CS 635 Advanced Object-Oriented Design & Programming
Fall Semester, 2021
Doc 1 Introduction
Aug 24, 2021

Reading

Aug 26 - Big Ball of Mud,
  http://www.laputan.org/mud/mud.html
What Compsi textbooks don't tell you: Real world code sucks,
http://www.theregister.co.uk/2012/12/21/financial_software_disasters/print.html

Wait List

Last Day to Drop or Add Class

Last day to file for graduation

Sept 3

Course Web Site

http://www.eli.sdsu.edu/index.html

CS 635 Fall 21

Course Details

Canvas
Pandemic
Email
Exams

Lecture Notes
Assignments
Wiki
Course Portal
Syllabus
Reading Assignments

Covid - Wave 4

Not clear how this wave will turn out

SDSU is committed to in-person classes

- Claim SDSU is the safest place to be in San Diego

Will be recording the lectures via Zoom

- If not comfortable attending class you can view on-line

No crowding before or after class

Zoom

Office Hours

Meeting ID: 914 283 418

https://SDSU.zoom.us/j/914283418

10:30-Noon Tuesday Thursday

Class Zoom

Meeting ID: 834 6805 0874

https://SDSU.zoom.us/j/83468050874

Canvas

Blackboard has been replaced with Canvas

Problems with Canvas

- Closed
- Lack of control over duration
- Discussion Board shows name for each post
- Grade Book

Email Addresses

SDSU is now only sending email to your SDSU email address

Exams

Oct 28 Midterm

Dec 16 Final

Languages

Java, C++, Swift, Kotlin, Python 3, Dart, Scala

C++ is STRONGLY Discouraged

I have not used C++ in over 10 years

I don't like the language

It is very difficult to grade

Each additional language make grading harder

It is extremely hard to deal with GUI assignments in C++

Assignments are often harder in C++

What about C#?

I don't know the C# libraries

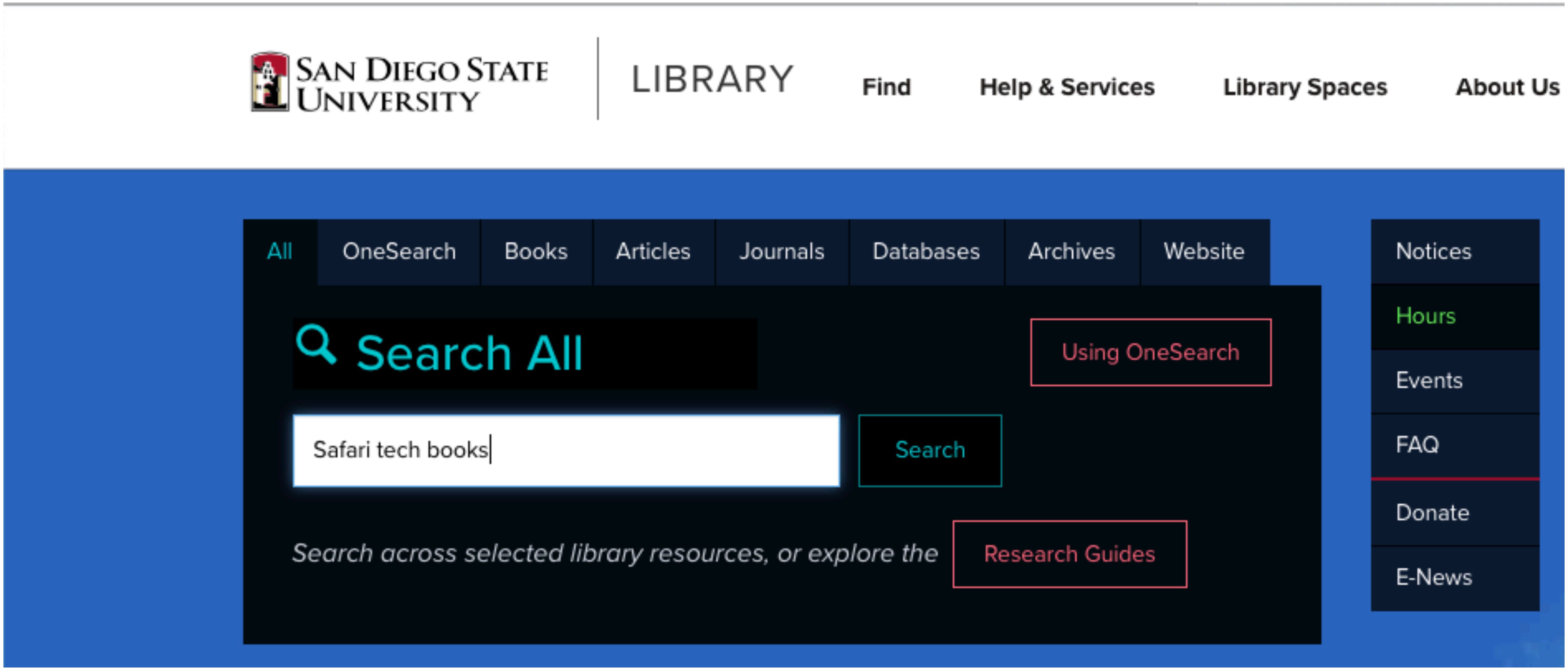
Which makes it too hard to grade assignments

Textbooks

Design Patterns: Elements of Reusable Object-Oriented Software, Gamma, Helm, Johnson, Vlissides, Addison-Wesley, 1995. Required

Refactoring: Improving the Design of Existing Code On-line access via SDSU Library, Optional

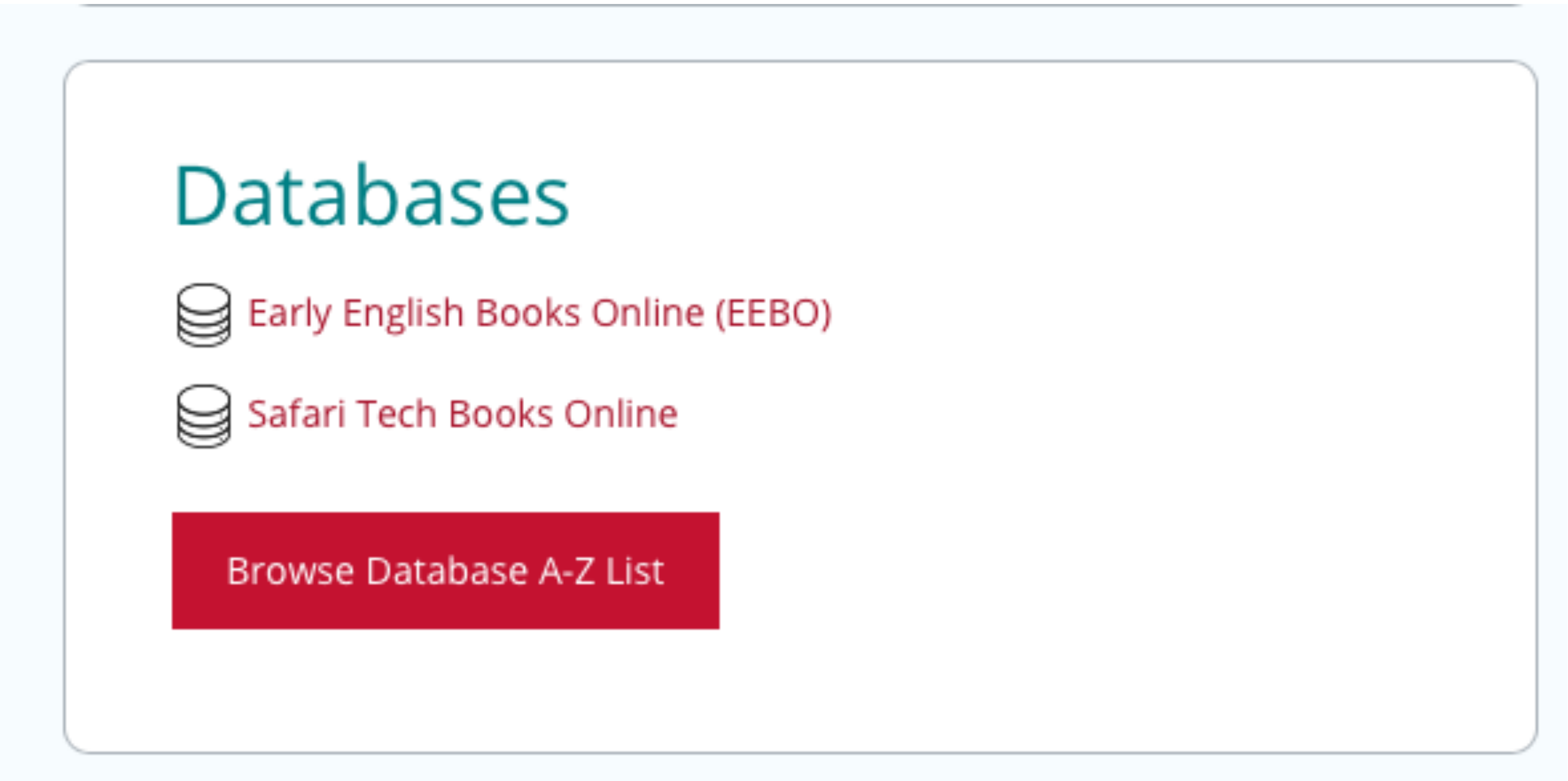
On-line Textbooks - https://library.sdsu.edu/



Safari tech books

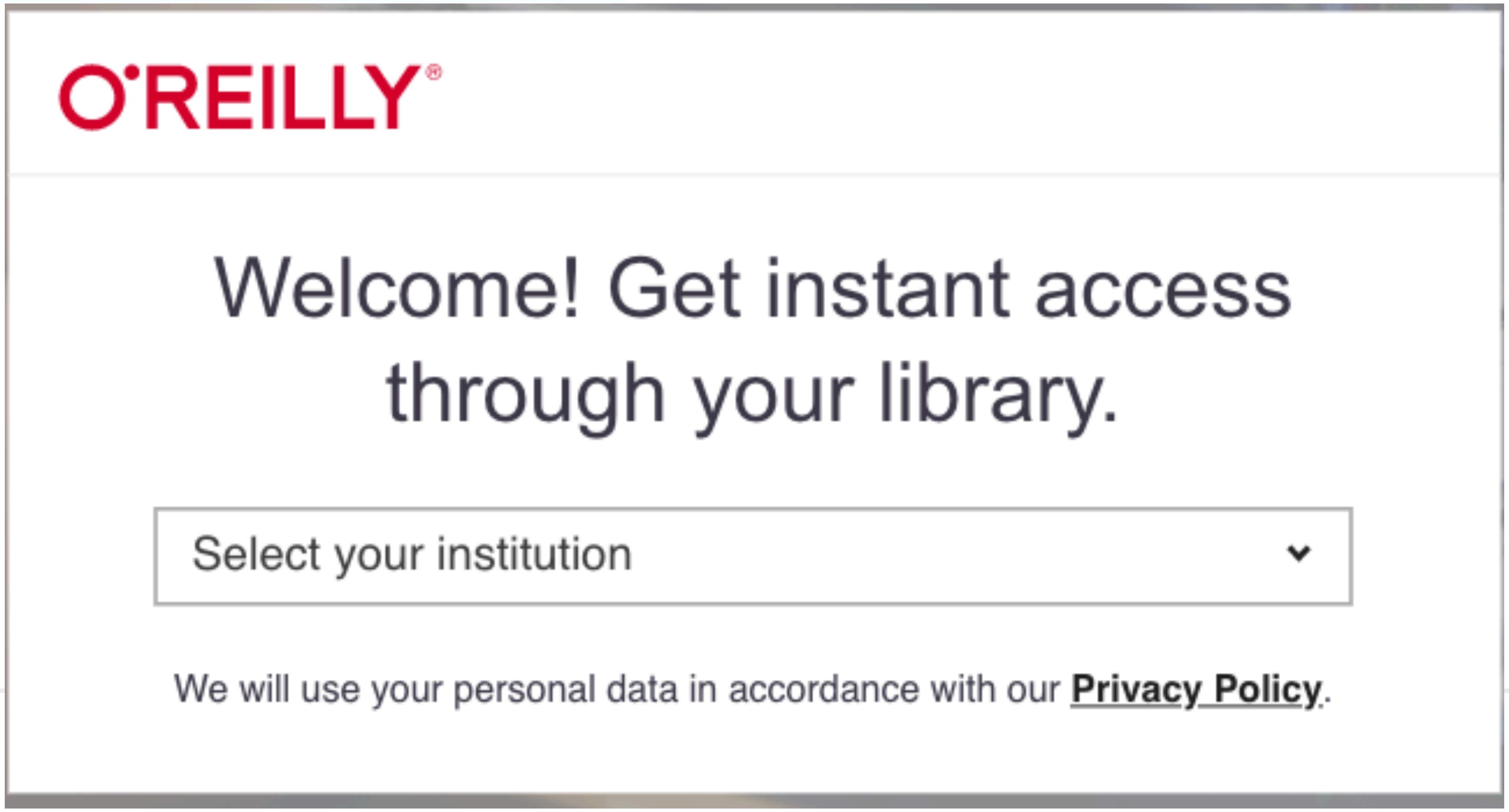
Search across selected library resources, or explore the Research Guides

On the resulting page



Databases

- Early English Books Online (EEBO)
- Safari Tech Books Online



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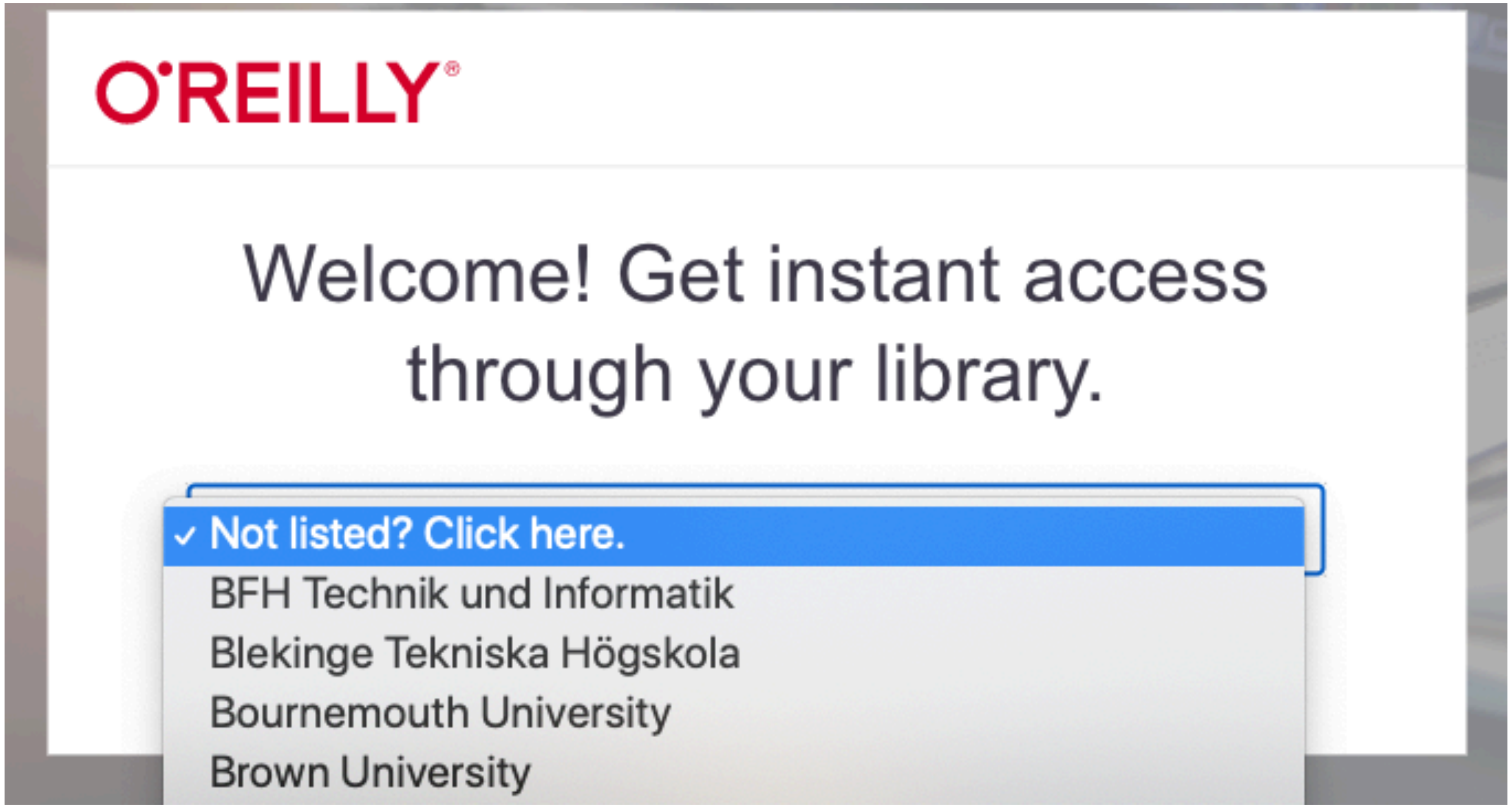

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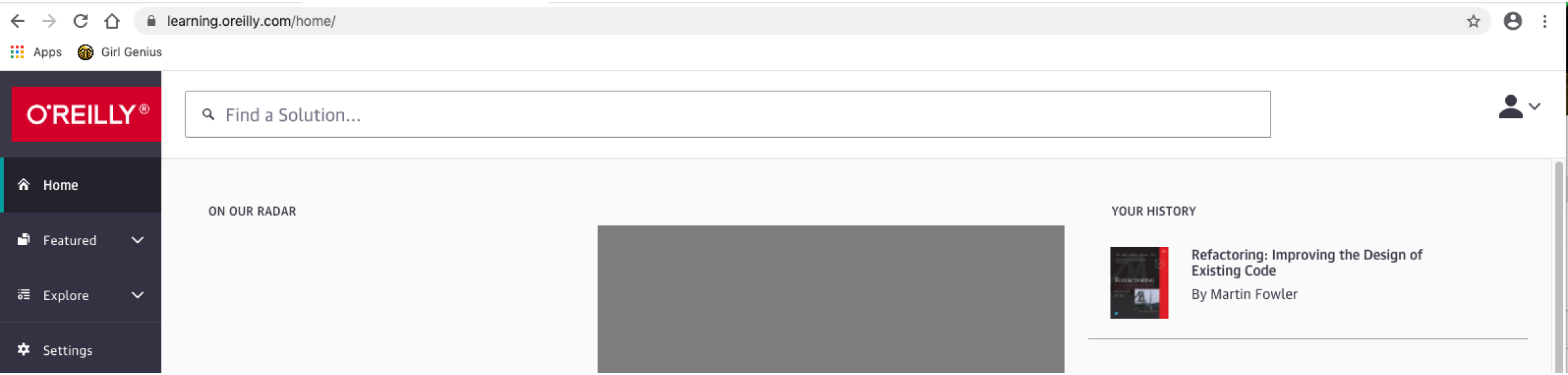
BFH Technik und Informatik
Blekinge Tekniska Högskola
Bournemouth University
Brown University

You then enter your SDSU email address

How you can search



In-Class verses On-line version

Same course but

In-Class verses On-line version

Same course but

In class provides visible social context

In-Class verses On-line version

Same course but

In class give access to other students

In-Class verses On-line version

Same course but

In class makes it easy to ask questions

In-Class verses On-line version

Same course but

on-line course requires more discipline and work

What this course is about

Writing quality OO code

Design Patterns

Coupling & Cohesion

Unit Testing

Refactoring

Scale Changes Everything

Norris Number

Average amount of code an untrained programmer can write before they hit a wall

~1,500 lines

Beyond that the code becomes so tangled they cannot debug or modify it without herculean effort

http://www.teamten.com/lawrence/writings/norris-numbers.html

Remedial Material

Formatting

- Format your code
  - Uniformly
  - Consistently
  - Show the block structure of your code

```
  public void commandAction(Command c, Displayable d) {
     if (c == restartCmd) {
  theGame.restart();
     } else if (c == levelCmd) {
     Item[] levelItem = {
   new Gauge(“level”, true, 9 theGame.getLevel())};
  Form f = new Form(“Change Level”, levelItem);
       f.addCommand(OkCmd);
   f.addCommand(cancelCmd);
  f.setCommandListener(this);
    Display.getDisplay(this).setCurrent(f);
    } else if (c == exitCmd) {
 destroyApp(false);
 notifyDestroyed();
  }
}
```

```
public void commandAction(Command c, Displayable d) {
if (c == restartCmd) {
theGame.restart();
} else if (c == levelCmd) {
Item[] levelItem = {
new Gauge(“level”, true, 9 theGame.getLevel())};
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f.setCommandListener(this);
Display.getDisplay(this).setCurrent(f);
} else if (c == exitCmd) {
destroyApp(false);
notifyDestroyed();
}
}
```

Grading Policy - Formatting

Each method with such poor formatting loses 1 point per method

Name Structure - Language Conventions

	Java	Smalltalk	C#	Ruby
Class	PascalCase	PascalCase	PascalCase	PascalCase
Method	camelCase	camelCase	PascalCase	foo_bar
Field	camelCase	camelCase	camelCase	@foo_bar
Parameter	camelCase	camelCase	camelCase	foo_bar
Local Variable	camelCase	camelCase	camelCase	foo_bar

PascalCase	ArrayList
camelCase	courseSize

Grading Policy - Names

Each name that does not following your languages naming structure

- Loses 1 point/name
- Up to 20 points/assignment

Reading Verses Writing Programs

Code

- Written once
- Read many times

Use names that help the reader understand the code

Avd brvtns

brvtns r hrd t rd

n brvtn cn stnd fr dffrnt thngs

tmp - tmprr r tmprtr

Dffrnt ppl wll brvt dffrntl

Ds tcmplt s dn't hv t typ lng nms

Avoid Abbreviations

Abbreviations are hard to read

An abbreviation can stand for different things

- tmp - temporary or temperature

Different people will abbreviate differently

IDEs autocomplete so don't have to type long names

Describe What "flag" is Used For

✗

```
if (flag) {
    ...
}
```

✓

```
if (foundDuplicate) {
    ...
}
```

✗

```
flag
flagStatus
computeFlag
```

Do not help understand code

Variables 1 through N

✗

```
String s1;
String s2;
```

✓

```
String fileContents;
String pattern;
```

Who can remember the difference between s1 and s2?

Avoid Names With No Meaning

✗ MyLinkedList

Who are you?
What makes your LinkedList different?

✗ temp

All variables are temporary

```
swap = a;
a = b;
b = swap
```

```
(a, b) = (b, a)
```

Guidelines - Class Names

Use nouns

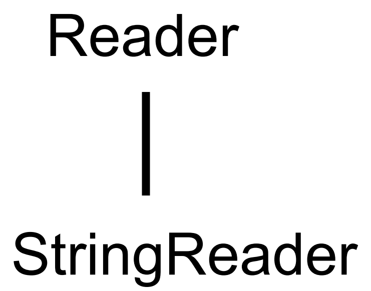
No abbreviations

Superclass

  Single word to convey its purpose

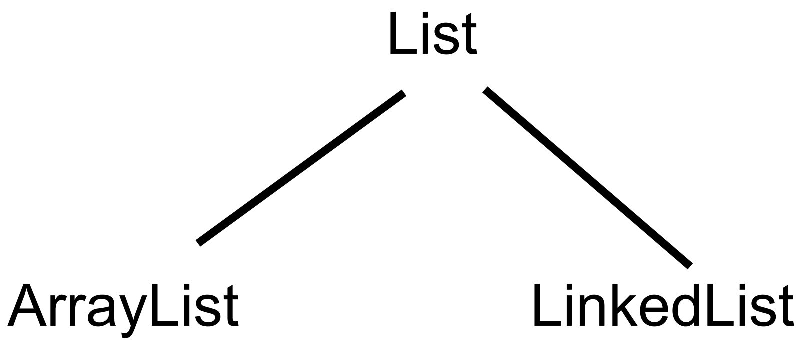
Subclass

  Prepend adjective to superclass name



Reader

StringReader



List

ArrayList

LinkedList

Guidelines - Method/Function/Procedure Names

Describe what method does

Use verb to describe an action

add(int index, E element)
clear()

If returns a value name what it returns

iterator()
subList(int fromIndex, int toIndex)

If returns boolean value make it true/false statement

isEmpty()
contains(Object o)

Guidelines - Variables, Fields, Parameters

Use names that indicate role variable is playing

If declare variable types don't use type as name

Use plurals to indicate collections

Make boolean variable names true/false statement

isVisible, hasMultipleParts,

✗

```
public void execute(Vector vector) {
    Stack s;
}
```

✓

```
public void execute(Vector commands) {
    Stack commandsExecuted;
}
```

Summary

Use names to help the reader understand the code

Follow language conventions

Avoid abbreviations

Use names that indicate role item is playing

Remedial Points

Each assignment I indicate points for different things

Remedial points (names, formatting) are in addition to those

Review

Define

Object
Class

What are the Benefits of OO

A verses B

```
struct A {
    int x;
    int y;
    int z;
}
```

```
public class B {
    public int x;
    public int y;
    public int z;
}
```

A verses B

```
public class A {
    public int x;
    public int y;
    public int z;
}
```

```
public class B {
    private int x;
    private int y;
    private int z;

    public int getX() { return x;}
    public int getY() { return y;}
    public int getZ() { return z;}
    public void setX(int value) {x = value;}
    public void setY(int value) {y = value;}
    public void setZ(int value) {z = value;}
}
```

A verses B

```
public class Stack {
  ArrayList elements;

  public void push(Object item) {
    elements.add(item)
  }

  public Object pop() {
    if elements.isEmpty()
      throw new NoSuchElement;
    return element.remove(elements.length -1)
  }
```

```
struct Stack {
  ArrayList elements;
}


void push(Stack a, Object item) {
  add(a, item);
}

public Object pop(Stack a) {
  if isEmpty(a)
    throw new NoSuchElement;
  return remove(a, length(a) -1);
}
```

Heuristics

Keep related data and behavior in one place

A class should capture one and only one key abstraction

Heuristics

Beware of classes that have many accessor methods defined in their public interface

Do not create god classes/objects in your system

Beware of classes that have too much noncommunicating behavior

Learning, Understanding & Memorization

One disease long life
No disease short life

Memorization is not Understanding

One disease long life

No disease short life

Richard Feynman Visit to Brazil

Richard Feynman

- Nobel Prize winner in Physics
- Spent a year in Brazil

Interviewed student

- Asked about properties of certain type of material
- Student could describe the properties clearly

- But did not know of anything that had those properties
- Even when Feynman had the student look at material with the properties

Description is not understanding

Example - Global Variables

Globals are evil

But most (all?) language allow them

Understanding

When are globals

- Useful?
- Harmful?
- Why?

Recognizing when

- Globals are not to be used
- Knowing how to remove them

Applying this as you code

Laws of Software Architecture

Everything in software architecture is a trade-off

First law of Software Architecture

Why is more important that how

Second law of Software Architecture

Fundamentals of Software Architecture
Richards & Ford
O'Reilly Media, Inc.
2020