Scientific Computing and Machine Learning on Multi- and Manycore Architectures
Exercise 1

林澤佑

Tse-Yu Lin

D06946003@ntu.edu.tw

Data Science Degree Program

- ## Analysis

The performance of vector-vecotr, matrix-vector and matrix-matrix multiplication are shown below.

For the calculation of vector norm, since it requires only linear time tocompute. So, even if the size of matrix is increased from 10 to 1000, the computational time is around 1 3 microsseconds. Hence, the it is not easy to see the roofline of the performance of vector-vector multiplication.

For the matrix-vector, the roofline can be easily found.

For the matrix-matrix multiplication, I only run with the size $10, 60, 110, \cdots, 960$ to save computational time.

Run the code

For each program in this exercise, please use

```
gcc ex1_x.c -o ex1_x -lm
```

to compile, where $x = 1, 2, 3$ indicates the vector-vector, matrix-vector and matrix-matrix multiplication.

To see computational time, please type

```
./ex1_x N
```

where N is the size of matrix/vector used for computation. The result would looks like:
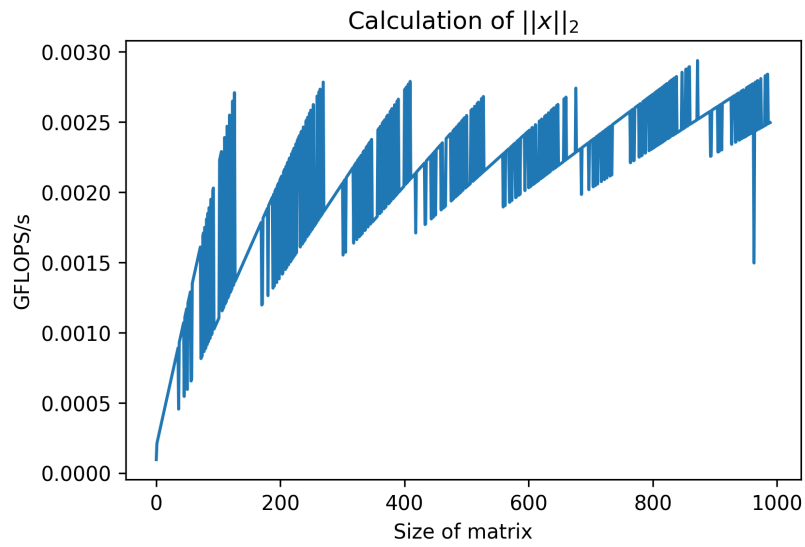
```
Time : 0.000077 sec
```

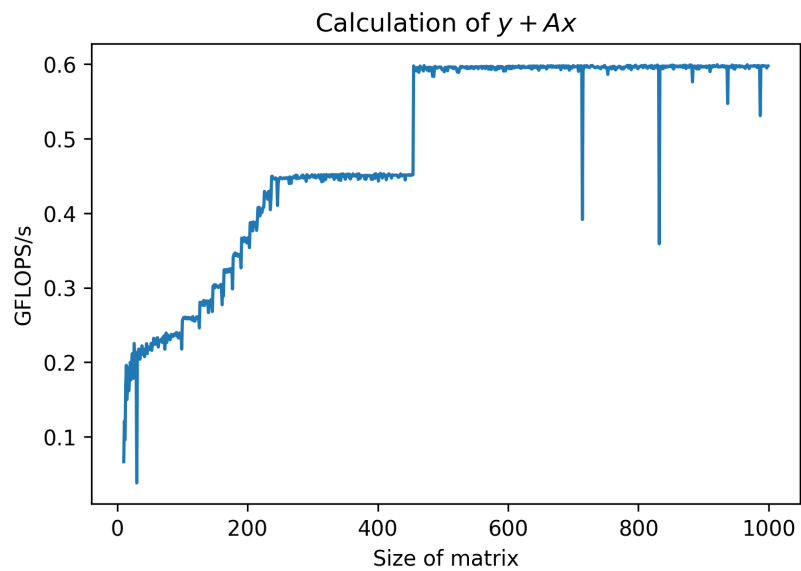Figure 1: Performace of vector-vector multiplication with different matrix size.

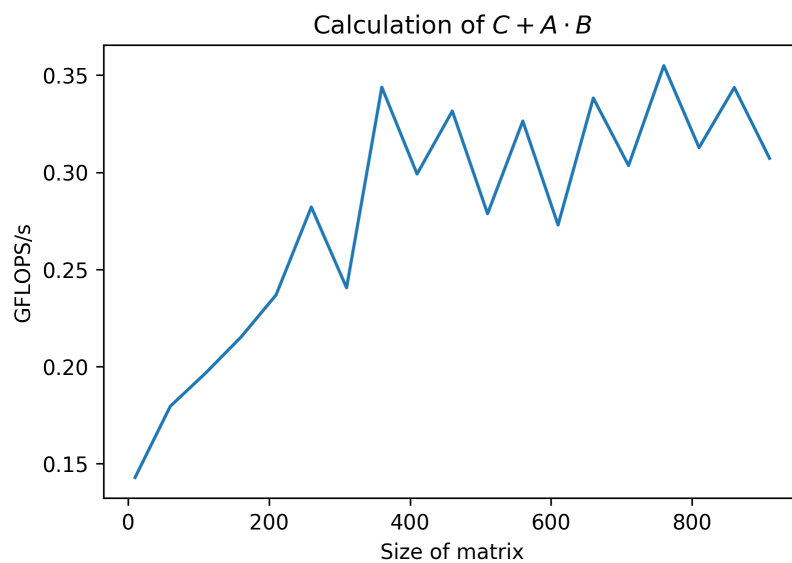Figure 2: Performace of matrix-vector multiplication with different matrix size

Figure 3: Performace of matrix-matrix multiplication with different matrix size.