CMPS 10: Following National NSF Initiative for CS Principles

Introduction to Computer Science

Prof. Marilyn Walker, Office E2 267, OH Tues 2 to 4.

Introductions ...
- Instructor: Marilyn Walker, Prof. of CS
- Teaching Assistants:
  - Gabby Halberg
  - Zhichao Hu
  - Stephanie Lukin
- ... and you?
- We will tell you a lot more about us in a minute BUT first ....

This class: Computer Science Principles
- A new way of teaching CMPS 10 to align with a new AP course
- Supported by NSF and College Board
- Started three years ago ... number of different pilot courses. We started here at UCSC changing CMPS 10 in spring of 2011
- In a few years (2015) there will be a standard AP high school course and an AP exam called CS Principles
- We are trying to understand what people think is interesting about computer science (or not)
- SO......

To start: we want to know what you are like and what you think about computer scientists
- We want you to fill out a survey about you and what you think of computer science at the beginning.
- We will do the same survey (or similar one) at the end
- How many of you have already done it?
- It is part of the homework due on Thursday this week.
- Should take less than 15 minutes

What are the most interesting things happening in computing right now?
- Social Media?
- Chatbots?
- Mobile Computing?
- Your Ideas Here!!

The most interesting things in Computer Science are ....
This class

Natural Language and Dialogue Systems Lab

Introduction to this class

- http://www.bitsbook.com/excerpts/
- Getting started with Processing: Reas and Fry (buy it)
- Supplemented with reading/watching online sources, e.g. Wikipedia, You Tube

Two Aspects to the 7 Big Ideas

- **Computational Principles** – “bits can represent all information” – that everyone should know
- **Computational Thinking** – thinking approaches you can use to solve (your) problems with computers
- One to two homeworks a week. Need to keep up and keep on top of them
- Class should not be ‘too hard’, similar classes being taught at 8th grade and high school level
- At the end: understand much better what is going on inside your phone, computer, facebook, google
- You might like this class so much that you decide to do a double major in CS

AIMS: Cover the Seven Big Ideas in computing

- As defined by the College Board for new AP test
  1. Computing is a creative human activity that enables innovation
  2. Abstraction is a way to understand and solve problems
  3. Data and information help to create knowledge
  4. Algorithms are tools for developing and expressing solutions to computational problems
  5. Programming is a creative process that produces computational artifacts
  6. Digital devices, systems, and the networks that interconnect them enable and foster computational approaches to solving problems
  7. Computing enables innovation in other fields, like sciences, engineering, humanities, etc.
    - We will have pre- and post-surveys
    - We want your feedback about what in computing you find exciting and interesting

Interactive Graphics Programming!

- This is a really fun programming language that with minimal effort lets you make lots of cool things!
  - www.processing.org

National Initiative: NSF, NCWIT, Microsoft

- Pilot class: taught by Larry Snyder, CSE 120
- Follow-on to Pilot: taught by Kelvin Sung, UW Bothell
  - Also taught to 8th grade class
- Charlie McDowell and I developing shared syllabus for CMPS 10 based on my syllabus last year, with changes from Fall 2012 etc.
- There will be a new high school AP exam for CS principles by 2015
Project Awesome: http://awesome.soe.ucsc.edu/

CS BA in combination with other major?

- You might like this class so much that you decide to do a double major in CS (from awesome link)

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<th>Winter</th>
<th>Spring</th>
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BACKGROUND:

- Why teach a new version of CS Principles?
- Projected National SHORTAGE: 150K jobs in 2015

Why teach a new version of CS Principles?

One part of the solution:

- Attract students not typically attracted to CS

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<td>Physical sciences</td>
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<tr>
<td>Engineering</td>
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<tr>
<td>Computer science</td>
<td>80%</td>
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<tr>
<td>Environmental &amp; agricultural sciences</td>
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<table>
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<td>1,270</td>
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<tr>
<td>Female</td>
<td>1,405</td>
<td>1,132</td>
<td>2,537</td>
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<tr>
<td>Total</td>
<td>2,837</td>
<td>2,402</td>
<td>5,239</td>
</tr>
</tbody>
</table>
Calling all tech-savvy girls, coders, gamers, and web divas!

Apply for the NCWIT Award for Aspirations in Computing at www.ncwit.org/award.

Why NCWIT

- The National Center for Women & Information Technology is a non-profit community of more than 300 prominent corporations, academic institutions, government agencies, and non-profits working to increase women’s participation in technology and computing. NCWIT helps organizations recruit, retain, and advance women from K-12 and higher education through industry and entrepreneurial careers by providing community, evidence, and action.

People Who Build Technology Should Represent The People Who Use It

- Although women today comprise half the world’s population and more than half of the U.S. professional workforce, they play only a small role in inventing the technology of tomorrow. The lack of girls and women in computing and technology represents a failure to capitalize on the benefits of diverse perspectives: in a world dependent on innovation, it can bring the best and broadest problem-solvers to the table; and at a time when technology drives economic growth, it can yield a larger and more competitive workforce.

- Companies with the highest representation of women in their management teams have a 34% higher return on investment than did those with few or no women.

People Who Build Technology Should Represent The People Who Use It

- The U.S. Bureau of Labor Statistics predicts that IT will be one of the fastest-growing sectors of the U.S. economy, adding nearly 1.4 million job openings by 2018. Over two-thirds of these jobs could go unfilled due to the insufficient pool of college graduates with computing-related degrees. Women represent a vastly untapped talent pool.

- Groups with greater diversity solve complex problems better and faster than do homogenous groups, and the presence of women in a group is more likely to increase the collective intelligence (problem-solving ability, creativity) of the group.
Most Exciting Things in Computing Now:
mobile, pervasive, personalized, always on

Computing as part of our lives
- “Computing capacity is increasing at 58% annually, telecommunications at 28%, and storage at 23% per year. The former rate is approximately the rate of Moore’s Law, a doubling every 18 months. Communications are doubling every 34 months and storage every 40 months. Information has been expanding at this rate for the past decade.”

Increase of Computing Power
- Computing techniques same, but can do it now
- Miniaturization & Mobile
- Apple Siri: Speech recognition and Text to Speech as in
- PERSONALIZED & CONTEXT: who and where the user is

Big Data is here
- Every company in the world (Safeway) wants access to information about your online behavior
  - What apps you use
  - What you buy online
  - Where you go
- Storage (disk space) has gotten incredibly cheap
How big?

- The full scale of how much information we make is hard to appreciate. We humans collectively now have capacity to store approximately 300 exabytes of information. This is close the total amount of information stored in one person’s DNA. Or, as Hilbert puts it, it’s the equivalent of 80 Libraries of Alexandria per person on the planet. And remember, the technium is doubling its capacity every year and a half, and your DNA is not. Broadcasting has grown at about the same speed as world’s GDP, but our information storage capacity has grown 4 times faster and telecommunication capacity has grown roughly 5 times faster than the world’s economic power.

Why might you be interested in CS? A job?


- Although the economy continues to face many challenges, the startup and tech industries are very much alive. The IPO window slightly opened up for companies like LinkedIn, Pandora, Groupon, Zynga, and Carbonite. We saw monster rounds of funding for companies like Facebook, Twitter, Dropbox. The appetite for seed and angel investing was extremely active. Tech incubators and accelerator programs kept popping up.

- 2011 was a very busy year for hiring at startup companies, and it doesn’t look like that will slow down in 2012.

More missing talent

- Marketing
- I’m not talking about old-school marketing communications. Companies are looking for expert online marketers who know how to create a buzz of inbound marketing or viral traffic through the web, social media, and content discovery. Writing a good press release just doesn’t cut it anymore, as everyone is looking for the savvy online marketing professional who understands how the current state of the web operates and knows how to make it work to their benefit.

- Analytics
- Since data is becoming more and more accessible, smart companies are increasingly making decisions driven by metrics. Analytics is becoming a central hub across companies where everything (web, marketing, sales, operations) is being measured and each decision is supported by data. Thus, we are seeing a high level of demand for analytics and business intelligence professionals who almost act like internal consultants; they help determine what should be measured and then build out the capability for a company.

- Big Data: Even Salesforce wants to be able to predict what you might buy from your past spending patterns, and spending of others like you.

Fastest growing occupations by 2016

VH = Very high salaries. VL = Very low salaries.

Fastest growing occupations

This file represents Table 2, fast-growing occupations, 2006-16, in “Occupational employment prospects in 2007 Monthly Labor Review.”

Table 2: Fastest growing occupations, 2006-16

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<tbody>
<tr>
<td>Search systems and data</td>
<td>13,395</td>
<td>246</td>
<td>450</td>
<td>354</td>
<td>148</td>
<td>VH</td>
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<td>Communications analysts</td>
<td>11,092</td>
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<td>115</td>
<td>101</td>
<td>190</td>
<td>115</td>
<td>5</td>
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<tr>
<td>Personal and home health aides</td>
<td>39,932</td>
<td>262</td>
<td>1,565</td>
<td>1,533</td>
<td>605</td>
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<tr>
<td>Urban planners</td>
<td>21,910</td>
<td>30</td>
<td>1,172</td>
<td>1,142</td>
<td>574</td>
<td>5</td>
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<tr>
<td>Computer software engineers, applications</td>
<td>30,551</td>
<td>50</td>
<td>170</td>
<td>160</td>
<td>320</td>
<td>VL</td>
<td>10</td>
</tr>
</tbody>
</table>

What areas are the most competitive areas for talent (hiring challenges) these days?


- Software Engineers and Web Developers: The demand for top-tier engineering talent sharply outweighs the supply in almost every market especially in San Francisco, New York, and Boston. This is a major, major pain point and problem that almost every company is facing, regardless of the technology “stack” their engineers are working on.

- Creative Design and User Experience: After engineers, the biggest challenge for companies is finding high-quality creative design and user-experience talent. Since almost every company is trying to create a highly compelling user experience that keeps people engaged with their product, it is tough to find people who have this type of experience (especially with mobile devices including tablets) and a demonstrated track record of success.

- Product Management: It is always helpful for an early-stage company to hire someone who has very relevant and specific experience in your industry. This is especially true for product management, since the person in the role will interface with customers and define the product strategy and use cases. However, be prepared, as it will be a challenge to find people with experience in these high-growth industries: consumer web, e-commerce, mobile, software as a service, and cloud computing.

The designer who programs?


The powerful fusion of great design, great engineering, and real authority in the hands of those people, results in magical user experiences.
Class Structure

- 2 "lectures" a week – I will talk, show you how stuff works, discuss various topics, ask you to discuss stuff
- Clickers to motivate classroom discussion and direct class time
- Lecture slides will be available before class and should be read before class
- Lecture videos will be put online after the lecture
- Homework – exercises that help you learn the material... plan to spend about one hour a day (that's 7 hours per week)
- Sections: Plan to go once or twice a week. Put it on your schedule!
- Quizzes with Clickers in class to make sure you are getting the core ideas
- Midterm, Final

How does this class work?

- This class is designed a bit differently from what you might normally be used to
  - “Lecture” will be focused around YOU
  - What YOU understand
- A “clicker” is required for this class
  - It's not optional, using it will be 10% of your grade
  - Clickers are used to help both YOU and ME figure out what you understand and what you might need some help with
- So, lecture will be different
  - Ever thought about why we have “lecture”?

Why do we have lecture?

- Why do we have lecture?
GREAT Innovations:
The printing press, The web

- You don't have to trust the monk!
  - Read it and analyze for YOURSELF!
  - If I rephrase it for you, what purpose does that serve?
- Traditional class structures often look like:
  - First Exposure
  - Read Hard Stuff
  - See if You Know Hard Stuff
  - Show Knowledge Mastery

- You get very little opportunity for "expert" feedback

Peer Instruction-Based Design

- Greater opportunity for expert feedback!
- Research on how people learn:
  - Everyone constructs their own understanding
  - I can't dump understanding into your brain
  - To learn YOU must actively work with a problem and construct your own understanding of it

Lecture: Peer Instruction

- Pose carefully designed question
  - Solo vote: Think for yourself and select answer
  - Discuss: Analyze problem in teams of 3
    - Practice analyzing, talking about challenging concepts
    - Reach consensus
    - If you have questions, raise your hand and I or the TAs will come around
  - Group vote: Everyone in group votes
    - You must all vote the same to get your point
  - Class wide discussion:
    - Led by YOU (students) – tell us what you talked about in discussion that everyone should know!

How to do well in this class

- Come to class & go to section every week at least once
- Make a sincere effort to understand the material
- Go online to work on this class each day ...
  - Submit work that you alone created, except for the pair programming assignments
  - Do your pair programming as a pair. Always work together.
  - Make constructive comments about improving this class

More details.

- http://courses.soe.ucsc.edu/courses/cmps10/Winter13/01
- ecommons.ucsc.edu: know how to submit homeworks!
- piazza.com: use the forum. Check it to see if your question has already been answered!
- Labs/Sections: All the times should be onto AIS today
- Location: Merrill Ming Ong PC Lab
  - 01A: Mondays, 11:00am-1:00pm
  - 01B: Mondays, 1:00pm -3:00 pm
  - 01C: Mondays, 3:00pm - 5:00 pm
  - 01D: Mondays, 5:00pm - 7:00 pm
  - 01E: Tuesdays, 10:00am -12:00pm
  - 01F: Thursdays, 10:00am -12:00pm
  - 01G: Thursdays, 6:00 pm -8:00pm
  - 01H: Fridays, 9:00am - 11:00 am

Announcements

- Please note that we are no longer receiving Accommodation Authorization forms from the DRC.
- DRC students must bring form to me, to turn in to the Faculty Services desk.
- To DO: Familiarize yourself with the class Web page on Ecommons
- Also see classes.soe.ucsc.edu/cmps010/Winter13

Know

- The location of announcements, assignments, etc.
- Look at the syllabus for the whole quarter, midterm etc
- The Academic Conduct guideline
A Brief Word About Programming

- Some people panic at the mention of the word *programming* ... as if saying it would cause them to become social outcasts, nerdy, ...
- Programming is actually fun, and creative!
  - You get immediate feedback if what you are doing is working
  - Programming is solving a puzzle, have to stick to it
- Programming’s a career; it takes years to learn
- We teach some programming in this class as part of teaching computational thinking
  - You won’t be a programmer at the end
  - You will, I hope, think differently as a result

Announcements

- Please note that we are no longer receiving Accommodation Authorization forms from the DRC.
- DRC students must bring form to me, to turn in to the Faculty Services desk.
- To DO: Familiarize yourself with the class Web page on Ecommons, and at
- Also see classes.soe.ucsc.edu/cmps010/winter12

Know

- The location of announcements, assignments, etc.
- Look at the syllabus for the whole quarter, midterm etc
- The Academic Conduct guideline

Assignment 1: Lightbot 2.0

- Lightbot shows up on many gaming sites but whether or not it’s a “game” is a topic for Thursday
  - You direct a robot around a “blocks world”
  - It’s pretty easy, and should be fun. I will explain Thursday what the homework is intended to show.

Introductions ... What our interests are

- Teaching Assistants:
  - Gabby Halberg
  - Zhichao Hu
  - Stephanie Lukin
- Instructor: Marilyn Walker
- What we are doing in computer science
- What we think is exciting
Narrative Chains

- Learning Narrative Structures from text
  - Newspaper articles
  - IMDB Scripts Film Corpus

- arrest
- charge
- plead
- convict
- sentence
- police
- agent
- criminal
- suspect
- guilty
- innocent
- judge
- jury

Entrainment in Task-Oriented Dialogues

- Entrainment is the phenomenon that dialogue partners often become more similar to each other as the dialogue continues
- How can we automatically extract the utterance features that exhibit entrainment?
- How should we measure how much entrainment there is?

- Levelt & Kelter 83:
  - At what time do you close?
  - At five o'clock
  - What time do you close?
  - Five o'clock

Chao: Lifelogging with SenseCam

- Computer Science + Social Media
- Wear an "automatically-taking-photo" thing
- Reflections
  - Aid to memory
  - Beauty finder
  - Curious angle
  - Good way to show family and friends what your life is like

Lifelogging with SenseCam

- Camera starts taking photos as soon as you switch it on
- It captures everyday moments

Chao’s Research Projects

- Narrative Chains
- Entrainment in Task-Oriented Dialogues
- Lifelogging with SenseCam
that ideological topics tend to be more highly threaded and contested perhaps because the participants are playful (e.g., Firefox vs. IE) and technical (e.g., issue vs. feature) topics. The Rebuttal column in Figure 6 indicates that the number of dialogs varies by topic. Figure 6 separates ideological topics below the line from those above the line. The properties and number of dialogs can be seen across topics. Figure 6 provides more detail for ideological topics.

We have not yet begun to explore how we can use these argumentation links. Another important determinant is the clarification process. To date, we have only scraped debate and created a database of these explicit links if necessary. However, we also provide two other types of explicit argumentation links: support and opposition.

For example, if a user posts a comment, it can include the following counts of discourse aspects of another's turn. Because the site's layout encourages quoting, 94% of all posts contain at least one quoted line. The average number of characters per post is 364, and the average number of posts per dialogue is 1.9. The percentage of posts linked together into a rebuttal chain (P1%) is 3.4, and the average number of posts per dialogue is 11.8. The average number of dialog properties can be seen across topics. Figure 6 provides more detail for ideological topics.

1. Mechanical Turk experiments to identify indicators of how dialogic the conversation is. Long chains of rebuttals are common, and ideological topics have more than non-ideological topics. The number of dialogs per topic varies, but there are also multiple sites, which increases the number of posts in the corpus. Collecting data from CreateDebate, a dataset consisting of 324 forums and 47,522 posts, created a database of these explicit links. If necessary, we can use these argumentation links when we create and curate the database.

Sarcasm Detection: Stephanie Lukin

Quote: The key issue is that once children are born they are not physically dependent on a particular individual.

Response: Really? Well, when I have a kid, I’ll be sure to just leave it in the woods, since it can apparently care for itself.

1. Mechanical Turk experiments to identify indicators of sarcasm. Crowd sourcing to get many annotations with little cost.

2. Sarcasm Classification
   - Simple matching with indicators
   - Grammatical sentence structure
   - Repeat

Alfred: Facial Dominance Behaviors & Personality

Hypothesis: Sarcasm could be identified using facial dominance and personality cues.

Extravert, High Dominance  Introvert, Low Dominance

Beauy or Wimpy? Expressing Social Dominance by Combining Gaze and Linguistic Behaviors (Barrett, 2010)
Evaluating the Effect of Gesture and Language on Personality Perception in Conversational Agents

Natural Language and Dialogue Systems Lab
Intelligent Virtual Agents, 2010
Michael Neff, Yingying Wang (UCD), Rob Abbott, Marilyn Walker (UCSC)

Example Gestures Clips Used in the Experiment
This is a labelled version of the prologue shown to subjects.

SPYFEET: Dynamic NPC/Player dialogue
- Role playing game
- Solve a mystery by talking to 'animal spirits'
- Hypotheses: Dynamic elements will increase engagement & immersion

NLDS Lab research on online dialogue

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<th>Data Source</th>
<th>Dialog Affordances Available from Site</th>
<th># Dialogs</th>
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<td>3,650,000</td>
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<tr>
<td>4forums</td>
<td>Reply links, Quoting, Debate Topic</td>
<td>11,800</td>
<td>84,300,000</td>
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A New Way to Argue
Debate online, Vote online

Okay that's us!
- Do your homework
- Come to class on Thursday prepared to talk about your experiences with Lightbot!