LEC 15

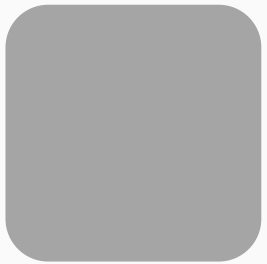
CSE 122

Collections

Questions during Class?

Raise hand or send here

sli.do #cse122



BEFORE WE START

Talk to your neighbors:

Or better yet, talk to your friends/roommates, since you're likely at home!

Instructors Elba Garza

TAs Abigail, Ambika, Arthur, Atharva, Autumn, Ayush, Chaafen, Chloë, Claire, Colin, Elizabeth, Helena, Jacob, Jasmine, Jaylyn, Kavya, Kevin, Kyle, Marcus, Megana, Mia, Poojitha, Rishi, Rohini, Rucha, Saivi, Shananda, Shivani, Shreya, Smriti, Steven, Zane

Lecture Outline

- Announcements
- Optional
- Recap of Collections
- Dumb Data Structures
- Collections

Announcements

- Resubmission Cycle 5 (R5) out; due November 21st by 11:59 PM
- Programming Assignment 3 (P3) out tonight!
  - Due November 27th by 11:59 PM
  - Note IPL will be **very limited** next week; plan accordingly
- Quiz 2 **delayed** to November 28th
  - No quiz section on November 21st! 🦃
- Lecture on November 22nd, however. 🦃
  - If you come to class, I'll bring snacks!
- Reminder on Final Exam: **Tuesday, December 12th 12:30 – 2:20 PM**

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Optional

`Optional` is a Java class that is used to handle situations where a value is *sometimes* there.

Like a collection, Optional uses <> to denote the type it contains..

e.g., `Optional<String>, Optional<Integer>, Optional<Point>`

Optional Methods

Method	Description
`Optional.empty()`	Creates an empty `Optional` object
`Optional.of(…)`	Creates an `Optional` object holding the object it's given
`isEmpty()`	Returns `true` if there *is no* value stored, and `false` otherwise
`isPresent()`	Returns `true` if there *is* a value stored, and `false` otherwise
`get()`	Returns the stored object from the `Optional` (if one is stored; otherwise throws a `NoSuchElementException`)

The Optional class has more than just these methods, but these are what you'll need to focus on for this class!

Optional Methods

`isEmpty()`, `isPresent()`, and `get()` are called like normal instance methods (on an actual instance of `Optional`).

`Optional.of(…)` and `Optional.empty()` are called differently

(Like the `Math` class methods)

Why Optional?

Using `Optional` can help programmers avoid `NullPointerExceptions` by making it explicit when a variable may or may not contain a value.

- Remember – `null` refers to the absence of an object!

There are other `Optional` methods (that you should explore in your own time if you're interested) that can be really useful to cleanly work with data that may or may not be present.

Student / Course Example one more time…

Let's add two more methods to `Course.java`:

```
public void setCourseEvalLink(String url)

public Optional<String> getCourseEvalLink()
```

The link to the evaluations for a course doesn't usually exist until the last few weeks of the quarter. What if a client calls `getCourseEvalLink` before one is set up?

`Optional` to the rescue!

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- **Recap of Collections**
- Dumb Data Structures
- Collections

Goal for Today

Review some of the data structures we've talked about this quarter

Understand how Java organizes them with *interfaces*

Collections: What *classes* have we seen so far?

…

Collections: What *interfaces* have we seen so far?

…

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Dumb Data Structures

We're going to create our own versions of these classes so we can dig into how they all relate to each other!

BUT they're going to be real dumb.

If you want to get a sense of how they're *actually* implemented, go take CSE 123!

DumbArrayIntList

```
DumbArrayIntList()
add(int value)
add(int index, int value)
contains(int value)
isEmpty()
get(int index)

set(int index, int value)
remove(int index)
size()
indexOf(int value)
toString()
```

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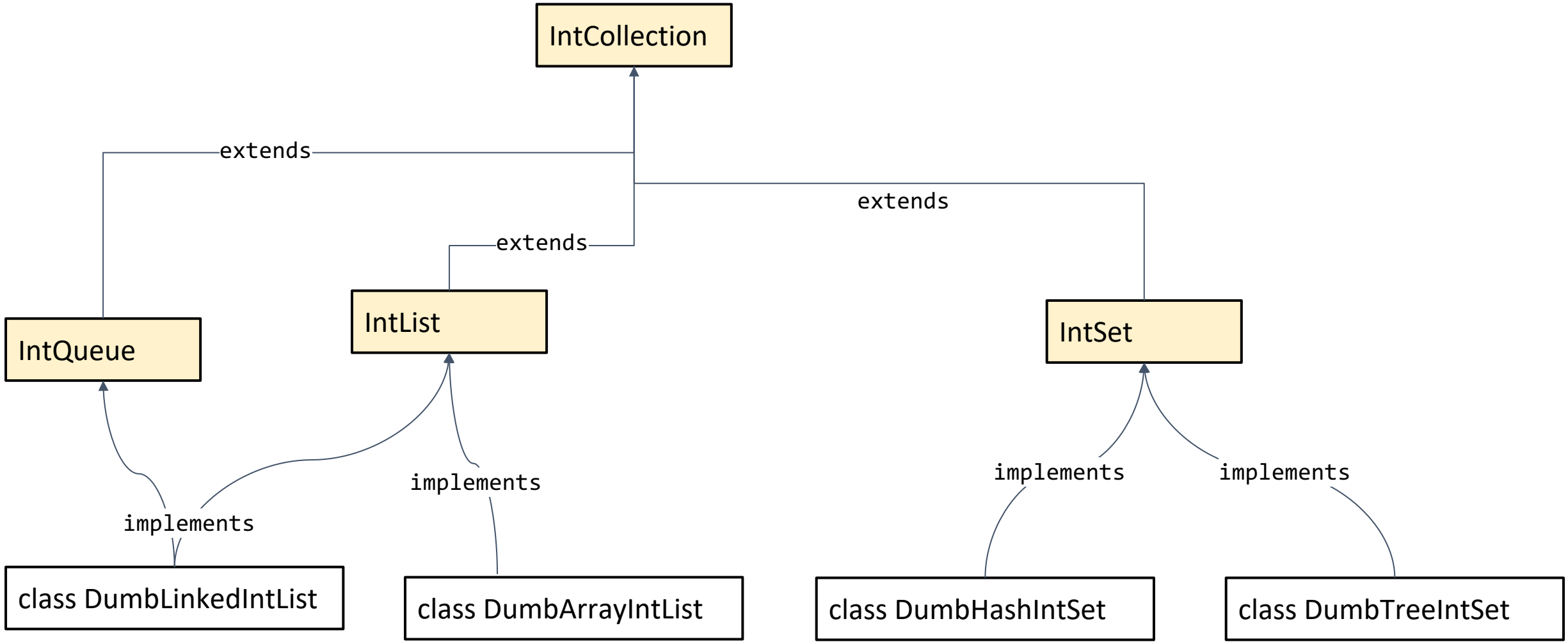
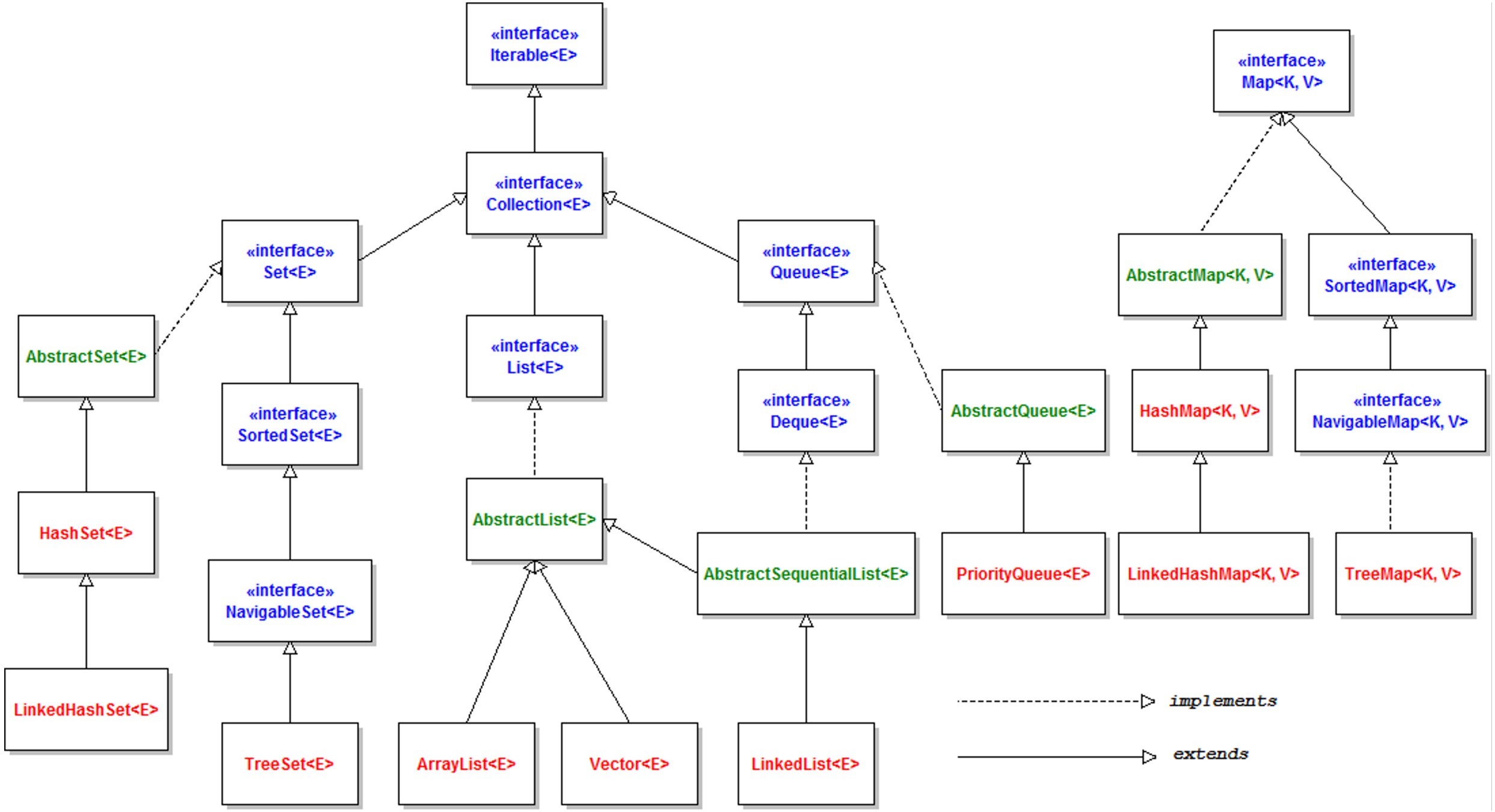
IntCollection Relationships




«interface»
Iterable<E>
«interface»
Collection<E>
«interface»
Set<E>
«interface»
List<E>
«interface»
Queue<E>
AbstractSet<E>
«interface»
SortedSet<E>
«interface»
NavigableSet<E>
AbstractList<E>
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Deque<E>
AbstractSequentialList<E>
HashSet<E>
LinkedHashSet<E>
TreeSet<E>
ArrayList<E>
Vector<E>
LinkedList<E>
AbstractQueue<E>
PriorityQueue<E>
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AbstractMap<K, V>
«interface»
SortedMap<K, V>
HashMap<K, V>
«interface»
NavigableMap<K, V>
LinkedHashMap<K, V>
TreeMap<K, V>
implements
extends