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## **Programming Assignment**

This assignment contains two parts, in the beginning, you should show the [specifications](#) of your device (disk, RAM, processor specifications like speed, and cache). Note that these specifications will affect all values for both parts so try to solve your assignment on your device as copies will be severely penalized. You will need the Python module [time](#) or [timeit](#). You're free to use any programming language or tools you find easier for you.

### **Part 1: Benchmark (Group of 5 students)**

In this part, you will work in a team of 5 students to benchmark the load time of 5 different applications on various devices. Each team member will run the same 5 applications 10 times each on their device and record the average time taken for each application to fully load. To detect when an application has fully loaded, you will use an automation tool like [PyAutoGUI](#) or [pywinauto](#) to automate opening and closing the application once it's rendered. Then, you will tabulate your results using four tables one with the specifications of the device, and assign numbers to the devices. The second one is for the names and versions of the application used and assigning numbers to each one of them. Then create another table that contains (the number of the device, the number of the application, the time taken for 1<sup>st</sup> run, the time taken for 2<sup>nd</sup> run,..., the time taken for the 10<sup>th</sup> run, and the average time of each application. The last one contains the number of the device, the average of the averages (taken from the previous table), and a percentile from the lowest device (taken from the previous column))

### **Part 2: Matrix Multiplication (individuals)**

In this part, you are required to analyze the impact of [blocking](#) on the performance of matrix multiplication. You will vary the matrix size and blocking size and measure the time taken to complete the multiplication process. You will then draw



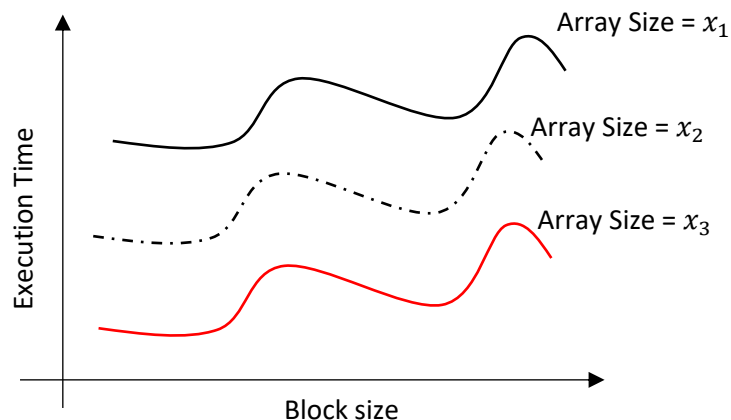
diagrams showing the relationship between blocking size and time for each size of the matrix. To complete this part, you will need to do the following:

1. Write a program to perform matrix multiplication using blocking. Your program should take as input the size of the matrices and the blocking size to be multiplied. The matrices should be filled with random numbers.
2. Perform an automated run of your program for different matrix sizes and block sizes. Record the time taken to complete the multiplication process for each combination of matrix size and blocking size.
3. Draw diagrams showing the relationship between blocking size and time for each size of the matrix. Analyze your results and discuss how changing the blocking size affects the performance of matrix multiplication.

Take the following figure as a guideline for what you should include in your plot

Comment on the table and the plot. If you find that there are special regions of your plot that deserve attention just draw it again on a different scale.

You may need to rerun your code with different values or large values including (but not limited to) when **block=1** and **without blocking**.



You may need to use the following modules ([numpy](#), [pandas](#), [matplotlib.pyplot](#))

### submission forms

Part 1: <https://forms.office.com/r/aEg2dJm5Cq>

Part 2: <https://forms.office.com/r/DfPLdZaxnv>