CSE-217: Theory of Computation

Introduction

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Overview

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Three traditionally central areas of the theory of computation

- Automata
- Computability
- Complexity

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- Computability
- Complexity

What are the fundamental capabilities and limitations of computers?

Complexity Theory

Computer problems come in different varieties

- Easy
- Hard

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Computer problems come in different varieties

- Easy
- Hard

`What makes some problems computationally hard and others easy?`

Comparability Theory

Again Computer problems come in different varieties

- Solvable
- Unsolvable

Comparability Theory

Again Computer problems come in different varieties

- Solvable
- Unsolvable

What makes some problems computationally solvable and others unsolvable?

Complexity Theory vs Comparability Theory

The theories of computability and complexity are closely related. In complexity theory, the objective is to classify problems as easy ones and hard ones, whereas in computability theory the classification of problems is by those that are solvable and those that are not. Computability theory introduces several of the concepts used in complexity theory.

Automata Theory

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Example 1

The Finite Automaton
used in text processing, compilers, and hardware design.

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The Finite Automaton
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Example 2

The Context-Free Grammar
used in programming languages and artificial intelligence.

Thank You