Lecture 1: Introduction to Computation

Motivation for CS 202

Computation is revolutionizing daily life
• Change how we live, work, learn, and communicate
• Increases productivity
• Drive advances in nearly all other fields

Goal: Understand fundamentals of computation

What will you learn in CS 202?

1. Computation is powerful
   • Simple algorithms can solve complex problems quickly
     - Algorithm: Step-by-step method for accomplishing a task
     - Experience with creating solutions yourself (in Scratch)

2. How modern computers work
   • Hardware:
     - How to go from bits (1s and 0s) to running any program and storing all information?
   • Software (Operating System):
     - How to run multiple applications? How to send messages?
     - How does Google work?

3. Interesting applications of Computer Science
   • Artificial Intelligence, Robotics, Security, Education

What is NOT focus of CS 202?

1. How to use different applications
   • Word, ppt, excel, databases, web searching
   Goal: Design and build our own applications

2. How to use or administer computers
   • Reboot or install OS, new printers, network?
   Goal: Understand fundamentals of how computers work

3. Implications of technology
   • Impact of facebook and twitter on society
   Goal: Understand basics of how technology is designed
Programming Language: Scratch

Scratch Demo

Easy to create many interesting programs
• Animations with Music
• Interesting Graphic Effects
• Educational Software
• Simulations
• Logic and Strategy Games
• Video Games

Administrative Details

Instructor:
• Professor Andrea Arpaci-Dusseau
dusseau@cs.wisc.edu
• Office: Computer Sciences 7375
• Office Hours: TBA

Four TAs: Help with homeworks and programming
• Weekly (optional) help sessions in Computer Lab
  • Help with current homework
  • Go over similar problems
  • Review solutions to homeworks
  • Group atmosphere for programming in 1370 CS
• Times posted soon

What will you do in CS 202?

Two Scratch Projects: 25% of total grade
• Open-ended games, show some creativity
• Expect significant effort: many, many hours
• Share with classmates (work is individual)
  • Scratch website + in-class demos
  • Create mosaic at end of semester
• Instructor and TAs happy to give advice
What will you do in CS 202?

Homework (~10 assignments): 40%
  • Approximately 1/week
  • Straight-forward programs, pencil+paper analysis, short essays
  • First one available today (see webpage), due in one week
Exams (3): 35%
  • Two in-class exams; Final exam on December 22nd!
  • Closed book, closed notes
Class attendance and participation: Extra credit
  • No laptops

What will you learn in CS 202?

<table>
<thead>
<tr>
<th>How do computers...?</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solve problems?</td>
<td>Algorithms</td>
</tr>
<tr>
<td>Know what to do?</td>
<td>Programming languages</td>
</tr>
<tr>
<td>Make art?</td>
<td>Sequential blocks and Loops</td>
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<tr>
<td>Show animated stories?</td>
<td>Messages</td>
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<tr>
<td>Make decisions?</td>
<td>IF statements</td>
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<tr>
<td>Represent information?</td>
<td>Bits</td>
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<tr>
<td>Represent words, pictures, sound?</td>
<td>Encode in binary</td>
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<tr>
<td>Automate calculations?</td>
<td>Variables and boolean logic</td>
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<tr>
<td>Act logically?</td>
<td>Gates and truth tables</td>
</tr>
<tr>
<td>Calculate?</td>
<td>Circuits</td>
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<tr>
<td>Remember?</td>
<td>Memory</td>
</tr>
<tr>
<td>Answer difficult questions?</td>
<td>Artificial intelligence</td>
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<tr>
<td>See?</td>
<td>Computer vision</td>
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<tr>
<td>Interact with humans?</td>
<td>Social robots</td>
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</table>

<table>
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<tr>
<th>How do computers...?</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Find stuff?</td>
<td>Searching</td>
</tr>
<tr>
<td>Find stuff faster?</td>
<td>Binary search</td>
</tr>
<tr>
<td>Find goal?</td>
<td>Optimization</td>
</tr>
<tr>
<td>Execute instructions?</td>
<td>CPUs</td>
</tr>
<tr>
<td>Run multiple applications?</td>
<td>Operating systems</td>
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<tr>
<td>Teach you with educational software?</td>
<td>Instructions for waiting</td>
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<tr>
<td>Teach the world?</td>
<td>Digital StudyHall</td>
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<tr>
<td>Avoid races in parallel programs?</td>
<td>Critical sections</td>
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<tr>
<td>Guess what happens?</td>
<td>Probability trials</td>
</tr>
<tr>
<td>Predict the future?</td>
<td>Simulation</td>
</tr>
<tr>
<td>Win games?</td>
<td>AI and Decision trees</td>
</tr>
<tr>
<td>Communicate with others?</td>
<td>Networking</td>
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Resources

Course Web Page:
http://www.cs.wisc.edu/~cs202-1

Detailed syllabus
• Slides from lecture (after)
• Code samples from class
• Screencasts of Scratch programming
• Readings

Recommended textbook: Invitation to Computer Science
• Not perfect match with 202 (does not use Scratch)
• Might not be needed if attend every lecture
• Copy on reserve at library and available in Computer Lab

Homework 1

Purpose: Investigate Scratch website and projects
• http://scratch.mit.edu/
1. Create new user account, upload picture of self
   • User name should be FirstnameLastname
2. Find 3 interesting existing projects
   • Recommend Featured, Top Viewed, Top Loved
   • Make Gallery named something like “Assignment 1”
   • Place 3 projects in your gallery
   • In comments (of Gallery, not Projects) write 1 paragraph per project about why picked each
3. Request to be friends with Instructor and specified TA
   • http://scratch.mit.edu/users/dusseau

Today’s Overview

Contents of CS 202: Introduction to Computation
1. Experience solving problems with computation (algorithms + programming)
2. Understand how computers work (hardware and software)
3. Exposure to applications of computer science

Scratch: Excellent language for beginners

Administrative items:
• Fill out survey
• Reading: Check out course web site
• Homework 1 Available; Due 1 week