CompSci 1: Principles of Computer Science

Lecture 1
Course Overview
Course Information

“A survey of the great ideas of computer science along with experience with programming, the theoretical foundations of computer science, how computer systems are organized and work, and the applications of computers including their effect on society.”

- Grading Breakdown

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Approx Weight</th>
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<tbody>
<tr>
<td>Attendance and Participation</td>
<td>5%</td>
</tr>
<tr>
<td>Labs</td>
<td>10%</td>
</tr>
<tr>
<td>Lab Final</td>
<td>5%</td>
</tr>
<tr>
<td>Quizzes/Assign</td>
<td>25%</td>
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<tr>
<td>Project/Essay</td>
<td>15%</td>
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<tr>
<td>Midterm</td>
<td>15%</td>
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<tr>
<td>Final</td>
<td>25%</td>
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- Scores on absolute scale
Important Dates

- Project Proposal: Wednesday, June 8
- Midterm Exam: MONDAY, June 13, 2:00 PM to 3:15 PM
- Project Outline: Friday, June 17
- Lab Final: TUESDAY, June 21, 3:20 PM to 4:20 PM
- Final Project due: Friday, June 24
- Final Exam: THURSDAY, June 30, 2:00 PM to 5:00 PM

- No make-ups, no late submissions
- Let me know ASAP if you have any concerns
Resources

- Course website
  - [http://www.cs.duke.edu/courses/summer05/cps001](http://www.cs.duke.edu/courses/summer05/cps001)
    - syllabus
    - lecture notes
    - prelab and lab assignments
    - links to supplementary material
- Blackboard
  - grade lookup
  - discussion board
  - Quizzes
Questions?
What is a computer?

• In general, a device designed to input and process data, produce output and store results based on a sequence of instructions.
• Typically refers to *digital computers*
  – process data as numbers
  – mainframes, minicomputers, microcomputers (PCs)
• Can also refer to *embedded computers*
  – special-purpose devices that can compute only one or a limited range of functions
• and also to *analog computers*
  • represent data by measurable quantities such as voltage, resistance, or position
Computers in everyday life

• At the store …
  • bar codes and scanners
• At the ATM …
  • transfer funds electronically
• In your car …
  • regulate fuel, airbag deployment, cruise control, A/C
• On your person …
  • cell phones, PDAs, calculator
• In your home …
  • A/C, security systems, microwaves, VCRs, game consoles
  • checking email and browsing the web on your PC
“He used to love running on the beach, chasing squirrels, catching a ball. That was before I got a computer.”
What is computer science?

Computer science is the study of algorithms with a goal towards their efficient execution. This includes the design, analysis, hardware realizations, and software realizations of algorithms.

• One may also say computer science is the study of …
  • algorithms
  • computation
  • computing systems
  • information processing
  • computer software and hardware resources
Computer science is not defined by...

- Programming
  - what is important is discovering the steps needed to solve a particular problem, not the act of translating them to a programming language
- Designing cool web pages
- Using software for spreadsheets, word processing, etc.

“Computer science is no more about computers than astronomy is about telescopes”

- E. W. Dijkstra
What do computer scientists do?

- Study what computers can and cannot do
- Design and analyze algorithms to efficiently perform specific tasks
- Design data structures and databases to store and retrieve specific kinds of information
- Discover applications of computer technology
- Apply theory to real world problems

“Although it is true that programmers do (mostly) programming, computer scientists deal with computing, using programming as a tool with which to explore and develop ideas.”

- John Impagliazzo & Paul Nagin
Algorithms as Cornerstone of CS

- Step-by-step process that solves a problem
  - more precise than a recipe
  - eventually stops with an answer
  - general process rather than specific to a computer or to a programming language

- Searching: for phone number of G. Samsa, whose number is 929-9338, or for the person whose number is 489-6569
  - Are these searches different?

- If the phone book has 8 million numbers in it:
  - How many queries to find phone number of G. Samsa?
  - How many queries to find person with number 929-9338
Layers of abstraction

The Result:

<table>
<thead>
<tr>
<th>Applications</th>
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</thead>
<tbody>
<tr>
<td>Programming Languages</td>
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<tr>
<td>Operating Systems</td>
</tr>
<tr>
<td>Machine Architecture</td>
</tr>
<tr>
<td>Circuits</td>
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<tr>
<td>Physics</td>
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Survey the field

- Artificial intelligence
- Graphics/Multimedia
- Parallel Computation
- Programming Languages
- Systems
- Scientific Computing
- Theory
- User Interfaces
Themes and Concepts of CS

• Theory
  • properties of algorithms, how fast, how much memory
  • average case, worst case: sorting cards, words
  • provable properties, in a mathematical sense
• Language
  • programming languages: C++, Java, C, Perl, Fortran, Lisp, Scheme, Visual BASIC, ML, ...
  • Assembly language, machine language,
  • Natural language such as English
• Architecture
  • Main memory, cache memory, disk, USB, ...
  • pipeline, multi-processor
Questions you will be able to answer

• Vendor tries to sell you a system that will check all of your systems and procedures to see if they are correct.
  • A good deal?

• Programmer tells you that to optimize the routing of your sales personnel is beyond the power of today's computers.
  • Do you believe her?

• Computer consultant demonstrates complicated management system with test data including a handful of employees.
  • Is the performance with this small set of data a good indicator of how the system will perform with all of your company data entered?
Tomorrow’s topic

- HTML Webpages
  - Read GI Chapter 1

- Lab starts Tuesday (05/24)
  - Prelab 1 online (due before lab!)

QUIZZES!!!