Course Staff

- Instructor
  - Thorsten Joachims (tj@cs.cornell.edu)

- Teaching Assistants
  - Adith Swaminathan (adith@cs.cornell.edu)
  - Konstaninos Mamouras (mamouras@cs.cornell.edu)
- 9 more TAs are TBD

- Consultants
  - TBD

What is wrong with this Program?

```java
public class Mystery {
    public static void main(String[] args) {
        int[] a = {7, 121, 12, 13, 9, 324, 1};
        boolean d;
        do {
            d = false;
            for (int b = 1; b < a.length; b++) {
                if (a[b-1] > a[b]) {
                    int c = a[b];
                    a[b] = a[b-1];
                    a[b-1] = c;
                    d = true;
                }
            }
        } while (d);
        for (int e : a) {
            System.out.println(e);
        }
    }
}
```

→ Output: “1, 7, 9, 12, 13, 121, 324”

Moore’s Law

From Lives and death of Moore’s Law, Ilkka Tuomi, 2002

Grandmother’s Law

- Brain takes about 0.1 second to recognize your grandmother
  - About 1 second to add two integers (e.g. 3+4=7)
  - About 10 seconds to think/write statement of code
- Your brain is not getting any faster!
Why the world need CS 2110!

- Real systems are large and complex.
- Year Operating System Millions of lines of code*
  - 1993 Windows NT 3.1 6
  - 1994 Windows NT 3.5 10
  - 1996 Windows NT 4.0 16
  - 2000 Windows 2000 29
  - 2001 Windows XP 40
  - 2005 Windows Vista 50


- Computer Science → Managing Complexity
  - Analyze highly complex situations
  - Decompose problem into independent components
  - Assure correctness of components
  - Reuse prior work that is proven correct
  - Spread work over multiple people

Sam Loyd’s 8 Puzzle

- Goal:
  - Given an initial configuration of tiles, find a sequence of moves that will lead to the sorted configuration.
  - A particular configuration is called a state of the puzzle.

State Transition Diagram of 8-Puzzle

- State Transition Diagram: picture of adjacent states.
- A state Y is adjacent to state X if Y can be reached from X in one move.

State Transition Diagram for a 2x2 Puzzle

Graphs

- State Transition Diagram in previous slide is an example of a graph: a mathematical abstraction
  - vertices (or nodes): the puzzle states
  - edges (or arcs): connections between pairs of vertices
  - vertices and edges may be labeled with some information (name, direction, weight, cost, ...)
- Graphs: vocabulary/abstraction for problems
  - Airline routes
  - Roadmaps
  - Social network
  - etc.

Path Problems in Graphs

- Is there a path from node A to node B?
  - Solve the 8-puzzle
- What is the shortest path from A to B?
  - 8-puzzle (efficiently)
  - Driving directions
- Network flow
  - Friendship structure of facebook
- Eigenvectors
  - Pagerank in Google
Course Objectives

• Concepts in modern programming languages
  – recursive algorithms and data structures
  – data abstraction, subtyping, generic programming
  – frameworks and event-driven programming, graphical user interfaces
  → Organizing large programs
• Building blocks: data structures and their algorithms
  – arrays, lists, stacks, queues, trees, hashtables, graphs
• Algorithm analysis and designing for efficiency
  – asymptotic complexity, induction

Using Java, but not a course on Java!

Why you need CS 2110?

• Fun and intellectually interesting: cool math ideas meet engineering (and make a difference)
• Crucial to any engineering or science career
  – Good programmers are 10x more productive
  – Leverage knowledge in other fields, create new possibilities
  – Where will you be in 10 years?
• Great job prospects with high salaries...
• Computational Thinking: You’ll learn to think in a more logical, structured way
• Computational thinking pervades almost every subject of inquiry in today’s world

Are you ready for CS2110?

• CS2110 assumes you know Java
  – You took CS1110 at Cornell
  – You have “completed” CS1130
  – Or took a high school course and got a 4 or 5 on the CS AP exam
• CS2110 assumes you actually remember Java
  – Go over online material of CS1130
  – classes, objects, fields, methods, constructors, static and instance variables, control structures, arrays, strings, exposure to inheritance
• Don’t take CS1110 just because you are worried that your high school Java experience won’t do
• We recommend against trying to skip directly into CS3110. Doing so requires permission from both Professor Joachims and Professor Joachims!

And how about CS2112?

• CS2112 is equivalent to CS2110 in terms of
  – requirements
  – prerequisites
  – course material that is covered
• CS2112 is different in the following respects
  – gives more depth in some areas
  – is more project driven
  – more challenging assignments
  – includes a lab in addition to sections (4 credits)
• Students can easily switch between the two courses in the first 3 weeks.

Lectures

• Time and place
  – Tuesday/Thursday 10:10-11am, Olin 155
  – Attendance is mandatory
  – In-class quizzes
• ENGRD 2110 or CS 2110?
  – Same course! We call it CS 2110
  – Non-engineers sign up for CS 2110
  – Engineers sign up for ENGRD 2110
• Reading and examples will be posted online together with lecture notes

Sections

• Each section will be led by a TA
  • Reinforces lecture material, help on homework
  • Sometimes additional material
• Everybody needs to register for a section
  • Section numbers are different for CS and ENGRD
  • Like lecture, attendance is mandatory
  • No permission needed to switch sections
  • We recommend that you do NOT switch often
• You may attend more than one section
• No sections this week – they start next week!
Consulting and Office Hours

• Office Hours
  – Instructor (after class, Upson 4153)
  – Teaching Assistants
  – See webpage for times and locations
• Consulting Hours
  – Google calendar on webpage
  – In Upson 360
  – “Front line” for answering questions
  – Consulting hours start next week

Resources

• Course web site
  – http://courses.cs.cornell.edu/cs2110
• Piazza
  – Good place to ask questions
  – Announcements
• Textbook
  – Frank M. Carrano, Data Structures and Abstractions with Java, 3rd ed., Prentice Hall
  – Additional material on the Prentice Hall website
• Recorded Videonote Lectures Fall 2010
  – Warning: Different instructor, different content

Academic Excellence Workshops

• Two-hour labs in which students work together in cooperative setting
• One credit S/U course based on attendance
• Time and location TBA
• See the website for more info
  http://www.engineering.cornell.edu/student-services/learning/academic-excellence-workshops

Obtaining Java

• See “Resources” on website
• We recommend Java 6
• Need Java Development Kit (JDK), not just Java Runtime Environment (JRE)

Eclipse

• IDE: Interactive Development Environment
  – We highly recommend use of Eclipse
  – Helps you write/compile your code
  – Helps with debugging
  – Eclipse tutorial in section
• See “Resources” on website

Coursework

• Components
  – Five assignments (43%)
  – Two prelims (15% each)
  – Final exam (20%)
  – Course evaluation (1%)
  – Survey (1%)
  – Quizzes in class (5%)

• Submit assignment late:
  – 5 points deduction per 24h late.
  – Everybody has 5 “free” late days.
  – Maximum 3 days late on each assignment
• For assignments and quizzes, lowest grade gets replaced by second-lowest grade.
Assignments

• Assignments may be done by teams of two students (except for A1)
  — You may choose to do them by yourself
  — A1 will be posted on Thursday
• Finding a partner
  — Choose your own or contact your TA.
  — Piazza may be helpful.
  — Monogamy encouraged. However, you may change partners between assignments (but not within).
• Please read partner info and Code of Academic Integrity on website

Survey

• Soon available on CMS as a “quiz”
• Learn about course participants
  — Understand better who you are
  — Refine CS2110 content
• Participating accounts for 1% of overall grade
  — Obviously not graded
  — There are no wrong answers
• Deadline: next week Friday, Feb 3.

Academic Integrity

• See Academic Integrity Policy on website
• We use artificial intelligence tools to check each homework assignment
  — The software is very accurate!
  — It tests your code and also notices similarities between code written by different people
• Sure, you can fool this software
  — ... but it's easier to just do the assignments
  — Penalty ranges from negative points for the assignment to failing the course.

Welcome!

We hope you have fun, and enjoy programming as much as we do.