CSCI 136:
Data Structures
and
Advanced Programming

Lecture 1

Welcome

Instructor: Dan Barowy

Williams

Topics

What this course is **about**

What to **expect** in this course

Some things to **work on** over the weekend

Every week:

1. Lab **due Tuesday at 10pm**.
2. Quiz **opens Friday at noon, closes Saturday by noon**.
   30 minutes to complete it once you start.

Your to-dos

1. Quiz (see GLOW), **due Saturday 9/10**.
2. Lab 0, **due Tuesday 9/13**.
   Grade scale:
     Not graded. But please do it anyway.

Please stop me to ask questions!

Toyota Production System

Any worker can stop the line!

Toyota Production System

Stop me if you feel like something is missing!

About me

National Highway System (NHS) roadways are important to the economy, defense, and mobility. The NHS includes all Interstate highways (arterials), the Strategic Highway Network (defense purpose), intermodal connectors (roads connecting to major intermodal facilities), and other principal arterials. The NHS includes over 163,000 miles of highways.

Legend:
— Interstate Highways
— Other NHS Roads

Rural Interstate	Urban Interstate	Rural Others	Urban Others
30.6	16.0	82.3	34.1

Miles (thousand)

Note: Roadway mileage from 2008 data

By avoiding left turns whenever possible, UPS estimates to save:

10 million
gallons of fuel a year

6 to **8** fewer miles driven per route

100,000
metric tons of CO$_2$ emissions a year

(equivalent to **21,000** cars taken off the road)

A study on crash factors in intersection-related accidents from the US National Highway Traffic Safety Association shows that turning left is one of the leading "critical pre-crash events" … About 61 percent of crashes that occur while turning or crossing an intersection involve left turns, as opposed to just 3.1 percent involving right turns.

source: cnn.com

Finding Shortest Paths

<u>Data</u>: road segments

  road segment: (source, destination, length)

<u>Input</u>: source, destination

<u>Output</u>: shortest path

  path: (segment$_1$, …, segment$_n$)

<u>The Algorithm</u>: Dijkstra's Algorithm

<u>Data structures</u>:

  graph: essential representation of a "road network"

  priority queue: ordered set of next roads to try

  also uses: lists, arrays, stacks, …

Demo

DALL·E

A tasteful watercolor of Pikachu snowboarding in Massachusetts

StyleGAN2

You already know how to program.

This course is about: "good" programs
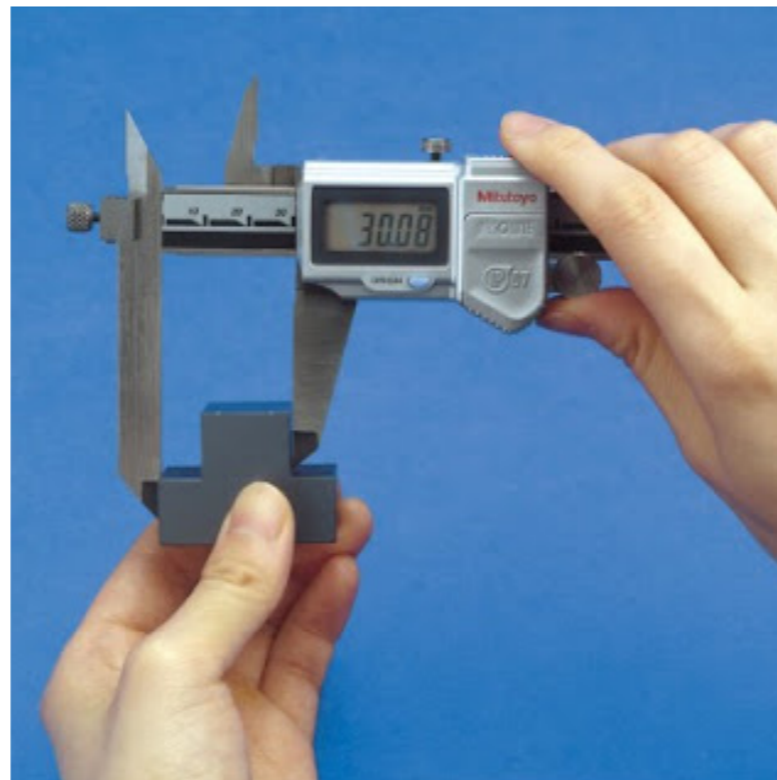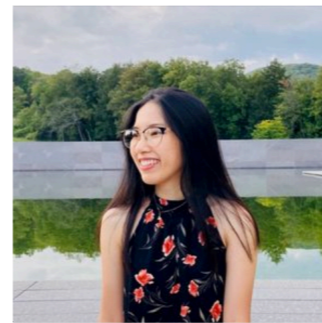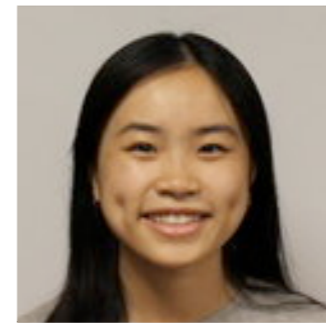
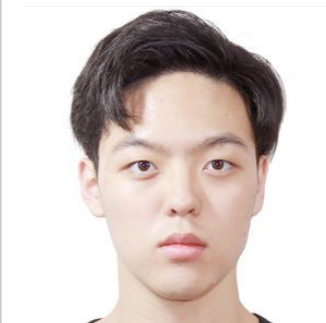Prof. Dan Barowy

Prof. Kelly Shaw

Lab instructor: Lida Doret ('02)
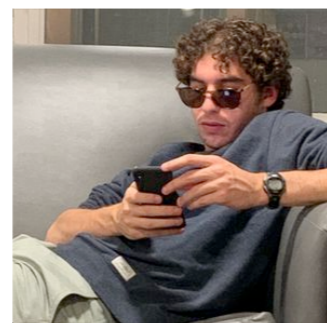
Emma

Maddy

Kit

Harry

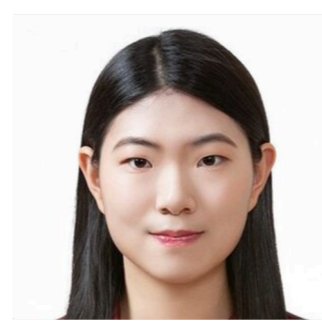Minh

Kary

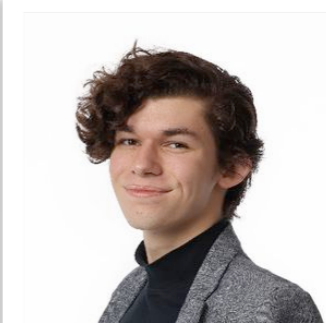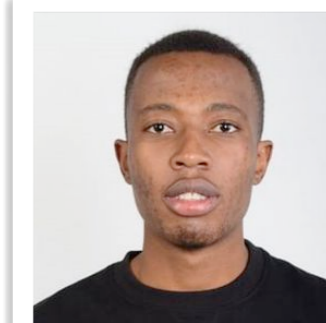Yufeng

Lindsey

Matt

Noah

Michael

Jeeyon

Carl

Lee

Outline

1. ~~Course preview~~

2. Course bureaucracy

3. Quiz 1 due Saturday

4. Lab 0 due Tuesday

Administrivia

- Class roster: Who's here?

  - And who's trying to get in?

- "Handout": Class syllabus

- Lecture location: Wachenheim 114

- Lab:

  Wed 1-2:30pm (sec 3),

  Wed 2:30-4pm (sec 4),

  Thur 1-2:30pm (sec 5)

  Thur 2:30-4pm (sec 6)

  (please go to your assigned lab!)

- Lab locations: TCL 217a

Administrivia

- Lab entry code: 3-9-27-81 (quick, memorize this!)

- Course Webpage:

  https://www.cs.williams.edu/~cs136

Course webpage!

https://www.cs.williams.edu/~cs136

Syllabus

How to contact us

Section 01 Instructor	Prof. Kelly Shaw
Office	Thompson Chemistry 308
Email	kas10@cs.williams.edu
Section 02 Instructor	Prof. Daniel Barowy
Office	Thompson Physics 306
Email	dbarowy@cs.williams.edu
Office Hours	Tue 1:00-2:30pm, Wed 4:00-5:00pm, or by appointment
Lab Instructor	Lida Doret
Office	Thompson Chemistry 205
Email	lpd2@williams.edu
Lectures	MWF 10:00-10:50am (Section 01; Shaw) in Wachenheim 114
	MWF 9:00-9:50am (Section 02; Barowy) in Wachenheim 114
Labs	W 1:00-2:30pm (Section 03; Shaw) in TCL 217
	W 2:30-4:00pm (Section 04; Shaw) in TCL 217
	Th 1:00-2:30pm (Section 05; Barowy) in TCL 217
	Th 2:30-4:00pm (Section 06; Barowy) in TCL 217
	Labs are due weekly on Tuesday before 10pm
Web Page	https://www.cs.williams.edu/~cs136

Course textbook

Java Structures

Data Structures in Java for the Principled Programmer

The $\sqrt{7}$ Edition

(Software release 33)

Duane A. Bailey

Williams College
September 2007

Tips for success

- Come to lab and lecture **on time**

- Read assigned material **before class** and lab

- **Bring paper/pencil** to lab for brain-storming, …

- **Come to lab prepared**

- Bring **design docs** for program

- 1 Prof + 1TA == **help** for you: take advantage of this

- **Ask questions!**

- Your work should be **your own**. Unsure? Ask!

- **Participate**

A CAFFEINE HIGH

Weekly activities

- Reading the **text**: 12-15 pages, on average, <u>per lecture</u>

- Preparing for **weekly quizzes**

- **Preparing for** the weekly programming labs

- **Completing** the weekly labs

Yes, quizzes

- **One quiz** per week.

- The quiz opens on Friday at noon and is due on Saturday before noon.

- You have 30 minutes to complete it.

- Open book, open notes, but no websites.

- **Prepare for quizzes by doing the reading.**

- No make-up quizzes.

Lab Assignments

- Assigned: Monday

- Lab Meeting: Wednesday or Thursday

- Pre-lab: sometimes work due *before* lab meeting

- Due: Tuesday no later than 10pm

Assignments submitted using GitLab

Late Work

Late Work. You are expected to turn in all assignments in a timely manner receive full credit. Please contact us ahead of time to discuss the matter if you foresee issues that prevent timely submission. Without prior arrangement, late assignments will be penalized at a rate of **20% per day**.

Resubmissions

- No late assignments allowed in this course.

- 2 resubmissions allowed.

- For all assignments except last lab and final exam.

- **Yes, you may resubmit your midterm.**

- Gain up to 50% of points back.

- *You cannot resubmit an unsubmitted assignment!*

- Due by the end of the semester.

- See syllabus for instructions.

- Use them wisely.

Accounts and Passwords

- Be sure you know how to login to your CS account.

- Lab 0 will make it clear whether you know how to do this or not.

- If you have trouble logging in, email csaccounts@williams.edu for a password reset.

- Remember that the csaccounts is read by real humans with lives (Lida and Kelsey) who work M-F 9-5. If you email them on Tuesday at 9pm… you're out of luck.

Honor Code

We take this seriously.

It is much better to reach out to me, Sam, or Lida when you're having difficulties than it is to copy someone else's work.

It is much better to get partial credit than it is to copy someone else's work.

There is never a penalty for asking for help.

We know when you copy work.

The consequences are severe.

Most problems can be avoided with planning.

Github Copilot is **explicitly disallowed** in this course!

Homework for Friday/Saturday

Read the syllabus.

There will be a GLOW quiz on the syllabus.

Homework for Tuesday

Lab 0: Setting Up Your Environment

Introduction

This lab introduces us to some of the tools, techniques, and workflows used throughout this course. Many of the approaches here are the same tools currently used by industrial software developers. This lab handout walks through all of the steps that we will take in a typical week to acquire lab starter code and to submit your completed lab assignment.

Before we start working, we need to configure our computers so we can create, compile, and run Java programs. In the future, you will have access to lab computers where you can perform your work if you wish. This week, we're asking you to set up your own computer. There are a few reasons:

- We want you to have the opportunity to practice installing and configuring programming tools.
- To safeguard against the small chance that we need to work remotely, your computer will already be ready to use.
- You may just prefer to use your own personal computer.

Note that our computing environment has a bias toward Unix-like operating systems like Linux and the macOS. If you have a different operating system, like Windows, that is OK. Some setup tasks will be slightly different—be sure to look out for the extra steps we provide for Windows users. Do your best, but if you need help, you are welcome to reach out to us.

Recap & Next Week

Today:

- What this course is about.
- Course policy.

Next class:

- Java!
- Program design: Nim
- Our first data structure