Intensive Computation

Exercises 26th February 2021

Objectives:

- Generation and manipulation of random matrices with entries in different intervals
- Use of scripts and functions
- Commands: `help`, `rand` and its variants, `size`, `reshape`

Exercise 1

- Write a script that creates a matrix M of size n x n, with n even and n >=10, consisting of random values in the interval [-10,10]
- Consider the n/2 submatrix 2x2 in the first 2 rows and swap these submatrices with submatrices 2x2 along the diagonal.

Exercise 2

Write a script that:

- Creates a matrix M of size n x m, consisting of **random integer values** in the interval [100,199].
- Generates the matrix MM obtained by swapping rows h and k and columns h' and k', by using functions rowSwap and columnSwap having as input parameters the two indices.

Exercise 3

- Write a script that creates a matrix M of size n x n, with n>=10, consisting of **random integer values** in the interval [min,max], where min and max are given interactively by the user.
- Write the **function ExtractRows** that extracts k rows from M starting from a given index i and return the k rows in a matrix K.
- Write a **function** that swaps k rows (starting from a given index i) selected by calling the function **ExtractRows** with the last k rows.
- Return the matrix M' obtained by swapping rows.
- **Remark: 1)** avoid superimposition of the sets of rows that are swapped by imposing limitations to the values of k and the index i; **2)** do not use additional matrices.

Esercizio 4

- Write a script that creates a matrix M of size n x m, with n multiple of 5, consisting of **random integer values** in the interval [min,max], where min and max are given interactively by the user
- Write a **function ExtractMatrix** that generates the submatrix SM of size k x k from matrix M starting from element (i,j) as upper left corner. Values i, j,and k are randomly generated, and are chosen so that that the submatrix SM is included in M.
- Generate the matrix newM obtained from M summing SM to M starting from element (1, 1).
- Generate the matrix R obtained by reshaping M into a matrix with 5 rows.

Try also commands at your choice, for example: `sort`, `sum`, …