Algorithms

Overview

Algorithms

- A generic recipe for computation

  - Should work on broad category of computers

    - E.g. Algorithms for quantum computers, biological computers are / would be different

Algorithms

- Algorithms $\neq$ Implementation

  - An algorithm can be implemented more or less efficiently

Algorithms

- Correctness

  - Can we prove that the answer given by an algorithm is correct?

    - via Automated proof methods

    - via human reasoning

  - Often involves pseudo-code

Algorithms

- Correctness of Implementation

  - Formal methods

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Algorithms

- Performance

  - Needs to be measured independently of implementation

  - Depends on the "instance size"

    - Many problems in CS become proportionally <u>more difficult</u> as they grow

    - Use an "asymptotic" notation to capture behavior as we "scale up"

Impossibility Results

- Can all problems be solved with a computer

  - Depends on the type of computer, but:

    - In a very generic computing model, there are problems that cannot be solved

Impossibility Results

- Are there problems that can become prohibitively expensive?

- Answer: Probably yes. There are classes of problems that become intractable as they scale up