Design and Analysis of Algorithms

Review of algorithm analysis

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Presented By

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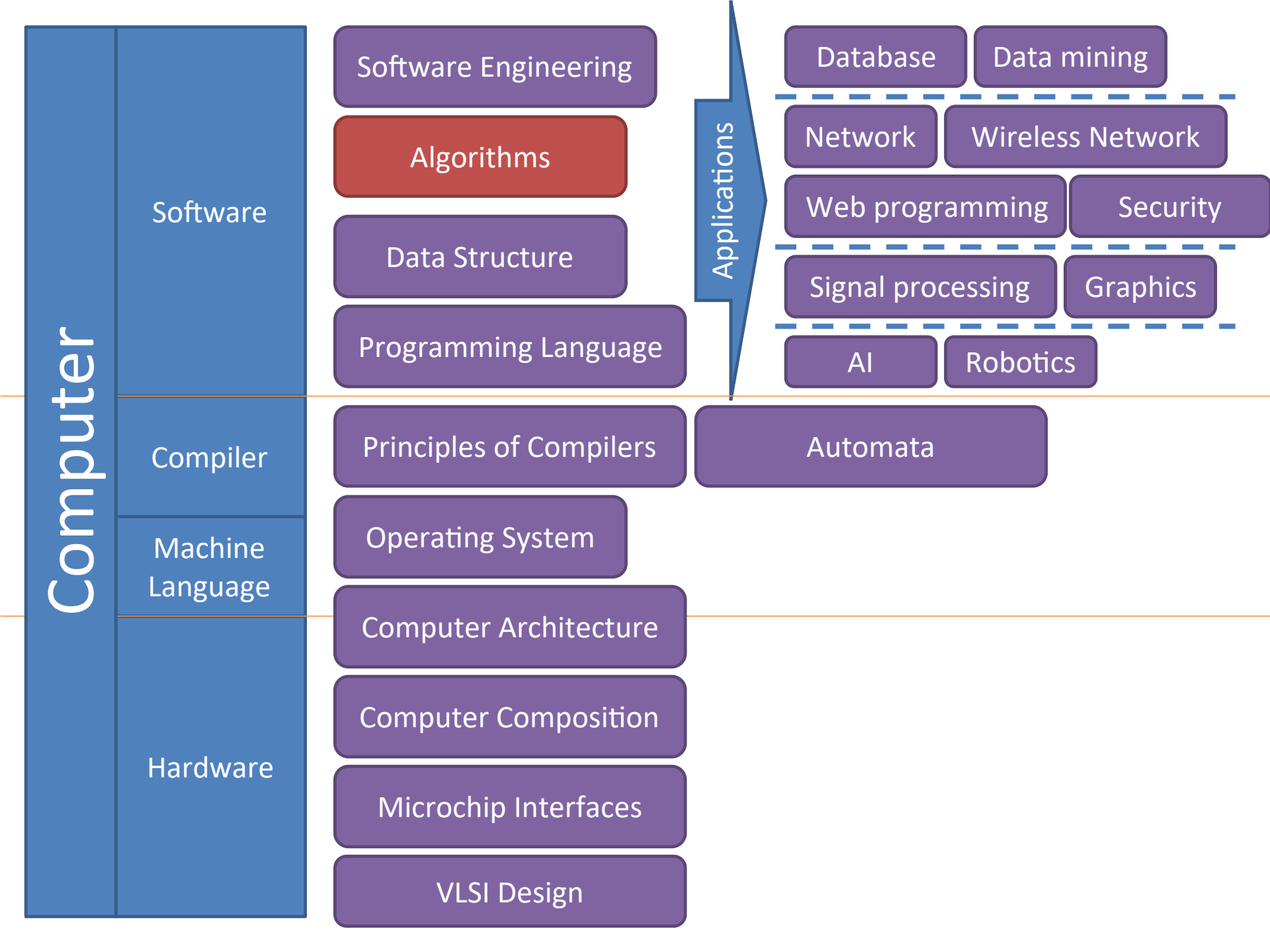
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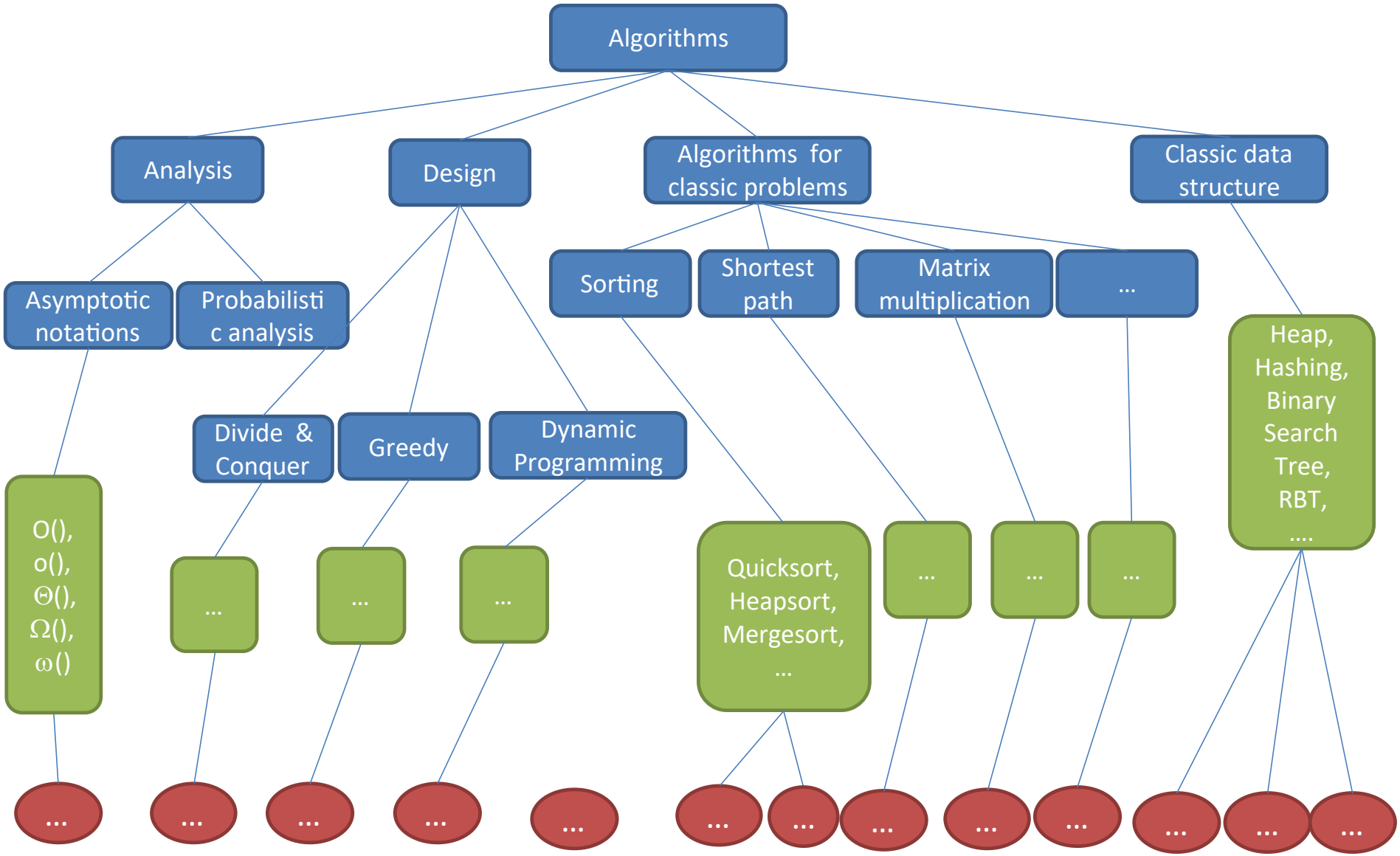
Knowledge tree



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()
- Θ()
- Ω()
- ω()