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:Lab8

Task1)

1) All the cores are real
2) Level 1 Cache Size:
    a) 8 x 32 KB 8-way set associative instruction caches
    b) 8 x 32 KB 8-way set associative data caches
3) Level 2 Cache Size:
    a) 8 x 256 KB 4-way set associative caches
4) Level 3 Cache Size:
    a) 12 MB 12-way set associative shared cache
5) Microarchitecture: Coffee Lake
6) Maximum Memory Bandwidth: 42.7 GB/S
7) Operating Bandwidth: 19.87GB/S

Task2)

1) Resolution: 1 * 10^-9 seconds , 1ns
2) Precision: 1 * 10^-9 seconds
3) Error: 1 * 10^-9 seconds, 1ns
4) How to calculate error?
    a) The error is calculated by taking the average of the 10 values of the time, and then finding the deviation of the maximum of the 10 values using the mean.
    b) Although we have a high resolution, we can read with lower precision. Therefore, there is always added error from reading the data directly.

Task5)

1) The payload loops are what we expected. Furthermore, it is doing different arithmetic operations on the different values of the arrays, and it calculates the time taken to perform them. It does the same operation multiple times and takes the best value as the end result.
2) The memory bandwidth is 11.524 GB/s. This is around 30 GB/s slower than the maximum memory bandwidth found online, but only 8Gib/s difference from normal operating memory bandwidth.

3) Graph

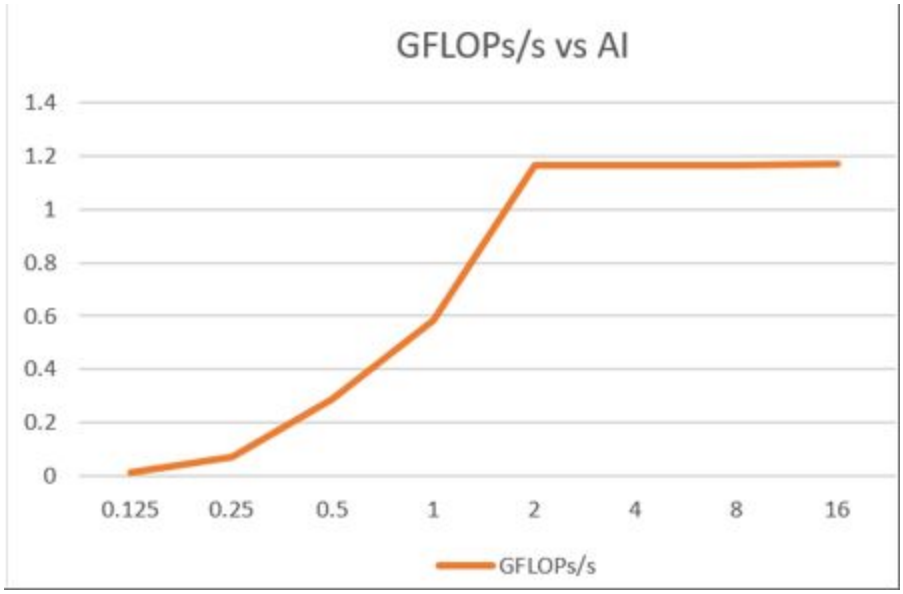

Figure1: GFLOPs/s vs Arithmetic intensity

4) Looking from figure1 it is clear that the GFLOPs/s plateaus at an arithmetic intensity of 2. The reasons behind the Gflops/s plateauing after a certain amount of AI is because there is a limit on the performance of a CPU. Moreover, no matter how much arithmetic intensity is increased, it is always limited by the maximum memory bandwidth.