

## Lecture 2: Data Structures

American Computer Science League, February Contest

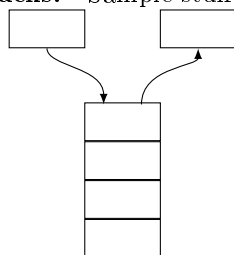
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In the modern era where data is being produced at a rapidly increasing pace<sup>1</sup> and being used for ever-increasing applications<sup>2</sup>, we need fast ways of storing data. Ideally, we could develop one data structure to hold all types of data and perform all operations in the quickest time possible, however, such a structure is currently nonexistent. Instead, computer scientists need to be able to determine what data structures to use in their specific problem.

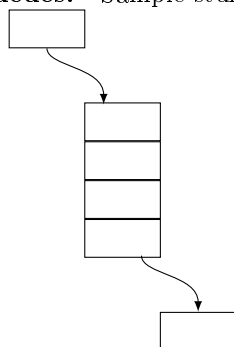
For the purposes of ACSL, we will be studying four data structures in the following lecture: stacks, queues, binary search trees, and heaps/priority queues. We will go through what each of them are, how they operate, operations you can do on them, and the runtime complexity for each operation. Hopefully, you will find the complexity analysis to be an interesting intellectual endeavor. If not, you will end up seeing this stuff a lot more in intermediate–advanced CS classes in college and in job interviews, so it's a good idea to start now.

**Basics on runtime.** Sample stuff

**Stacks.** Sample stuff.



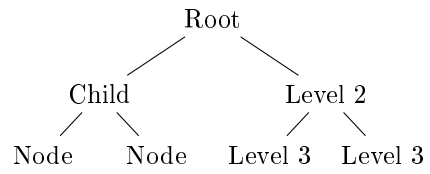
**Queues.** Sample stuff.



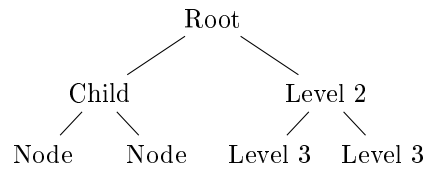
**Binary search trees.** Sample stuff.

<sup>1</sup>With the Internet of Things, everything from a lightbulb to your car is generating data.

<sup>2</sup>With Machine Learning, data-driven services like Google Translate and FaceID reach billions of users each day



**Heaps/priority queues** Sample stuff.



## 1 Exercises

1.

## 2 Solutions

1.