M5470 : Introduction to Parallel Scientific Computing

Course Instructor: Niranjan S. Ghaisas

Homework 1

Due Date and Time: 20 January 2025, 11 pm

Question 1:

(a) Run the code corresponding to Question No. 6 from HW0 for $n = 4000$ with 'format_flag' equal to 0 and then equal to 1. Report the sizes in MB of the two files that are generated (you can use the command 'du –sh {filename}').

(b) Estimate the size of the array in memory by multiplying the size of one double (8 bytes) with the number of doubles (n^2) in the array. Comment on the size in memory vs size on disk for the above two files. Comment on which format is best suited for saving large data.

Question 2: Write a code that reads n from the file 'input.in', then reads in an $n \times n$ matrix from 'mat_{nnnnnn}.in' and vectors of n elements each from 'vec_{nnnnnn}_{vecnum}.in'. For each of the above vectors, the code checks if the vector is an eigenvector of the matrix or not. If a vector is an eigenvector, the code finds the corresponding eigenvalue and appends it to the corresponding vector file. The code also prints "vec_{nnnnnn}_{vecnum}.in : Yes : {eigenvalue}" to the screen. If the code is not an eigenvector, the code prints "vec_{nnnnnn}_{vecnum}.in : Not an eigenvector " to the screen.

The tasks needed for the above should be distributed across appropriate functions that are called from 'main()'. Code should be reused as much as possible.

Test the above code using the input files provided for $n = 3$, $n = 5$, $n = 50$ and $n = 80$.

General Instructions:

1. Please prepare a short report with any plots or figures you generated with very brief (2 or 3 lines) comments. Do not waste time and effort in re-typing the question.

2. Submit the pdf on google classroom.

3. Upload your codes as well as the report pdf to Github.