Topic 1
CS314 Course Introduction

Chapman: I didn't expect a kind of Spanish Inquisition.

Cardinal Ximinez: NOBODY expects the Spanish Inquisition! Our chief weapon is surprise...surprise and fear...fear and surprise.... Our two weapons are fear and surprise...and ruthless efficiency.... Our **three** weapons are fear, surprise, and ruthless efficiency...and an almost fanatical devotion to the Pope.... Our **four**...no... **Amongst** our weapons.... Amongst our weaponry...are such diverse elements as fear, surprise....

In class: please close laptops and put away mobile devices.

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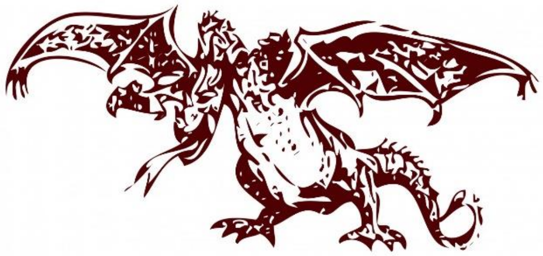
Who Am I?

- Professor of Instruction (lecturer) in CS department since 2000
- Undergrad Stanford, MSCS RPI
- US Navy for 8 years, submarines
- 2 years Round Rock High School prior to coming to UT



Purpose of these Slides

- Discuss
  - course content
  - procedures
  - tools
- For your TO DO list:
  - complete items on the startup page

www.cs.utexas.edu/~scottm/cs314/handouts/startup.htm

Course Goals

- Analyze algorithms and code for efficiency
- Be able to create and use canonical data structures: lists (array and linked), stacks, queues, trees, binary search trees, balanced binary search trees, maps, sets, graphs, hash tables, heaps, tries
- Know and use the following programming tools and techniques: object oriented programming (encapsulation, inheritance, polymorphism), Java Interfaces, iterators, sorting, searching, recursion, dynamic programming, functional programming

Course Goals

- After CS314 you can design and implement medium size programs (several 100’s of lines of code split between multiple classes) to solve interesting problems
- Recall, the three core areas of the UTCS undergrad degree:
  Programming, Theory, Systems
- After this class your instructors shall expect you can write complex programs given a specification or problem statement.
  - You have to design the algorithm in many cases.

Prerequisites

- Formal: CS312 with a grade of C- or higher
- Informal: Ability to design and implement programs in Java using the following:

•variables and data types

•expressions, order of operations

•Conditionals (if statements)

  •including boolean logic and boolean expressions

•iteration (loops)

•Methods (functions, procedures)

•Parameters

•structures or records or objects

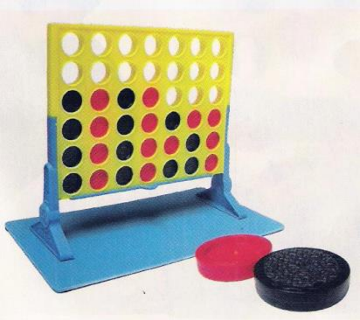
•arrays (vectors, lists)

•top down design (breaking big rocks into little rocks)

  •algorithm and data design

  •create and implement program of at least 200 - 300 loc

•could you write a program to let two people play connect 4?



CS314 Topics

1. Introduction
2. Algorithm Analysis
3. Encapsulation
4. Inheritance
5. Polymorphism
6. Generics
7. Interfaces
8. Iterators
9. Abstract Classes
10. Maps, Sets
11. Linked Lists
12. Recursion
13. Recursive Backtracking
14. Searching, Simple Sorts
15. Stacks
16. Queues
17. Fast Sorting
18. Trees
19. Binary Search Trees
20. Graphs
21. Hash tables
22. Red-Black Trees
23. Huffman Code Trees
24. Heaps
25. Tries
26. Dynamic Programming
27. Functional Programming

Data Structures

- simple definition:
  - variables that store other variables
- We will learn a toolbox full of data structures …
- … and how to build them …
- … and how to use new ones.

Clicker Question 1

- Which of the following is a data structure?

A. a method

B. a try / catch block

C. a double

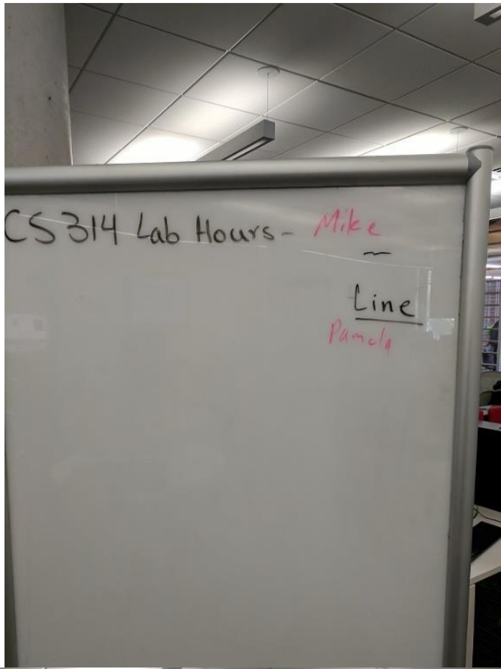
D. an array

E. more than one of A - D

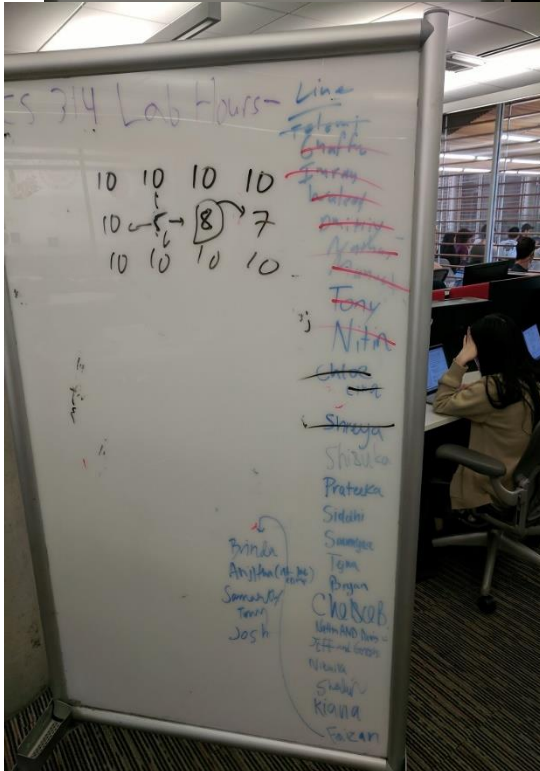
Resources

- Class web site – most course material
- Class discussion group – Piazza
- Canvas -> Grades, Program Submissions, Access Zoom Links, Recorded Lectures, Help Videos

Monday ->

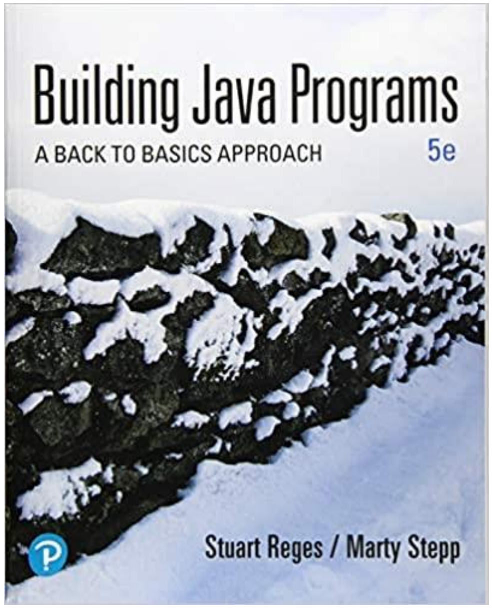


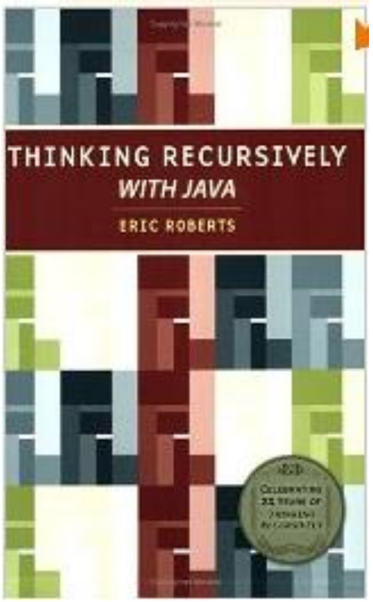
Wednesday ->



Books

- books are recommended, not required
- free alternatives on the web, see schedule
  - BJP (CS312 book) ***strongly recommended***
  - Thinking Recursively in Java - recursion





Clicker Question 2

Which of these best describes you?

A. First year at UT and first year college student

B. First year at UT, transferring from another college or university

C. Second year at UT

D. Third year at UT

E. Other

Graded Course Components

- Syllabus Quiz, **10 points**
- Extra credit: Background survey **10 points**
- Academic Integrity Quiz, **10 points** (all correct or 0, multiple attempts)
- Section problems, 8 sections with problems, 4 points each. **4 * 8 = 32**
- Programming projects
  - 11 projects, 20 points each, **220 points total**
- Exams: Outside of class
  - Exam 1, Thursday 2/15, 6:45 – 9:15 pm, **250 points**
  - Exam 2, Thursday, 3/28, 6:45 - 9:15 pm, **250 points**
  - Exam 3, TBD, could be as late as 5/6, **250 points**
- Course Instructor Evals **10 points**
- **10 + 10 + 10 + 32 + 220 + 250 + 250 + 250 + 10 = 1042**
- Non exam points capped at 250 pts
  - 42 points of "slack" among those non exam components
- **No points added!** Grades based on 1000 points, not 1042
- final points = min(250, sum of non exam)
  + e1 score + e2 score + e3 score

Grades and Performance

- Final grade determined by final point total and a 900 – 800 – 700 – 600 scale
  - plusses and minuses if within 25 points of cutoff:

A: 925 – 1000   A-: 900 – 924   B+: 875 – 899   B: 825 - 874

- My CS314 Historical Grades
- **82% C- or higher:**
  - **28% A's, 34% B's, 20% C’s**
- **8% D or F**
- **10% Q or W (drop)**
- WORK LOAD EVALUATED AS **HIGH** **(but not EXCESSIVE)** ON COURSE SURVEYS

Programming Assignments

- Individual – **do your own work (no copying or use of LLMs / generative AIs)**
- **Programs checked automatically with plagiarism detection software (MOSS)**
- Turn in the right thing - correct name, correct format or you will lose points / slip days
- Graded on Correctness AND program hygiene

  "Code is read more often than it is written."
  - *Guido Van Rossum,* Creator of Python
- Slip days: 8 for term, max 2 per assignment, don’t use frivolously

Succeeding in the Course

- Randy Pausch,
  CS Professor at CMU said:

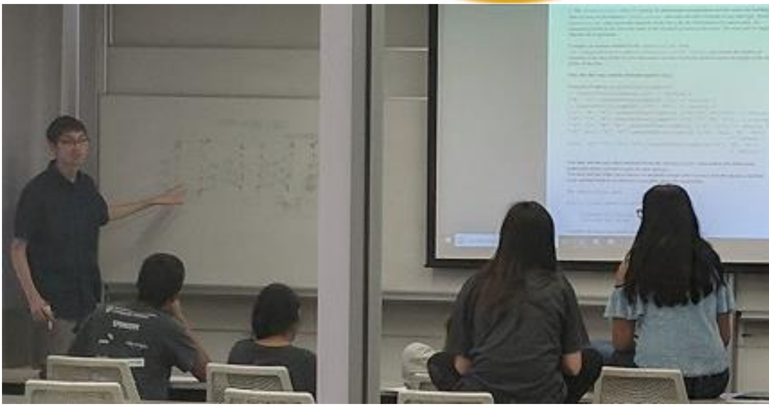
- *"When I got tenure a year early at Virginia, other Assistant Professors would come up to me and say, 'You got tenure early!?!?! What's your secret?!?!?' and I would tell them, 'Call me in my office at 10pm on Friday night and I'll tell you.' "*

- *"A lot of people want a shortcut. I find the best shortcut is the long way, which is basically two words:* ***work hard****."*

Succeeding in the Course - Meta

- “Be the first penguin”
  - – Ask questions!!!
  - – lecture, section, Ed Diss, lab hours

- “It is impossible to be perfect”
  - – Mistakes are okay.
  - – That is how we learn.
  - – Trying to be perfect means not taking risks.
  - – no risks, no learning
- “Find a Pack”
  - – Make friends.
  - – Study with them!



How to Get Help

- Ed Discussion Post
- Help Hours
- Class examples
- Examples from book
- Discuss with other students at a high level

Succeeding in the Course - Concrete

- Former student:
  - "I really like the boot camp nature of your course."
- do the readings
- start on assignments early
- get help from the teaching staff when you get stuck on an assignment
- attend lecture and discussion sections
- go to the extra study sessions
- participate on the class discussion group
- **do extra problems** - http://tinyurl.com/pnzp28f
- study for tests using the old tests
- study for tests in groups
- ask questions and get help

Software

- Java - Oracle or OpenJDK, limit ourselves to Java 8
- IDE such as IntelliJ or Eclipse
- SSH into CS machines to test your programs
  - CS department account
  - SSH keys
  - Ability to transfer files and login remotely (WinSCP, Putty, Cyberduck, Filezilla, …)
- A zip tool (create zip files to turn in)
- Zoom, used occasionally

Clicker Question 3

Which computer programming language are you most comfortable with?

A. Java

B. C or C++

C. Python

D. Javascript

E. Other

See: http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html
and http://lang-index.sourceforge.net/