CS201 HW2 Algorithm Analysis

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The Comparison Table of Algorithms

Input Size (N)	**Algorithm 1** An iterative algorithm which works in O(n) time (milliseconds)	**Algorithm 2** A recursive algorithm which works in $O(2^n)$ time (milliseconds)
1	0.001	0.002
5	0.002	0.003
10	0.003	0.006
20	0.003	0.032
25	0.003	0.338
30	0.003	3.745
40	0.003	369.594
50	0.003	41515.2
100	0.004	NA
1000	0.005	NA
100000	0.346	NA
1000000	3.243	NA
10000000	32.429	NA

Figure 1

Plots

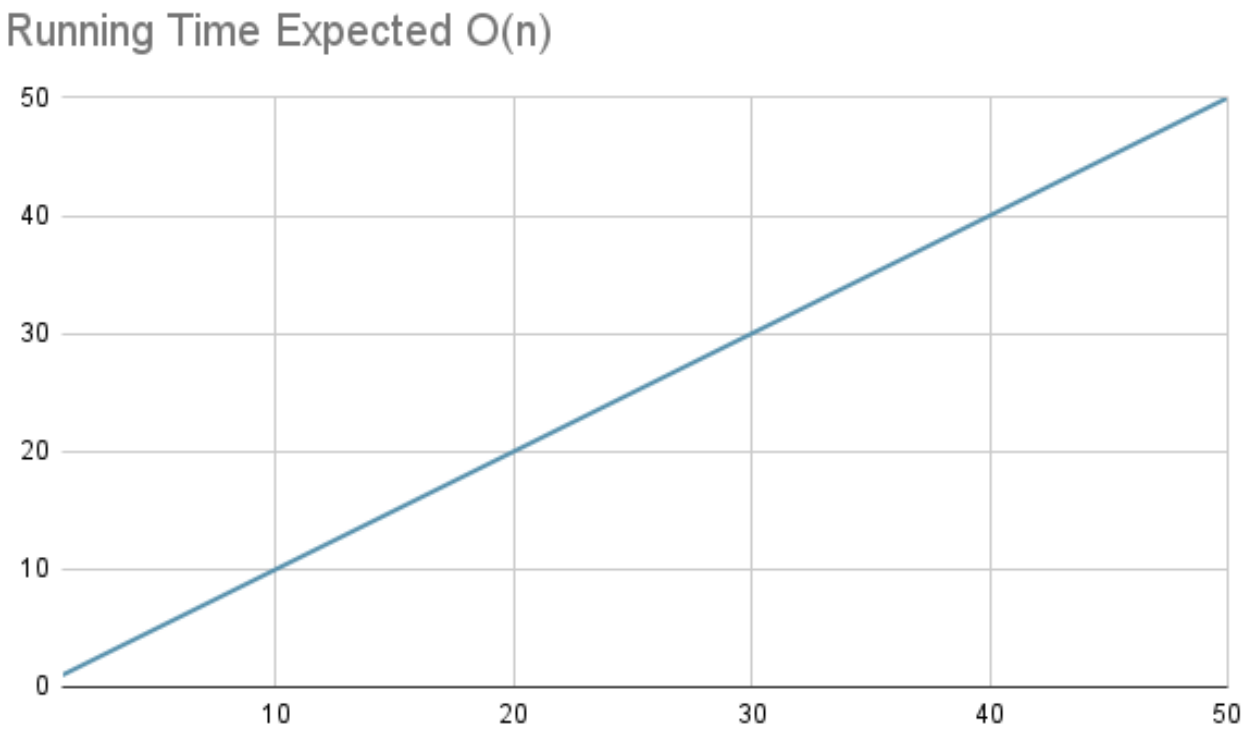

Figure 2

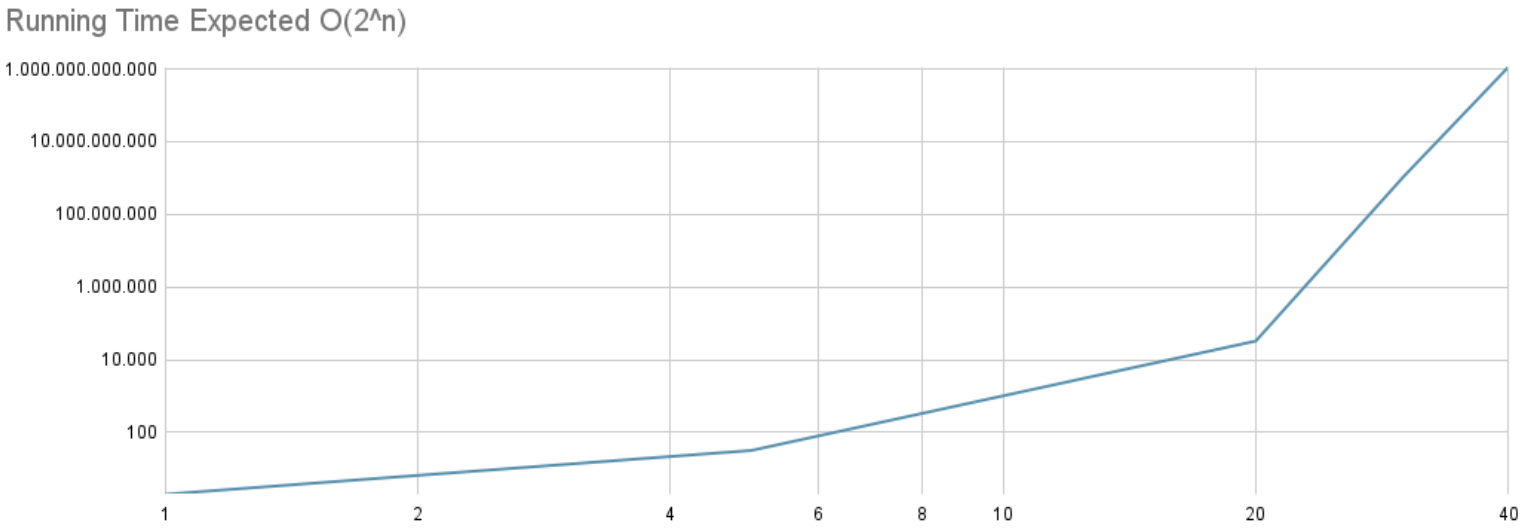

Figure 3

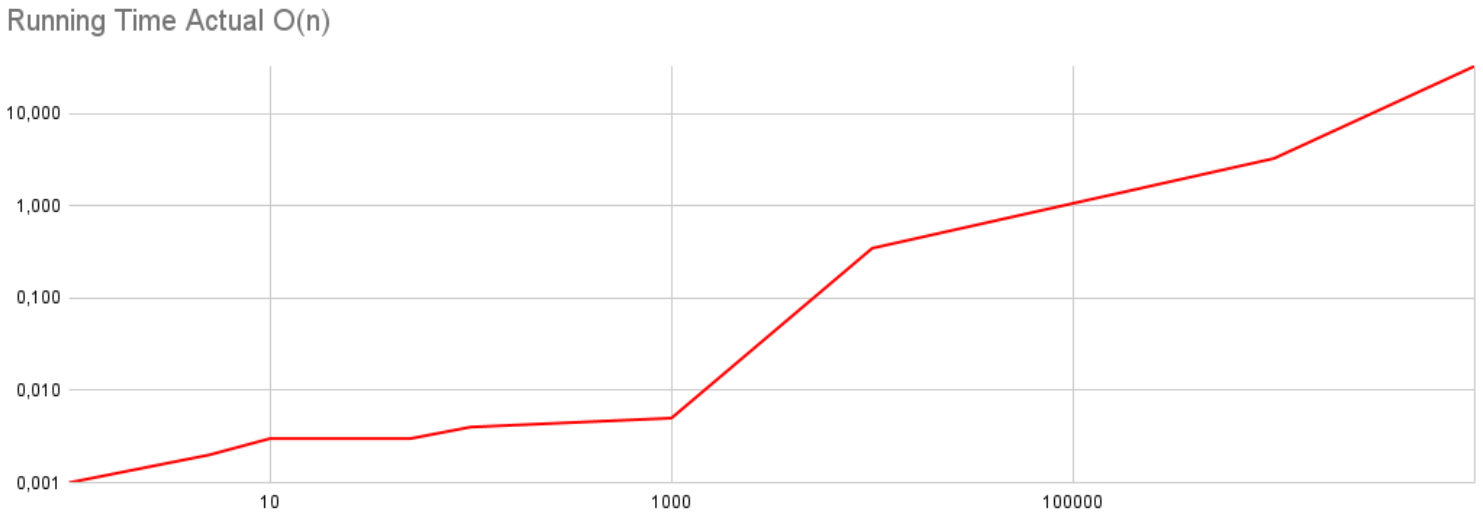

Figure 4

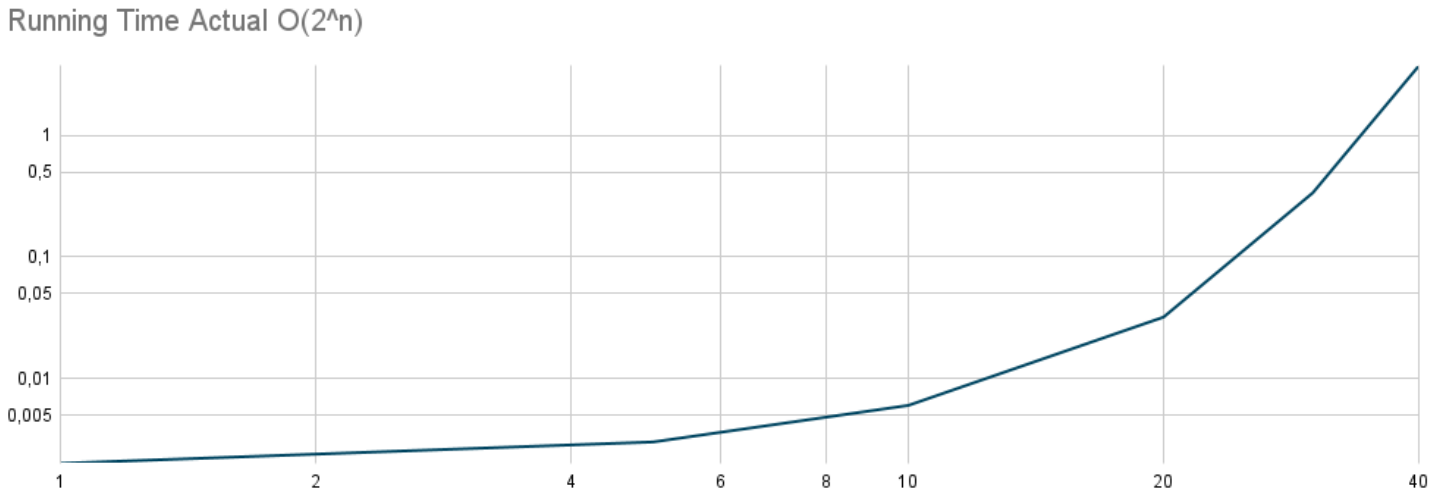

Figure 5

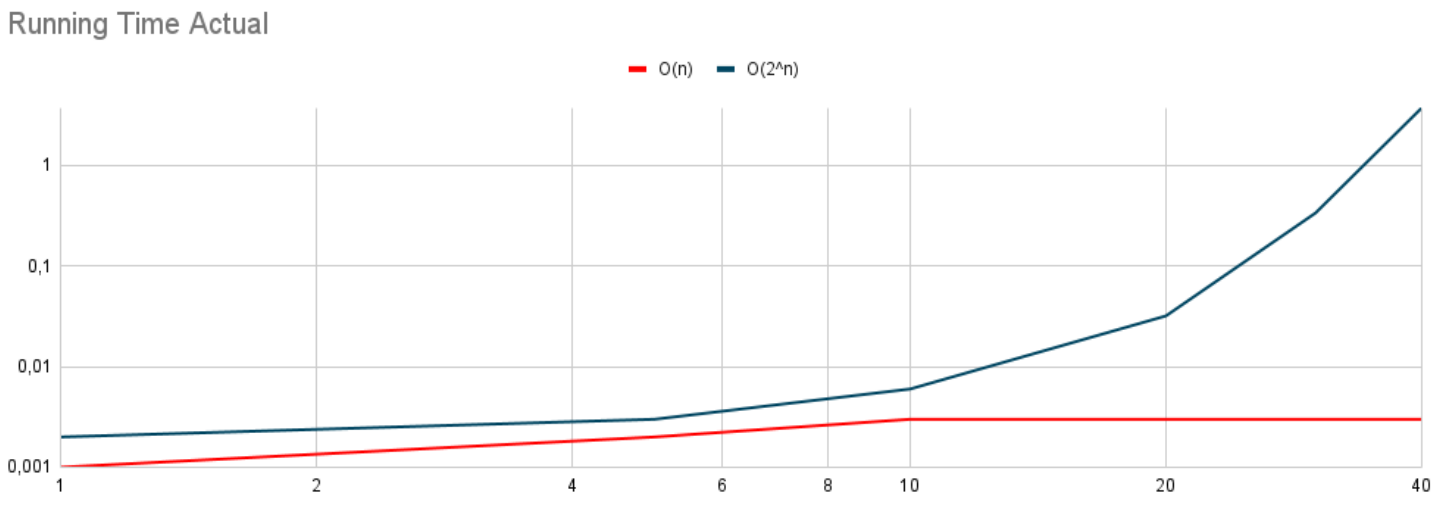

Figure 6

Discussion

In this study, I examined the time complexity of two algorithms working in O(n) and O(2^n). Algorithm one is an iterative algorithm that works in O(n) for finding the Fibonacci numbers. On the other hand, algorithm two is the recursion algorithm which works in O(2^n) for finding the Fibonacci number. First of all, many different values were tested in two different algorithms, and the values conducted were recorded in Figure 1. Then, according to the time complexity, the expected algorithm graph was plotted in Figure 2 and Figure 3. In addition, according to the data obtained from my computer, the graph of these two algorithms is shown in Figure 4 and Figure 5, and combined in Figure 6. When we look at Figure 2 and Figure 4, it can be seen that the expected curve of the iterative algorithm has a similar orientation to the actual curve. The same applies to the recursion algorithm when looking at Figure 3 and Figure 5. In Figure 6, it is also seen that the recursion algorithm takes more milliseconds to work compared to the iterative algorithm. When Figure 1 is examined, it is seen that the iterative algorithm can work at both low and large values such as 10000000, while the recursion algorithm is difficult to work after 50. In addition, the time when the iterative algorithm works with a value such as 1000000 is always less time than the time recursion algorithm works with a value such as 30. In summary, the iterative algorithm is more efficient than the recursion algorithm in every value and should be used instead of the recursion method when the iterative state can be used.

Computer Specification