
SC9502B – Scientific Computing. Winter 2024

Instructor: Dr. M. Karttunen

Assignment 4. Due: Tue. Apr. 2, 2024 by 23:59.

See the template(s) for presenting the results + all answers should be returned using GitHub.

Each problem is of equal value.

Use the lecture notes on random numbers.

1. Write a Python code that performs the addition of two matrices A and B . Do not use any libraries such as `numpy`. To demonstrate that your code works, use

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} -1 & 0 & 1 & 2 \\ 3 & 4 & 5 & 6 \\ -7 & -8 & -9 & -10 \end{bmatrix}$$

2. Modify the code from the previous problem to perform matrix multiplication without any libraries. Then, write a second code that does the same with `numpy`. Instead of using the above matrices, use randomly generated $n \times n$ matrices where n is varied: plot the execution time vs n . Interpret the results for the two codes.
3. Follow the lecture notes and write a code that performs singular value decomposition. You can use library functions to complete the different steps as describe in lecture notes, except the ones that do a direct SVD, such as `numpy.linalg.svd`.