Exercise 00

Introduction to Linux and Matlab

Deadline: No deadline for this exercise. It will not be graded.

1.1 Linux (-P)

In this exercise, you can practice the basic Linux commands. Open a Terminal Shell.

(a) Identify the path of your home directory($hint : pwd$). List all directories.

(b) Create ($hint$: $mkdir$) a folder called "MD_Lecture_Exercises". This folder will contain all the directories and files for the exercise of this Lecture. In it create a folder "Exercise00".

(c) Create a file for your report inside "Exercise00". Write in it your personal data and the list of all files you will create in this Exercise. Make a copy for backup.

(d) Create a subdirectory of "Exercise00" for your backups. Move the copy of your report in it.

(e) Open a text file (could be your report if it is a text file). Print the first 10 and the last 10 lines of your report to screen. What happens if your file has less than 20 lines? Try to redirect the output into a file. How can you write only the first (last) 5?

(f) Find out the total number of words in your report and how many times you have used the word "to" ($hint : wc/grep$).

(g) Check who has the reading and writing permission on our report backup. Recede reading and writing permissions from group and yourself, so that the document cannot be modified. ($hint : chmod$)

(h) Check the amount of disc space the files you have created occupy ($hint : du$).

1.2 MatLab (-P)

In this Exercise you will try some basic MatLab commands for creating variables and plotting. Open MatLab by typing "matlab" in your Terminal window.

(a) Write a script that computes the result of the following operations:

$$y = x + 3\ . \tag{1}$$
$$y = 2 * x + 4\ . \tag{2}$$
$$y = x/2\ . \tag{3}$$
$$\tag{4}$$

For values of $x \in [-10, 10]$ in $\mathbb{N}$

(b) Plot in one single graph these functions in the range $x \in [-5, 5]$. Use different colors for each line and the following line specifiers:

- Dashed lines for (1) and Marker "o". Can you make it filled?
- Solid lines for (2) with Linewidth 2 and Marker "*" and Markersize 5.
- Dotted line for (3).

Set ticks on the x axis only for the odd natural numbers. Print legend on the top right part of the plot. Save plot to file. Save into a variable called z the values that satisfy the condition $y > 0$ for $y = x/2$. Print z to file.

(c) Load z from file ($hint$: $load$). Construct a matrix $C_{10,10}$ with the elements of z on the diagonal. Sum to it the matrix:

$$A_{10,10} = \begin{pmatrix} 1 & 2 & \cdots & 10 \\ 2 & 3 & \cdots & 11 \\ \vdots & \vdots & \ddots & \vdots \\ 10 & 11 & \cdots & 19 \end{pmatrix} \tag{5}$$

$$M = C + A; \tag{6}$$

Extract eigenvalues and eigenvectors of M (*hint: use eigs()*). Compute $D = M \cdot A$. What is the sum of the elements of D?

(d) Define a 100x100 matrix $H_{100,100}$ of random numbers in the interval $[0, 1]$, which is MatLab default (*hint: remember the ";" at the end of the command line so that it is not printed out.*). Check what is the maximum MAX of the $\sum_{c=1}^{100} H(:, c)$. With a for loop over the number of columns of H, check if $\sum_{c=1}^{100} H(:, c) > MAX - 1$. If true print $sum(H(:, c))$ to file (*hint: you need to open a file with fopen, use fprintf to write to file and then remember to close the file afterwards.*) and plot the distribution of $H(:, c)$ for such columns as an histogram with 20 bins.