System Description :

```
kusa@awfulC740:~/Documents/cs218/ast12$ hwinfo --short
cpu:
                        Intel(R) Core(TM) i5-10210U CPU @ 1.60GHz, 2100 MHz
                        Intel(R) Core(TM) i5-10210U CPU @ 1.60GHz, 2100 MHz
                        Intel(R) Core(TM) i5-10210U CPU @ 1.60GHz, 1517 MHz
                        Intel(R) Core(TM) i5-10210U CPU @ 1.60GHz, 2100 MHz
                        Intel(R) Core(TM) i5-10210U CPU @ 1.60GHz, 2100 MHz
                        Intel(R) Core(TM) i5-10210U CPU @ 1.60GHz, 2100 MHz
                        Intel(R) Core(TM) i5-10210U CPU @ 1.60GHz, 2100 MHz
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```

8 gbs of RAM
LENOVO Yoga C740
RUNNING UBUNTU

- the final results for 1, 2, 3, and 4 thread executions, including final results (list of perfect/abundant/deficient numbers) and the execution times for both each.

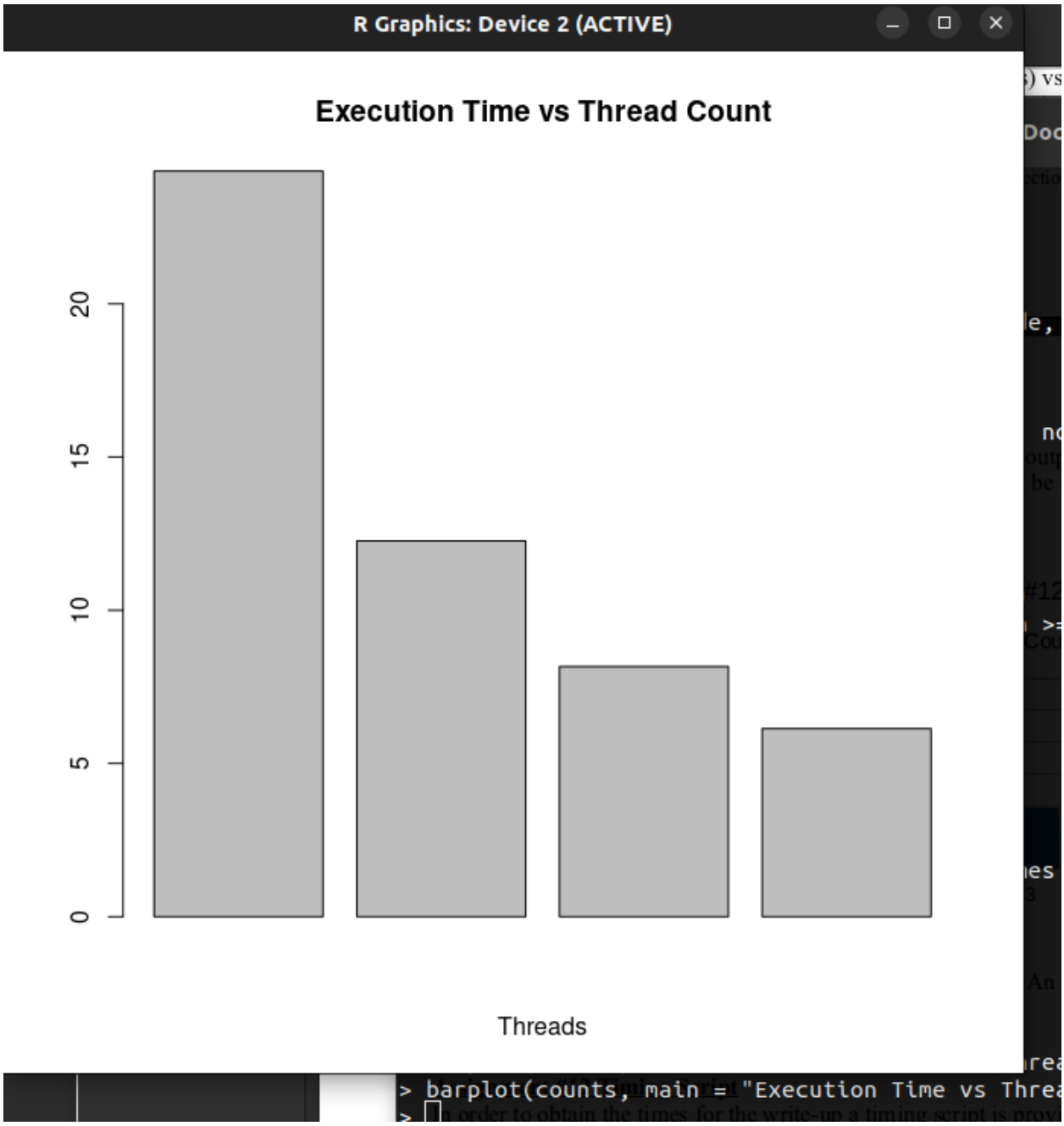
Final results for 1 threads - 0m24.328s
Final results for 2 threads - 0m12.263s
Final results for 3 threads - 0m8.161s
Final results for 4 threads - 0m6.138s

- the speed-up factor from 1 thread to 2, 3, and 4 threads (via the provided formula)

Thread 1 SpeedUp - 24.328/24.328 = **1**
Thread 2 SpeedUp - 24.328/12.263 = **1.98**
Thread 3 SpeedUp - 24.328/8.161 = **2.98**
Thread 4 SpeedUP - 24.328/6.138 = **3.96**

Speed up in bold.

- simple chart plotting the execution time (in seconds) vs thread count (see example below).

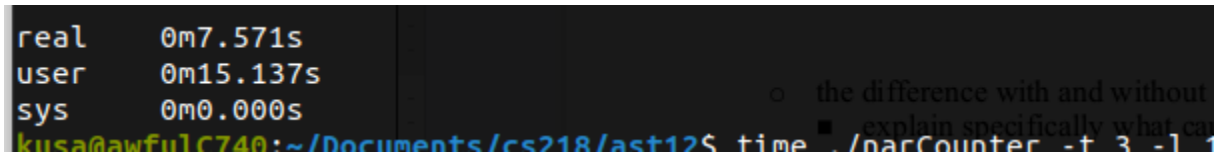


From left to right thread 1 to 4 . y axis is the time in seconds.

- the difference with and without the locking calls for the parallel execution
  - explain specifically what caused the difference

Result for 1 thread no spin lock:

Result for 2 thread no spin lock:



Result for 3 thread no spin lock:

Result for 4 thread no spin lock:

Explanation:

From what I can see after comparing the ‘real’ times of my program with no spin lock vs the ‘real’ times of my program with the spin lock I noticed that not having the spin lock makes it execute much faster. For example thread 3 originally had an execution time of 8.161s vs 5.053s without the spin lock. I believe this is the case because the threads do not have to wait for each other to finish or anything like that. With no spin lock all threads continue working simultaneously, whereas with a spin lock included the threads get paused whenever we call spinlock making sure that only one thread is used. This in turn makes the execution time with no spinlock faster.