**SUMMARY**

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **M+N** | **Time in MS (Basic)** | **Time in MS (Efficient)** | **Memory in KB (Basic)** | **Memory in KB (Efficient)** |
| 16 | 1.001119613647461 | 0 | 13988 | 14184 |
| 64 | 1.032114028930664 | 2.164602279663086 | 14004 | 14192 |
| 128 | 6.471395492553711 | 4.054784774780273 | 14228 | 14028 |
| 256 | 21.741867065429688 | 15.633106231689453 | 14768 | 14116 |
| 384 | 64.60261344909668 | 48.05898666381836 | 15496 | 14040 |
| 512 | 83.69588851928711 | 113.4183406829834 | 15572 | 14060 |
| 768 | 195.88685035705566 | 255.50055503845215 | 17352 | 14168 |
| 1024 | 359.43078994750977 | 475.6619930267334 | 17624 | 14196 |
| 1280 | 525.698184967041 | 735.7320785522461 | 18348 | 14176 |
| 1536 | 813.5907649993896 | 1214.0331268310547 | 18300 | 14236 |
| 2048 | 1440.735101699829 | 1967.7352905273438 | 17592 | 14032 |
| 2560 | 2268.460512161255 | 3069.2052841186523 | 18340 | 14024 |
| 3072 | 4124.944686889648 | 4386.900186538696 | 18908 | 14192 |
| 3584 | 5429.443597793579 | 5909.696340560913 | 19672 | 14168 |
| 3968 | 5781.914472579956 | 7441.009283065796 | 19244 | 14200 |

## **DATAPOINTS:**

## **INSIGHTS**

### **Graph1 – Memory vs Problem Size (M+N)**

Run 01:

Chart, line chart

Description automatically generated

Run 02:

Chart, line chart

Description automatically generated

#### **Nature of the Graph (Logarithmic/ Linear/ Exponential):**

**Basic:** Polynomial (M\*N)

**Efficient:** Constant (approximately)

#### **Explanation:** Memory consumption for the basic algorithm requires the entire 2-dimensional table of size M\*N (input size of each string) for finding the optimal sequence alignment. Whereas, in the efficient algorithm we try to reduce this issue by looking at maximum two columns at a time, thereby reducing the consumption of space overall.

### **Graph2 – Time vs Problem Size (M+N)**

Run 01:

Chart, line chart

Description automatically generated

Run 02:

Chart, line chart

Description automatically generated

#### **Nature of the Graph (Logarithmic/ Linear/ Exponential):**

Basic: Polynomial

Efficient: Polynomial

#### Explanation: Both, efficient and basic algorithms, run in O(M\*N) when implemented as dynamic programming. Due to this, the time grows proportional to the problem size in the above graph.

## **CONTRIBUTION**

<USC ID/s>: <Equal Contribution>