CMSC 110
Introduction to Computing

Eric Eaton
What is Computing?
Computing: internet, e-mail, network...
Computing: Productivity...
Computing: Digital Photography
Computing: Digital Photography

Computing: Entertainment...
Computing: Entertainment...
“Computer science is no more about computers than astronomy is about telescopes”

- Edsger Dijkstra
Mapping the Epigenome

DNA contains the genetic blueprint for all human cells, but the reading and execution of the blueprint inside each cell is controlled in part by chemical markers attached to the DNA. Scientists have begun to map some of these epigenetic markers, including CpG methylation.

**CpG methylation**

DNA is a code written with four letters: A, T, C, and G. Each standing for one nucleotide.

In CpG methylation, a small marker called a methyl group attaches to the DNA at a CpG site, where a C and a G nucleotide sit next to each other.

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**Chromosome 22**

Of the 23 pairs of chromosomes in the human genome, 22 is the second smallest, containing only about 2
Chinook

- Chinook is the World Man-Machine Checkers Champion, developed by researchers at the University of Alberta.
- It earned this title by competing in human tournaments, winning the right to play for the (human) world championship, and eventually defeating the best players in the world.
- Visit http://www.cs.ualberta.ca/~chinook/ to play a version of Chinook over the Internet.
- The developers have fully analyzed the game of checkers and have the complete game tree for it.
  - Perfect play on both sides results in a tie.
- “One Jump Ahead: Challenging Human Supremacy in Checkers” Jonathan Schaeffer, University of Alberta (496 pages, Springer. $34.95, 1998).
Google’s Autonomous Car

• Nevada made it legal for autonomous cars to drive on roads in June 2011
• In February 2011, IBM Watson bested Brad Rutter (biggest all-time money winner) and Ken Jennings (longest winning streak)

• IBM is currently applying Watson’s technology to medical diagnosis and legal research
Finding Life-Supporting Planets

Doppler Shift due to Stellar Wobble
Protobytes
By Ira Greenberg
Areas in Computer Science

- Operating Systems
- Computer Networking
- Computer Graphics
- Computer Vision
- Databases
- Computer Security
- Artificial Intelligence
- Robotics
- Human-Computer Interaction
- Ubiquitous Computing
What is Computer Science?

Simple definition: Computer science is the study of solving problems using computation

– Computers are part of it, but the emphasis is on the problem solving aspect

Computer scientists work across disciplines:

Mathematics          Geoscience          Medicine/Surgery
Biology (bioinformatics) Archeology          Engineering
Chemistry            Psychology          Linguistics
Physics              Sociology           Artists
Geology              Cognitive Science   ...
Computing is important.
# Fastest Growing Occupations

## Table 1.3 Fastest growing occupations, 2008 and projected 2018
(Numbers in thousands)

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Network systems and data communications analysts</td>
<td>292.0</td>
<td>447.8</td>
<td>155.8</td>
<td>53.36</td>
<td>VH</td>
</tr>
<tr>
<td>Computer software engineers, applications</td>
<td>514.8</td>
<td>689.9</td>
<td>175.1</td>
<td>34.01</td>
<td>VH</td>
</tr>
<tr>
<td>Computer software engineers, systems software</td>
<td>394.8</td>
<td>515.0</td>
<td>120.2</td>
<td>30.44</td>
<td>VH</td>
</tr>
</tbody>
</table>

The Best and Worst Jobs

CareerCast rated 200 jobs based on income, working environment, stress, physical demands and job outlook, using data from the Labor Dept. and U.S. Census researchers’ own expertise. See which jobs were ranked highest and lowest, and their midlevel income. The highest-ranked jobs are highlighted in yellow. Click on headers to sort. See full rankings on CareerCast.com. (More: The Best and Worst Jobs.)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Title</th>
<th>Midlevel Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>software engineer</td>
<td>$87,000</td>
</tr>
<tr>
<td>2</td>
<td>mathematician</td>
<td>$64,000</td>
</tr>
<tr>
<td>3</td>
<td>actuary</td>
<td>$67,000</td>
</tr>
<tr>
<td>4</td>
<td>statistician</td>
<td>$73,000</td>
</tr>
<tr>
<td>5</td>
<td>computer systems analyst</td>
<td>$77,000</td>
</tr>
<tr>
<td>6</td>
<td>meteorologist</td>
<td>$85,000</td>
</tr>
<tr>
<td>7</td>
<td>biologist</td>
<td>$74,000</td>
</tr>
<tr>
<td>8</td>
<td>historian</td>
<td>$63,000</td>
</tr>
<tr>
<td>9</td>
<td>audiologist</td>
<td>$63,000</td>
</tr>
</tbody>
</table>
How many of us are studying CS?
United States and Canada

Figure 7. Newly Declared CS/CE Undergraduate Majors

Figure 6. BS Production (CS & CE)

Computing Research News, CRA May 2010
http://www.cra.org/resources/taulbee/

CS=Computer Science, CE=Computer Engineering
We've turned a corner...

• "Stanford University enrollment for in CS106A (CS1) [in 2010/2011] is 1087, which represents a year-on-year growth of 51%"

• Why?
  1. I'm just curious
  2. Increase my potential to land a good job
  3. I love computing
  4. Need to fill a requirement
  5. Other…

Computer science tops list of best major for jobs

By Rachel Gottfried

Computer science graduates now get more offers of employment than any other major. This is the first time since 2009 that computer science has topped the list: previously, accounting majors had the highest offer rate.

In 2011, 55.2% of computer science majors received job offers, compared to only 53.8% of accounting majors. The offer rate for computer science majors increased 13.8% this year from the previous year.

Computer science and accounting majors are in high demand because both are needed in a wide range of industries.

“Many different companies ... need to hire computer scientists. They aren't tied to one particular industry,” said Mimi Collins, director of communications at the National Association of Colleges and Employers.

Although this is good news for computer science grads, it might not be for the computer industry. According to Collins, “One computer science graduate may have 10 offers as opposed to one accounting graduate that’s getting five offers.” So, computer science majors may be getting more offers, but this is only because there is a shortage of people who graduate with such a degree.

According to Collins, companies like to hire recent graduates because they have the latest skills.

“Things change very quickly, especially in computer science,” said Collins. “Many organizations have a formal track where they want to bring in new college graduates and train them the way they want them to be trained.”

Annabelle Evans graduated as a computer science major from the University of Southern California in 2008. “When I picked my major, I knew there wouldn’t be a lack of jobs as a computer scientist, but I wasn’t sure if I’d like the work.” Evans now works at Google.
Administrivia

CMSC 110: Introduction to Computing
Fall 2011 – Section 1

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Email: eaton@cs.brynmawr.edu (put CS110 at start of subject line)

Lectures
Tues/Thurs 2:15-3:45 pm in Park 349

Labs
Wed/Thurs 10am-12 pm in Park 231

Grading
• 7 Assignments 56%
• Exam 1 20%
• Exam 2 24%
Total 100%

Office Hours
Mon/Thurs 1-2 pm and by appointment in Park 249
Creative Computing

Introduction to ^ Computing

Computing

Visualizations

Programming

Aesthetics & Art

Algorithms

Processing/Java

Computational Media
Algorithms

An algorithm is an effective method for solving a problem expressed as a finite sequence of instructions. For example,

Put on shoes
left sock
right sock
left shoe
right shoe
Programming = Writing Apps

**Programming** is the process of designing, writing, testing, debugging / troubleshooting, and maintaining the source code of computer programs. This source code is written in a programming language.
A program

```c
int areaOfCircle(int radius){
    return PI*radius*radius;
}

r = 10;
area = areaOfCircle(r);
```
## Programming Languages

<table>
<thead>
<tr>
<th>Processing</th>
<th>Python</th>
<th>Lisp</th>
</tr>
</thead>
</table>
| `int areaOfCircle(int radius){
    return PI*radius*radius;
}
r = 10;
area = areaOfCircle(r);` | `def areaOfCircle(radius):
    return PI*radius*radius;
r = 10
area = areaOfCircle(r)` | `(defun areaOfCircle (radius)
    (return (* PI radius radius)))
(setq r 10)
(setq area (areaOfCircle r))` |
A more interesting program...

```java
Eye e1, e2, e3, e4, e5;

deploy(void)
{
  size(200, 200);
  smooth();
  noStroke();
  e1 = new Eye(50, 16, 80);
  e2 = new Eye(64, 85, 40);
  e3 = new Eye(90, 200, 120);
  e4 = new Eye(150, 44, 40);
  e5 = new Eye(175, 120, 80);
}
deploy(void)
{
  background(102);

e1.update(mouseX, mouseY);
e2.update(mouseX, mouseY);
e3.update(mouseX, mouseY);
e4.update(mouseX, mouseY);
e5.update(mouseX, mouseY);
e1.display();
e2.display();
e3.display();
e4.display();
e5.display();
}
class Eye
{
  int ex, ey;
  int size;
  float angle = 0.0;

  Eye(int x, int y, int s)
  {
    ex = x;
    ey = y;
    size = s;
  }

  void update(int mx, int my)
  {
    angle = atan2(my-ey, mx-ex);
  }

  void display()
  {
    pushMatrix();
    translate(ex, ey);
    fill(255);
    ellipse(0, 0, size, size);
    rotate(angle);
    fill(153);
    ellipse(size/4, 0, size/2, size/2);
    popMatrix();
  }
}
```
Our Goal

• Use computing to realize works of art

• Explore new metaphors from computing: images, animation, interactivity, visualizations

• Learn the basics of computing

• Have fun doing all of the above!
Creative Introduction to Computing

Computing

Visualizations

Programming

Aesthetics & Art

Algorithms

Processing/Java

Computational Media
Examples
Shepard Fairey
Abstract

Art
Red & Blue States
Summertime

Summertime,
And the livin' is easy
Fish are jumpin'
And the cotton is high

Your daddy's rich
And your mamma's good lookin'
So hush little baby
Don't you cry

One of these mornings
You're going to rise up singing
Then you'll spread your wings
And you'll take to the sky

But till that morning
There's a'nothing can harm you
With daddy and mamma standing by

Summertime,
And the livin' is easy
Fish are jumpin'
And the cotton is high

Your daddy's rich
And your mamma's good lookin'
So hush little baby
Don't you cry

Lyrics by George Gershwin
Let’s get started...