SUMMARY

USC ID/s

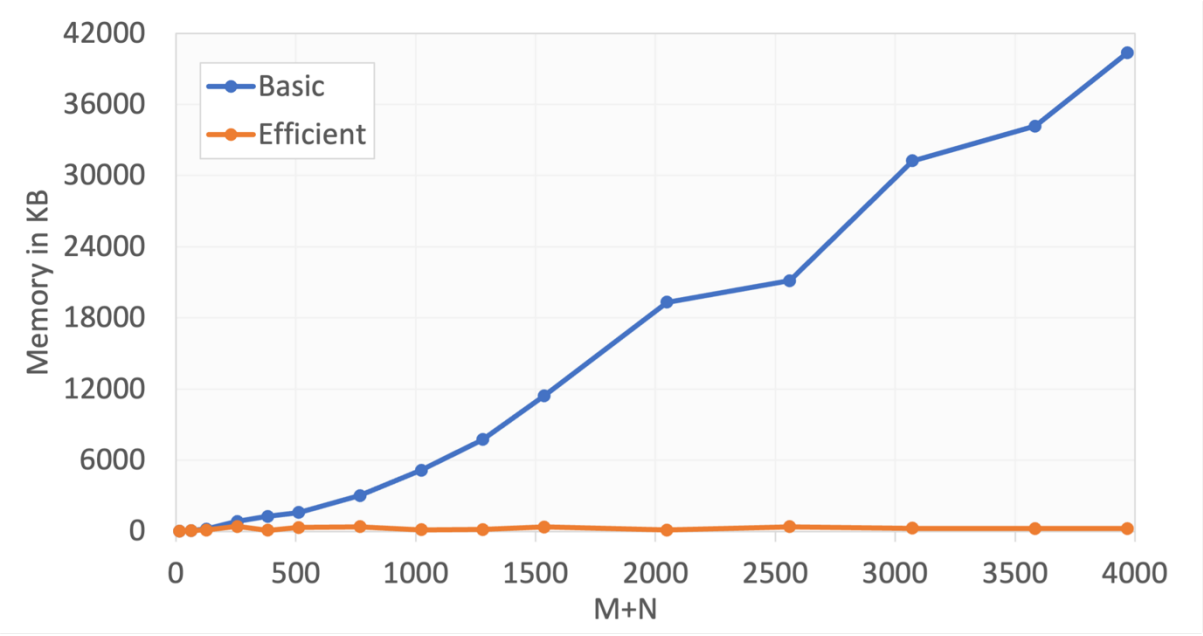
6074572947

Datapoints

M+N	Time in MS (Basic)	Time in MS (Efficient)	Memory in KB (Basic)	Memory in KB (Efficient)
16	0.0002	0.0004	16	32
64	0.0009	0.0079	64	80
128	0.0028	0.0698	192	112
256	0.0112	0.3239	848	416
384	0.0236	0.7573	1280	96
512	0.0412	1.5656	1600	336
768	0.0921	2.0021	3024	400
1024	0.1654	2.2367	5168	144
1280	0.2828	2.4869	7744	160
1536	0.3954	2.8621	11456	384
2048	0.7589	3.8460	19328	128
2560	1.1252	5.1345	21136	400
3072	1.7095	6.5633	31248	272
3584	2.0518	8.2935	34176	240
3968	2.7316	9.7231	40352	256

Insights

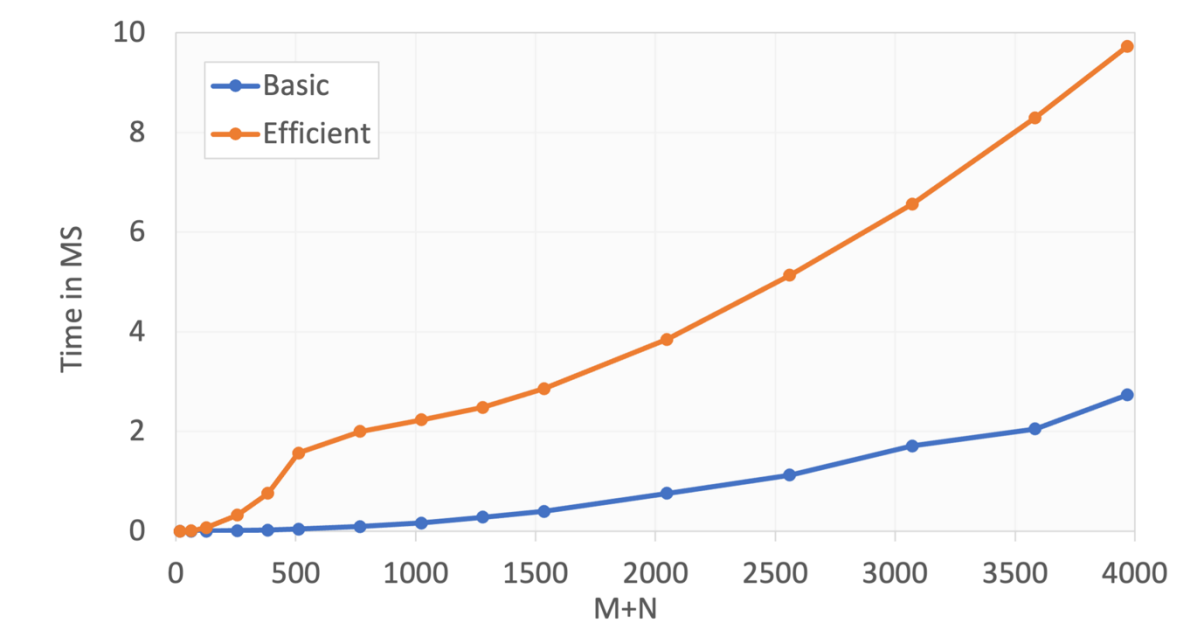
Graph1 – Memory vs Problem Size (M+N)



Nature of the Graph (Logarithmic/ Linear/ Polynomial/ Exponential)
Basic: Polynomial
Efficient: Linear

Explanation:
Graph1 shows the performance of the efficient algorithm is improved compared to basic algorithm in terms of memory usage. Although the basic algorithm uses less memory for very short inputs (M+N < 64), the space complexity of the algorithm increases proportional to the input size, thus growing in polynomial space complexity (it is almost quadratic, however we can't be sure because of the outliers and because of the limited number of inputs). On the other hand, the efficient algorithm shows a linear trend in which memory usage do not increase with increased input size. It must be noted that the trend of the efficient algorithm are not perfectly linear (it can be interpreted as polynomial as well).

Graph2 – Time vs Problem Size (M+N)



Nature of the Graph (Logarithmic/ Linear/ Polynomial/ Exponential)
Basic: Logarithmic
Efficient: Polynomial

Explanation:
The runtime performance of the basic algorithm is better compared to efficient algorithm. In Graph2, it can be seen that the efficient algorithm grows almost *exponentially* up to some point (when the input size *M+N* is equal to 512), then switches to a *loglinear* trend (*nlogn*). Basic algorithm also shows *loglinear* trend for all its datapoints, hence we can say that it has a *logarithmic* time complexity. The time complexity of the basic algorithm grows slower compared to the efficient algorithm.

Contribution
6074572947 : The project was completed individually.