CSCI 241

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Trees: Motivation

Goals

Understand some of the uses for trees:

- To model hierarchical data.

- To implement abstract data types.
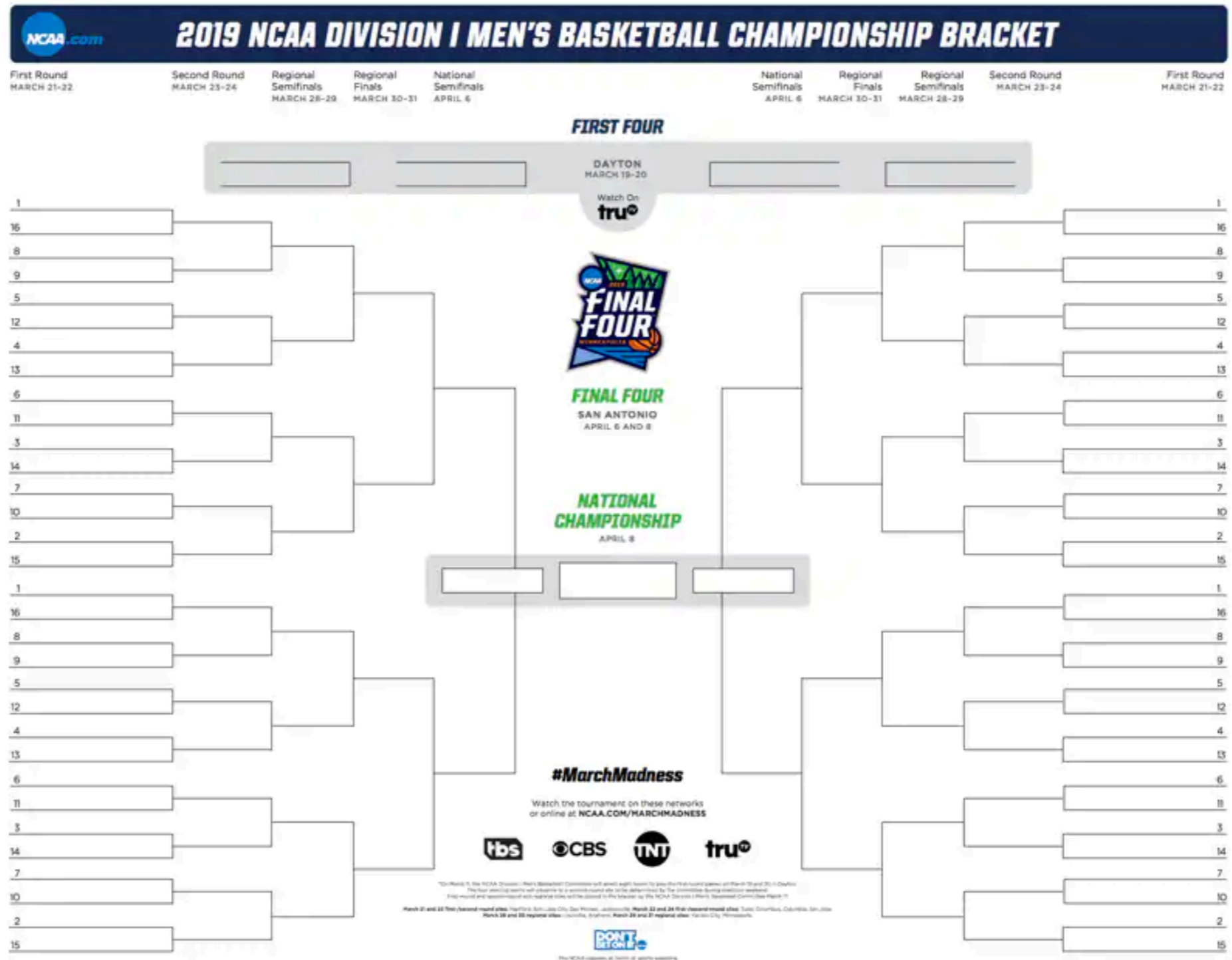
Trees in computer science

Why do we need these?

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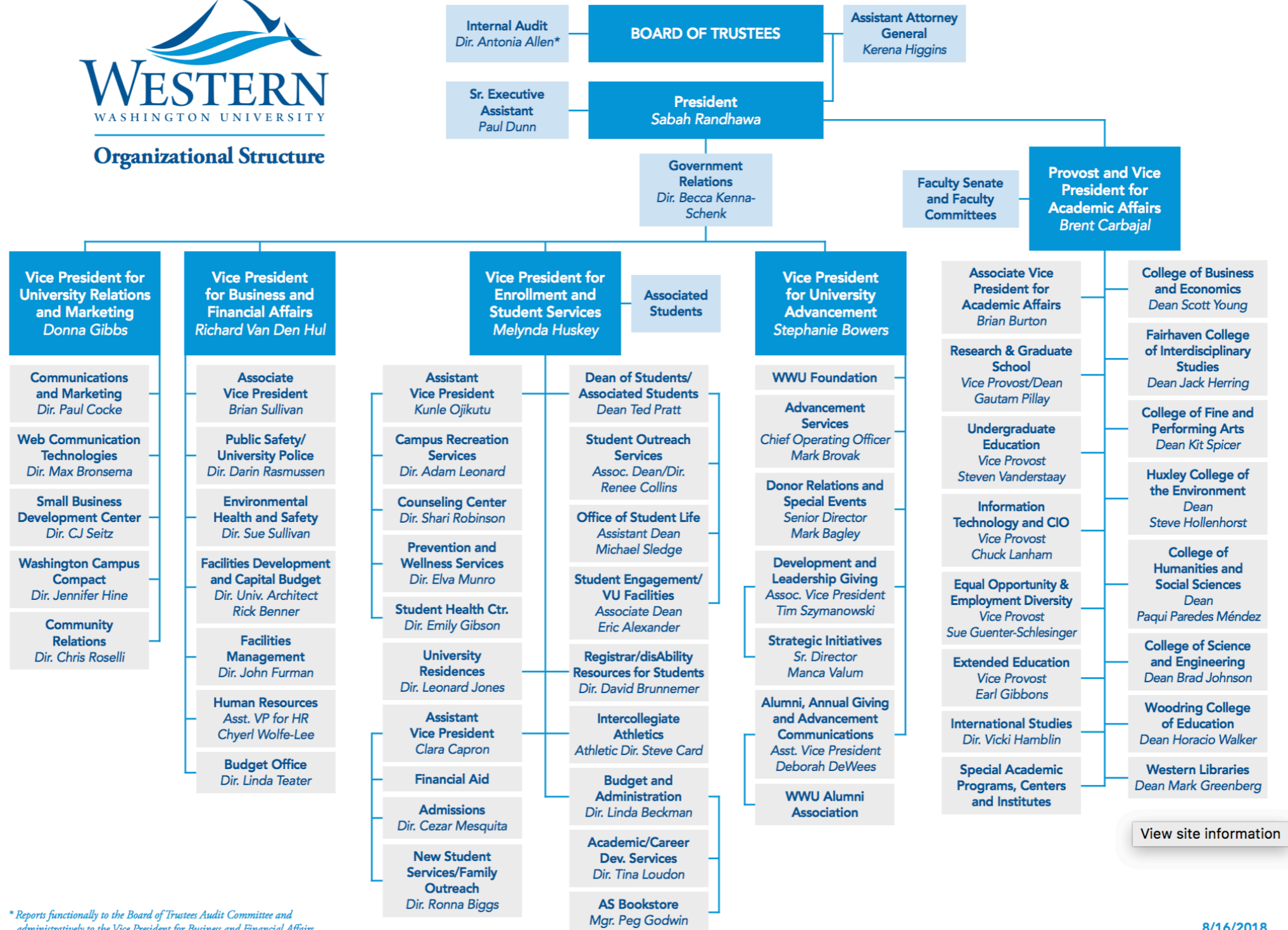1. to represent **hierarchical structure**.

Why do we need these?

1. to represent **hierarchical structure**.
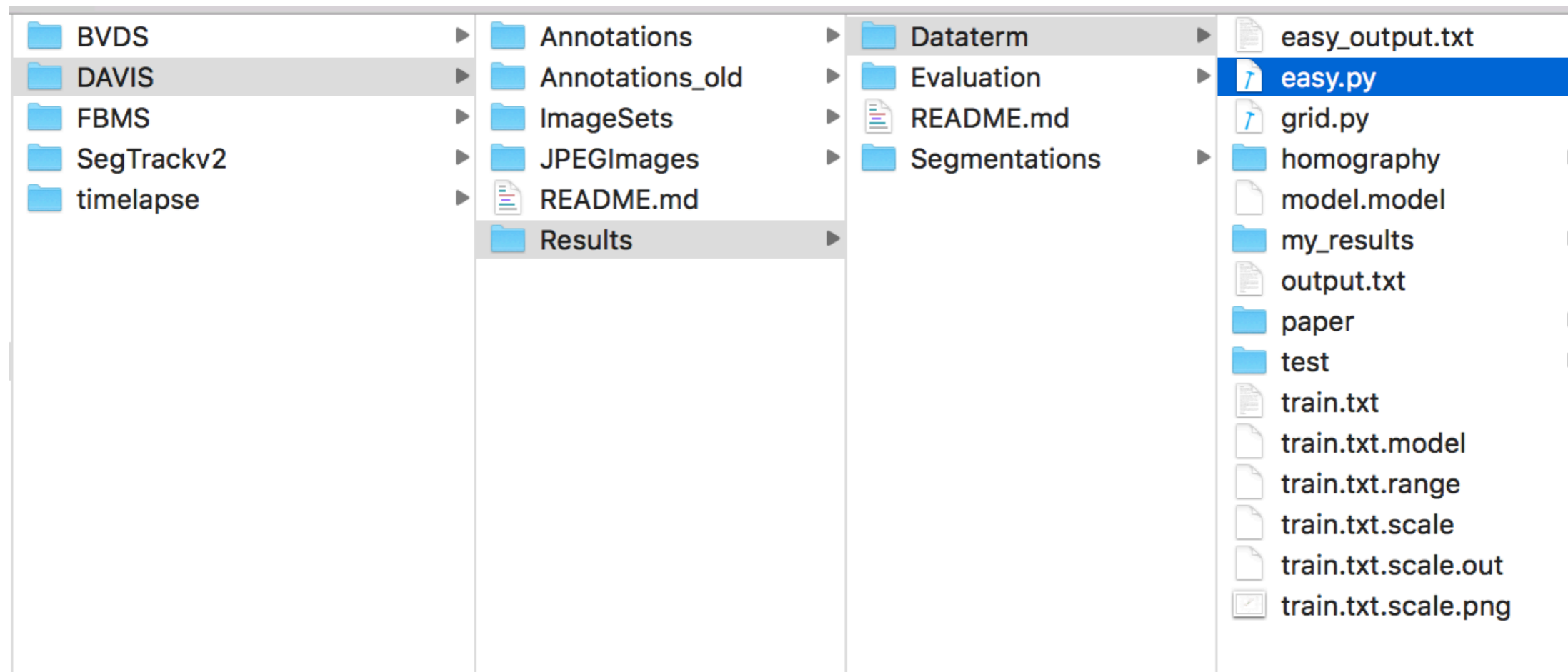
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Syntax Trees:

$$((2+3) + (5+7))$$

- In textual representation, **parentheses** show hierarchical structure

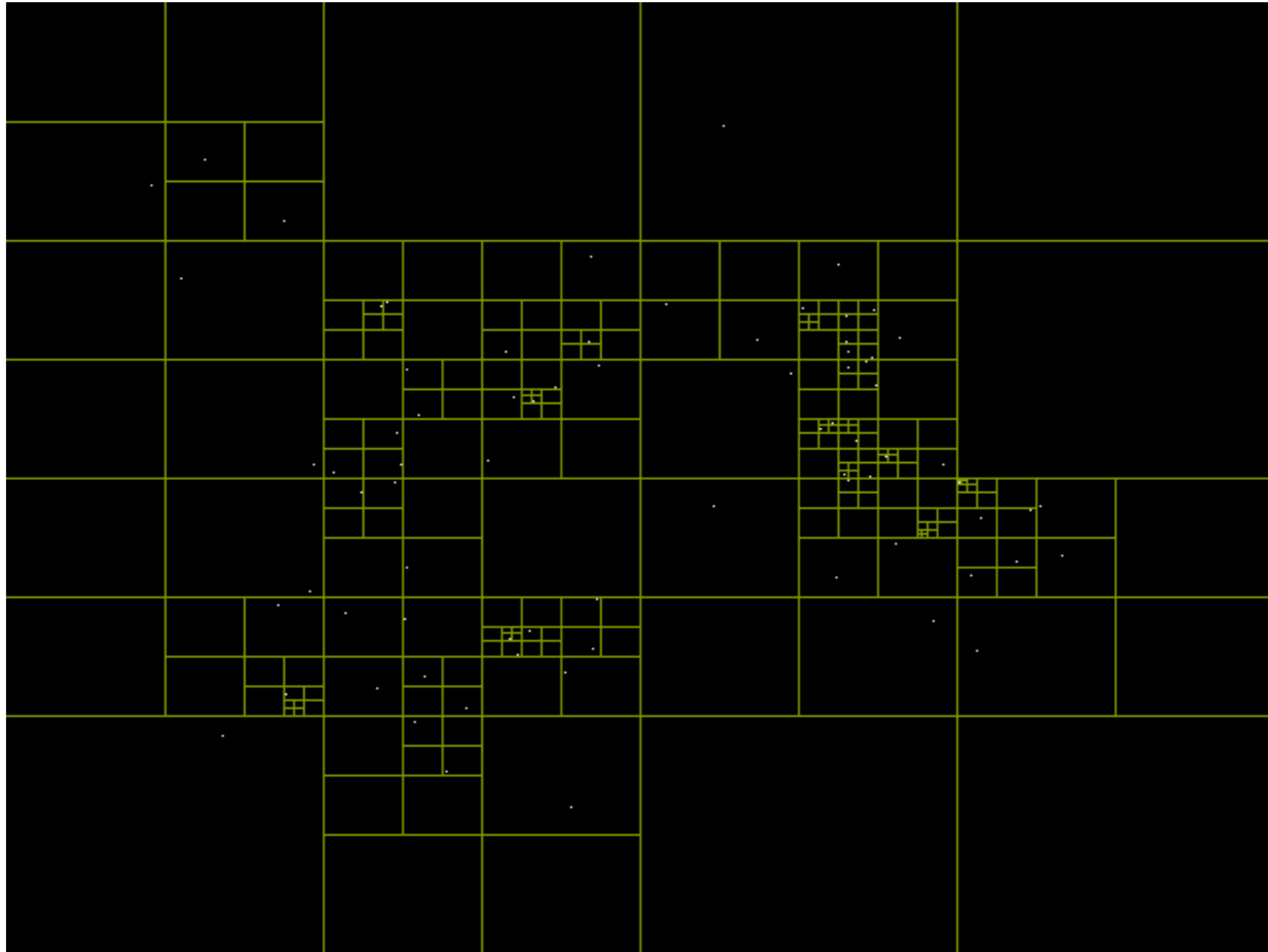- In tree representation, hierarchy is explicit in the tree's **structure**
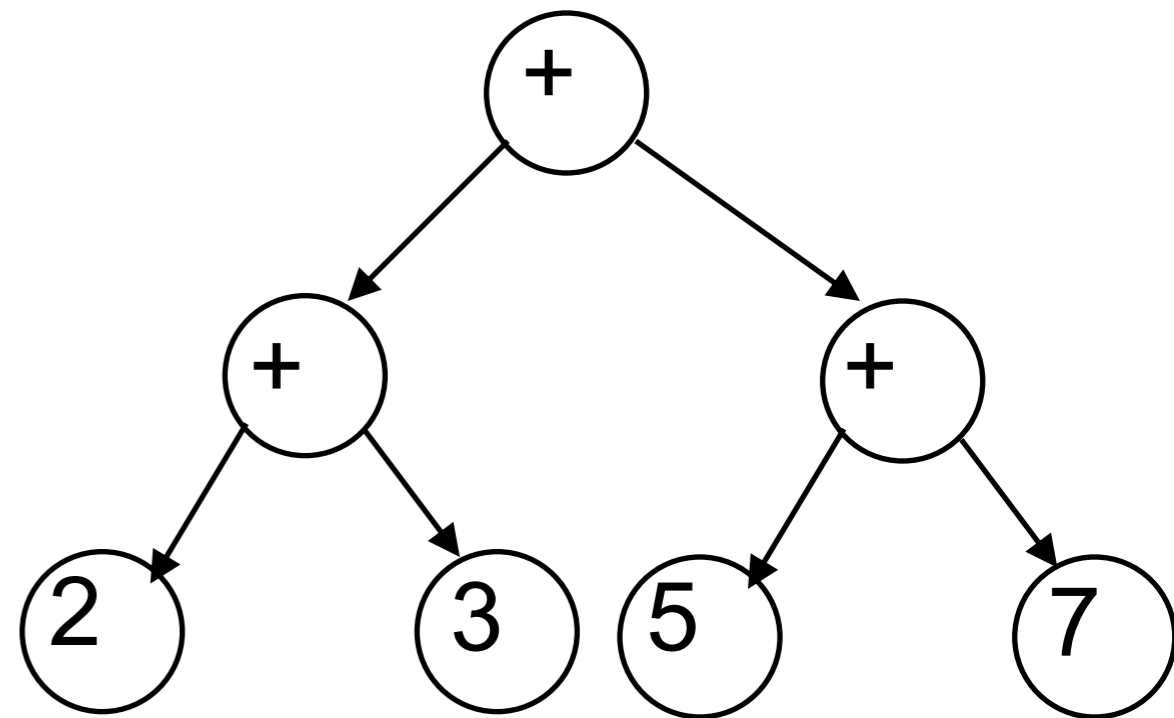
Also used for **natural languages** and **programming languages**!

Why do we need these?

1. to represent **hierarchical structure**.

Quadtrees for **collision detection** in graphics and simulation

Why do we need these?

2. to implement various ADTs **efficiently**.

Tree**Set**, Tree**Map**

The height of a balanced binary tree is O(log n)

Consequence: Many operations (find, insert, …) can be done in **O(log n)** in *carefully-designed* trees.