Programming with Data Structures

CMPSCI 187

Fall 2018

- **Please find a seat**
  - **Try not to leave empty seats (the room will be pretty full!)**
- **Turn off or silence your mobile phone**
- **Turn off your other internet-enabled devices**

Today’s class

- Overview of course topics
- Course staff
- Course logistics, policies & grading
- Brief intro:
  - Program testing & JUnit
  - The Eclipse IDE

Getting into CS 187
(if you aren’t enrolled)

- You must read this:
- https://www.cics.umass.edu/ugrad-education/overrides

Should I take 186?

If you have any doubts, take 186

An A in 121 = high probability of a B or better in 187

An A- in 121 does not

What are Data Structures?

Anyone?

What are Data Structures?

Ways to store (complex) data, and operate on it in specified ways

- Our life is surrounded by all sorts of data: files, photos, videos, music, 3D models, social network… We need efficient ways to represent and store data. Examples:
  - A collection of names -> Arrays
  - Sparse data sets -> Hash tables
  - Hierarchical / Organizational data -> Trees
  - Social network -> Graphs

What are Data Structures?

Ways to store (complex) data, and operate on it in specified ways

- Algorithms that operate on the data:
  - Sorting
  - Searching
  - Add / delete / modify
- Think about Java classes:
  - Objects: where data are stored
  - Methods: algorithms

What we will learn in this course

- Learn several important data structures and implement them using Java
- Improve your general programming skills
- Learn about and use Java-provided data structure implementations
- Compare implementations of data structures
- Learn when to use which data structures

Syllabus (topics)

Java review

Abstract data types

Complexity of algorithms

Stacks

Recursion

Queues

Lists and binary search

Binary search trees

Heaps, priority queues

Graphs

Sorting and searching

Hashing

Class Structure

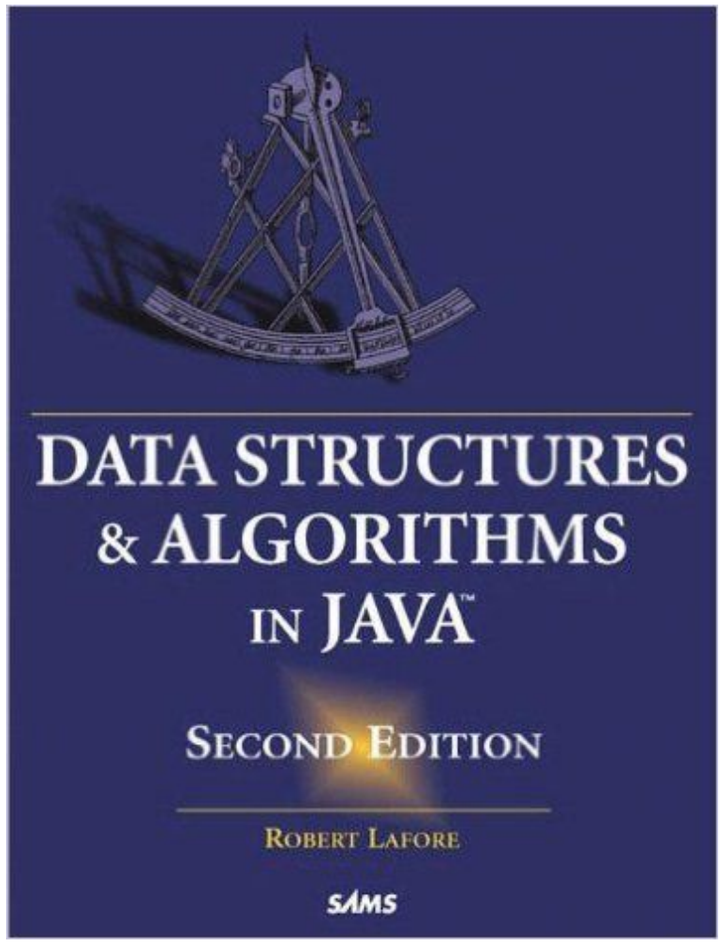
Lectures

- Will explain and demonstrate data structures
- Both their uses and implementation details

Labs (all on Mondays)

- Smaller, focused sessions
- Typically an in-depth problems related to material
- Discuss with peers but individual submission

Textbook



- We do not have a required textbook

- That said, **the *Lafore* book is not terrible**.
  It is highly rated, has great and clear code, and nice visualizations. However, it is a bit old and has no Java Generics.

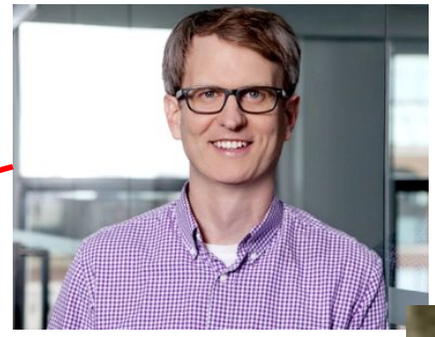
- You can rent the book on Amazon

Course staff

Come see any of us in office hours.

- One of the TAs will lead your lab section.
- You can see any TA for office hours.
- Any TA may answer your questions online.

Mark Corner



Joe Chiu

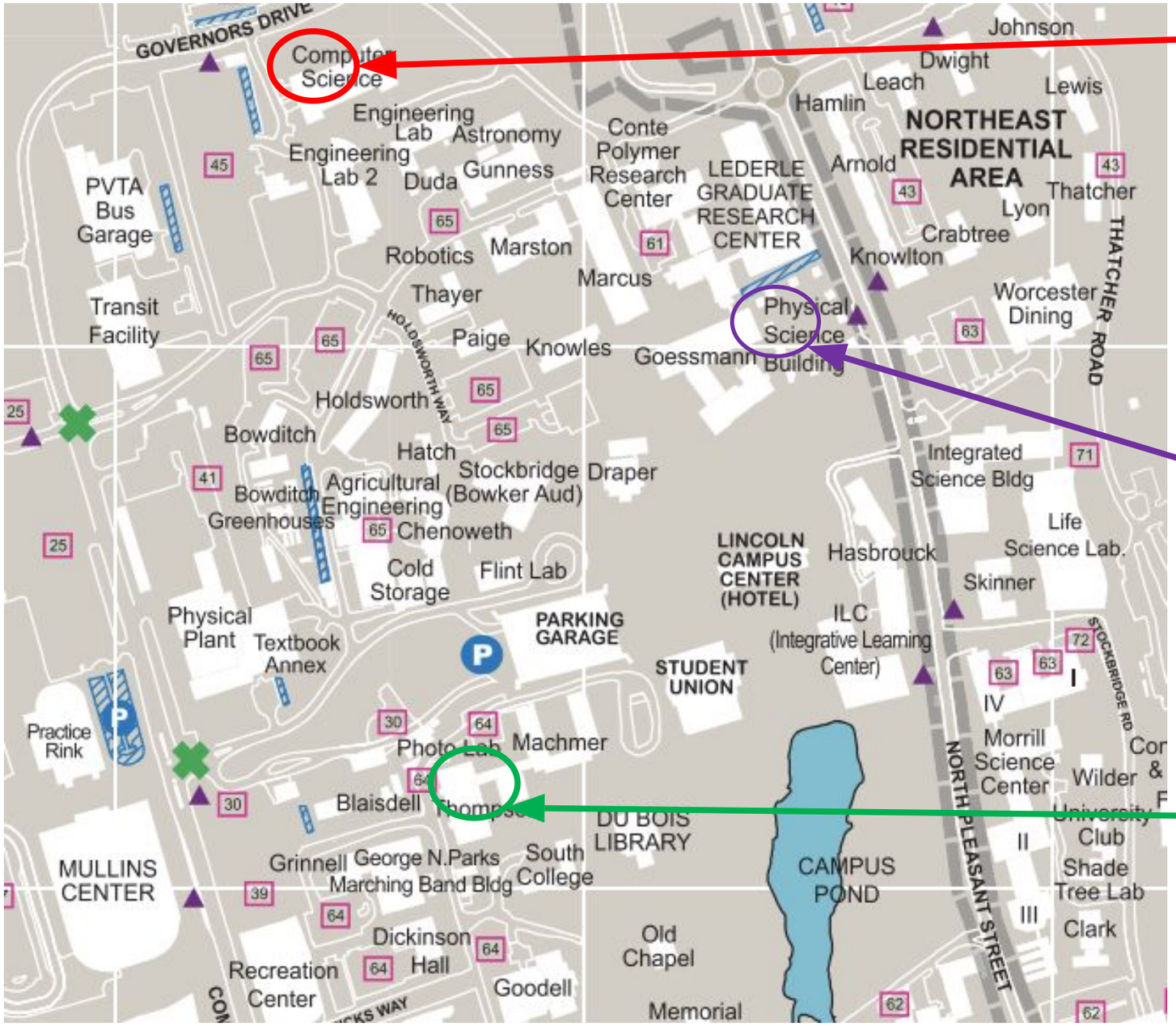
Aritra Ghosh

Jared Rondeau

Joie Wu

Yi Fung

Locations



Mark's Office Hours
CS338

Lab Sections / TA office hours
Joe's Office Hours (A246)

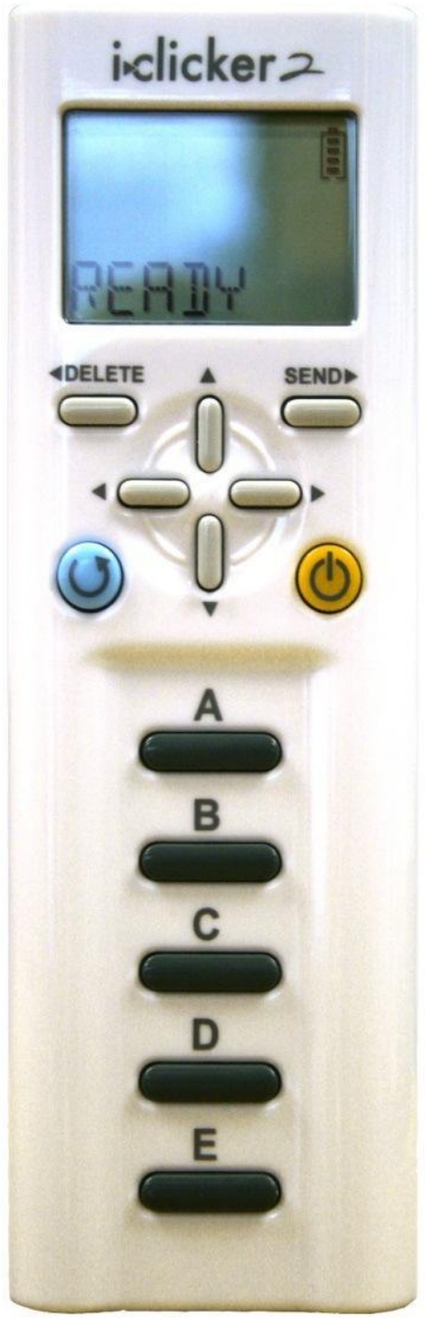
Lectures

Labs

- LGRT 223 and 225
- Go to the correct one you are assigned to!

i-clicker2

- **<u>Required</u>** for this class
  - no excuses for not having it
  - Do not use REEF/Wifi
- **Bring to every lecture** (not labs)
  - Real questions start next class
- Set to correct frequency (see sign)
  - Hold power button for 3 seconds
  - When it blinks, select correct 2 letters
  - You should get feedback



i-clicker – Let’s try it out

Do you have a clicker?

A. Yes
B. No
C. Maybe
D. D’oh!

Clicker Question #2

What experience do you have with the Eclipse IDE?

A. None
B. I tried it and gave up.
C. I've used it a little.
D. I've used it extensively.
E. I write Eclipse plug-ins.

Course website

- The course’s public website:
  - http://umass-cs-187.github.io
    - Syllabus, policies, schedule
- All course materials are distributed in Piazza
  - Projects, lab exercises, exam solutions etc.
  - Please check website and Piazza regularly

Office hours

- Instructor office hours
  - Mark Corner: CS 338
  - TA office hours held in the LGRT 223/225
- Check website for office hours

Moodle

http://moodle.umass.edu

- Log in with your UMass username and password.
- If you're registered in SPIRE you should see this course listed.
- **Only used for posting grades and grade keeping.**

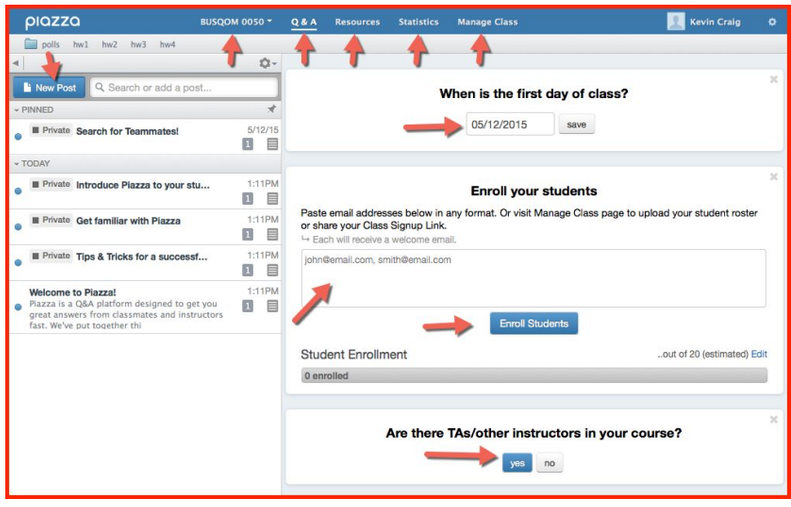
Log in soon and register your clicker in Moodle

- Right side of Moodle's screen
- Input your clicker remote ID
- You won't get credit until you register it!

Piazza

All course materials and communication are managed through Piazza!

- Post your questions. **If your question contains code or private information, make it '<u>private</u>'.**



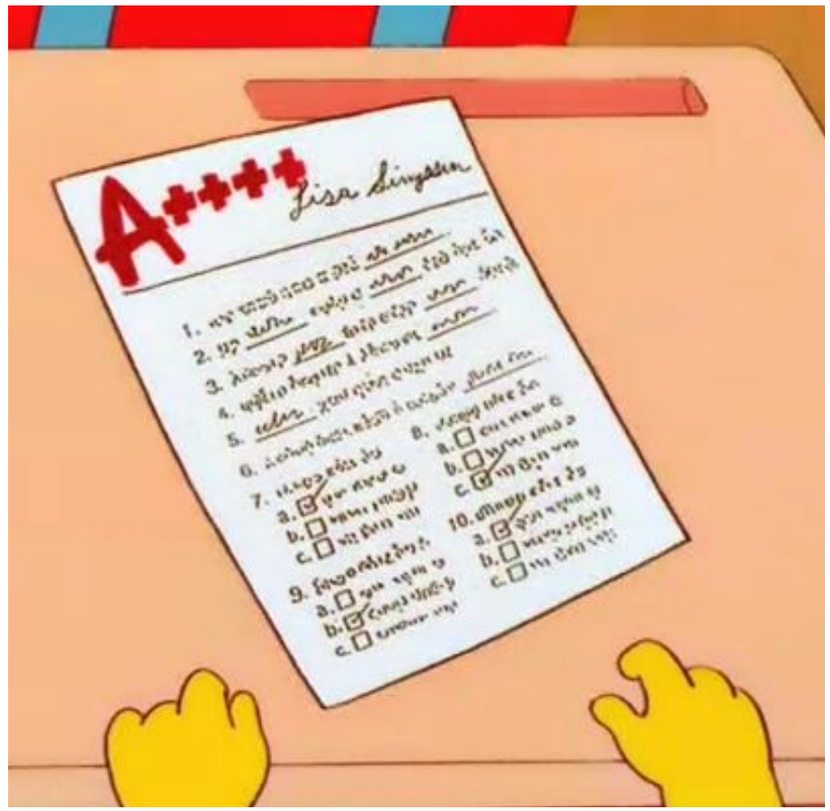
- You are likely to get quicker responses for public questions.
- Contact instructors & TAs.
- Answer other students' questions.
- TAs and instructors will be monitoring closely.
- You should have an account already, check.

Asking for help

Post Responsibly! Don't ask questions that you can easily find answers for on the course webpage!

Public posts to Piazza www.piazza.com	Any general questions that others could benefit from (no code please). Please do a quick search before posting.
Private posts to Piazza	Code / questions not appropriate for public posts. Private posts are only visible to TAs and instructors.
Email your TA	Questions pertaining to specific lab section.
Email instructor	Personal or serious issues that need the instructor's attention.

Gradescope



- Grading is done in **Gradescope**: https://gradescope.com
- **Weekly Projects**: automatic grading (autograder)
- **Weekly Lab exercises**: upload and manual grading
- **Exams**: paper and pen, but will be scanned, digitized and manually graded in Gradescope
- You should have an account already, please check.

Programming Projects

- Substantial programming problems, typically completing starter code provided to you.
  - Projects come with **automated tests** your code should pass (these are the *public tests*).
  - When done, you submit your code to **Gradescope**, which will check both the public tests and **additional *private* *tests*** and give feedback.
    - You can submit as often as you like, prior to the deadline. Details on the course webpage.
- Due on **Fridays at 3:59pm**.
- **First project is due this Friday (Sep 7) at 3:59pm.**

Late Policy

- **Deadlines are hard and non-negotiable**
- **We will drop the lowest project grade**
  - This accommodates exceptional circumstances, including includes illness, family issues etc.
- **Exam:** make-up exam or disability service requests must be approved **<u>one week before</u>** the exam.
  - If you fall ill on the day of exam and have to request a make-up, you must provide an official doctor's note.
  - No accommodation will be made after the exam.

Grading Components

Percentage	Component	Frequency
5%	iClicker	Every lecture
5%	Labs	Weekly
25%	Projects	Weekly
20%	Midterm 1	In class
20%	Midterm 2	In Class
25%	Final exam	See SPIRE

Course Management Summary

- **Each Lecture: Clicker**
- **Every Monday: Labs** (submitted to Gradescope)
- **Every Friday: Project due** (submitted to Gradescope)
- **Two midterms and One final**
  - Paper and pen, closed-book and closed-note
- **Course materials**: course webpage and Piazza
- **Questions:** Piazza
- **Grades:** posted in Moodle

Academic Dishonesty

We take this very seriously.

- You may discuss projects with others in this course, however, you **must write code on your own and implement solutions on your own**.

- Copying from someone else, or materials found directly from the web are considered dishonest.

- Copying or using sections of someone else's program or assignment, even if it has been modified by you, **is not acceptable**.

UMass Code of student conduct

Academic Dishonesty

We take this very seriously.

- We will be using automated and manual means for detecting software plagiarism.
- If I find you cheating on projects, I will contact you and punishments are typically an F in the course.
- If you plan to use Github or BitBucket etc. **PLEASE make your repository private**!
- When in doubt, contact the instructor about whether a potential action would be considered plagiarism.

UMass Code of student conduct

Programming Environment

- Eclipse IDE
- Required. ***You must use Eclipse to complete projects for this course.***
- You will download and install the latest version of Eclipse as part of Project 1.
- Start immediately, don’t underestimate the time needed to complete any project, including Project 1!

First Programming Project

- Install Eclipse, import code, run JUnit tests, complete code, debug to pass public tests
- Submit project through the Gradescope.
- Up on the website now! Get started now!
  - Download PDF and starter code, released in Piazza (Course Materials pinned post)
- **Due this Friday, 3:59pm**

Testing in this course

- To facilitate auto-grading, this course uses testing to evaluate your submissions.
- Test cases are used to examine many aspects of your submission. Each test case represents an important testable piece of your program.
- The starter code given to you contains ***public*** tests that you can use to evaluate your implementation before submission. After submission, additional ***private*** tests will be applied during the auto-grading process.
- **Gradescope** will provide limited feedback and a score.

JUnit

- JUnit is a testing framework for testing Java code.
- JUnit test cases focus on individual classes, however, they can be used to test the interaction between groups of classes.
- Eclipse supports JUnit directly and provides a visual report of tests that pass/fail.

First Lab

- Next Monday
- Meet in room / time assigned to you on SPIRE
- Purpose is to help you get familiar with JUnit, debugging, and prepare for the second project.
- **Bring a laptop**

Eclipse & JUnit

- Next, we will show you how to import the first assignment into Eclipse, run the code, and run the JUnit tests to test your code.

Debugging Tips

- Testing tells you when your program fails to produce expected output. But it does not directly tell you where the problem is / how to fix the code.
- Throughout this semester, you should learn and practise using debugging tools
  - **Simple print debug**
  - **Setting breakpoints / conditional breakpoints**
  - **Step-over and Step-into**

Things for you to do now

- On course webpage, read:
  - Syllabus, course policies, course management, and academic honesty.
- Make sure you can log in to Piazza and Gradescope.
- You should have received invitation to gradescope in your umass.edu email account if you filled out the poll).
- Login to Moodle and register your iClicker
- Start on Project 1 right away.

Questions?