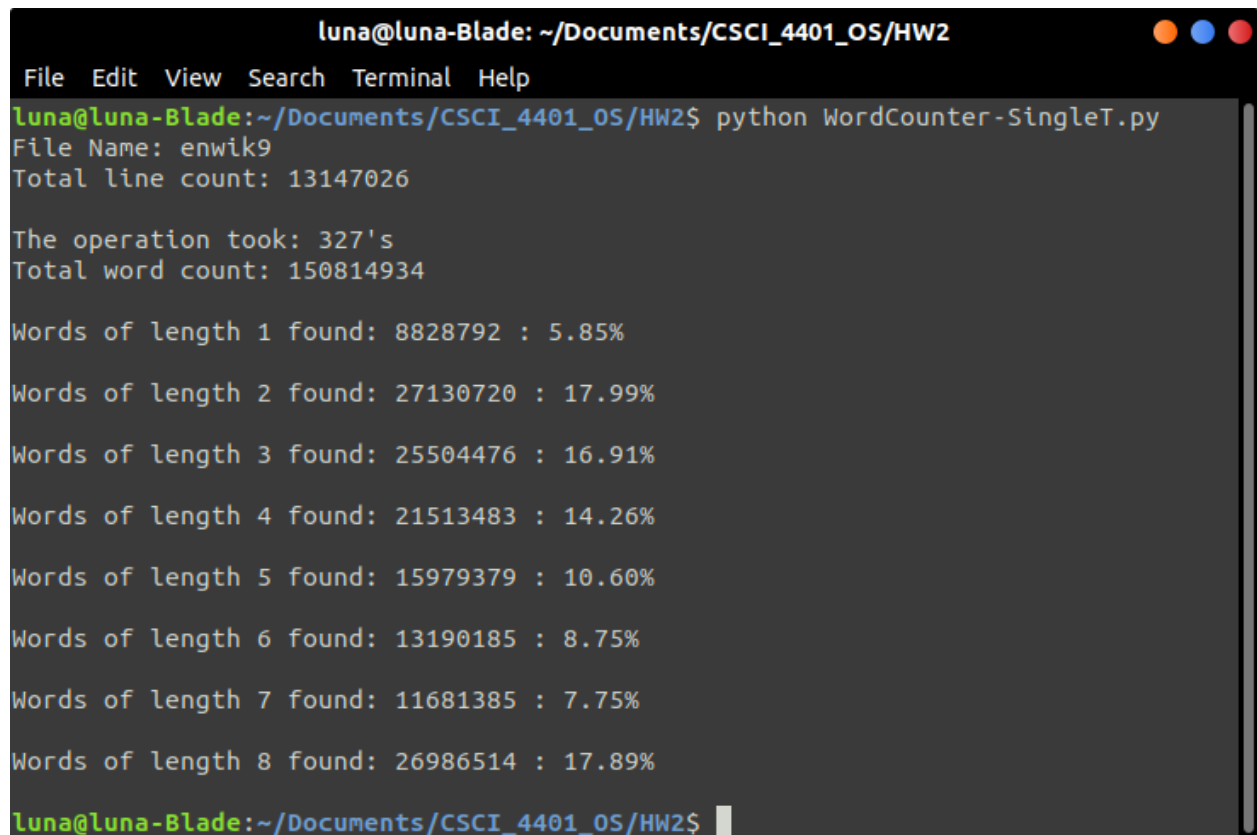


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## Assignment 2

### Question One

A terminal window titled 'luna@luna-Blade: ~/Documents/CSCI\_4401\_OS/HW2' with standard macOS window controls (orange, blue, red buttons). The terminal shows the execution of a Python script 'WordCounter-SingleT.py'. The output includes the file name 'enwik9', total line count '13147026', operation time '327's', total word count '150814934', and a list of word counts by length from 1 to 8, each with a percentage. The prompt 'luna@luna-Blade:~/Documents/CSCI\_4401\_OS/HW2\$' is visible at the bottom.

```
luna@luna-Blade: ~/Documents/CSCI_4401_OS/HW2
File Edit View Search Terminal Help
luna@luna-Blade:~/Documents/CSCI_4401_OS/HW2$ python WordCounter-SingleT.py
File Name: enwik9
Total line count: 13147026

The operation took: 327's
Total word count: 150814934

Words of length 1 found: 8828792 : 5.85%
Words of length 2 found: 27130720 : 17.99%
Words of length 3 found: 25504476 : 16.91%
Words of length 4 found: 21513483 : 14.26%
Words of length 5 found: 15979379 : 10.60%
Words of length 6 found: 13190185 : 8.75%
Words of length 7 found: 11681385 : 7.75%
Words of length 8 found: 26986514 : 17.89%

luna@luna-Blade:~/Documents/CSCI_4401_OS/HW2$
```

This is the output of my single threaded code titled: WordCounter-SingleT.py

```
luna@luna-Blade: ~/Documents/CSCI_4401_OS/HW2
File Edit View Search Terminal Help
Total line count: 13147026

creating thread for lines 1 to 6573513
creating thread for lines 6573514 to 13147026
The operation took: 517's
Total word count: 150814934

Words of length 1 found: 8828792 : 5.85%
Words of length 2 found: 27130720 : 17.99%
Words of length 3 found: 25504476 : 16.91%
Words of length 4 found: 21513483 : 14.26%
Words of length 5 found: 15979379 : 10.60%
Words of length 6 found: 13190185 : 8.75%
Words of length 7 found: 11681385 : 7.75%
Words of length 8 found: 26986514 : 17.89%

luna@luna-Blade:~/Documents/CSCI_4401_OS/HW2$
```

This is the output of my multi threaded code titled: WordCounter-MultiT.py

The results of the multi threaded test were not as expected. I believe this can be attributed to the overhead of having multiple threads requiring access to the IO bus as well as the single cored nature of python and the rapid passing around of it's GIL lock.

Question Two

```
luna@luna-Blade: ~/Documents/CSCI_4401_OS/HW2
File Edit View Search Terminal Help

luna@luna-Blade:~/Documents/CSCI_4401_OS/HW2$ python DiningPhilosopherQ2.py
Thread-1: Time spent in hungry state: 29724ms : 49.54%
Thread-1: Time spent in thinking state: 8429ms : 14.05%
Thread-1: Time spent in eating state: 21478ms : 35.80%
Thread-3: Time spent in hungry state: 29621ms : 49.37%
Thread-3: Time spent in thinking state: 8459ms : 14.10%
Thread-3: Time spent in eating state: 21501ms : 35.84%
Thread-4: Time spent in hungry state: 35891ms : 59.82%
Thread-4: Time spent in thinking state: 6729ms : 11.22%
Thread-4: Time spent in eating state: 17138ms : 28.56%
Thread-2: Time spent in hungry state: 35926ms : 59.88%
Thread-2: Time spent in thinking state: 6739ms : 11.23%
Thread-2: Time spent in eating state: 17107ms : 28.51%
luna@luna-Blade:~/Documents/CSCI_4401_OS/HW2$ python DiningPhilosopherQ2.py
```

This is the time data output by my dining philosophers code titled: DiningPhilosopherQ2.py

This code also produces another file following each step of the iteration called: q2output

Question 3

```
luna@luna-Blade: ~/Documents/CSCI_4401_OS/HW2
File Edit View Search Terminal Help
luna@luna-Blade:~/Documents/CSCI_4401_OS/HW2$ python DiningPhilosopherQ3.py
Thread-3: Time spent in hungry state: 145ms : 0.24%

Thread-3: Time spent in thinking state: 16869ms : 28.12%

Thread-4: Time spent in hungry state: 140ms : 0.23%
Thread-3: Time spent in eating state: 42150ms : 70.25%

Thread-4: Time spent in thinking state: 16959ms : 28.27%
Thread-4: Time spent in eating state: 42066ms : 70.11%

Thread-1: Time spent in hungry state: 147ms : 0.25%
Thread-1: Time spent in thinking state: 16779ms : 27.97%
Thread-1: Time spent in eating state: 42231ms : 70.39%

Thread-2: Time spent in hungry state: 133ms : 0.22%
Thread-2: Time spent in thinking state: 16749ms : 27.92%
Thread-2: Time spent in eating state: 42306ms : 70.51%

luna@luna-Blade:~/Documents/CSCI_4401_OS/HW2$
```

This is the output of my optimized dining philosophers code titled: DiningPhilosopherQ3.py

It has an extra output called: q3output which is a step by step iteration of the code

If we take a look at the tread times in q2 vs q3 it's fairly clear that a significant amount of hungry time has shifted to eating and thinking due to q3 using semaphores to optimize eating time instead of just using random waits like in q2.