CSCI 136
Data Structures &
Advanced Programming

Williams College

Linear Structures

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- General idea: we impose *access restrictions* on our data structure, disallowing add/remove/access at arbitrary indices
  - **No** `get(int i)`, `set(int i, E value)`
  - **No** `add(int i)`, `remove(int i)`
- Insight: By limiting access, we can actually gain some utility—linear structures are useful building blocks with important use cases!

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Examples: Dining Hall

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- LIFO: Last In – First Out (Stack)
  - Pile of plates or cups at dining hall

Examples: Computer Science

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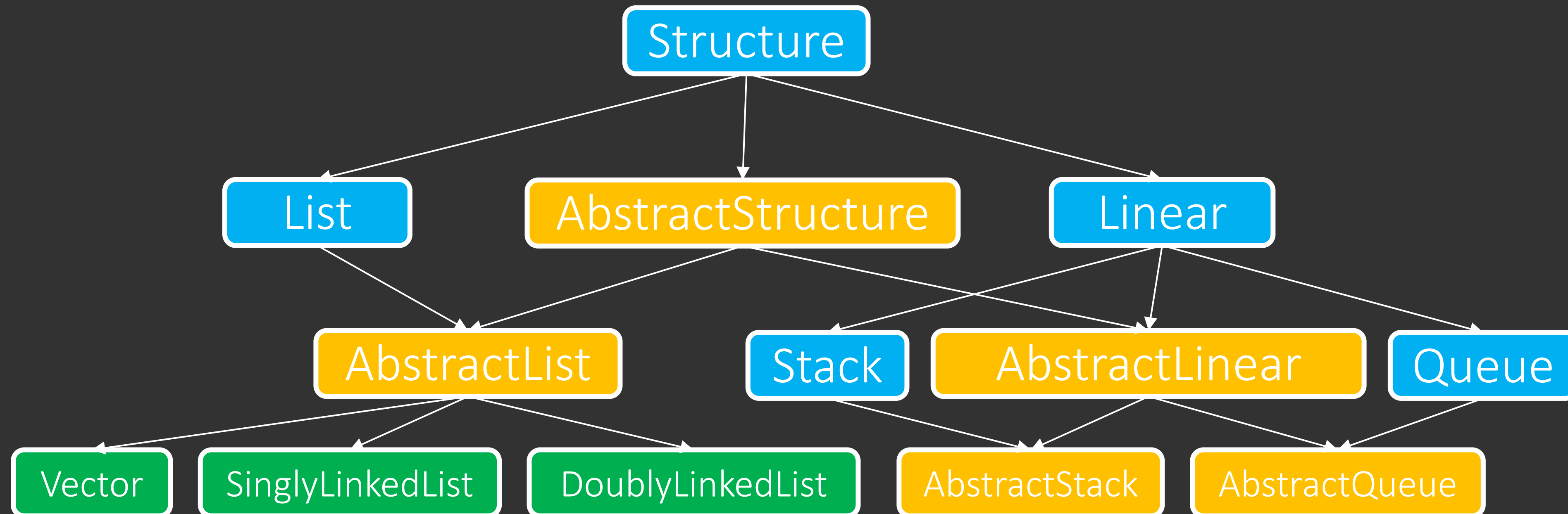
The Structure5 Universe (+ Linear!)



Quick Note about Terminology

- Note: `Stack` interface *extends* `Linear` interface
  - Interfaces *extend* other interfaces
  - Classes *implement* interfaces
- If you look at the structure5 documentation for Linear, you will see:
  - A list of superinterfaces
  - A list of subinterfaces
  - A list of implementing classes

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    - `size()`, `isEmpty()`, `clear()`, `contains(E val)`, …
  - Adds new methods
    - `E get()` – Preview the *next* object to be removed.
    - `E remove()` – Remove the *next* value from the structure.
    - `boolean empty()` – same as `isEmpty()`

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  - `peek` = look at top of stack (do not remove)

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  - Reimplement “stripped down” versions of those structures (same underlying organization) simplified

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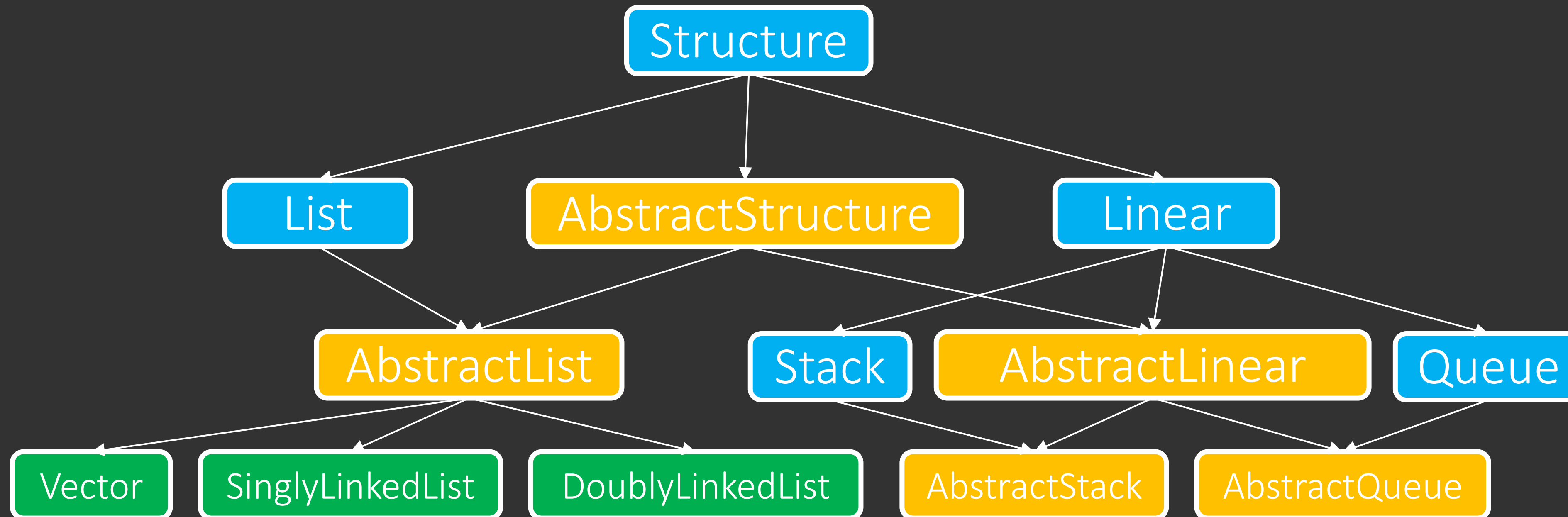
Abstract Class

Class



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  - Essentially introduces "stack-ish" names for linear methods
    - `push(E val)` is `add(E val)`
    - `pop()` is `remove()`
    - `peek()` is `get()`

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    - A singly-linked list with add/remove at `head`
  - For each, we implement `add`, `empty`, `get`, `remove`, `size` directly
    - `push`, `pop`, `peek` are indirectly implemented by abstract class

The Structure5 Universe (+ Stacks!)

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