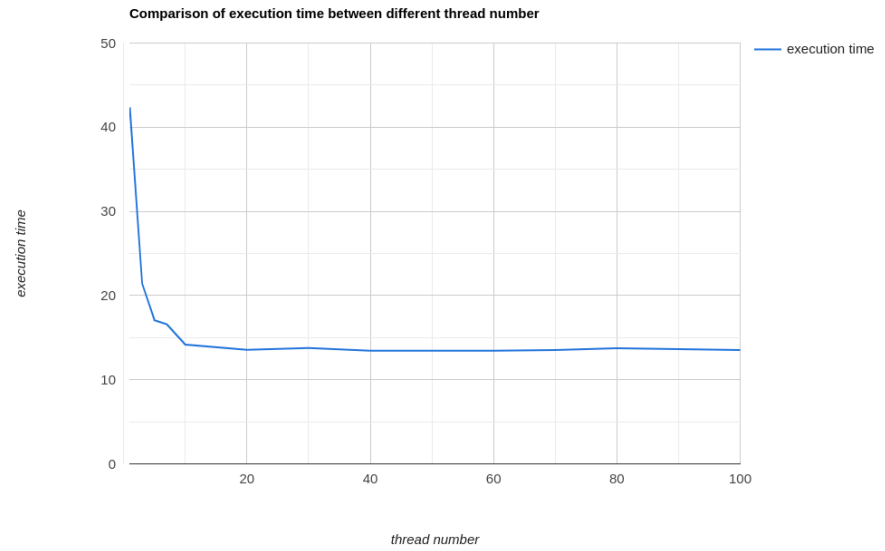
Programming Assignment #4 Report

Student Name: 林楷恩
Student ID: b07902075

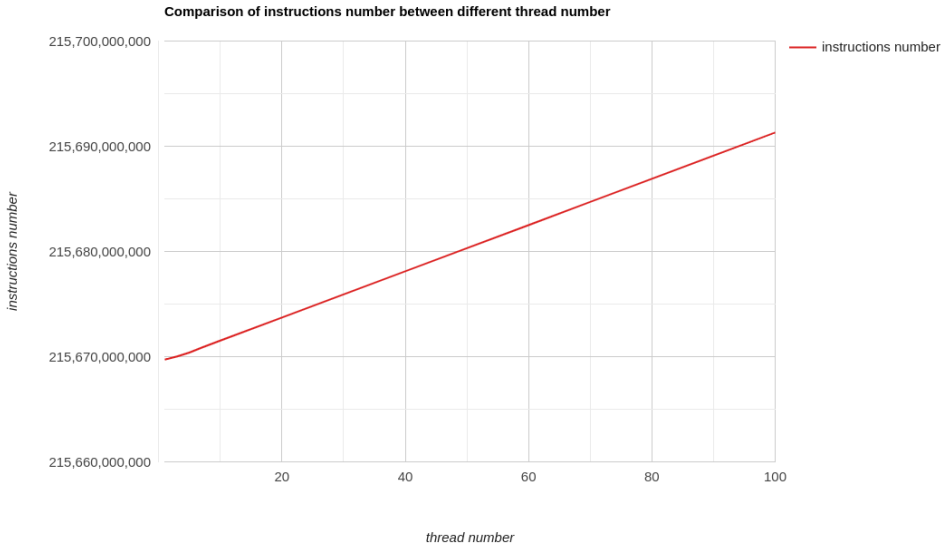
1 execution time v.s. different thread number

From the line chart, I find that the benefit of adding more threads is diminishing, since the CPU have limited threads to take use of. So perhaps 20 threads suffices.



2 instructions number v.s. different thread numbers

The instructions number grows almost linearly as the thread number increases.



3 Bonus: other parallel method

Instead of distributing tasks by row, I divide the matrix into blocks and make each thread responsible for one block of submatrix. For example, when doing $X * W = Z$, the division is as follow:

$$Z = \begin{bmatrix} Z_{0,0} & Z_{0,1} & \cdots \\ Z_{1,0} & Z_{1,1} & \cdots \\ \vdots & \vdots & \ddots \end{bmatrix}$$

- **Performance:** Worse than the row method's, maybe because accessing memory row-by-row is more cache-friendly.
- **file name:** `hw4_bonus.c`
- **Execution:** `make bonus && ./hw4_bonus X_train y_train X_test [thread number]`