

Design and Analysis of Algorithms

Review of algorithm analysis

Haidong Xue (GSU)

Presented By

Dr M A Tahir

Computer

Software

Software Engineering

Algorithms

Data Structure

Programming Language

Compiler

Principles of Compilers

Machine
Language

Operating System

Hardware

Computer Architecture

Computer Composition

Microchip Interfaces

VLSI Design

Applications

Database

Data mining

Network

Wireless Network

Web programming

Security

Signal processing

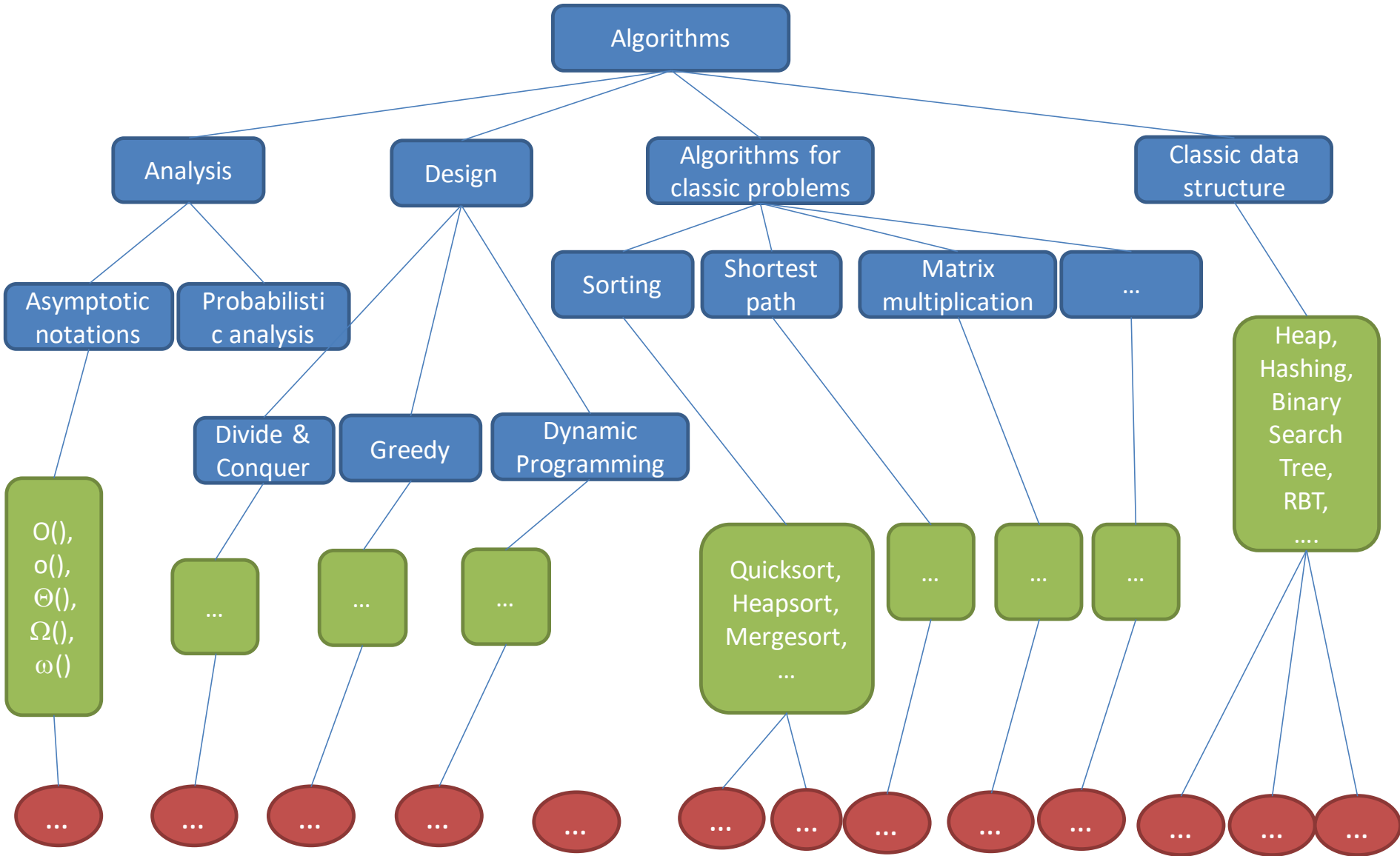
Graphics

AI

Robotics

Automata

Knowledge tree



Review of algorithm analysis

- What is an algorithm?
- What are we interested in an algorithm?
- How to measure an algorithm?
- How to code divide-and-conquer algorithm?
 - Recursion
- How to calculate the running time of divide-and-conquer algorithm?
 - Recurrence equation

What is an algorithm?

- “a sequence of operations” (informal)
- E.g.
 - The algorithm to walk
 - The algorithm to cook instant noodle
 - The algorithm to sort N integers

What is an algorithm?

- Algorithm: walk to a destination
while (have not arrived at the destination)
{
 put the back foot in front of the front foot;
}

What is an algorithm?

- Algorithm: cook a cup of instant noodles
 1. Pull back lid to the dotted line.
 2. Fill the cup to the inside line with boiling water from a kettle or from the microwave
 3. Close lid and let stand for 3 minutes.
 4. Stir well and add a pinch of salt and pepper to taste.



What are we interested in an algorithm?

- Correctness
- Efficiency
 - Time complexity – measure the execution time?
 - Space complexity

How to measure an algorithm?

- The number of key operations
- The number of space units needed
- What if the input is uncertain?

How to measure an algorithm?

- E.g. Search a book in a box of books
 - Key operation: check the title of a book
 - Space unit: the space for one book

Asymptotic Notation

- $O()$
- $o()$
- $\Theta()$
- $\Omega()$
- $\omega()$