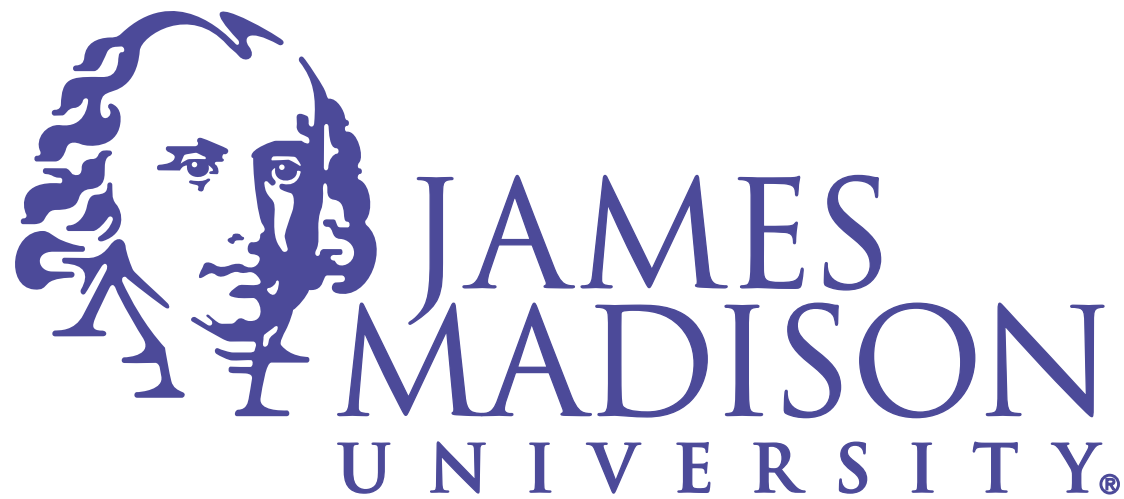


CS 240: Data Structures

Course Introduction

Prof. Michael S. Kirkpatrick
August 2019



From types to data structures

- What is a...?
 - Type
 - Data type
 - Abstract data type (ADT)
 - Data structure

Why you should care

- Separate implementation from interface...

```
List<String> list
```

```
= new LinkedList<String>();
```

```
for (int i = 0; i < 200000; i++) {  
    list.add(0, "A");  
}
```

```
for (int i = 0; i < 200000; i++) {  
    list.remove(0);  
}
```

0.9 seconds

```
List<String> list
```

```
= new ArrayList<String>();
```

```
for (int i = 0; i < 200000; i++) {  
    list.add(0, "A");  
}
```

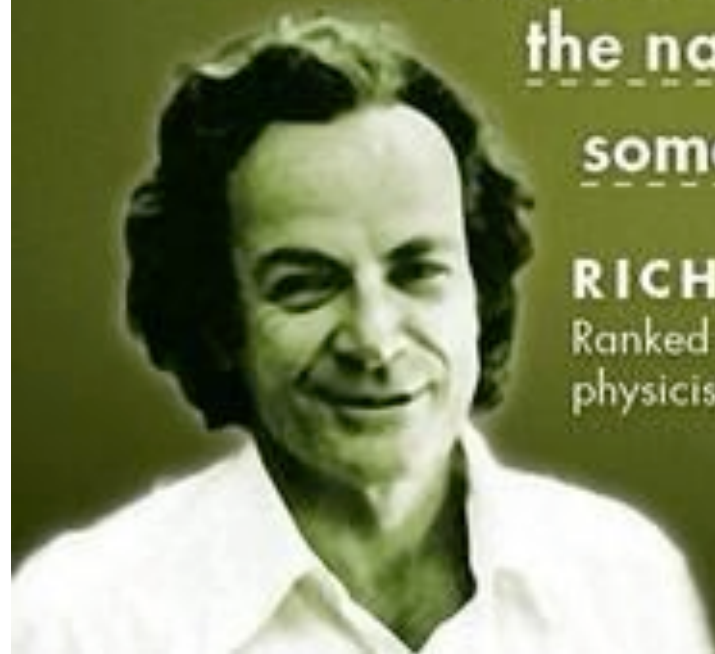
```
for (int i = 0; i < 200000; i++) {  
    list.remove(0);  
}
```

10.2 seconds

Sorting performance

Language	Exec method	Optimization	BSort time
C	Compiled	None	2468 ns

»YOU CAN KNOW the name
of a bird in all the languages of the world,
but when you're finished, you'll know
absolutely nothing whatever about the bird.
So let's look at the bird and see what it's
doing — that's what counts. I learned very
early the difference between knowing
the name of something and knowing
something.«



RICHARD P. FEYNMAN

Ranked as one of the ten greatest
physicists of all time

If you can't code
it, you don't
understand it.

What you can expect

- OpenDSA readings on Canvas + daily warm-up question

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- A lot of in-class participation
 - Peer Instruction with Socrative
 - Worksheets and labs



What you can expect

- OpenDSA readings on Canvas + daily warm-up question
- A lot of in-class participation
 - Peer Instruction with Socrative
 - Worksheets and labs
- Homework & metacognitive reflections
- Projects and analysis papers
- In-class exams



Peer Instruction

- Shift in responsibilities
 - Me: pose problems for your exploration
 - You: take control of learning

Peer Instruction

- Shift in responsibilities
 - Me: pose problems for your exploration
 - You: take control of learning
- Good discussions
 - Take turns and discuss all options
 - Verbalize your answers even if you agree
 - "So what I think you said was, ..."



Effective learning practices



Retrieval practice
Interleaving
Spacing
Elaboration

How to succeed

- Pre-learning: readings and problems



How to succeed

- Pre-learning: readings and problems
- Make gradual progress



How to succeed

- Pre-learning: readings and problems
- Make gradual progress
- Mistakes and frustration



How to succeed

- Pre-learning: readings and problems
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- Deliberative effort and focus

How to succeed

- Pre-learning: readings and problems
- Make gradual progress
- Mistakes and frustration
- Deliberative effort and focus
- Office hours, TAs, Piazza



<https://socrative.com/>
Room: JMUUKIRKPAMS
Name: *Your e-id*

Which of the following would be elements of an ADT specification, and which would be elements of an API specification?

I. `int getValueAtIndex(int index)` throws `IndexOutOfBoundsException`

II. Get operation: given an index, returns the value at that index

A. I is part of an API and II is part of an ADT

B. II is part of an API and I is part of an ADT

C. Both I and II could be part of an API or ADT

D. None of the above

<https://w3.cs.jmu.edu/kirkpams/240/f19>

<https://wiki.cs.jmu.edu/student/start>

