

# CP 321 - Data Visualization

## Assignment 1

Check dropbox for due date

### Tools/Software Requirement

- An IDE for writing Python code
- Use Python and Numpy library to complete this assignment.
- This assignment may require some Numpy concepts that are not covered in the class. Students are expected to research those topics on their own and use them to complete the assignment. Self-learning will be a goal for all the assignments and the project in this course.

### Task 1: [10]

Write a function called **modifier** in file **functions.py** that takes a 2D array called "data" as a parameter and performs the following:

1. Print the first and last elements from the first and the last row.
2. Create an array of random values. Round the random values to 0 digits after the decimal point. Combine it as the last column to 'data'. Print the 'data'.
3. Extract the second last row from the 'data' and print it in reverse order.
4. Calculate mean for each column in the data and return all the means as a list.

Sample Solution:

If the data is:

```
[[1 2 3]
 [2 3 4]
 [5 6 7]]
```

Output of item 1 above is:

```
1, 3, 5, 7
```

Output of item 2 above is:

```
[[1 2 3 43]
 [2 3 4 24]
 [5 6 7 23]]
```

Output of item 3 above is:

```
[24 4 3 2]
```

Output of item 4 above is:

```
[2.66, 3.66, 4.66, 30]
```

### Task 2: [10]

Write a function called **grade\_stats** in **functions.py** that takes a 2D array called 'data' as a parameter. The 'data' contains quiz marks for students in a class. The first column is the student ID (students Id consists of numbers only) and each column (after the first column) corresponds to one quiz. Column 2 is quiz 1, column 3 is quiz 2 and so on. Quiz marks are always between 0 and 10. The function performs the following:

1. Prints the quiz numbers where the mean is above 70%
2. Prints student Id for all the students whose mean in above 79%
3. Prints student Id for all the students who scored 100% in the last quiz.

Sample Solution

If the 'data' is:

```
[[123456 9 8 0 2]
 [234567 8 8 0 5]
 [345678 9 8 6 10]
 [456789 8 7 7 10]]
```

The output for item 1 above is:

Quizzes with mean above 70%: Quiz 1, Quiz 2

The output for item 2 above is:

Students with mean above 79%: 345678, 456789

The output for item 3 above is:

Students with 100% in last quiz: 345678, 456789

### Task 3: [10]

Create a function called **matrix\_manipulator** in **functions.py** that takes two matrices (both square matrices of same shape), A and B, as parameters.

Within the function, perform the following operations in sequence:

1. Calculate the transpose of matrix A and store it in a variable A\_transpose and print it.
2. Calculate the dot product of A and B and store it in a variable AB\_dot. Print AB\_dot in the terminal.
3. Add AB\_dot to the transpose of B and store the result in result. Print the resulting matrix in the terminal.

Sample Solution

If the 'data' is:

```
A = [[1, 2], [3, 4]]
B = [[5, 6], [7, 8]]
```

The output for item 1 above is:

```
[[1 3]
 [2 4]]
```

The output for item 2 above is:

```
[[19 22]
 [43 50]]
```

The output for item 3 above is:

```
[[24 29]
 [49 58]]
```

### Task4: [5]

Create a file called **testing.py** and write code for testing each of the function written in **functions.py**.

**Submission Details.**

1. Create a folder named: `FIRSTNAME_LASTNAME`.
2. Place `functions.py` and `testing.py` in the folder created in the previous step.
3. Compress the folder into a zip file. Please make sure that your folder is appropriately named (See step 1 above) before creating the zip file. Do not rename the zip file after creating it.
4. Upload the zip file in the appropriate dropbox on MLS.
5. Redownload the file you submitted and confirm if you uploaded the correct file on MLS.