LEC 11

CSE 122

Introduction to Objects

Questions during Class?

Raise hand or send here

sli.do #cse122

BEFORE WE START

Talk to your neighbors:

Best places to study on campus?

Music: 122 24wi Lecture Tunes

Instructors Miya Natsuhara and Joe Spaniac

TAs

Ailsa	Chaafen	Helena	Megana	Sahej
Alexander	Chloe	Jessie	Mia	Shivani
Ambika	Claire	Katharine	Minh	Smriti
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Arkita	Colton	Ken	Poojitha	Vinay
Atharva	Connor	Kyle	Rohini	Zane
Autumn	Elizabeth	Logan	Ronald	
Ayush	Hannah	Marcus	Rucha	

Lecture Outline

- Announcements
- SearchEngine Recap
- OOP Review
- Example
- Abstraction

Announcements

- Programming Assignment 2 (P2) out
  - Due February 15th by 11:59 PM
  - Which means… no assignment releasing tonight!
- Quiz 0 grades released yesterday
  - Check them out and use results to calibrate how much you should study over the weekend!
- Resubmission Cycle 3 (R3) out
  - Due February 13th by 11:59 PM

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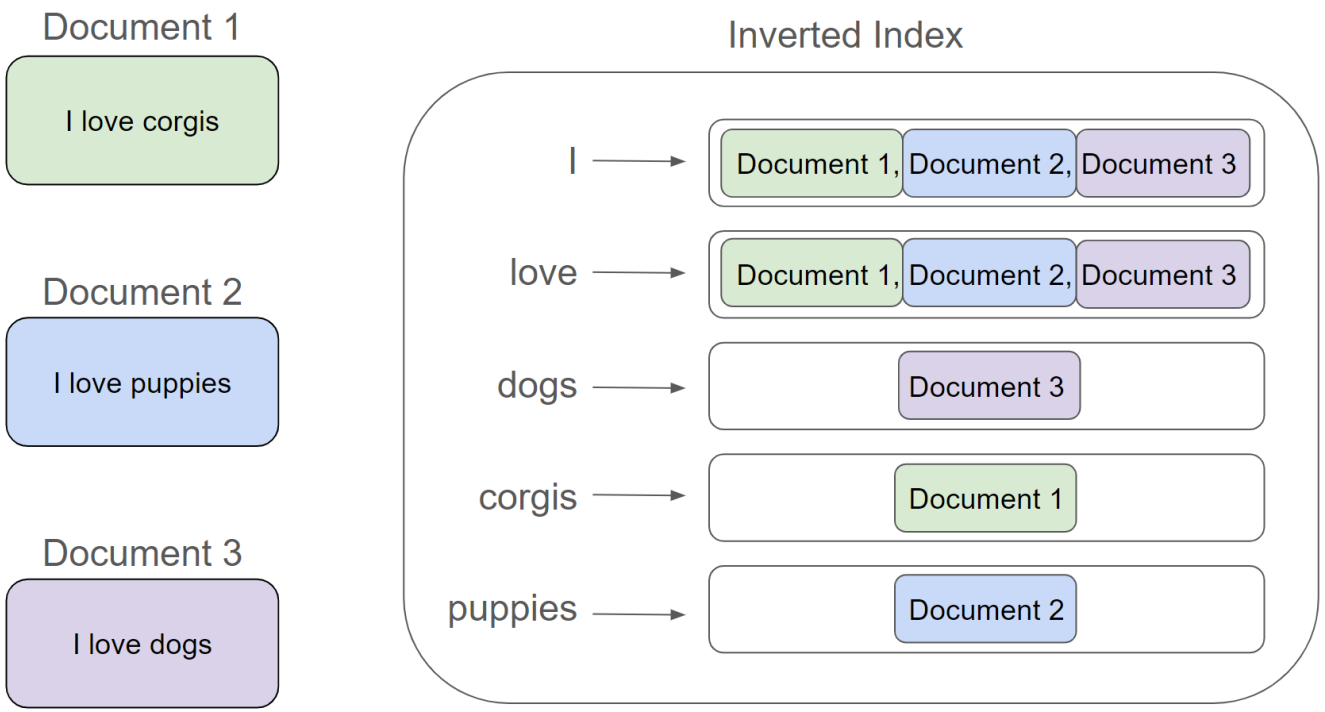
searchEngine & Inverted Index

- An **inverted index** is a Mapping from possible query words to the set of documents that contain that word
  - Answers the question: "What documents contain the word 'corgis'?"

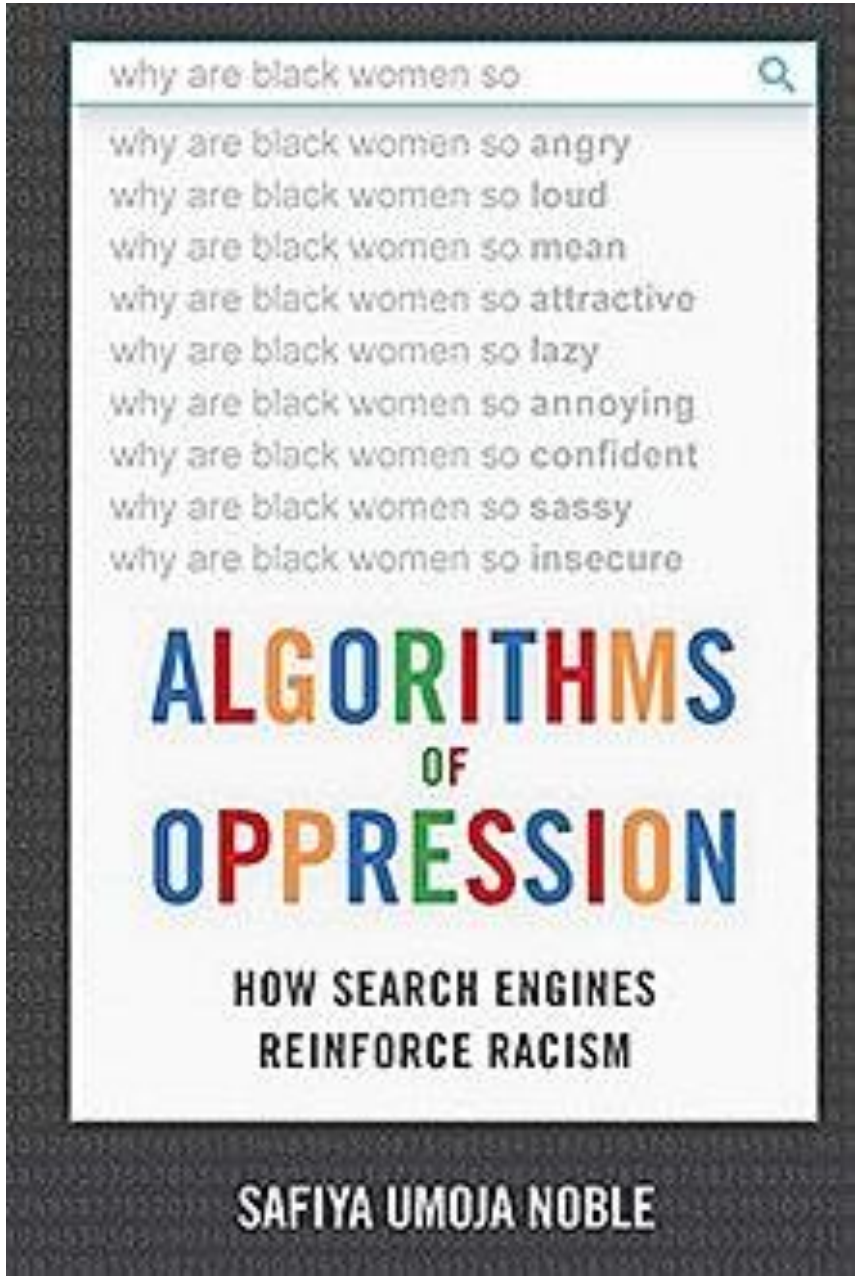


Data Bias

- Google's autocomplete recommendations used to actually look like this
  - Fix: Don't display autocomplete results for phrases like "why are [group] ____"

<u>Are these changes fixing the right thing?</u>

Btw, Miya says this is a great book that you should check out if you're interested ->



What to do?

- Obviously, ideal to have datasets that aren't biased in the first place.
  - But might not always be possible if we can't fix the sources of bias in the real world…
- AI/Models aren't "neutral" or "more objective", they just quicky and automatically codify the status quo (and perpetuate biases)
  - Garbage in -> Garbage out
- Lots of work going into how to de-bias models *even if* they are trained on biased data. Active area of research!
  - Key take-away: None of this comes "for free", requires hard word to fight bias
- Ask ourselves:
  - What biases might be present in my data?
  - What assumption might I be making about who is using my program?
  - How can I write code to be more inclusive?
  - What happens when ***(not if)*** mistakes happen? Who potentially benefits and who is potentially harmed?

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Object Oriented Programming (OOP)

- **Procedural programming**: Programs that perform their behavior as a series of steps to be carried out
  - Classes that do things

- **Object-oriented programming (OOP):** Programs that perform their behavior as interactions between objects
  - Classes that represent things
  - We're going to start writing our own objects!

Classes & Objects

- **Classes** can define the template for an object
  - Like the blueprint for a house!
    "What does it mean to be this thing?"

- **Objects** are the actual instances of the class
  - Like the actual house built from the blueprint!
    "It is an example of this thing!"

We create a new instance of a class with the new keyword

e.g., `Scanner console = new Scanner(System.in);`

State & Behavior

- **Objects** can tie related *state* and *behavior* together

- **State** is defined by the object's *fields* or *instance variables*
  - *`Scanner`'s state may include what it's scanning, where it is in the input, etc.*

- **Behavior** is defined by the object's *instance methods*
  - *`Scanner`'s behavior includes "getting the next token and returning it as an `int`", "returning whether there is a next token or not", etc.*

Syntax

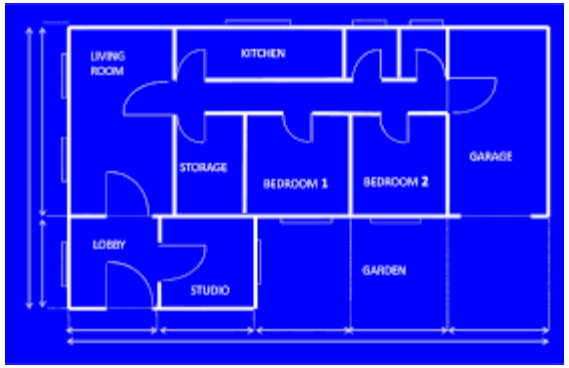
```
public class MyObject {
    // fields
    type1 fieldName1;
    type2 fieldName2;
    ...

    // instance methods
    public returnType methodName(...) {
        ...
    }
}
```

Instance Variables

- Fields are also referred to as **instance variables**

- Fields are defined in a class
- Each instance of the class has their own copy of the fields
  - Hence *instance* variable! It's a variable tied to a specific instance of the class!



Instance Methods

- **Instance methods** are defined in a class
- Calling an instance method on a particular *instance* of the class will have effects on <u>that</u> instance

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Representing a Coordinate Point

How would we do this given what we knew last week?

Maybe `int x`, `int y`?

Maybe `int[]`?

Representing a point

`int x, int y`

- Easy to mix up x, y
- Just two random `int`s floating around – easy to make mis

Let's make a class instead!

`int[`

- Not really what an array is for
- Again, just two `int`s – just have to "trust" that we'll remember to treat it like a point

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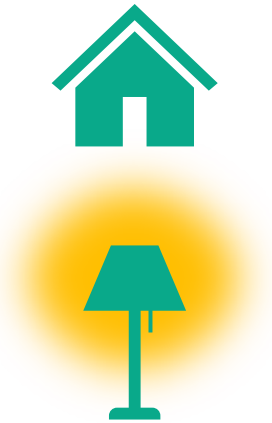

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Abstraction

The separation of ideas from details, meaning that we can <u>use</u> something without knowing exactly <u>how</u> it works.

You were able use the `Scanner` class without understanding how it works internally!

Client v. Implementor

We have been the clients of many objects this quarter!

Now we will become the implementors of our own objects!