TOGETHER. TOMORROW. EWHA

Computer Architecture Homework #01

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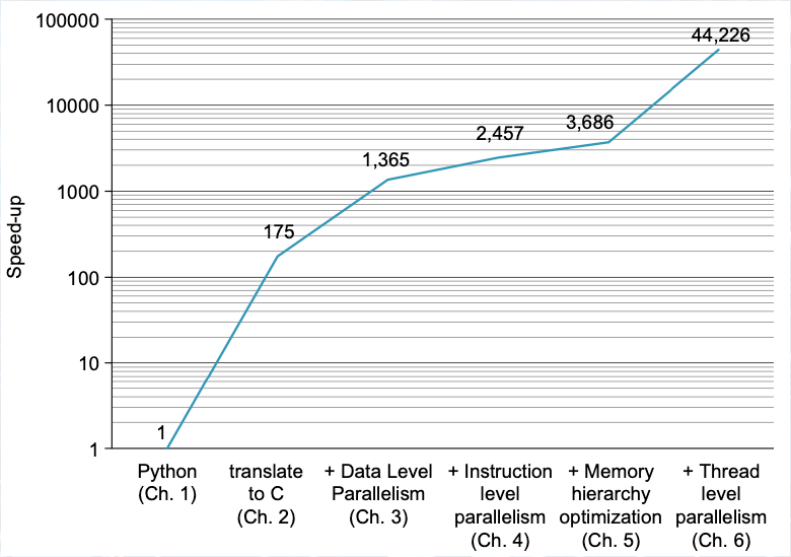
Going Faster: Matrix Multiply in Python

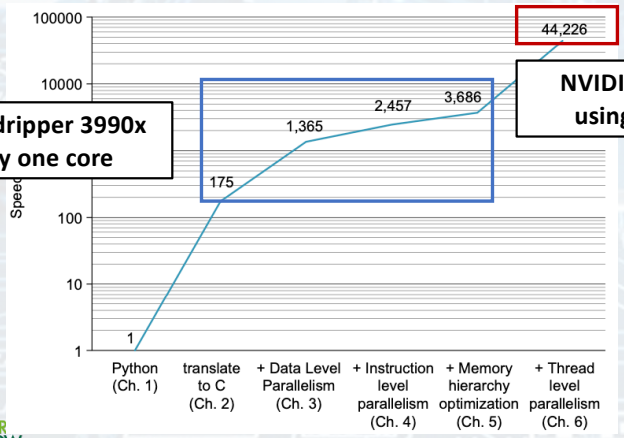


[Optimizations of matrix multiply program in Python in the next five chapters of this book]

Real Example

```
ClockMeasure[CPU CODE][Total Time:    23.615664 (s),   Avg Time:      2.361566 (s),   Count:  10]
ClockMeasure[GPU CODE][Total Time:    9.087855 (ms),   Avg Time:      0.908786 (ms),  Count:  10]
```

960 x 960 Matrix



AMD Threadripper 3990x using only one core

NVIDIA RTX3090 using all cores

Performance?

$$\frac{Excution\ Time_y}{Excution\ Time_x} = \frac{2.361566}{0.000908786} = 2598.6$$

Performance?
GPU code is 2598.6 times faster than CPU code

Guide

- **Grading: 0% ~ 100%**
  - Based on the corrected number of answers
  - If the program doesn't run, you'll get 0 points (such as Segmentation Fault!!)
- **Due date: 2022-09-28 (11:59 PM)**
  - Late homework is not allowed
  - A compressed file must be uploaded to the cyber campus
  - Folder name must be studentID_YourName (Ex: 1234567_MyungKukYoon)
  - The compressed file name must be studentID_YourName.zip (Ex: 1234567_MyungKukYoon.zip)
- **Q/A**
  - I will be happy to answer your questions about homework #01 until **September 23rd**. After September 23rd, I will not answer your questions about homework #01
- **Execution time: less than 5 seconds**

Guide

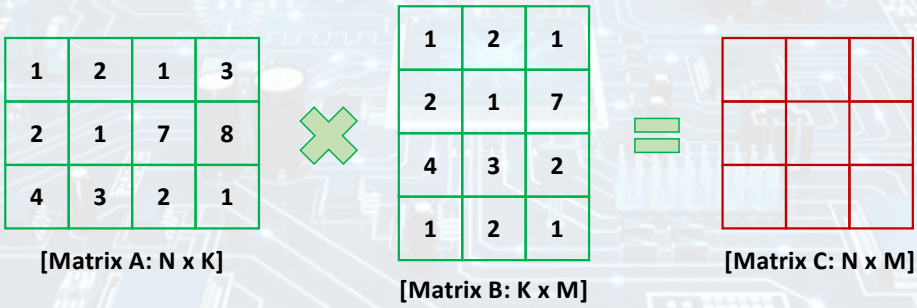
```
/*
* ********** Please read the instructions below carefully **********
* Your name and student ID must be printed when this project is executed
* Do not print anything other than your name and student ID (Delete printf functions used for debugging when submitting this homework)
* - If not, there will be 20% penalty
* Run make clean command before submitting your homework
* Change this project folder name to studentID_yourname (EX: 1234567_myungkukyoon)
* You must compress this project folder (not the files in this folder)
* - If not, there will be 20% penalty
* - Use ZIP compression utility (DO NOT USE TAR COMMAND)
* The name of ZIP file must be studentID_yourname.zip (EX: 1234567_myungkukyoon.zip)
* All the tests must be done in 5 seconds
* - If not, you will get 0%
*/
```


Prerequisite

- **Operating system (Linux)**
  - Ubuntu OS 20.04
- **Install build-essential (If you are using virtualbox)**
  - $sudo apt-get install build-essential gcc g++ make
- **Compiler version**
  - $g++ --version
  - g++ (Ubuntu 9.4.0-...)
- **Download the base code from the cyber campus**

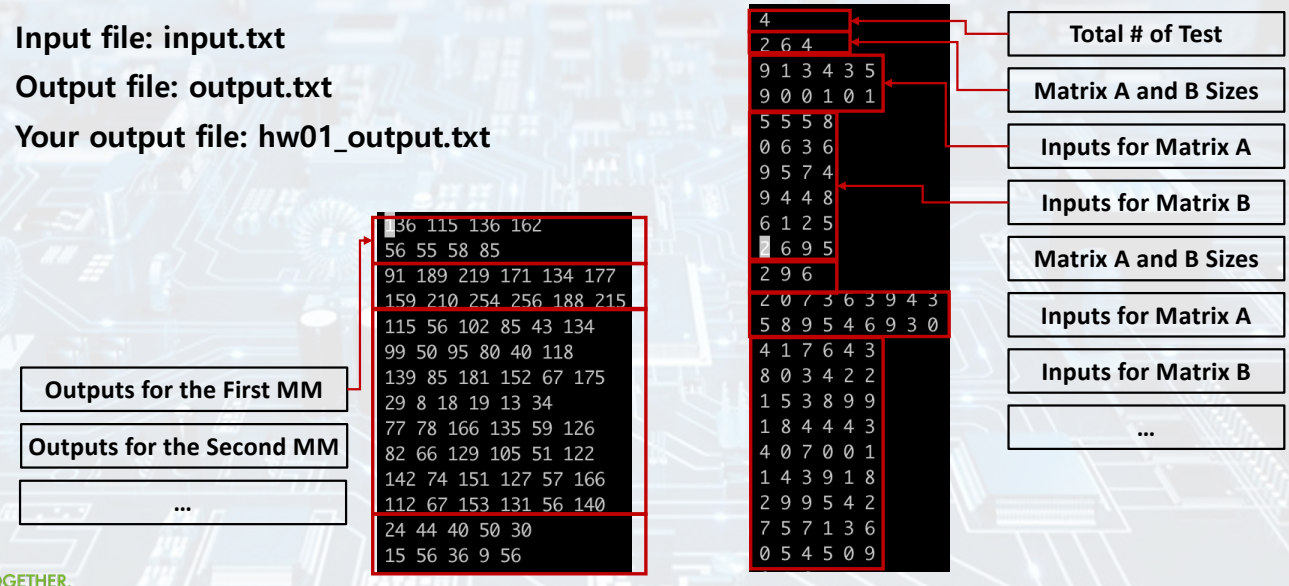
Matrix Multiplication

- N, K, and M <= 100
- Input values <= 100
- Total test case <= 100



Input and Output Files

- Input file: input.txt
- Output file: output.txt
- Your output file: hw01_output.txt



Additional information

- **Build/Clean/Run**
  - $make
  - $make clean
  - $./hw01
- **Diff (this command will be used to check your answer)**
  - $diff hw01_output.txt output.txt
- **Change working directory**
  - $cd filderName
  - $cd ..
- **ZIP & UNZIP**
  - $zip FILE_NAME.zip FOLDER_NAME/*
  - $unzip FILE_NAME.zip

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Thank You!

- Questions?

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