

Algorithms

(Introduction)

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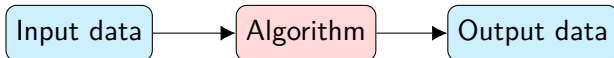
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What is an algorithm? What is a data structure?

Definition

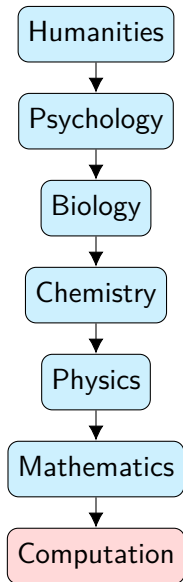
- An **algorithm** is a step-by-step procedure to solve a problem in a finite amount of time.
- A **data structure** is a systematic way of storing, organizing, modifying, and accessing data.
(Good data structures help in designing good algorithms.)



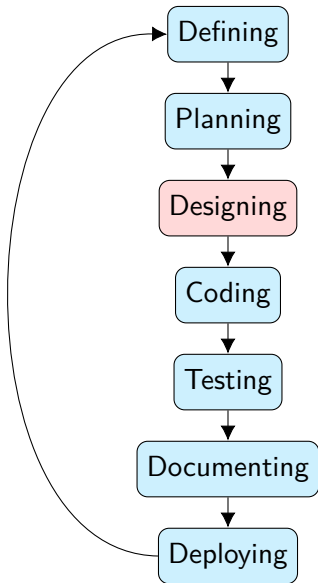
Why learn algorithms? (Applications)

Field/application	Algorithms
Google Search	Ranking/relevance algorithms
Internet routing/Google Maps	Shortest path algorithms
Secure emails/ecommerce	Cryptographic algorithms
Pharmaceuticals	Computational biology algorithms
Movie graphics	Geometric algorithms
Stock market prediction	Machine learning algorithms
Image processing	Computer vision algorithms
Amazon/Netflix/Facebook	Recommendation algorithms
IBM Watson	Artificial intelligence algorithms
Companies/banks/hospitals	Database algorithms
Physics/chemistry/biology	Simulation algorithms
Compilers	Automata algorithms
Evolution	Evolutionary algorithms
Cooking	Cooking algorithms (recipes)

Why learn algorithms? (Understanding universe)



Why learn algorithms? (Designing software)



Why learn algorithms? (Good programming)

Good computer program = Good algorithm
+ Good data structure
+ Good programming language
+ Good coding

What is the measure of goodness of algorithms?

- Correctness
- Running time
- Space-efficiency
- Clarity
- Functionality
- Modularity
- Generality
- Reliability
- Maintainability
- Robustness
- Testability
- Debuggability
- Usability
- Energy-efficiency

Data structures

