DESIGN AND ANALYSIS OF ALGORITHMS (MA30207)
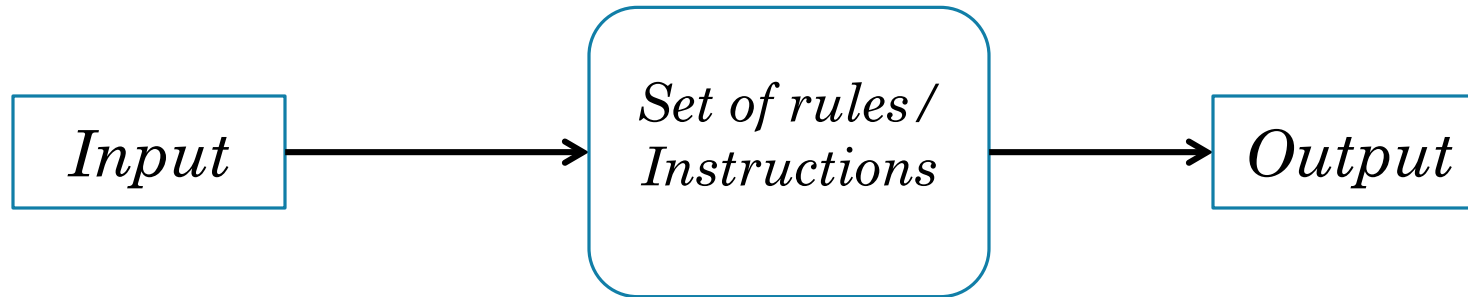
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WHAT IS AN ALGORITHM

A set of rules/instructions that is to be followed to obtain a desired output from a given input.

| Input | → | Set of rules/ Instructions | → | Output |

ANALYSIS OF ALGORITHMS

The theoretical study of computer-program performance and resource usage.

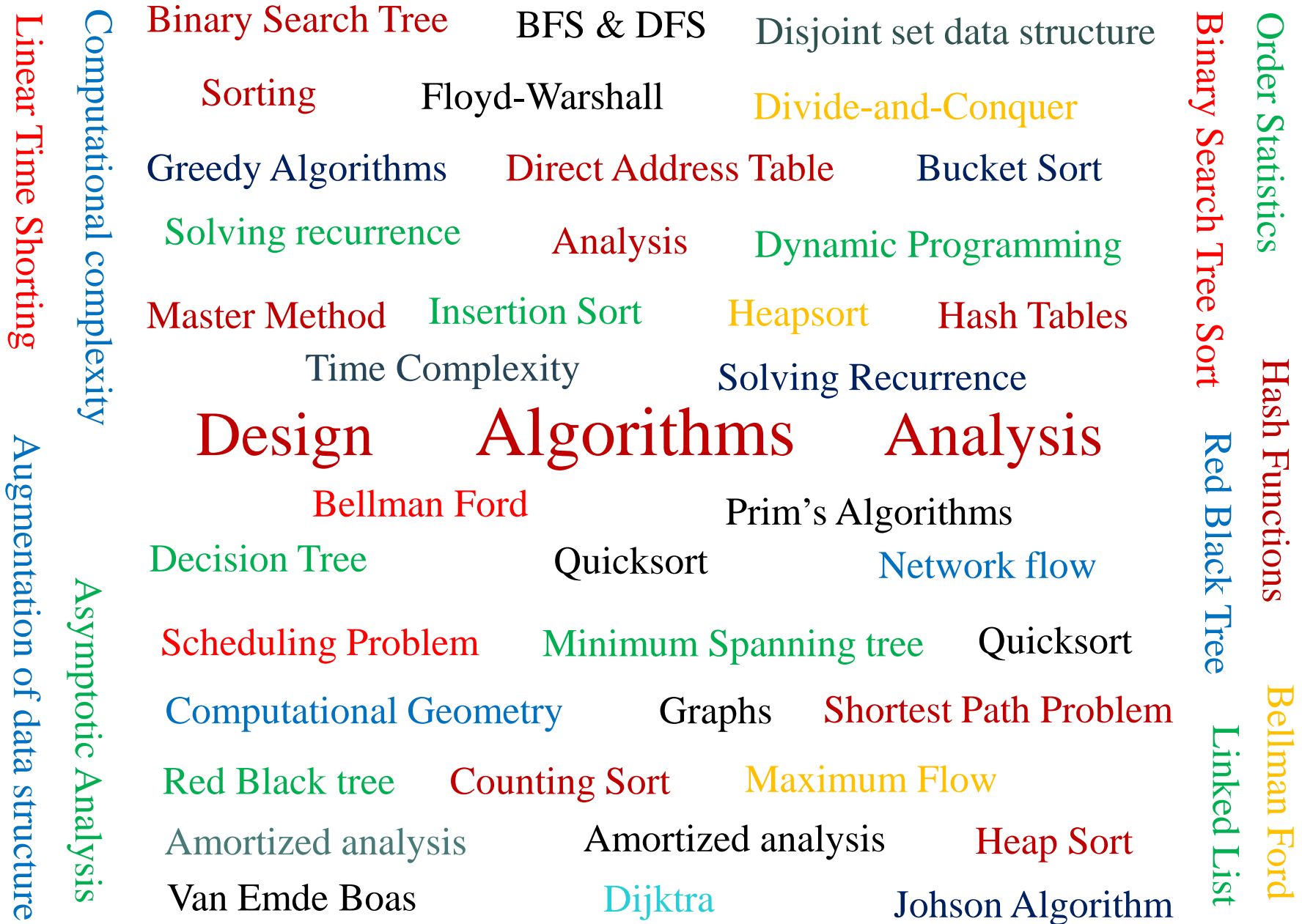What's more important than performance?

- modularity
- correctness
- maintainability
- functionality
- robustness
- user-friendliness
- programmer time
- simplicity
- extensibility
- reliability

WHY STUDY ALGORITHMS AND PERFORMANCE?

- Algorithms help us to understand *scalability*.

- Performance often draws the line between what is feasible and what is impossible.

- Algorithmic mathematics provides a *language* for talking about program behavior.

- The lessons of program performance generalize to other computing resources.

- Speed is fun!

TENTATIVE WEEK-WISE CONTENTS

1. Sorting problem, time complexity, asymptotic analysis.
2. Solving recurrence, Divide-and-Conquer.
3. Quicksort and Heap Sort, Decision Tree.
4. Linear time Sorting, Order Statistics.
5. Hash Function, Binary Search Tree (BST) Sort.
6. Randomly build BST, Red Black Tree, Augmentation of data structure.
7. Van Emde Boas, Amortized analysis, Computational Geometry.
8. Dynamic Programming, Graphs, Prim's Algorithms.
9. BFS & DFS, Shortest path problem, Dijktra, Bellman Ford.
10. All pairs shortest path, Floyd-Warshall, Johnson Algorithm.
11. More amortized analysis, disjoint set data structure.
12. Network flow, computational complexity.

Binary Search Tree

BFS & DFS

Disjoint set data structure

Sorting

Floyd-Warshall

Divide-and-Conquer

Greedy Algorithms

Direct Address Table

Bucket Sort

Solving recurrence

Analysis

Dynamic Programming

Master Method

Insertion Sort

Heapsort

Hash Tables

Time Complexity

Solving Recurrence

Design

Algorithms

Analysis

Bellman Ford

Prim's Algorithms

Decision Tree

Quicksort

Network flow

Scheduling Problem

Minimum Spanning tree

Quicksort

Computational Geometry

Graphs

Shortest Path Problem

Red Black tree

Counting Sort

Maximum Flow

Amortized analysis

Amortized analysis

Heap Sort

Van Emde Boas

Dijktra

Johson Algorithm

Linear Time Shorting

Computational complexity

Augmentation of data structure

Asymptotic Analysis

Order Statistics

Binary Search Tree Sort

Hash Functions

Red Black Tree

Bellman Ford

Linked List

Text Book

- **Introduction to Algorithms, Third Edition**
 Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein