CS201 – 002

Homework - 2

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*: All tables are created via *Canva*

1. Table:

Algorithm
Array Size
	Sol1(Cubic)
	O(N^3)
		Sol2(Quadratic)
		O(N^2)
			Sol3(Recursive)
			O(Nlog(N))
				Sol4(Linear)
				O(N)

10	0.0032	0.0015	0.0019	0.0013
100	0.5475	0.0127	0.0081	0.0015
1,000	366.02	1.2836	0.0986	0.017
5,000	44538.8	34.628	0.4176	0.0168
10,000	356876	110.729	1.0024	0.0231

Figure1: Running times (ms) of 4 different maximum subsequence sum solution algorithms (worked on arrays filled with random numbers at interval [-100, 100])

2. Plots:

2.1 Obtained Results:

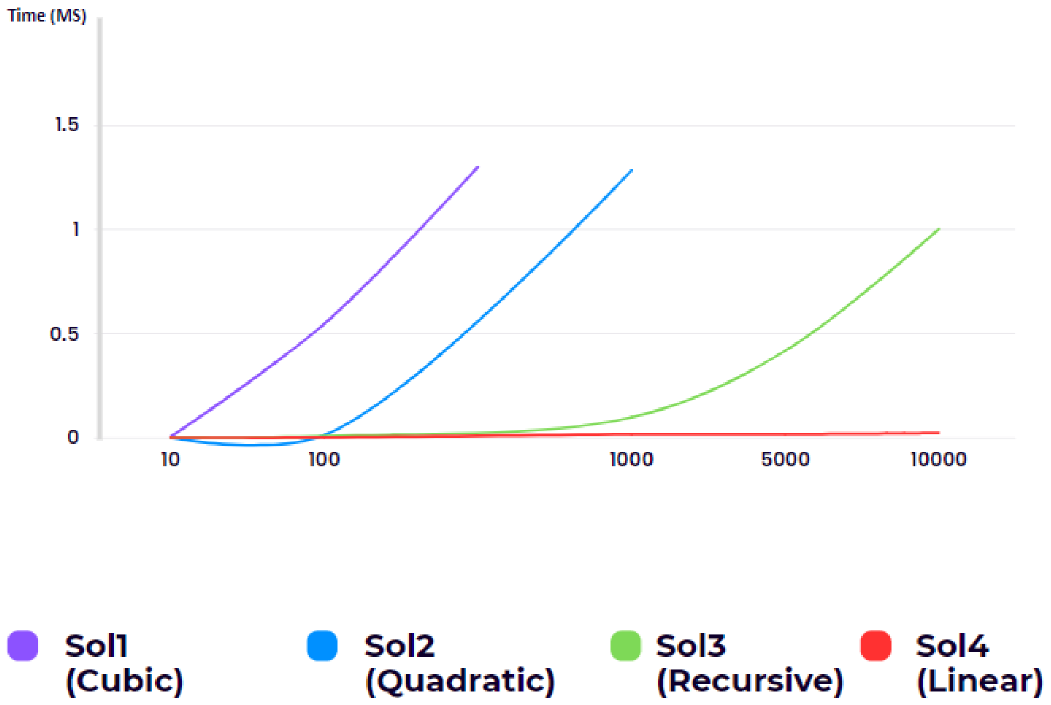

Figure2: Time-Array Size Plot of Figure 1*

2.2 Expected (Theoretic Results):

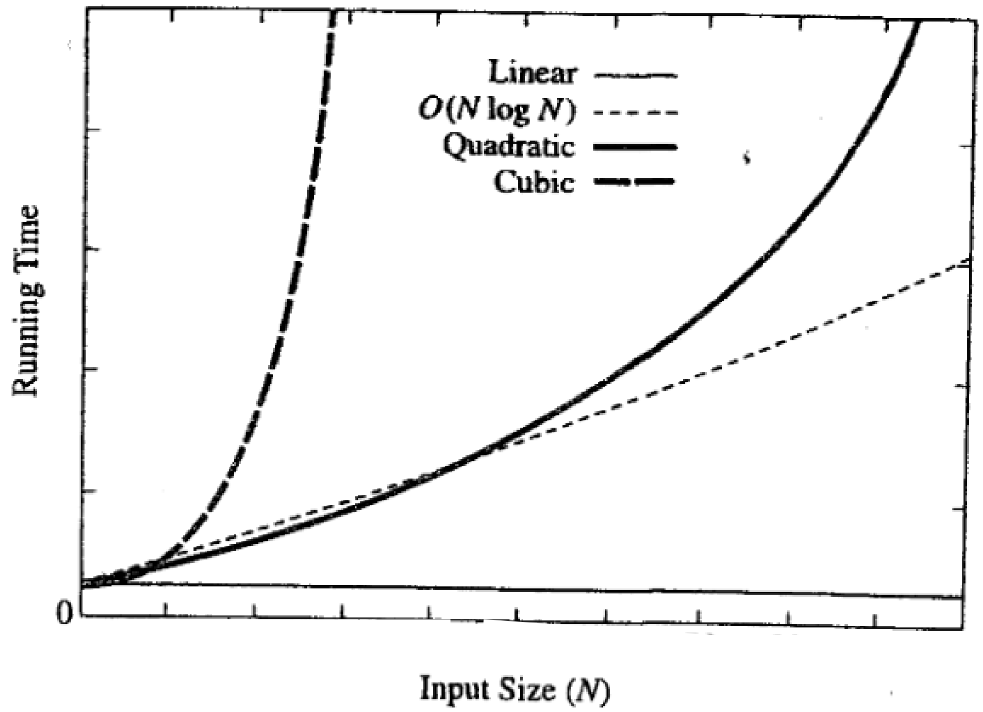

Figure3: Theoretic Time-Array Size Plot

2.3 Additional Sample Results (small interval):

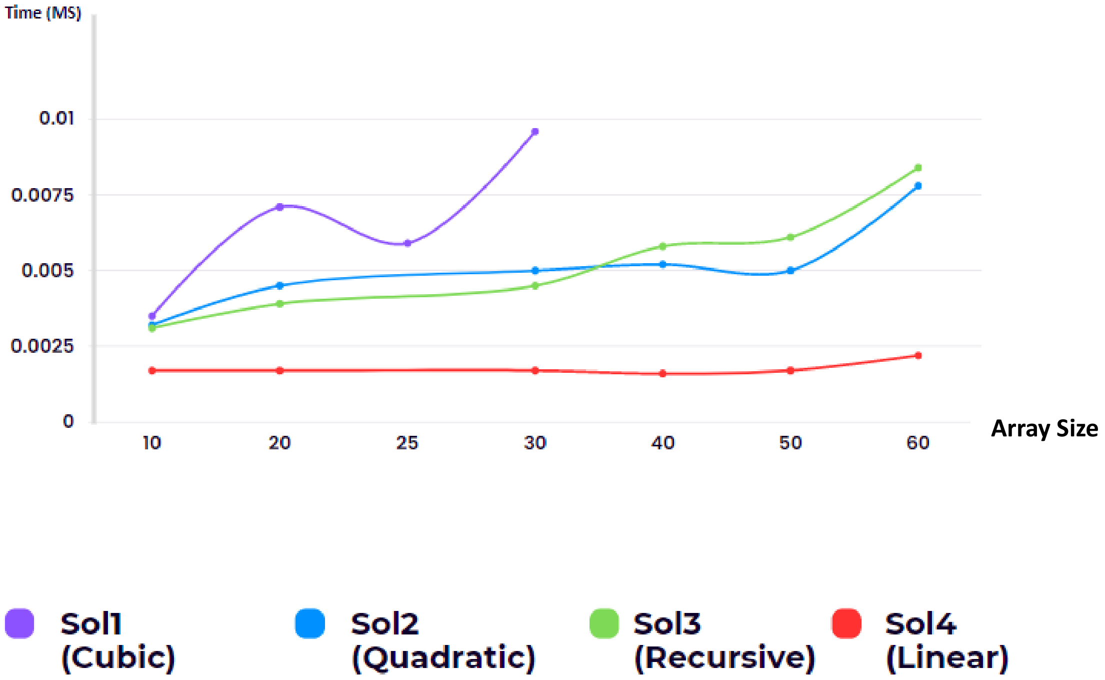

Figure4: Sample Case 1: Plot of Time vs. Array Size (Array's interval: [-500, 500])*

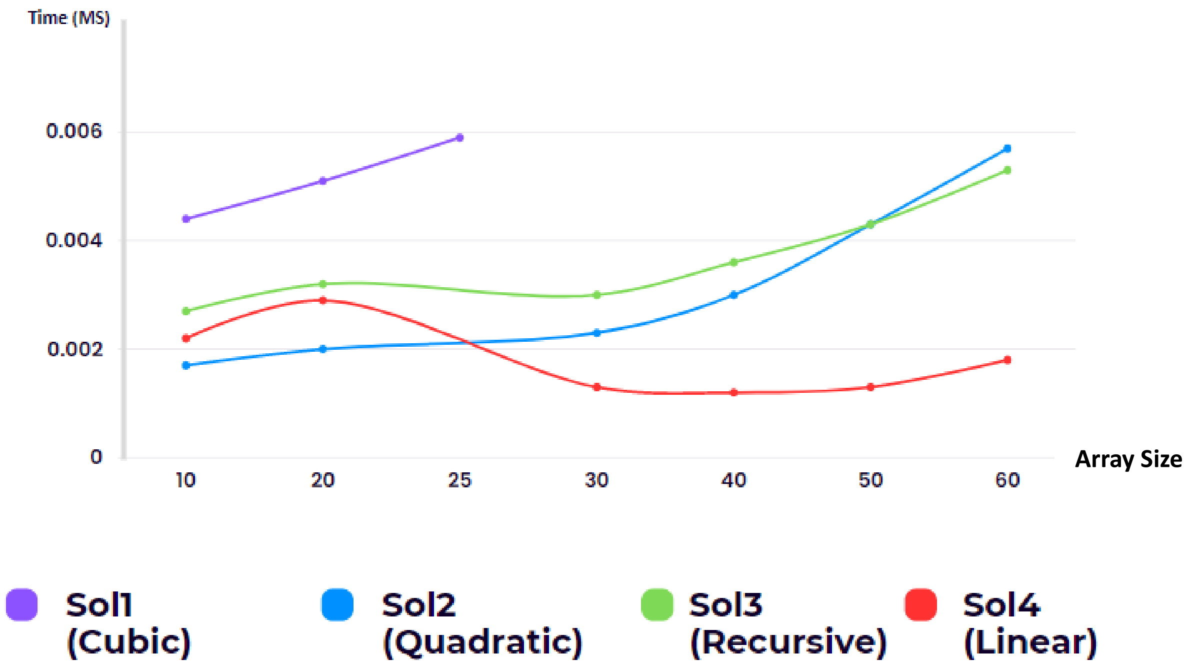

Figure5: Sample Case 2: Plot of Time vs. Array Size (Array's interval: [-500, 500])*

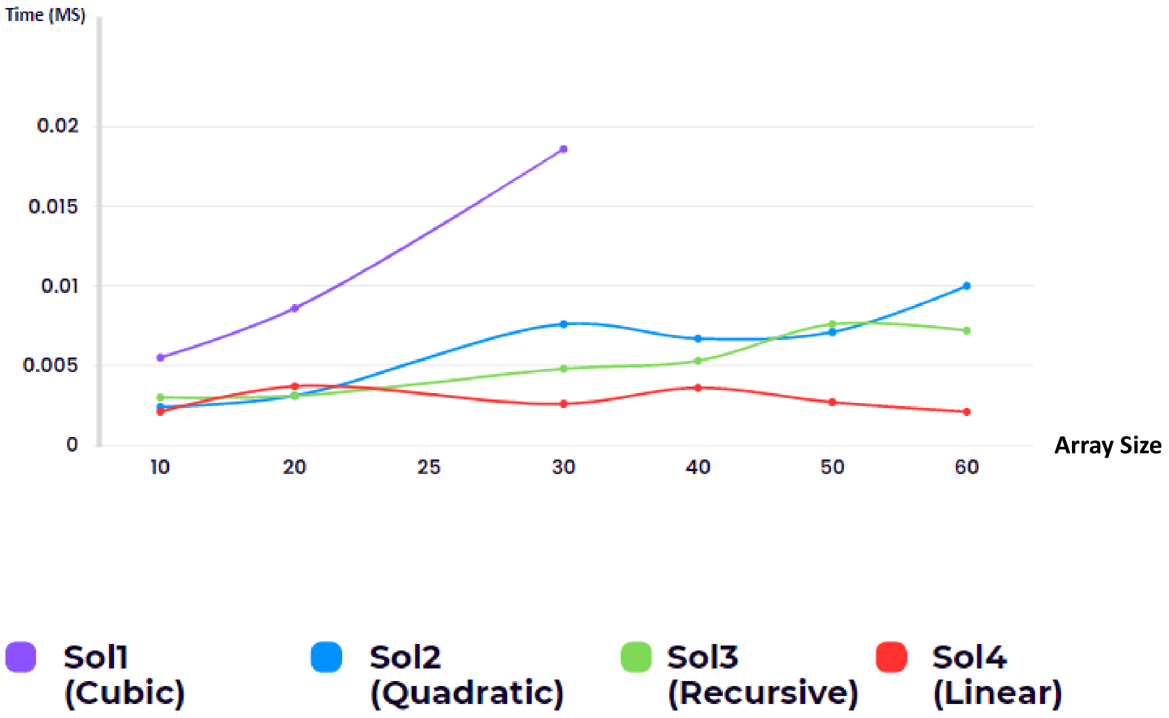

Figure6: Sample Case 3: Plot of Time vs. Array Size (Array's interval: [-500, 500])*

3.Evaluation-Discussion

Taking into consideration both theoretical and obtained growth rates; one can see that results start to match the expected ones when the input size is large and growing. However, in a smaller input range (Figure 4, 5 & 6), the running time tables vary and none of them is similar to the theoretical case's table (Figure 3). Even though the results are not as expected, encountering more matching running time tables as the input number grows is expected, now that the estimations are calculated regarding the algorithm's performance as the input size increases toward infinity. One can deduce that the larger the test case range is, the closer are the results to the theoretical.

Sol1 (Cubic): It is growing slower than expected in many cases (probably because of the cases which are tested being similar to the best case). However, it is almost always (Figure 4) increasing persistently.

Sol2 (Quadratic) & **Sol3** (Recursive): The expected relation between these solutions is met in the test case with big input sizes and once in a smaller input (Figure 5). This approves that bigger sized arrays are more accurate test cases. The expected results are too close to each other for these two algorithms for the given input sizes (Figure 4, 5 & 6). So, the obtained results do not match the expected ones many times.

Sol4 (Linear): Obtained results are close to expected results almost always. Yet, some fluctuations occur (Figure 5.)

All in all, the obtained running times can be different than expected, depending on many factors. So, it is a good practice to test the code several times and not just rely on estimations.

4.Computer Specifications

Operating System: Windows 10 Home (22H2) / 64-bit Operating System

Processor: Intel(R) Core(TM) i5-10210U CPU @ 1.60GHz 2.11 GHz

RAM: 16.0 GB (Available: 15.8)

Brand: HP