Your Next Week

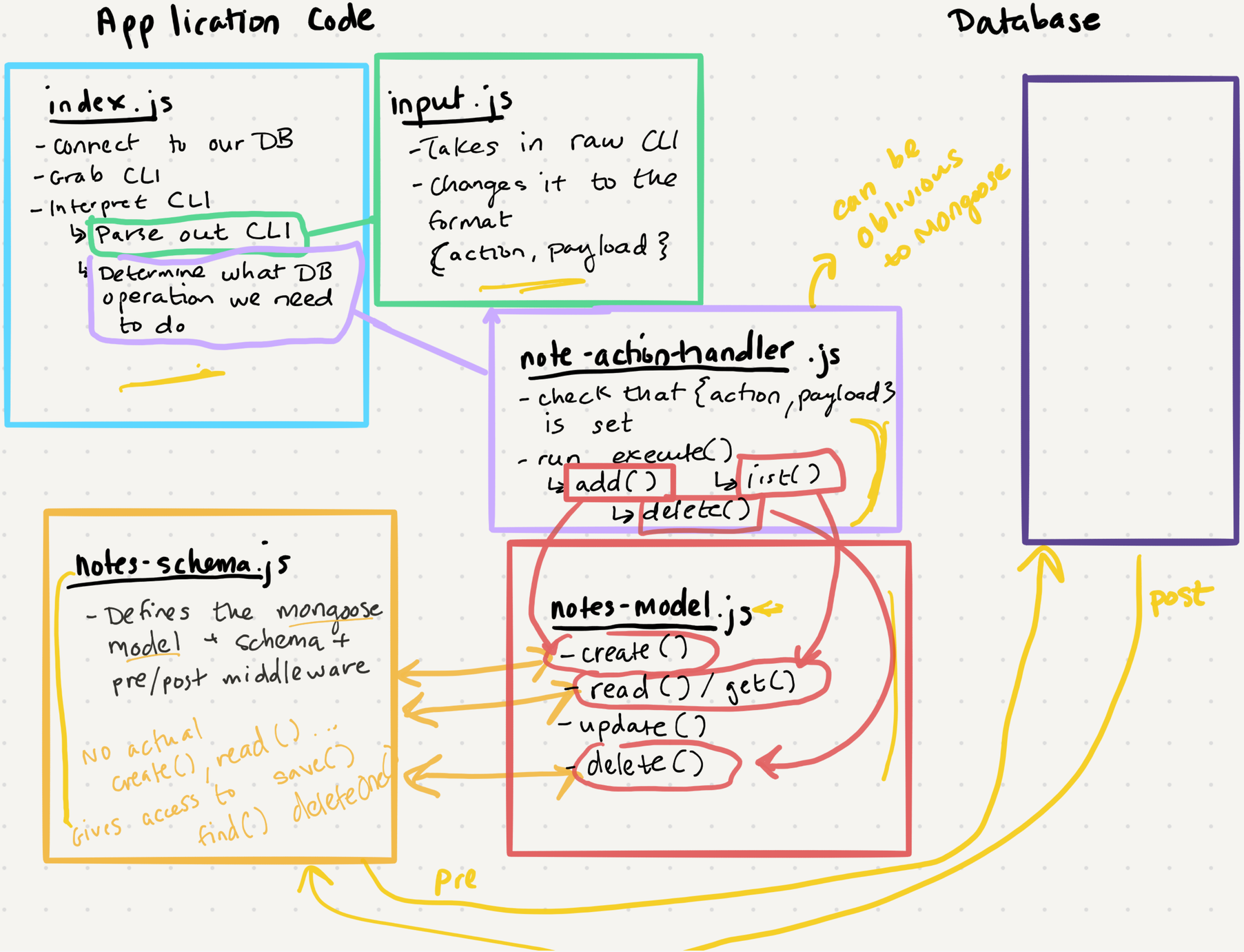
Saturday March 28	Sunday March 29	Monday March 30	Tuesday March 31
9 AM **— DUE ALL PRE-WORK** **— DUE Class 04 Code Challenge** **— DUE Class 04 Lab** **— DUE Class 05 Reading** — Class 05 *MIDNIGHT* **— DUE Class 05 Learning Journal**	*MIDNIGHT* **— DUE Career: Accountability Partners** **— DUE Class 04-05 Feedback**		*6:30 PM* **— DUE Class 05 Lab** **— DUE Class 06 Reading** — Class 06A
Wednesday April 01	**Thursday April 02**	**Friday April 03**	**Saturday April 04**
6:30 PM — Class 06B *MIDNIGHT* **— DUE Class 06 Learning Journal**	*6:30 PM* — Co-working		*9 AM* **— DUE Class 06 Code Challenge** **— DUE Class 06 Lab** **— DUE Class 07 Reading** — Class 07 *MIDNIGHT* **— DUE Class 07 Learning Journal**

Class 05

DSA: Linked Lists + Module 1 Review

seattle-javascript-401n16

Lab 04 Review


Application Code
Database
index.js
- connect to our DB
- Grab CLI
- Interpret CLI
↳ Parse out CLI
↳ Determine what DB operation we need to do
input.js
- Takes in raw CLI
- Changes it to the format {action, payload}
can be oblivious to mongoose
note-action-handler.js
- check that {action, payload} is set
- run execute()
↳ add()
↳ list()
↳ delete()
notes-schema.js
- Defines the mongoose model + schema + pre/post middleware
No actual create(), read()... Gives access to find() deleteOne()
notes-model.js
- create()
- read() / get()
- update()
- delete()
post
Pre

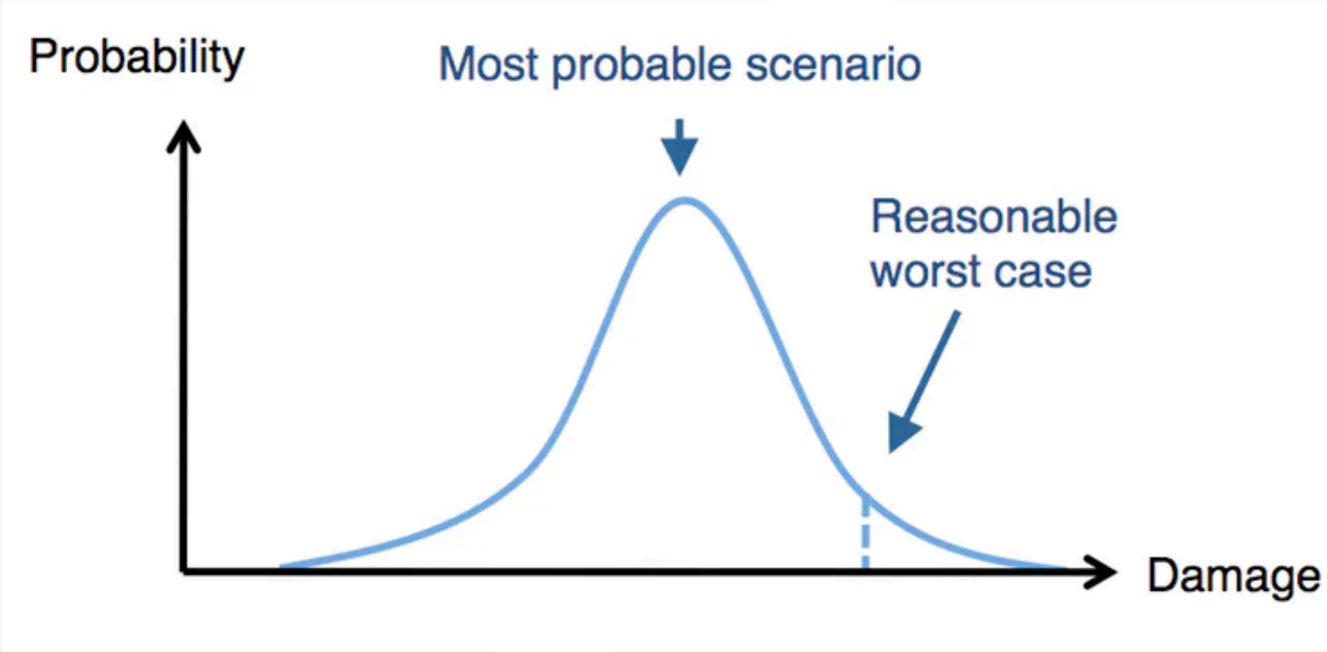
Code Challenge 04
Review

DSA??

- DSA = Data Structures and Algorithms
- **Data structures** define how we store data for easy access, modification, and more!
- **Algorithms** define the most efficient function for doing some process
- Best/most efficient is determined by **Big-O**

Worst Case Says What's Best

- **Big O notation** tells us the worst case scenario
    - "O" = **order/growth rate** of a function
    - What is the longest something will run
    - What is the most space something will take up
- We want to minimize our Big O
    - That's how we know what's efficient

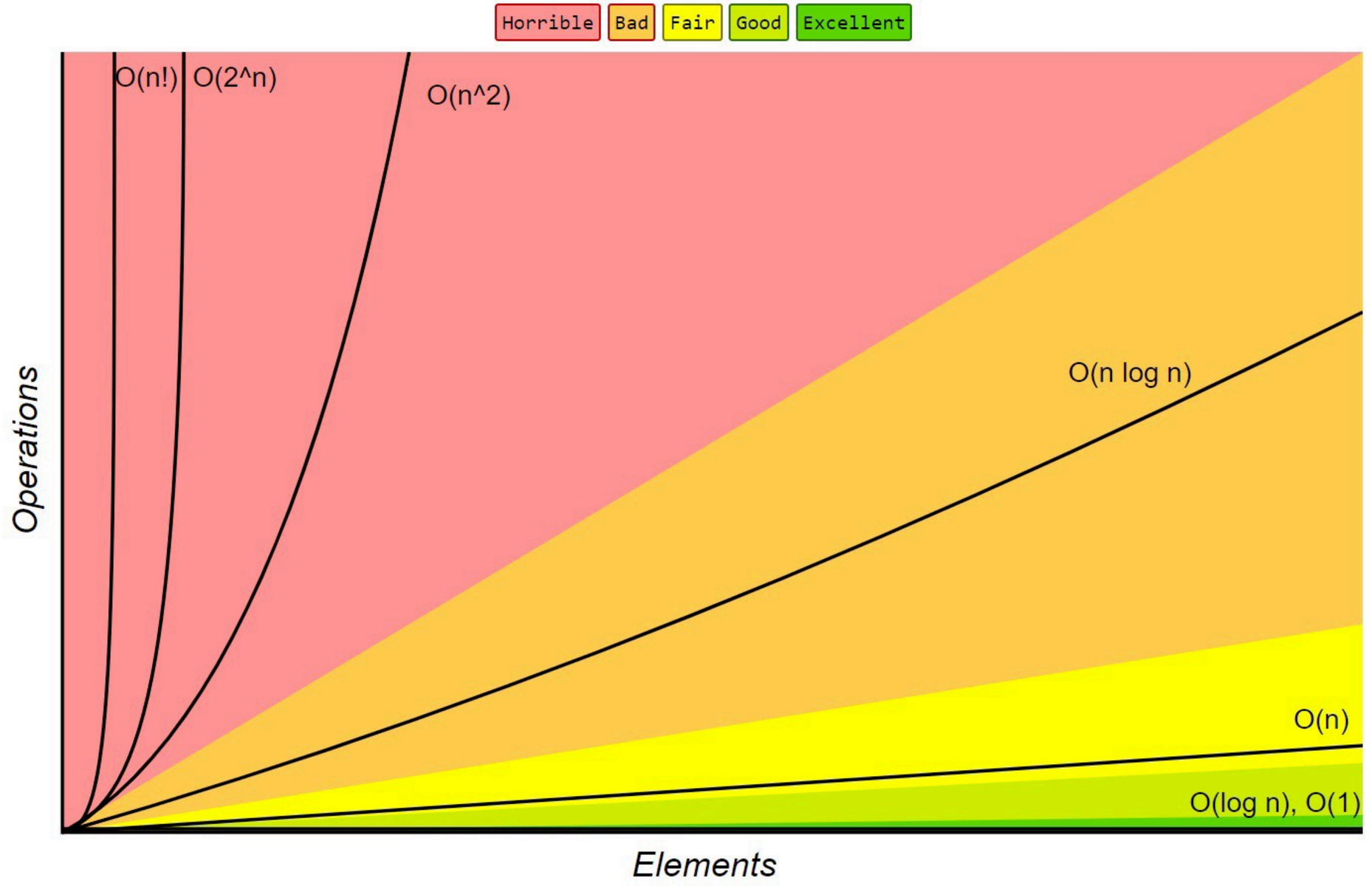


Big-O Is Based On Input Size

- If you had to iterate through an array, how “long” would it take?
    - Array of size 5 >> 5 commands
    - Array of size 100 >> 100 commands
    - Array of size **n** >> n commands
- The size of the input determines the worst case time and space
- `O(n)` >> if there are `n` items, it will take `n` time or `n` space

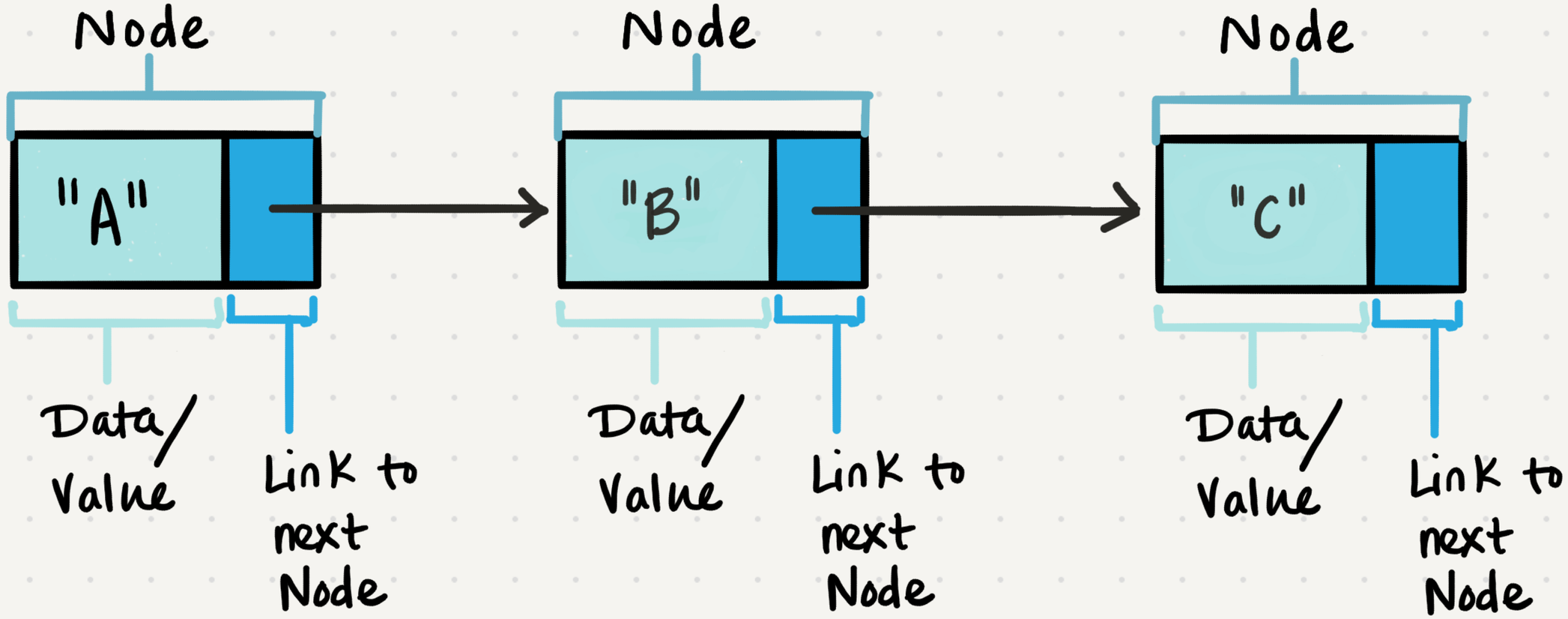
O(1)	😎	Speed doesn't depend on the size of the dataset
O(log n)	😁	10x the data means 2x more time
O(n)	😕	10x the data means 10x more time
O(n log n)	😖	10x the data means about 20x more time
$O(n^{2})$	😫	10x the data take 100x more time
$O(2^{n})$	😱	The dilithium crystals are breaking up!

Big-O Complexity Chart



Linked Lists

- Arrays are very rigid in other languages
- Linked Lists are more old-school and flexible
  - A collection of independent **Nodes**
  - Directions of how to get to the next Node
  - No “hopping around” like in arrays

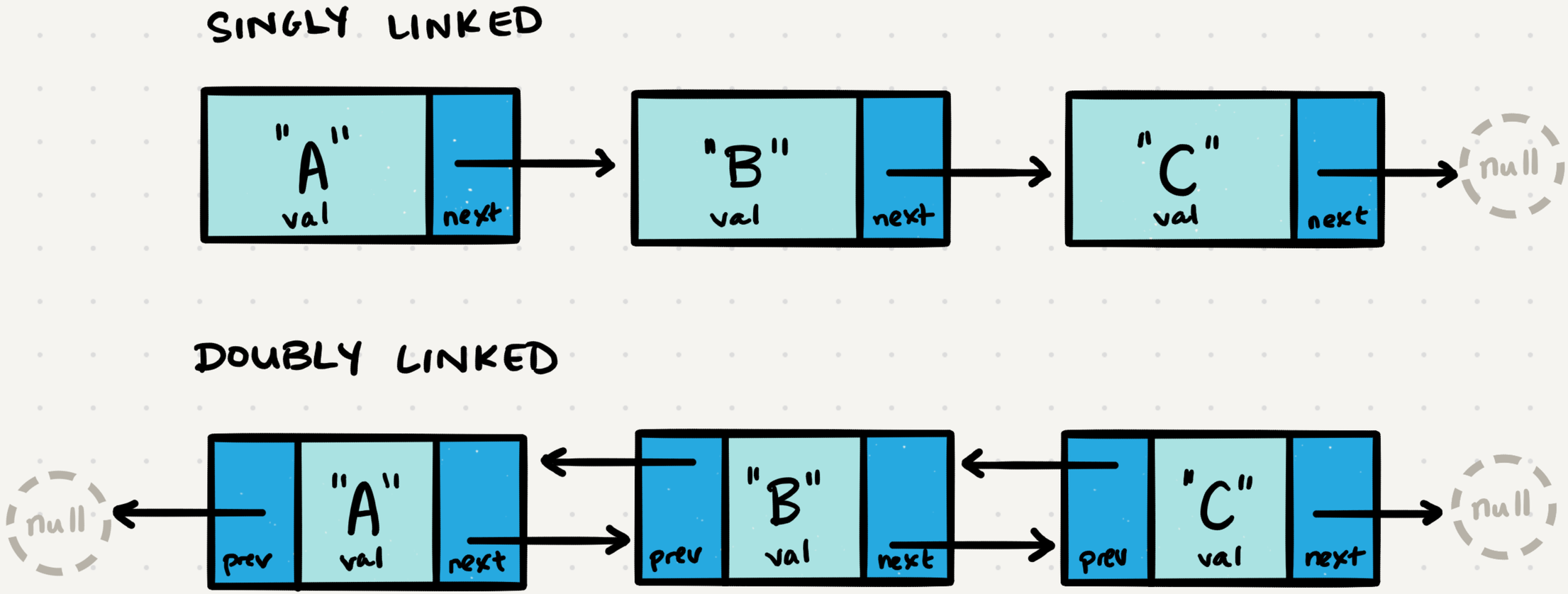

Node
"A"
Data/
Value
Link to
next
Node
Node
"B"
Data/
Value
Link to
next
Node
Node
"C"
Data/
Value
Link to
next
Node

Singly Linked List

- Every Node has two properties:
    - value
    - **next** Node
- Every Singly Linked List keeps track of only the start of the list, called the **head**
- No way to go backwards from a Node, always moving until `next = null`

Doubly Linked List

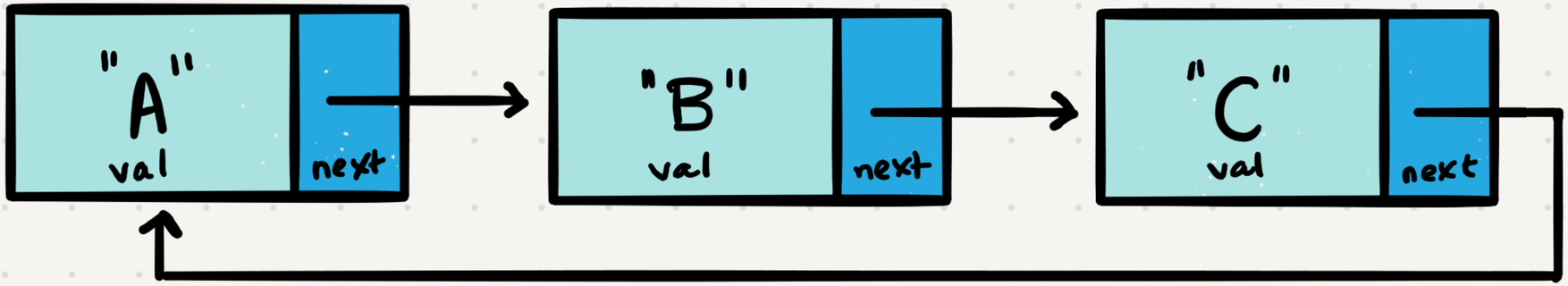
- Every Node has three properties:
    - value
    - **next** Node
    - **prev** Node
- Every Doubly Linked List keeps track of only the start of the list, called the **head**
- You can move forwards or backwards until either `prev=null` or `next = null`


SINGLY LINKED
"A"
val
next
"B"
val
next
"C"
val
next
null
DOUBLY LINKED
null
prev
"A"
val
next
prev
"B"
val
next
prev
"C"
val
next
null

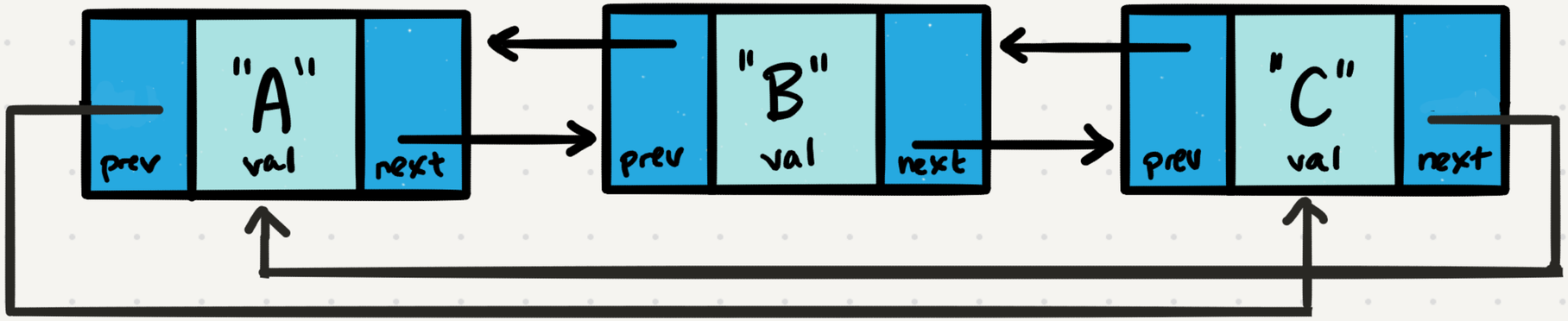
Circular Linked List

- Just an extension of either a singly or doubly linked list
- One Node points back to a previous Node in the list
    - Creates a cycle
    - You can end up looping the list forever!
    - How could you detect this using code?

CIRCULARLY SINGLY LINKED

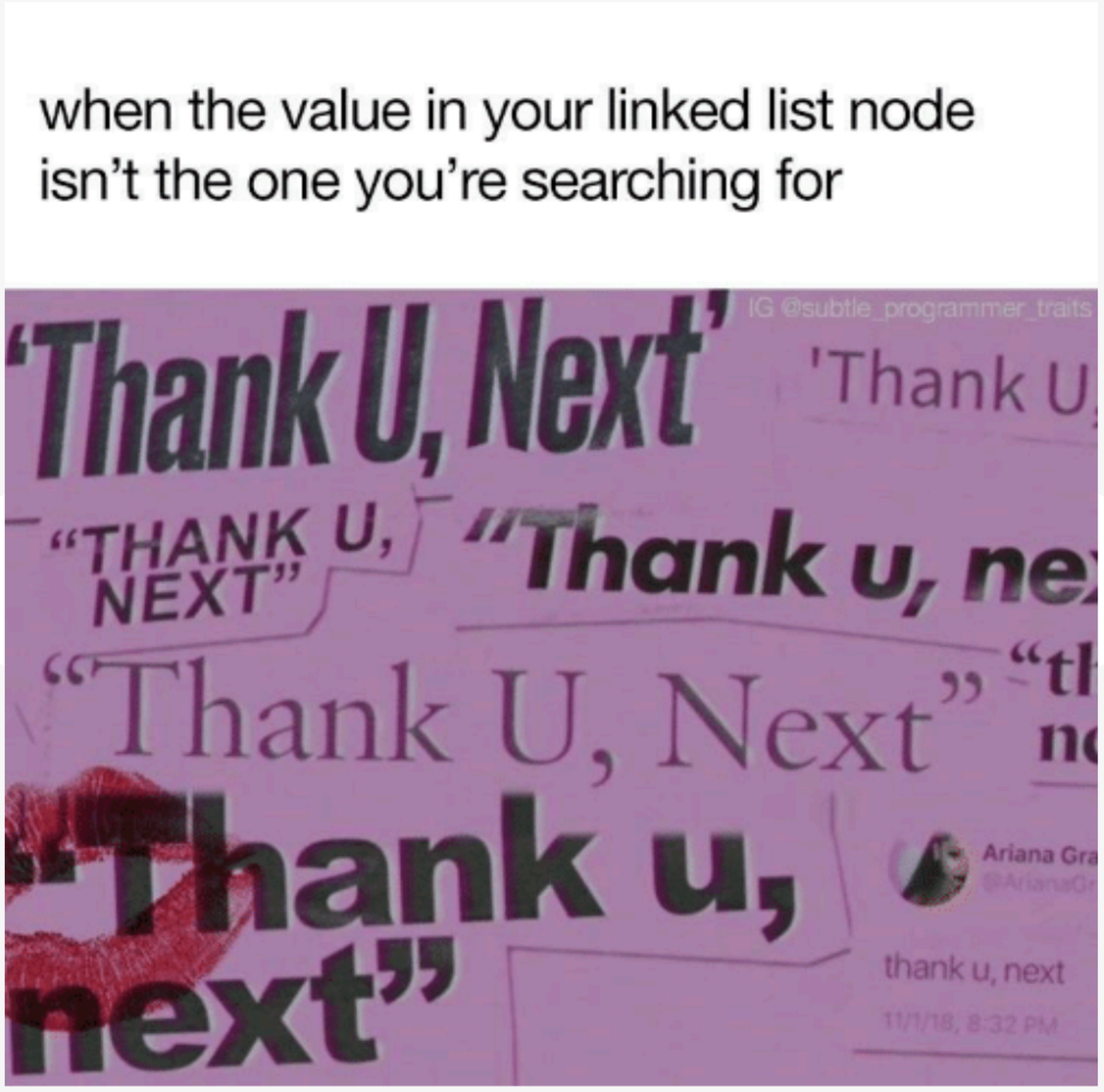


CIRCULARLY DOUBLY LINKED



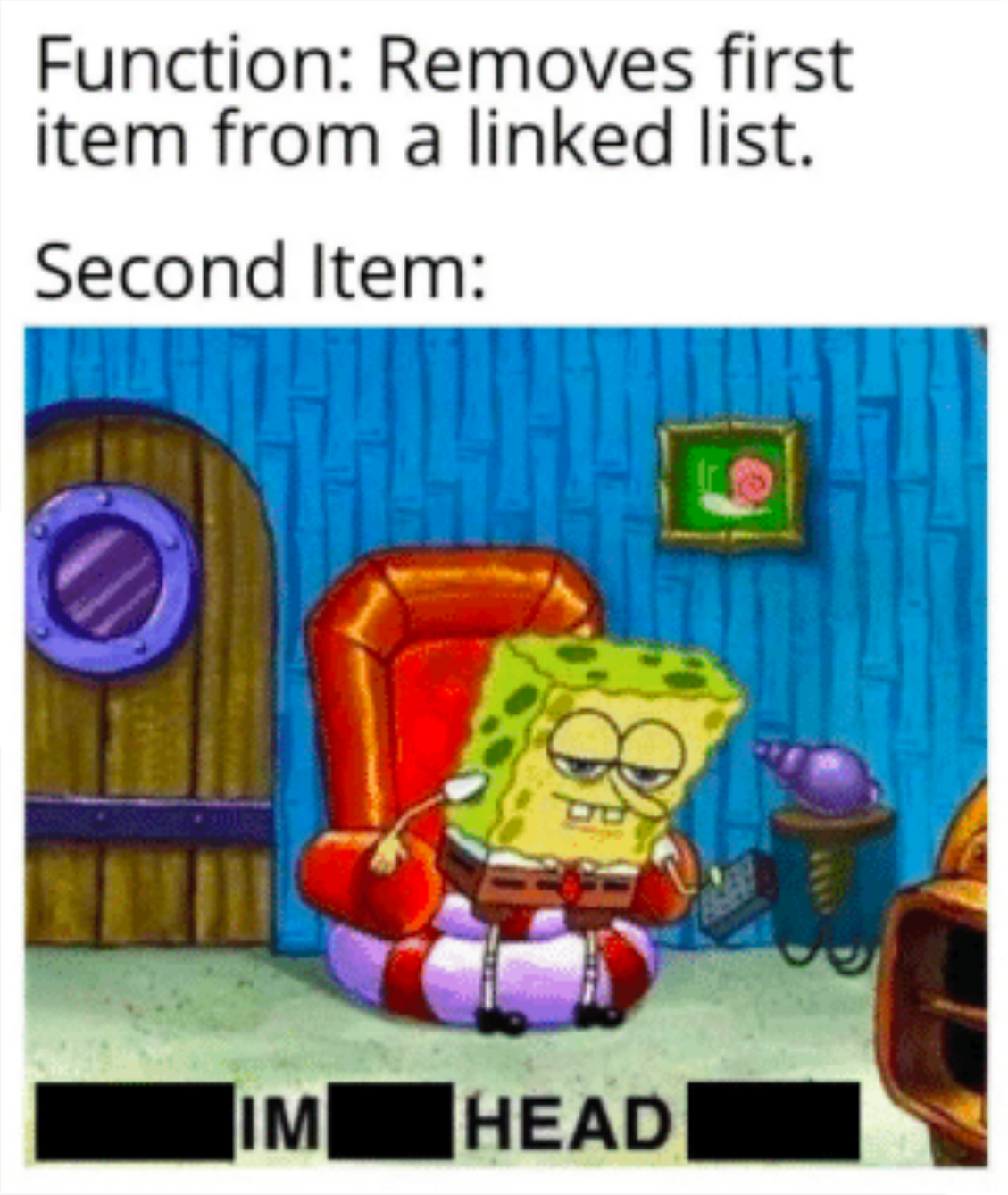
Big O and Linked Lists

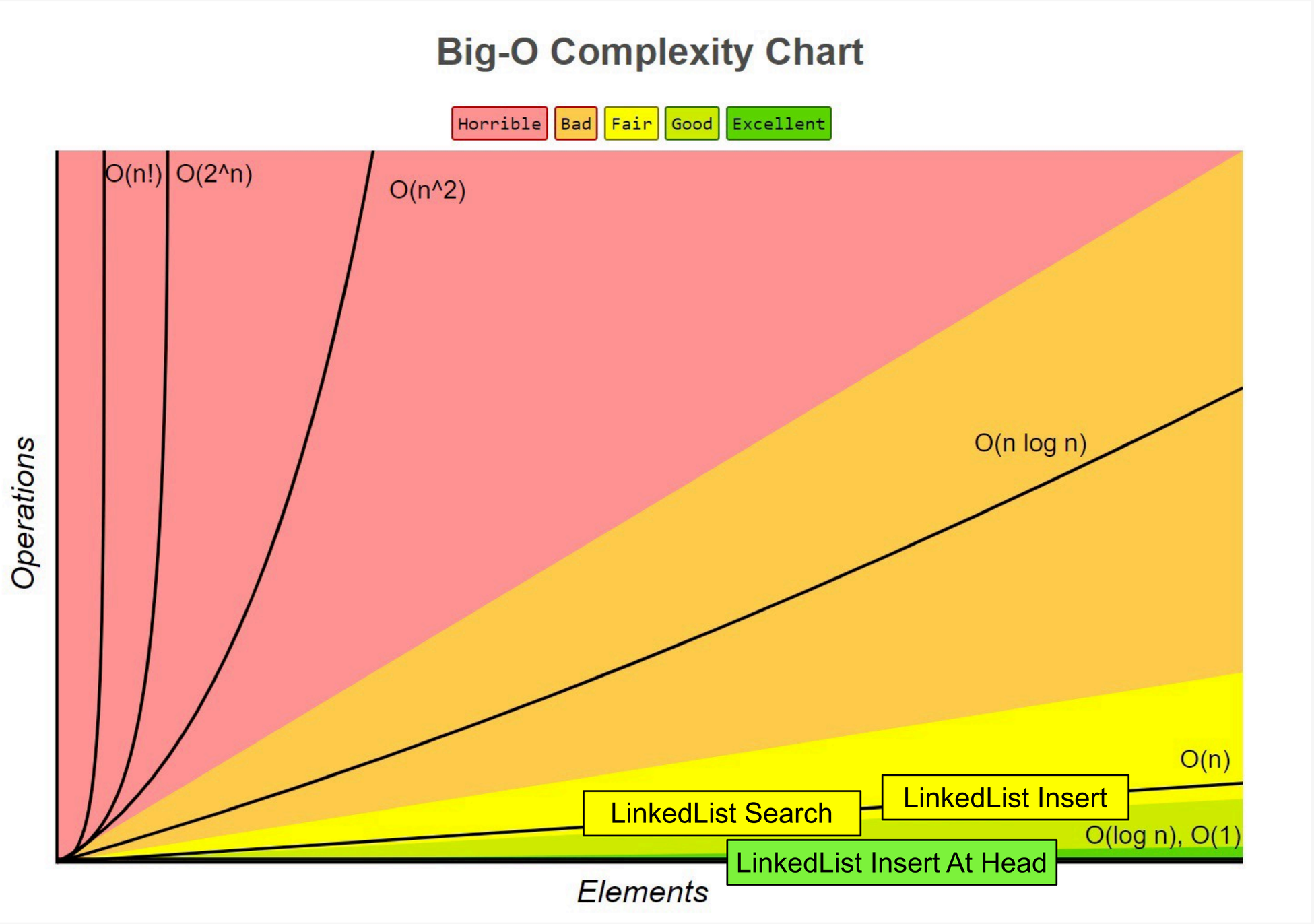
- How long does it take to search for something?
    - What you're looking for could be the last list item (in the worst case)
    - You'd have to visit each Node
    - If there are `n` Nodes then….`O(n)`



What About Changing the List?

- To insert something in a Linked List, you either
  - Insert at the beginning
    - Since you know the head, this is an instant command
    - No looping or traversal, so `O(1)`
    - Size of the list doesn't matter!
  - Insert somewhere else
    - Might be the end, in which case `O(n)`




Big-O Complexity Chart
Horrible
Bad
Fair
Good
Excellent
O(n!)
O(2^n)
O(n^2)
O(n log n)
O(n)
O(log n), O(1)
LinkedList Search
LinkedList Insert
LinkedList Insert At Head
Operations
Elements

Vocab Review

ecosystem

ecosystem

The collection of tools you’re using to develop and run your code. Ecosystems (also referred to as environments) can include the type of compiler, IDE, language and infrastructure you’re using as a developer for your application.

Node.js

Node.js

An open-source JavaScript runtime environment which allows to run JavaScript code outside of a browser. Node.js (often called Node) also enables developers to write JavaScript server-side code. Node has unified web development such that JavaScript can be used in every part of application development.

V8 Engine

V8 Engine

Google’s high performant open-source program that runs JavaScript code. The V8 Engine is what powers Chrome web browsers.

module

module

A module is a collection of functions or JavaScript code that is defined in a single JavaScript file and then exported for later use. Application code imports various modules and calls the functions or code defined within those modules.

package

package

A file or directory that is described by a `package.json` file.

This `package.json` lists which modules the file/directory needs to install, how to run the application located in the file/directory, and any scripts for development use. Packages usually contain a module(s), and are formatted for easy sharing across multiple developers.

node package manager (npm)

node package manager (npm)

The node package manager allows us to install packages from external developers and maintain package versions and updates.

test driven development (TDD)

test driven development (TDD)

A development process where tests for new code is written *before* the code. TDD encourages developers to plan their code and their code's test cases thoroughly before developing. This reduces errors during the development process, and makes it simpler to refine and refactor code.

Jest

Jest

Jest is a JavaScript testing framework that makes it very simple for developers to write and run unit tests for the JavaScript code. Jest relies on the idea of “expecting” an outcome from a code operation. Jest also has the ability to show how much of an application’s code is covered by unit tests.

continuous integration (CI)

continuous integration (CI)

This is a development practice where all code changes go through an automatic process of re-running tests, and then merging new code with existing tested code if no tests are broken. CI helps teams with multiple developers unify their codebase frequently.

unit test

unit test

A unit test is a small, modular test that covers one “unit” of code in an application. The definition of “unit” can be arbitrary or vary from team to team, but it generally refers to independent functions

functional programming

functional programming

A set of guiding principles for software development, where more thought is given to the input and output of functions.

The goal of functional programming is that calling a function anywhere with the same input parameters results in the same output.

pure function

pure function

A pure function is a function where given the same inputs, it always returns the same outputs and has no side effects on the application environment. An example of a side effect is logging to the console.

higher order function

higher order function

A higher order function is any function which takes another function as an argument and/or returns a function. They are often used to abstract or isolate actions within an overarching action.

immutable state

immutable state

Immutable means to not change, and the state of an application usually refers to all of the data an application is maintaining at a certain point in time. Functions which maintain the paradigm of immutable state do not change anything in the application during or after running.

object

object

An object can be a variable, data structure, function or method. Objects, also called *instances*, are a piece of data recorded in memory and accessible by an identifier (such as the variable name or function name).

object-oriented programming (OOP)

object-oriented programming (OOP)

A set of guiding principles where an application is thought of as a collection of objects interacting with one another. The creation of classes helps to solidify complex data collections as a single object.

class

class

A blueprint for an object, specifying how that object should be created, what initial data values it has, and what actions can be done upon this object through class methods. You can think of writing a class as similar to creating a new data type.

prototype

prototype

A prototype is the blueprint of an object.

In JavaScript, everything is based on a generic “Object” class, which is not directly editable by developers. We can change this class blueprint by accessing the prototype of any instance, thereby faking a class specification.

super

`super`

The `super` keyword refers to the parent class of the current class you're developing. By calling `super()`, you essentially call the parent class constructor.

inheritance

inheritance

The process of basing an object or class upon an existing “parent” object or class. This allows the “child” to acquire all the variables and methods specified by the “parent”, making code more DRY.

constructor

constructor

A constructor is a function that defines how an object should be created. Because all JavaScript objects innately inherit from a generic “object” class, we usually don’t have to define much in a constructor other than the initial values of any custom variables.

instance

instance

An instance is a single object created based on a class or data type’s specifications. Instances only exist while the application is running, and in our application code we provide variable name references for them so we can instruct how that instance is used.

context

context

A term used to represent the current scope or environment you're operating in. Any data, variables or functions available to you in that point in time are all within your current context.

this

`this`

A keyword used to refer to the current context; the current object, class, or function you're in. The `this` keyword is usually very helpful in blueprint-type code to refer to itself before any instances of it have been created. Each instance can then interpret `this` to mean themselves.

database

database

An organized set of data stored long-term

in an accessible location.

data model

data model

An abstract set of rules or guidelines that categorizes data in an application. Data models define what data should look like, how data relates to one another, and how to access data.

CRUD

CRUD

Create, Read, Update and Delete are the four basic functions for storing and accessing stored data. We use this acronym to keep in mind how we most commonly interact with a database.

schema

schema

A schema is a collection of rules that describes a type of data within our larger data model. Schemas typically define what properties a piece of data should have.

sanitize

sanitize

The process of “cleaning” data to remove any illegal characters, to standardize naming conventions, and to enforce type upon data values.

Structured Query Language (SQL)

Structured Query Language (SQL)

A standard language for interacting with relational databases. SQL relies on “data queries” in the format of “SELECT __ FROM __ WHERE”.

Non SQL (NoSQL)

Non SQL (NoSQL)

Non SQL refers to databases that are non-relational (do not enforce a relation table) and thus do not need to use the SQL language. NoSQL databases can choose what language to use, and they expose custom APIs for communicating with the database within an application.

MongoDB

MongoDB

A cross-platform document-based database that is non-relational. MongoDB uses JSON-like documents that adhere to a certain schema, and arranges these documents into collections.

Mongoose

Mongoose

A package / library for using MongoDB in a Node.js application. Mongoose provides a large suite of features, such as schema validation, API connection to a MongoDB database, and translation between JavaScript code and MongoDB code.

document

document

In MongoDB, each piece of data is stored as a binary json (`.bson`) file on the database server (which can be your local computer if you're running MongoDB locally!). Because each piece of data is stored as a file, data entries are referred to as "documents".

record

record

A more generic term for a data entry in a database. For MongoDB, documents and records are synonymous.

Object Relational Mapping (ORM)

Object Relational Mapping (ORM)

A programming technique of converting data between two incompatible systems.

For example, Mongoose converts JavaScript data into terms MongoDB can understand, and vice-versa.

mock

mock

A mock allows you to skip testing some piece of your code while still maintaining a roughly similar input/output path. This way, you can skip calling certain functions and still test your application flow. And by skipping some functions, you can save on time and prevent redundant or unnecessary tests.

middleware

middleware

Code that is used to bridge the gap between applications or tools. Often described as “software glue”, middleware makes it much simpler for two differing systems to communicate with one another. Broadly, middleware can be described as any code running between two other processes.

supergoose

supergoose

A package developed by Code Fellows, supergoose is used to help set up a mock database for your tests. This can otherwise be tedious to do on your own, and many companies use similar packages to spin up a fake database for testing.

pre hook

pre hook

With Mongoose, you can write your own middleware that runs between a Mongoose command being called, and the MongoDB receiving that command. To write this middleware, Mongoose exposes a ‘`pre`’ function, often called the pre hook since it hooks your middleware code up to the correct part of the process.

post hook

post hook

With Mongoose, you can write your own middleware that runs between a MongoDB command being called, and the response to Mongoose on your application. To write this middleware, Mongoose exposes a ‘`post`’ function, often called the post hook since it hooks your middleware code up to the correct part of the process.

in-memory

in-memory

When something is in-memory, it is only accessible while a program is running.

Any in-memory data is not persisted after the application ends.

interface

interface

Like middleware, an interface is a shared space where two systems can exchange information. Interfaces allow two unrelated entities to interact. Interfaces receive a certain kind of input and translate that into the commands needed to get the expected output.

Linked List

Linked List

A data structure where pieces of data are not stored next to each other in memory, but in fact can be stored anywhere. A Linked List only keeps track of the starting Node, and each Node keeps track of the next Node in the sequence.

Singly Linked List

Singly Linked List

In a Singly Linked List, all Nodes move only from head to tail, and each Node only stores the next Node in the sequence.

Doubly Linked List

Doubly Linked List

In a Doubly Linked List, you can move bi-directionally back and forth through the list, since every Node keeps track of the next AND previous Node in the sequence.

Circularly Linked List

Circularly Linked List

A Circularly Linked List is any linked list

that creates a cycle; some Node in the list

routes back to a previous Node when

traversing from head to tail.

Big-O

Big-O

Big-O refers to “Big O Notation”, a method of determining the efficiency of a data structure or algorithm based off of its worst case execution. Big-O categorizes the time and/or space complexity of something as the worst case growth rate based on input size `n`.

Node

Node

A Node is a piece of data in a data structure. Different data structures require different additional properties within a Node, but at the very least each Node holds some data value.

head

`head`

A reference to the start of a Linked List.

.next

`.next`

The property on a Node that routes to the

next Node in the Linked List / sequence.

.prev

`.prev`

The property on a Node that routes to the previous Node in the Linked List / sequence.

Lab 05 Overview

Code Challenge 05 Overview