

# Intensive Computation

## Exercises 2<sup>nd</sup> march 2018

### 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 create a matrix  $M$  of size  $n \times n$ , with  $n$  even and  $n=10$ , consisting of random values in the interval  $[-10,10]$
- Consider the  $n/2$  submatrix  $2 \times 2$  in the first 2 rows and swap these submatrices with submatrices  $2 \times 2$  along the diagonal.

### Exercise 2

- Write a script that creates a matrix  $M$  of size  $n \times m$ , consisting of **random integer values** in the interval  $[100,199]$ .
- Generate the matrix  $MM$  obtained by swapping rows  $h$  and  $k$  and columns  $h'$  and  $k'$ , by using functions `rowSwap` and `columnSwap`

### Exercise 3

- Write a script that create a matrix  $M$  of size  $n \times n$ , with  $n > 10$ , consisting of **random integer values** in the interval  $[\min, \text{MAX}]$ , 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** avoid superimposition of the sets of rows that are swapped by imposing limitations to the values of  $k$  and the index  $i$ .

### Esercizio 4

- Write a script that creates a matrix  $M$  of size  $n \times m$ , with  $n$  multiple of 5, consisting of **random integer values** in the interval  $[\min, \text{MAX}]$ , where  $\min$  and  $\max$  are given interactively by the user
- Write a **function ExtractMatrix** that generates the submatrix  $SM$  of size  $k \times k$  from matrix  $M$  starting from element  $(i,j)$  as upper left corner. Values  $i$ ,  $j$ , and  $k$  are randomly generated, verifying that the submatrix  $SM$  is included in  $M$ .
- Generate the matrix  $\text{newM}$  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`, ...