

Welcome

CSCI 345
Data Structures and Algorithms
Wheaton College
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Spring 2023

1. The correctness of an algorithm can be verified formally using loop invariants and other proof techniques and empirically using unit tests.
2. The efficiency of an algorithm can be measured formally using algorithmic analysis, big-oh categories, etc, and empirically by running experiments.
3. Abstract data types, especially list, stack, queue, set, bag, and map, are specified by how they are used; data structures, such as arrays, linked lists, binary trees, and hash tables, are implementation strategies, each with trade-offs.
4. Searching in an unordered data structure such as a map can be done in logarithmic time using a balanced binary search tree .
5. Searching in an unordered data structure can be done in constant time using a hash table.
6. Problems with overlapping subproblems and optimal substructure can be solved efficiently using dynamic programming.

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2. The efficiency of an algorithm can be measured formally using algorithmic analysis, big-oh categories, etc, and empirically by running experiments.

	formally		empirically
Correctness , verified	by invariants and correctness proofs	<i>and</i>	by unit tests
Efficiency , measured	by big-oh categories and related notation	<i>and</i>	by experiments

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ADTs

List

Set

Map

Stack

Queue

Bag

Data structures

Array

Linked list and other linked structures

Binary search tree

Hash table

The quest for the more efficient map

4. Searching in an unordered data structure such as a map can be done in logarithmic time using a balanced binary search tree .
5. Searching in an unordered data structure can be done in constant time using a hash table.

6. Problems with overlapping subproblems and optimal substructure can be solved efficiently using dynamic programming.

Other smaller topics: Sorting algorithms, graph algorithms, string algorithms, regular expressions, ...

Coming up:

*Do the **pretest** project (by Wednesday, Jan 11)*

*Due **Wednesday, Jan 11** (class time)*

Read Section 1.1

*Due **Wednesday Jan 18** (end of day)*

Read Section 1.2 (long section—spread it out)

Do Exercises 1.(6 & 7)

Take quiz