the points to a CSV file ($https : //en.wikipedia.org/wiki/Comma- separated - value$)

11. Read File operations:

    - Read the CSV file generated in the previous program to a matrix. Each column of matrix should represent a vector.

- Compute the following : $C = \frac{1}{n}\sum_{i=1}^{n}(X_i - \mu)(X_i - \mu)^T$ where $\mu = \frac{1}{n}\sum_{i=1}^{n}X_i$ where $i = 1,2,3 ... $ n. $X_i = [x_{i1}, x_{i2}, ... x_{i10}]$ is a column vector.

12. Define a class for a complex number a + jb. Define member functions to do basic operations conjugate, absolute value, addition, subtraction, multiplication, division and angle. Define two complex numbers $c1$, $c2$ and print the results of the following operations $c1 + c2$, $c1 - c2$, $c1 * c2$, $c1/c2$, $|c1|$, $|c2|$, $\angle c1$, $\angle c2$.

13. Plot the function y $=$ 3x $+$ 2 with x [10, 10]. Use Matplotlib for the same.

14. Scatter plot all the points.

- Generate a set of n $=$ 100 points, X $= x_i$, i $=$ 1,2, ... n, $x_i \epsilon R^2$ within an ellipse centered at $\mu_x = 5$ and $\mu_y = -5$ and has a major axis of 10 and minor axis of 5.

- Plot all the points using Matplotlib.