CIS 110
Introduction to Computer Programming

Eric Fouh, PhD

www.cis110.com
What is Computing?
Computing: internet, e-mail, network...
Computing: Productivity...
Computing: Entertainment...
Computing: Entertainment...
“Computer science is no more about computers than astronomy is about telescopes”

- Edsger Dijkstra
Cutting Edge Computer Science
Schools within the University

LOGO STYLE GUIDE

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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 G and a C nucleotides sit next to each other.

Reading the chart

The outer ring represents 36 million base pairs in Chromosome 22. Orange marks highlight areas of the chromosome that were tested for CpG methylation in a pilot study by the Human Epigenomes Project.

Measuring CpG methylation

Bar charts indicate the average amount of CpG methylation found within the tested areas. Each chart covers 100,000 base pairs. Some charts have been shifted, shown with connecting lines.

AMOUNT OF METHYLATION
0 to 20%
20 to 80%
80 to 100% of CpG sites

Variation among tissues

Each concentric ring of bar charts represents a different tissue, from muscle cells to sperm cells. Methylation levels that are significantly above or below the average level across all of the tissues are highlighted, indicating possible tissue-specific differences.

Gray and white bands on the circular chart correspond to those bands on the chromosome.

Genes

Some of the known genes from Chromosome 22 that fall within the tested areas are shown outside the chart. CpG methylation is one of several epigenetic factors that is
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).
Autonomous Cars

As of 2016

Legend
With Driver: Enacted | Executive Order | In Progress
Driverless: Enacted | Executive Order | In Progress
Driverless assuming already enacted with driver

Penn’s Autonomous Car
2011 Jeopardy!

- 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
Robot Soccer

Aibo League

UPennalizers
Robot Soccer Team
Areas in Computer Science

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

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
- Biology (bioinformatics)
- Chemistry
- Physics
- Geology
- Geoscience
- Archeology
- Psychology
- Sociology
- Cognitive Science
- Medicine/Surgery
- Engineering
- Linguistics
- Art
- ...
Computing is important
Annual Total U.S. STEM Jobs Thru 2022 vs. Recent College Grads

Data Sources:
Computing is Consistently Ranked Among the Best Occupations

CS-Related Jobs Highlighted in Red

CS Careers Rank Highly In:
- Job satisfaction
- Salary
- Work/life balance

- Growth potential
- Employment rate
- Work environment

The 25 Best Jobs of 2017

<table>
<thead>
<tr>
<th>Rank</th>
<th>Job Title</th>
<th>Rank</th>
<th>Job Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Software Developer</td>
<td>#6</td>
<td>Statistician</td>
</tr>
<tr>
<td>#2</td>
<td>Dentist</td>
<td>#7</td>
<td>Pediatrician</td>
</tr>
<tr>
<td>#3</td>
<td>Physician’s Assistant</td>
<td>#8</td>
<td>Obstetrician and Gynecologist</td>
</tr>
<tr>
<td>#4</td>
<td>Nurse Practitioner</td>
<td>#8</td>
<td>Oral and Maxillofacial Surgeon</td>
</tr>
<tr>
<td>#5</td>
<td>Orthodontist</td>
<td>#8</td>
<td>Physician</td>
</tr>
</tbody>
</table>
...many different companies ... need to hire computer scientists. They aren't tied to one particular industry.
Administrivia
Overview

CIS 110: Introduction to Programming and Computer Science

Goals:
- How can we use computers to solve problems?
- How can we formulate problems so that we can solve them via computation?

Topics:
- Programming in Java
- Computer organization and assembly language
- Applications to science, engineering, and art

“Computers are incredibly fast, accurate, and stupid; humans are incredibly slow, inaccurate, and brilliant; together they are powerful beyond imagination.” – Albert Einstein
The Basics

Instructors: Eric Fouh (Levine 603)
- Eric’s Regular Office Hours: Tue 12:30-2:30pm, Thu 11:00-12:00pm
- Please do not email; post a private message to Piazza instead with a subject starting with “[PROF]”

Recitations: Beginning 2 weeks from now

TA Office Hours:
- Help with debugging
- Bring your laptop or use lab computers
- All office hours are posted on piazza.
- Office Hours in Moore 100C and Ware College.
- Only use Piazza, office hours, or email to contact your TAs

Full details: www.cis110.com
Grading

Grade Breakdown:

- Homeworks: 60%
- Exam 1: 15%
- Exam 2: 15%
- Recitation: 6.6%
- Lecture/Polls: 3.4%

Exam 1: Mon, Mar 2\textsuperscript{nd} Time TBD (TENTATIVE!)

Exam 2: Mon, Apr 20\textsuperscript{th} Time TBD (TENTATIVE!)

Notes:

- You can check your grades on GradeScope
Course Materials

Course Website:  www.cis110.com
- Programming assignments and checklists
- Assignment submission & grades
- Lecture slides
- Discussion board (Piazza)

Textbook:  Sedgewick and Wayne

skim before lecture;
read thoroughly afterwards
Homework Programming Assignments

Due: 11:59pm on Tuesday/Thursday nights on GradeScope
- 4 late days to use throughout semester (max 2 per homework)
- No other late submissions allowed
- Lowest homework dropped (provided you earn 1/3 of possible points on each homework)
- See course webpage for other policies

Computing equipment:
- Your desktop/laptop
- Setting up the software will be described in HW0 (Info on Friday)
- Moore computer labs
Advice

- Start on HWs early! Debugging can take time.
- Back up your work like crazy.
- Office hours are less crowded if you show up early in the week.
- Do not hesitate to ask for help. If you have been trying to debug something for an hour and are getting frustrated, remember that we are there to help you.
- Your best sources for help are the instructors, the TAs and Piazza.
- Please read and follow the collaboration policy.
- Do not use Stack Overflow or other online discussion boards.
- OSC + WLRC Workshop on Academic Integrity for CIS 110 Jan 22