**Map Reduce MPI Report**

**Instructions:**

To be able to run the program with the desired number of processes, please run this command:

mpirun -n <number of processes> python3 map\_reduce\_mpi.py

**Problems:**

I mainly had problems in the sending and receiving information in between processes. I kept sending the information to all processes and made the code harder to debug. Placing the sending and receiving portion of the sentences and the dictionaries into one single if and else statement also made it harder.

**Solution:**

Through Professor’s Pruitt’s council I was able to fix all my issues. Instead of having to send and receive the sentences and dictionaries in one set of if and else statements I separated it to be able to have better control of that. I also specified to which processes the data will be sent or where to be received depending in the way it was meant to be.

**Bugs:**

I do not know if this is a bug or something it was meant to happen but when I select fewer number of processes to use the less accurate results I get. Part of the reason is that I believe it must be with the way the lists of sentences are split. When I used 8 processes, I received a message saying “MPI aborted or experienced performance degradation.”

**Time:**

The actual coding part took an approximate of 1 hours and one more for debugging.

**Performance:**

1 Thread: ~0.489 s

2 Threads: ~0.312 s

4 Threads: ~0.209 s

8 Threads: ~0.150 s

**Analysis:**

When using more processes, the higher the accuracy between my list and the given one from the professor was. Of course, the greater number of processes used the lower the time it took for the program.

**Observations:**

I saw the beneficial of splitting the work in a good way using MPI was beneficial. It seemed like I was in more control on what to make parallel and what to have a little more serial too. Overall, it was good to see the same program we made using pypm we did it again with MPI using send, receive commands as well as how each rank can be assigned to a specific task.

**CPU Info:**

processor: 0

vendor\_id: GenuineIntel

cpu family: 6

model: 142

model name: Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz

stepping: 9

microcode: 0xb4

cpu MHz: 2904.004

cache size: 4096 KB

physical id: 0

siblings: 4

core id: 0

cpu cores: 4

apicid: 0

initial apicid: 0

fpu: yes

fpu\_exception: yes

cpuid level: 22

wp: yes

flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ss ht syscall nx pdpe1gb rdtscp lm constant\_tsc arch\_perfmon nopl xtopology tsc\_reliable nonstop\_tsc cpuid pni pclmulqdq ssse3 fma cx16 pcid sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand hypervisor lahf\_lm abm 3dnowprefetch cpuid\_fault invpcid\_single pti ssbd ibrs ibpb stibp fsgsbase tsc\_adjust bmi1 avx2 smep bmi2 invpcid rdseed adx smap clflushopt xsaveopt xsavec xsaves arat md\_clear flush\_l1d arch\_capabilities

bugs: cpu\_meltdown spectre\_v1 spectre\_v2 spec\_store\_bypass l1tf mds swapgs itlb\_multihit

bogomips: 5808.00

clflush size: 64

cache\_alignment: 64

address size: 43 bits physical, 48 bits virtual

power management:

processor: 1

vendor\_id: GenuineIntel

cpu family: 6

model: 142

model name: Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz

stepping: 9

microcode: 0xb4

cpu MHz: 2904.004

cache size: 4096 KB

physical id: 0

siblings: 4

core id: 1

cpu cores: 4

apicid: 1

initial apicid: 1

fpu: yes

fpu\_exception: yes

cpuid level: 22

wp: yes

flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ss ht syscall nx pdpe1gb rdtscp lm constant\_tsc arch\_perfmon nopl xtopology tsc\_reliable nonstop\_tsc cpuid pni pclmulqdq ssse3 fma cx16 pcid sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand hypervisor lahf\_lm abm 3dnowprefetch cpuid\_fault invpcid\_single pti ssbd ibrs ibpb stibp fsgsbase tsc\_adjust bmi1 avx2 smep bmi2 invpcid rdseed adx smap clflushopt xsaveopt xsavec xsaves arat md\_clear flush\_l1d arch\_capabilities

bugs: cpu\_meltdown spectre\_v1 spectre\_v2 spec\_store\_bypass l1tf mds swapgs itlb\_multihit

bogomips: 5808.00

clflush size: 64

cache\_alignment: 64

address sizes: 43 bits physical, 48 bits virtual

power management:

processor: 2

vendor\_id: GenuineIntel

cpu family: 6

model: 142

model name: Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz

stepping: 9

microcode: 0xb4

cpu MHz: 2904.004

cache size: 4096 KB

physical id: 0

siblings: 4

core id: 2

cpu cores: 4

apicid: 2

initial apicid: 2

fpu: yes

fpu\_exception: yes

cpuid level: 22

wp: yes

flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ss ht syscall nx pdpe1gb rdtscp lm constant\_tsc arch\_perfmon nopl xtopology tsc\_reliable nonstop\_tsc cpuid pni pclmulqdq ssse3 fma cx16 pcid sse4\_1 sse4\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avx f16c rdrand hypervisor lahf\_lm abm 3dnowprefetch cpuid\_fault invpcid\_single pti ssbd ibrs ibpb stibp fsgsbase tsc\_adjust bmi1 avx2 smep bmi2 invpcid rdseed adx smap clflushopt xsaveopt xsavec xsaves arat md\_clear flush\_l1d arch\_capabilities

bugs: cpu\_meltdown spectre\_v1 spectre\_v2 spec\_store\_bypass l1tf mds swapgs itlb\_multihit

bogomips: 5808.00

clflush size: 64

cache\_alignment: 64

address sizes: 43 bits physical, 48 bits virtual

power management:

processor: 3

vendor\_id: GenuineIntel

cpu family: 6

model: 142

model name: Intel(R) Core(TM) i7-7500U CPU @ 2.70GHz

stepping: 9

microcode: 0xb4

cpu MHz: 2904.004

cache size: 4096 KB

physical id: 0

siblings: 4

core id: 3

cpu cores: 4

apicid: 3

initial apicid: 3

fpu: yes

fpu\_exception: yes

cpuid level: 22

wp: yes

flags: fpu vme de pse tsc msr pae mce cx8 adpe1gb rdtscp lm constant\_tsc arch\_perfmon nopl xtopol\_2 x2apic movbe popcnt tsc\_deadline\_timer aes xsave avi ssbd ibrs ibpb stibp fsgsbase tsc\_adjust bmi1 avx2 s flush\_l1d arch\_capabilities

bugs: cpu\_meltdown spectre\_v1 spectre\_v2 s

bogomips: 5808.00

clflush size: 64

cache\_alignment: 64

address sizes: 43 bits physical, 48 bits virtual