

Some problems I encountered while working on the program was that my program was skipping over files so the word count wasn't being done correctly, I refactored the way I was opening/reading the word files and simplified it which helped. Another issue I encountered was with the regular expression/cleaning up the word file of special characters and figuring out exactly how the file was being read, I researched different ways of making sure the lines were clean of spaces/special characters and eventually got it to work. The assignment took a few days to complete as I sometimes got really stuck to the point where I couldn't figure out what a good way to proceed was.

## Parallel Program 1, 2, 4, and 8 threads:

```
(base) daniel@daniel:~/Desktop/parallel-computing-map-reduce-dgarciaher$ python parallelMapReduce2.py
Starting Program...
-----Using 1 threads
Finished loading files with time: 0.0171201229005459
Finished reading file with time: 0.04465794563293457
Finished reading file with time: 0.4354584217071533
Finished reading file with time: 0.12663865809416504
Finished reading file with time: 0.3422682285388838
Finished reading file with time: 0.4012773830950787
Finished reading file with time: 0.4392571449279785
Finished reading file with time: 0.33757662773132324
Finished reading file with time: 0.29334497451782227
{'hate': 186, 'love': 2268, 'death': 928, 'night': 714, 'sleep': 266, 'time': 1119, 'henry': 605, 'hamlet': 463, 'you': 14437, 'my': 13182, 'blood': 690, 'poison': 84, 'macbeth': 282, 'king': 2941, 'heart': 1063, 'honest': 305}
Time taken: 2.453956127166748
(base) daniel@daniel:~/Desktop/parallel-computing-map-reduce-dgarciaher$ python parallelMapReduce2.py
Starting Program...
-----Using 2 threads
Finished loading files with time: 0.020774364471435547
Finished reading file with time: 0.04591059684753418
Finished reading file with time: 0.4888021945953369
Finished reading file with time: 0.14206266403198242
Finished reading file with time: 0.33778834342956543
Finished reading file with time: 0.3865222930908203
Finished reading file with time: 0.4189765453338623
Finished reading file with time: 0.32326579693933105
Finished reading file with time: 0.2959738625152588
{'hate': 186, 'love': 2268, 'death': 928, 'night': 714, 'sleep': 266, 'time': 1119, 'henry': 605, 'hamlet': 463, 'you': 14437, 'my': 13182, 'blood': 690, 'poison': 84, 'macbeth': 282, 'king': 2941, 'heart': 1063, 'honest': 305}
Time taken: 2.496914863586426
(base) daniel@daniel:~/Desktop/parallel-computing-map-reduce-dgarciaher$ python parallelMapReduce2.py
Starting Program...
-----Using 4 threads
Finished loading files with time: 0.01906132698059082
Finished reading file with time: 0.055135250091552734
Finished reading file with time: 0.13998126983642578
Finished reading file with time: 0.4815690517425537
Finished reading file with time: 0.39611077380654785
Finished reading file with time: 0.4006500244140625
Finished reading file with time: 0.34597134590140926
Finished reading file with time: 0.297777759033203
Finished reading file with time: 0.43353915214538574
{'hate': 186, 'love': 2268, 'death': 928, 'night': 714, 'sleep': 266, 'time': 1119, 'henry': 605, 'hamlet': 463, 'you': 14437, 'my': 13182, 'blood': 690, 'poison': 84, 'macbeth': 282, 'king': 2941, 'heart': 1063, 'honest': 305}
Time taken: 0.970609188679834
(base) daniel@daniel:~/Desktop/parallel-computing-map-reduce-dgarciaher$ python parallelMapReduce2.py
Starting Program...
-----Using 8 threads
Finished loading files with time: 0.0183103084564209
Finished reading file with time: 0.05724000930786133
Finished reading file with time: 0.1893010139465332
Finished reading file with time: 0.36419034004211426
Finished reading file with time: 0.3120233806090808
Finished reading file with time: 0.3517591953277588
Finished reading file with time: 0.4209892749786377
Finished reading file with time: 0.5122060775756836
Finished reading file with time: 0.46087217330932617
{'hate': 186, 'love': 2268, 'death': 928, 'night': 714, 'sleep': 266, 'time': 1119, 'henry': 605, 'hamlet': 463, 'you': 14437, 'my': 13182, 'blood': 690, 'poison': 84, 'macbeth': 282, 'king': 2941, 'heart': 1063, 'honest': 305}
Time taken: 0.660947660877637
```

The program takes less time as the thread number is incremented, I believe it behaves this way because of the fact that the work is more evenly distributed therefore it takes less time for everything to be completed.