

**ISTE-222 Assignment 3: Algorithm Analysis****The Count of Monte Carlo Report**

Ellie Parobek

**Table 1 – Average Number of Operations for Searches using Various Search Algorithms**

	Successful Searches	Unsuccessful Searches	Theoretical
Linear Search	500.45	503.18	500
Binary Search	8.89	9.98	9.97
Interpolation Search	3.21	2.84	3.32

```
----jGRASP exec: java ClassicSearchesA3
Average for successful linear search: 500.44893
Average for successful binary search: 8.88832
Average for successful interpolation search: 3.21243
Average for unsuccessful linear search: 503.1765934175201
Average for unsuccessful binary search: 9.977472849203982
Average for unsuccessful interpolation search: 2.844442234817098

----jGRASP: operation complete.
```

With the number of elements ( $n$ ) being 1,000, average linear search speed is  $O(n/2)$  making the theoretical average around 500. Average binary search speed is  $O(\log(n))$  making the theoretical average about 9.97. Average interpolation search is  $O(\log(\log(n)))$  making the theoretical average about 3.32.

Linear search success is very close to the theoretical which makes sense as half the elements will be found close to the best case ( $O(1)$ ) while half will be found close to the worst case ( $O(n)$ ) making the average  $O(n/2)$ ;  $1,000 / 2 = 500$ . Unsuccessful search is also very close to the average because the list is sorted so once it hits a number too high, it will stop searching.

Binary search success is also close to the theoretical but slightly better, possibly because variables that are very close to the middle will be found much faster. Unsuccessful search is closer to the theoretical because it will never find the variable, making it very close to  $O(\log(n))$  speed every time.

Interpolation search success is very close to the theoretical and faster than binary as it can start closer to the end or closer to the beginning of the array based on the value of the variable. The unsuccessful search is faster than the theoretical though because when it tries to find the element, it will quickly reach 0 results meaning the variable does not exist.