Parallel Computing

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Assignment 1

(Version 1.2 – November 13, 2025)

1 Mandatory Requirements

In this assignment, you are supposed to write programs for matrix multiplication:

- Naively proposed by yourself.
- Using the Strassen algorithm.

The tasks you are mandatory to complete are the following:

- Implementing your programs using C/C++, (1) in combination with any OpenMP implementation for shared-memory platforms (e.g., your notebooks), (2) in association with any MPI implementation for distributed-memory platforms (e.g., computer clusters available), and (3) with the marriage between MPI processes and OpenMP threads for the latter platforms.
- Devising the approach to testing the correctness of your implementations.
- Conducting a performance and scalability study of all your implementations on all machines you can run by determining execution time for the whole program as you tune predefined parameters (e.g., varying the matrix size from 100x100, 1.000x1.000, up to 10.000x10.000). Comparing the performance of your implementations to any existing matrix multiplication library you can find.

2 Other Requirements

This assignment must be conducted in groups, each of which consists of either 2 or 3 members. You must submit a zip file named <Leading Student ID> and containing your final pdf report as well as all relevant C/C++ source code to our course website by December 1, 2025. Especially, the number of experimented shared-memory platforms must at least be equal to the member count in your group. You are provided with a computer cluster for doing your assignment. It can be accessed via *gateway.hpcc.vn* using the following account/password: *mpistudent/dm89qHPnBEd9*. Note that you are not allowed to run your program on the cluster while somebody else is running his/her.

3 Bonuses

In case you conduct any task not compulsory to do (e.g., your implementation runnable on GPUs), you will have chance to gain a bonus per extra task for your final assignment grade.