CE100 Algorithms and Programming II

Week-3 (Matrix Multiplication/ Quick Sort)

Spring Semester, 2021-2022

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<iframe width=700, height=500 frameBorder=0 src="../ce100-week-3-matrix.md_slide.html"></iframe>

Solving Recurrences

Outline

- Matrix Multiplication
  - Traditional
  - Recursive
  - Strassen

Outline

- Quicksort
  - Hoare Partitioning
  - Lomuto Partitioning
  - Recursive Sorting

Outline

- Quicksort Analysis
  - Randomized Quicksort
  - Randomized Selection
    - Recursive
    - Medians

Matrix Multiplication

- **Input:** $A = [a_{ij}], B = [b_{ij}]$
- **Output:** $C = [c_{ij}] = A \cdot B \Longrightarrow i, j = 1, 2, 3, \ldots, n$

$$\begin{bmatrix} c_{11} & c_{12} & \ldots & c_{1n} \\ c_{21} & c_{22} & \ldots & c_{2n} \\ \vdots & \vdots & \vdots & \ddots \\ c_{n1} & c_{n2} & \ldots & c_{nn} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & \ldots & a_{1n} \\ a_{21} & a_{22} & \ldots & a_{2n} \\ \vdots & \vdots & \vdots & \ddots \\ a_{n1} & a_{n2} & \ldots & a_{nn} \end{bmatrix} \cdot \begin{bmatrix} b_{11} & b_{12} & \ldots & b_{1n} \\ b_{21} & b_{22} & \ldots & b_{2n} \\ \vdots & \vdots & \vdots & \ddots \\ b_{n1} & a_{n2} & \ldots & b_{nn} \end{bmatrix}$$

- $c_{ij} = \sum_{1 \leq k \leq n} a_{ik}.b_{kj}$

References

TODO