

Algorithm Analysis

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Strassen's Algorithm

Strassen's Algorithm

$A_{11} \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} A_{12} \begin{pmatrix} 7 & 6 \\ -1 & 5 \end{pmatrix}$
 $A_{21} \begin{pmatrix} 3 & 4 \end{pmatrix} A_{22} \begin{pmatrix} -1 & 5 \end{pmatrix}$

* Strassen's Algorithm should only be used for large matrices, but for the sake of learning we'll do this (large = greater than 100x100)

$S_1 = B_{12} - B_{22} = 6 - 5 = 1$
 $S_2 = A_{11} + A_{12} = 1 + 2 = 3$
 $S_3 = A_{21} + A_{22} = 3 + 4 = 7$
 $S_4 = B_{21} - B_{11} = -1 - 7 = -8$
 $S_5 = A_{11} + A_{12} = 1 + 4 = 5$
 $S_6 = B_{11} + B_{22} = 12$
 $S_7 = A_{12} - A_{22} = -2$
 $S_8 = B_{21} + B_{22} = 4$
 $S_9 = A_{11} - A_{21} = -2$
 $S_{10} = B_{11} + B_{12} = 13$

$P_1 = A_{11} \times S_1 = 1$
 $P_2 = S_2 \times B_{22} = 15$
 $P_3 = S_3 \times B_{11} = 49$
 $P_4 = A_{22} \times S_4 = -32$
 $P_5 = S_7 \times S_6 = 60$
 $P_6 = S_7 \times S_8 = -8$
 $P_7 = S_9 \times S_{10} = -26$

$C_{11} = P_5 + P_4 - P_2 + P_6 = 5$
 $C_{12} = P_1 + P_2 = 16$
 $C_{21} = P_3 + P_4 = 17$
 $C_{22} = P_7 - P_1 - P_6 - P_2 = 38$

$C = \begin{pmatrix} 5 & 16 \\ 17 & 38 \end{pmatrix}$

Hopefully I did that last bit of arithmetic correctly

Recursion Tree

- I was so confused the whole time, I'll try to rework the example we did in class at some point