Welcome!

Principles of Computer Science

Today's topics:

- What is this course about?
- How are we going to learn that?
- Who is this guy talking to us?
- Where do we go from here?

An overview of computer science

Upcoming

The World Wide Web and HTML

Internet & Networks

What is Computer Science?

- What does a computer scientist do?
- What does a programmer do?
- What does a systems administrator do?
- What do you want to do?

Computer Science = Programming

Computer Science is more than programming

The discipline is called informatics in many countries

Elements of both science and engineering

Elements of mathematics, physics, cognitive science, music, art, and many other fields

Computer Science is a young discipline

Fiftieth anniversary in 1997, but closer to forty years of research and development

First graduate program at CMU (then Carnegie Tech) in 1965

To some programming is an art, to others a science, to others an engineering discipline

In this course, you will program in a language called Python
Quotations about Computer Science

"Computer science has such intimate relations with so many other subjects that it is hard to see it as a thing unto itself."
- Marvin Minsky, 1979

"It has often been said that a person does not really understand something until he teaches it to someone else."
- Donald Knuth

"Actually, a person does not really understand something until he can teach it to a computer."
- Judith Gal-Ezer and David Harel

Algorithms as Cornerstone of CS

Representation of Information

What's the difference between "Rolex" and "Timex"? VCR tape and DVD?

What is digital?

Sampling analog music for CD: 44,100 samples/channel/second * 2 channels * 2 bytes/sample * 74 minutes * 60 seconds/minute = 783 million bytes

How does MP3 help?

Precise, logical thinking

Breaking down a task into unambiguous steps

Computers are deterministic

Algorithm: a set of steps that defines how a task is performed

Debugging

"Programs will rarely work the first time one writes them."

Systematic approach to detecting, diagnosing, and fixing errors

Debugging skills are useful in many parts of life

How many students are there in this class?

Design an algorithm
1.10 Creating a Program

1. Specify the problem
   - remove ambiguities
   - identify constraints

2. Develop algorithms, design classes, design software architecture

3. Implement program
   - revisit design
   - test, code, debug
   - revisit design

4. Documentation, testing, maintenance of program

A programming language is a way to describe an algorithm.

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**

- Final: 20%
- Midterm: 15%
- Project: 27%
- Quizzes/Assignments: 4%
- In-class: 4%
- Lab Final: 20%
- Labs: 5%

**Weight (approx)**

**Assessment**

**Course Information**

**Important Dates**

- Midterm 2/20
- Projects due 4/18
- Final 4/29 2pm - 5 Friday
- Quiz/Assignments

**Grading Breakdown**

- Scores on an absolute scale
- No make-ups, no late submissions

**Important Dates**

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Let me know ASAP if you have any concerns

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.

**Course Website**

- http://www.cs.duke.edu/courses/spring08/cps001/
- Read Blackboard page
  - http://courses.duke.edu
  - Read discussion forums
  - Reading posted on Blackboard page due by next Wednesday class time

**Frequently Asked Questions**

- What is the prerequisite?
  - High school algebra (?)

- How does this course fit into the curriculum?
  - A survey, service course designed for non-majors
  - CPS 4 & 6 are more programming oriented
  - Satisfies QSU and STS requirements

- Why take this course?
  - Computers are interesting, useful, and ubiquitous
  - Pure entertainment

- I'm computer-phobic. Will I be able to handle this course?
  - Computers rarely bite and the ones you deal with in this course are relatively small and not very mobile
What does this course teach?

Great Ideas of Computer Science

Why does Amazon.com work?

How do we keep information secure when using insecure media?

How can flipping coins allow us to solve problems?

What problems are easy, hard, or impossible?

How can free software be incredibly sophisticated and in some cases superior to proprietary software?

Why doesn't this course teach anything practical?

Learn how to create a webpage?

• Read a book

Learn to how to create a web browser?

• Programming paradigms, networking, security, operating systems and computer architecture, concurrent processing, social effects of computing, etc.

How does this course teach?

Active learning

Utilizing technology

On some days, you can bring your laptop

Concept Test: questions that highlight an important concept gleaned from the lecture and/or reading

It's OK not to know!

Peer instruction: after seeing the results, you will have a confere

Just in Time Teaching

Discuss your assignment responses in class

Class debates

Why respond?

Counts toward in class work score

Effort, participation, and altruism

Makes class better!

Layers of abstraction

Circuits

Physics

Machine Architecture

Operating Systems

Programming Languages

Applications

The User:

The Result:

Survey the field

Artificial intelligence

Graphics/Multimedia

Parallel Computation

Programming Languages

Systems

Scientific Computing

Theory

User Interfaces
Moore’s Law and rapid technological innovation
What do exponential increases in computing power bring?

Ubiquitous computing
When computers are everywhere, what are the opportunities and implications?

Security & Privacy
Are security and privacy concerns at odds or complementary?

Standards
How can systems developed by disparate groups work effectively?

Questions you will be able to answer
Vendor tries to sell you a system that checks 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?

Networks
Need to communicate. How to do it?
Robustly, efficiently, securely?

Classifications
LAN vs. WAN
Closed (proprietary) vs. Open

Topologies
What advantages do open networks have?

The Internet
Network of networks
Connect networks through routers and bridges
Internet: Started by DARPA in 1973
What is network neutrality?
The World Wide Web! Started!

Servers disseminate hypertext documents

“Hypertext is text with a link or reference

Uniform resource locator (URL): unique address of data on web

Hypertext markup language (HTML) is a common formatting language for the web

Tags are non-printing formatting markers

• Identified by angle brackets (i.e., <TAG>)

• Example: <TITLE>The Human Tornado</TITLE>

• Come in delimiting pair !

General Goals

Platform independent text specification (also called a markup language)

Links to other network resources

How is the Web different from the Internet?

What is Computer Science?

Computer science is no more about computers than astronomy is about telescopes. Edsger Dijkstra

Computer science is not as old as physics; it lags by a couple of hundred years. However, this does not mean that there is significantly less on the computer scientist’s plate than on the physicist’s: younger it may be, but it has had a far more intense upbringing! Richard Feynman

http://www.wordiq.com

Computer Science in a Nutshell?

Game!

10 coins

You and a friend have a stack of 10 coins. On each person’s turn, they remove either 1 or 2 coins from the stack. The person who removes the last coin wins. Can you win?

10 coins with a twist!

10 coins, can now also place 1 or 2 coins back on the stack. Person who removes last coin wins. Should you go first or second, and what's your strategy