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Matrix chain multiplication: **A and B can be multiplied when number of row in B= number of column in A**

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{bmatrix}_{2\times 3} \qquad B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \\ b_{31} & b_{32} \end{bmatrix}_{3\times 2}$$

$$A\times B = \begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} + a_{13}b_{31} & a_{11}b_{12} + a_{12}b_{22} + a_{13}b_{32} \\ a_{21}b_{11} + a_{22}b_{21} + a_{23}b_{31} & a_{21}b_{12} + a_{22}b_{22} + a_{23}b_{32} \end{bmatrix}_{2\times 2}$$

No. of multiplications = 12 (By observation).

$= \underline{2\times 3\times 2} = 12.$ (by formulae).

$A_1 = 2\times 3 \qquad A_2 = 3\times 4 \qquad A_3 = 4\times 2.$

Minimum multiplication to find A1 A2 A3.

$A_1 = 2\times 3 \qquad A_2 = 3\times 4 \qquad A_3 = 4\times 2.$

Minimum multiplication to find A1 A2 A3.

(A1 . A2) . A3

$(A_1 \; A_2) \cdot A_3$

Dimensions 2×4 $\quad 4\times 2.$

Cost- $2*3*4=24$

Resulting Dimension 2×4

A1 (A2 . A3).

$A_1 \cdot (A_2 \cdot A_3)$

Dimensions $\quad 3\times 2$

Cost $\quad 3 * 4 * 2 = 24$

Dimension $2\times 3 \quad 3\times 2$

Cost- $2*3*4=24$

Resulting Dimension 2×4

Cost = $2*4*2 = 16$

$\therefore$ Total cost operations $= 24+16 = 40$

Dimension 2×3 3×2

Cost = $2*3*2 = 12$

$\therefore$ Total cost = $24+12 = 36$

$c[1,3] =$

A

$A_1 = 2\times3 \quad A_2 = 3\times4 \quad A_3 = 4\times2.$

Minimum multiplication to find A1A2A3.

$\underbrace{c[1,1]}_{A_1} = 0$ | $\underbrace{c[2,2]}_{A_2} = \underbrace{c[3,3]}_{A_3} = 0$

	1	2	3
1	0	24	
2		0	24
3			0

$c[1,2] = c[1,1] + c[2,2] + 2*3*4$

$A_1 A_2 = 0+0+24 = 24$

A_1

$c[2,3] = c[2,2] + c[3,3] + 3*4*2$

$= 24$

$A_2 A_3$

$A_2 \quad A_3$

	1	2	3
1	0	24	36

$A_1 = 2\times3 \quad A_2 = 3\times4 \quad A_3 = 4\times2.$

Minimum multiplication to find A1A2A3.

	1	2	3
1	0	24	36
2		0	24
3			0

Minimum multiplication to find $A1A2A3$.

$$c[1,3] = c[1,1] + c[2,3] + 2*3*2 = 0 + 24 + 12$$
$$= 36.$$

$A_1 A_2 A_3$

$\underline{A_1 \cdot (A_2 A_3)}$ $\qquad$ $(A_1 A_2) \cdot A_3$

2×3 $\quad$ 3×2 $\qquad$ $\underbrace{2 \times 4 \quad 4 \times 2}$

$$= c[1,2] + c[3,3] +$$
$$2 * 4 * 2$$
$$= 24 + 0 + 16$$
$$= 40.$$

$A_1 A_2 A_3 A_4$

$(A_1 A_2)(A_3 A_4)$ $\qquad$ $A_1 \cdot (\underbrace{A_2 A_3 A_4})$

$A_2 \cdot (A_3 \cdot A_4)$ $\qquad$ $(A_2 A_3) \cdot A_4$.

Topic- Short Notes-

What ?? Why ?? How ???

~~Source~~ Algorithm.

TC SC

Differences

Greedy && DP

DP && Divide & Conquer.

Difference btwn 2 sorting algos.

Prims vs Kruskal.

Djikstra vs Floyd Warshall vs Bellman Ford.

Prims

Kruskal.

v/s Bellman

LCS $\rightarrow \phi$

Prepare.