

Assignment 1: Parallel Matrix Multiplication

CS328 - Distributed and Cloud Computing

DDL: 23:59, March 12, 2022

1 Requirements

In this assignment, you are required to use **MPI** to implement parallel matrix multiplication. There are two matrices, A and B , both of shape 500×500 , with the elements in **double** type. In your code, there should be a **master** process which controls the data distribution and gathering. Other **worker** processes should receive the data from the master, compute, and finally send the result back to the master. Then the master process should compare the result with the brute force approach (computation without parallelization) to check the correctness. You need to specify in your report whether or not your master process also performs some computations (both are accepted though).

After completing the code, run it with 1, 2, 4, 8, 16 and 32 processes which perform actual computations (Suppose 4 processes are involved in the computation: `mpirun -np 5 ./xx` when master does not compute, `mpirun -np 4 ./xx` when master computes) and draw a figure.

A code stub (`mpi_matrix_demo.c`) has been provided and you may use it to build your program.

2 Hints

Use `MPI_Scatter`, `MPI_Bcast` to distribute data to worker processes, and use `MPI_Gather` to collect the result in the master process.

3 What to Submit

1. Source code (as file)
2. A report (using a provided template) in PDF format, including:
 - Description about how your code works (prove that your code provides the correct result by comparing with the brute force approach)

- A figure, with the number of worker processes as X axis and the running time as Y axis
- Explanation about the pattern shown in the figure

Pack all files into `SID_NAME_A1.zip`, where `SID` is your student ID and `NAME` is your pinyin name (e.g., `11710106_ZhangSan_A1.zip`).