

CSC373 Worksheet 1 Solution

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1. Notes:

- Strassen's method for matrix multiplication
 - Reduces the time complexity of matrix multiplication from $O(n^3)$ to $O(n^{\log_2 7}) = O(n^{2.81})$
 - Has four steps
 - 1) Divide the input matrices A and B and output matrix C into $n/2 \times n/2$ submatrices
$$A = \begin{pmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{pmatrix}, \quad B = \begin{pmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{pmatrix}, \quad C = \begin{pmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{pmatrix},$$
 - Is not preferred in practical purposes
 - 1) The constants used in Strassen's method are high and for a typical application Naive method works better.
 - 2) For Sparse matrices, there are better methods especially designed for them.
 - 3) The submatrices in recursion take extra space.
 - 4) Because of the limited precision of computer arithmetic on noninteger values, larger errors accumulate in Strassen's algorithm than in Naive Method

References:

- 1) GeeksForGeeks, Divide and Conquer — Set 5 (Strassen's Matrix Multiplication), [link](#)
- Regular matrix multiplication
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