**Lab 10**

Q1:

1. Write a Python program to create a 5x5 array with random values and find the minimum and maximum values.
2. Write a Python program to create a random 10x4 array and extract the first five rows of the array and store them into a variable.
3. Write a Python program to create a random vector of size 10 and sort it.
4. Write a Python program to find the most frequent value in a one-dimensional integer array.

Q2.

1. Randomly generate a 2\*2 matrix and return the minimum value of x along the second axis.
2. Randomly generate a 2\*5 matrix and calcualte the difference between the maximum and the minimum of x along the second axis.
3. Randomly generate a 2\*3 matrix and get the values and indices of the elements that are bigger than 2 in x.

Q3.

1. Randomly generate a vector and draw corresponding histogram
2. Randomly generate two vectors and draw scatter plot

Q4. Predict the output of the following code:

x = [1,2]

y = [[4, 1], [2, 2]]

**print** np.dot(x, y)

**print** np.dot(y, x)

**print** np.inner(x, y)

**print** np.inner(y, x)

And type it in Python to see if they match your prediction

Q5. Curve fitting for a sin function. First of all, randomly generate a dataset following sin function (you can refer to the code below for the generation of such a simulated dataset. You can change the parameter values in this data generation process).

x\_data = [np.linspace](https://docs.scipy.org/doc/numpy/reference/generated/numpy.linspace.html#numpy.linspace)(-5, 5, num=50)

y\_data = 2.9 \* [np.sin](https://docs.scipy.org/doc/numpy/reference/generated/numpy.sin.html#numpy.sin)(1.5 \* x\_data) + [np.random.normal](https://docs.scipy.org/doc/numpy/reference/generated/numpy.random.normal.html#numpy.random.normal)(size=50)

plot this dataset using scatter plot. Then use curve\_fit function in numpy to fit a sin function specified below:

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Here and are the two parameter we want to estimate using curve\_fit.