

# Programming Assignment

Improve matrix multiplication on the following two matrices with data-level and thread-level parallelism:

A = | 1 2 3 4 |  
| 5 6 7 8 |  
| 9 10 11 12 |  
| 13 14 15 16 |

B = | 17 18 19 20 |  
| 21 22 23 24 |  
| 25 26 27 28 |  
| 29 30 31 32 |

## Tasks:

- 1. Matrix Multiplication Function:** Implement a matrix multiplication function in a programming language of your choice (e.g., Python, C++, C) that can multiply two matrices.
- 2. Serial Implementation:** Start by implementing a serial (non-parallel) version of the matrix multiplication algorithm. This will serve as a baseline for performance comparison.
- 3. Data-Level Parallelism:** Modify your matrix multiplication function to utilize data-level parallelism by splitting the input matrices into smaller blocks or chunks. Implement a parallel matrix multiplication algorithm that processes these blocks concurrently using multiple threads or processes.
- 4. Parallel Processing:** Use a threading library or framework (e.g., pthreads, or Python's multiprocessing) to create multiple threads or processes that work on separate blocks of the matrices in parallel.
- 5. Performance Comparison:** Measure and compare the performance of the serial matrix multiplication implementation with the data-level parallel version. You should consider metrics such as execution time, speedup, and efficiency.

**Note:** Please provide in-line comments with each function block in your code to make the code more readable. You have 48 hours to complete the tasks.

## Submission Instructions:

Email me at [aalmamun@people.unr.edu](mailto:aalmamun@people.unr.edu), the zipped pack of the following items: (i) source code (ii) report (no more than 2 pages: detailing how you solve each task, the performance comparison between serial and parallel versions), The submission folder should be formatted as **<your name>.zip**

The email subject line should be: **Homework Evaluation for AU Ph.D.**