CU in CS

Organized by CU ACM-W Chapter of Women in Computing (CUWIC)
April 22\textsuperscript{nd}, 2012
University of Colorado Boulder
Boulder, CO
Welcome

Dola Saha
PhD Student
Department of Computer Science
University of Colorado Boulder
Graduate Chair of CU Women in Computing
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Why Computer Science?

- Jobs
- Happiness
- Innovation
- Collaborative / Interactive / Fun
- Wide Variety of Applications
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Distribution of Projected S&E Job Openings
(new jobs plus net replacements) 2006-2016

- Information Technology: 62%
- Mathematics: 4%
- Engineering: 21%
- Life Science: 7%
- Physical Science: 4%
- Natural Science: 2%
More Jobs than People Trained
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Money Magazine

100 Best Jobs in America (November 2010)
great pay and growth prospects

- #1: software architect
- #7: database administrator
- etc.

approximately 25% in IT
Quality of Life

Money Magazine

10 Best Jobs in America (November 2010)

quality of life, low stress

- #4: web developer
- #5: geographic information systems analyst
- #7: test software development engineer
Working Environment

Wall Street Journal Article

10 Best Jobs (per CareerCast.com) income, working environment, stress physical demands, and job outlook

- #1: software engineer
- #4: computer systems analyst
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Top 30 Innovations of the Last 30 years
courtesy of www.pbs.org
Anti-Retroviral Treatment for AIDS

- 1984: retrovirus that causes AIDS is isolated
- Cancer drug Zidovudine renamed AZT
- 1987: AZT becomes 1st anti-retroviral drug approved by the U.S. FDA
SRAM/Flash memory

- 1970: Dynamic and Static Random Access Memory (D/SRAM) are invented
  - SRAM is simpler/faster than DRAM, and therefore better suited for cache memory functions
- 1980: Flash memory is invented
- 1996: 1st USB flash drive goes on the market, revolutionizing storage/transfer of data.
Stents

- Inspiration: angioplasty failures
- Method needed for permanently opening arteries
- 1986: 1st stent placed in human coronary artery
- 1994: Stents approved for use in the U.S.
ATMs

- 1960's: Early Automatic Teller Machines appear
- 1960's: ATMs are non-networking and dispense predetermined amounts
- 1970's: Magnetic stripe card is introduced; machines are networked to computers and use expands
- ATMs make it possible for people to do their banking with little to no human contact
Bar Codes and Scanners

- 1950's: 1st Barcode/reader invented
- 1960's: Commercial use
- 1970's: UPC barcode standard is developed, commercial use expands
- Marsh's in Troy, Ohio is 1st supermarket to install scanner
- Bar codes now a standard in retail settings
Biofuels

- Rudolf Diesel's first engines ran on biofuels (peanut oil)
- 1908: Henry Ford builds Model T, runs on ethanol
- Diesel & Ford found petroleum to be a more efficient fuel source
- 1970's: Energy crisis and U.S. Clean Air Act boost interest in biofuels
- Energy/environmental issues continue to boost market
Genetically Modified Plants

- Stem from the work of Gregor Mendel (1800's) and the discovery of DNA structure (1953)

- 1994: 1\textsuperscript{st} genetically modified plant goes to market (California tomatoes)

- Make them resistant to diseases

- Make them better able to tolerate pesticides
RFID and Applications

- Radio Frequency Identification
  Motivation: Identify aircraft during WWII

- 1970's: 1\textsuperscript{st} patents for RFID tags issued

- 1980's: Commercialization: used to develop automated toll payment system

- Retail: use RFIDs to track inventory
Digital Photography/Videography

- 1970: 1st solid-state video camera
- 1980's: Developments make digital photography and videography commercially viable
- Digital market overtakes film market
Graphical User Interface (GUI)

- 1968: Douglas Englebart invented the first GUI
- Late 1970's, early 1980's: GUIs advance with development of on screen windows and icons
- Preferred method of human-machine interaction
Social Networking via Internet

- 1997: Earliest example: SixDegrees.com
- 2003: MySpace launched
- 2004: Facebook launched
- 2006: Twitter launched

Profiles, friends lists and other features have changed the way people connect and interact.
Large Scale Wind Turbines

- 200 BC: 1st windmills appear
- 1970's: Modern wind energy movement starts in response to oil embargo/energy crisis
- US leads in total wind power generation
- Denmark leads in percentage of wind power as part of total energy output
Photovoltaic Solar Energy

- 1839: Photovoltaic effect is discovered
- 1970's: Modern solar energy movement starts in response to oil embargo/energy crisis
- Solar power used for heating and returning energy to the electric grid
Microfinance

- Definition: Bringing financial services to poor or low-income individuals
- Goal: to give people a means to overcome poverty
- 1980's: Muhammad Yunus founds Grameen Bank; microfinance becomes a movement
Media file compression

- Natural extension of data compression developed in the 1970's
- 1980's: Experts create compression standards JPEG, MPEG
- Enables transmission of images, audio, and video
E-Commerce

- Online transactions, shopping, auctions, etc.

- Grew out of Electronic Data Interchange used in the 1960's and 1970's

- 1980's: “Electronic Mall” created by CompuServe; non-user-friendly

- 1990's: Invention of World Wide Web, browsers prompts e-commerce explosion
Global Positioning System (GPS)

- Network of satellites used to pinpoint locations on Earth
- 1993: US Department of Defense brings GPS online
- From military applications to a civilian navigation aid
- GPS devices in cars, mobile phones, watches, even people (VeriChip/Digital Angel)
Liquid Crystal Displays (LCDs)

- Late 1800's: Liquid crystals first discovered
- 1960's: Electricity is used to create intricate patterns with the crystals
- 1970's: 1st LCDs begin to appear
- Today LCDs are in clocks, computers, televisions, automobiles, and many other products
Light Emitting Diodes (LED)

- Small, cool-running, low power light source
- Early 1900's: LEDs invented, experimented with
- 1960’s became practical
- Incorporated into many products: appliances, automobiles, consumer electronics
Open Source Software

Motivated from frustrations with copyright restrictions

New type of software license created: General Public License (GPL)

Linux, OpenOffice, Firefox, Wikipedia, many many others
Non-Invasive Laser/Robotic Surgery

- Huge advancement in surgery
- Bringing more precise operations, greater patient safety, and quicker recovery times
- 1985 - First operation performed with robotics
- 1987 - First operation performed with a laser
Office Software

- Word processing and database programs
- Changed the way business is conducted
- First evolution appeared on the market in the 1970s
- Visicalc, WordStar, MS Office, OpenOffice, etc.
Fiber Optics

- Wide use started in the 1970s
- Preferred medium of communication
- Networking, Telecommunication
- Support data rates over 100 gigabytes per second
Microprocessor

- Developed in 1970s for calculators
- Lead the development of the personal computer since the late 1970s
- Complexity and computational capacity growing exponentially
Magnetic Resonance Imaging (MRI)

- Able to image tissue for signs of disease and abnormalities
- 1970’s - scientists began using magnetic resonance to produce images
  - 1977 - first MRI full body scan performed
- 1990’s - Technology adopted and widely used through society
DNA structure discovered in 1953 by Watson and Crick

Humans have between 20,000 and 25,000 genes

Effort to map the entire human genome started in 1990 and finished in 2003

Led to advancements in research and treatment of genetic diseases
E-Mail

- Has changed the way people communicate
- Invented in 1960’s at MIT
- Public access became available in late 1980’s
- Today, e-mail is a staple of business and personal communication
Mobile Phones

- A revolution in how we communicate
- Motorola in 1973 made the first mobile phone
- Weighed more than 4 lbs!
- 1990: 12.4 million people own and use cell phones
- 2009: 4.6 billion people own and use cell phones!
PC & Laptop Computers

- IBM coined the term PC in 1981
- First laptop marketed to public in 1981
- Weighed more than 20 lbs!
- A ubiquitous part of modern life

# 2
The Internet

- A network of networks
- It is the infrastructure that we send e-mail on and shop with
- Came to life around 1979
- Bloomed into the internet we know today in the late 1990’s
Top 30 Innovations of the Last 30 years
courtesy of www.pbs.org
YOU can change the World
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Children at the Bridge Project in Denver explain how they categorized “yummy” and “yucky” foods to University of Colorado at Boulder doctoral student Jeffrey LaMarche during a spring workshop hosted by CU-Boulder. The workshop was aimed at creating technology to help improve food choices. Photo courtesy of Katie Siek

A University of Colorado at Boulder faculty member is developing technological solutions to help address the increase in obesity and related chronic illnesses among low-income communities, thanks to funding from the American Recovery and Reinvestment Act. Katie Siek, an assistant professor of computer science at CU-Boulder, has been granted more than $600,000 over a five-year period by the National Science Foundation's Faculty Early Career Development (CAREER) Program for the research.

The grant is one of six CAREER awards won by faculty in the College of Engineering and Applied Science, and 14 received campuswide last year. Two of the CU-Boulder awards were funded through ARRA, also including one to Emily Yeh, assistant professor of geography. Yeh's research, which received $490,000 in support, focuses on the emergence of environmentalism in China and Tibet and seeks to understand the ways in which environmental ideas travel and are adopted and articulated in particular times and places. The project, which will include learning and research opportunities for CU undergraduate and graduate students, will result in an ethnographic film about grassroots environmentalism in Tibet.

Siek is working with families in two of Denver's public housing neighborhoods to develop effective interventions based on social and environmental considerations. She is collaborating with the Bridge Project, a program operated by the Graduate School of Social Work at the University of Denver that aims to help high-risk children graduate from high school and succeed as adults.
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Explore your Interests

- Think about your interests
  - Health!
  - Biology!
  - Art!
  - Music!
  - Sports!
  - Recreation!

- Match your interests with CS/IT
  - Health Informatics!
  - Bioinformatics!
  - Graphic Design!
  - Audio Engineering!
  - Sports / Recreation Informatics!

- New opportunities, new avenues, more jobs
CUWIC Officers

Dola Saha
Grad Chair

Allison Brown
Grad Vice Chair

Madeline Leary
Undergrad Chair

Noelle Beaujon
Undergrad Vice Chair

Pooneh Mortazavi
Secretary/Treasurer

Prof. Katie Siek
Faculty Sponsor

Walk to C4C with
CUWIC Officers for Lunch
Opportunities in CS

Kelly McDuffie
Google

Noelle Beaujon
CS Undergrad

Kathy Keating
Envysion

Allison Brown
CS PhD Student
LUNCH
12:15 P.M. – 1:15 P.M.
Lilypad E-Sewing Kit

Prof. Leah Buechley
Assistant Professor of Media & Sciences at MIT
MS and PhD in CS from University of Colorado Boulder
Make a circuit

Continue sewing from the switch to stitch down each positive side of your LEDs.

Stitch down the other end of the switch. Ensure there is no thread connecting the two ends of the switch.

Knot and clip your thread. Re-thread your needle and tie a knot at the end.

Sew down the negative trace of your LEDs and stitch each negative hole of your LEDs down along the way.
What you received

- Cloth
- Conducting Thread
- Battery
- 1 Battery Holder, 6 LEDs, 1 Button, 1 ON/OFF Switch
- Needles
- Instruction Set
Insert Battery & Turn on Switch
Which goes where
Points to be noted

- Polarity (Positive and Negative) matters
- Battery holder and LEDs have positive & negative ends
- The ON/OFF Switch & Button does not have any polarity
- Do not connect Positive ends to Negative ends
- Cut the thread ends in the back as short as possible to avoid a short circuit
- Be careful working with needles
Back side after completion
Steps

- Complete each step
- Tie a knot in the back
- Cut the thread
- Rethread and start next step
Step 2
Halfway Through
Step 4
Step 5
Step 6
Press the Button to connect the circuit
Completed!!!
What’s Next?

- Lilypad Homepage -
  http://web.media.mit.edu/~leah/LilyPad/index.html

- Turn Signal Biking Jacket -
  http://web.media.mit.edu/~leah/LilyPad/build/turn_signal_jacket.html
Example Code to Blink LED

`/*
Blink
Turns on an LED on for one second, then off for one second, repeatedly.

This example code is in the public domain.
*/

// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led = 13;

// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage level)
  delay(1000); // wait for a second
  digitalWrite(led, LOW); // turn the LED off by making the voltage LOW
  delay(1000); // wait for a second
}
Other Projects

- Projects of High Low Tech Group @ MIT -
  [http://hlt.media.mit.edu/?cat=5](http://hlt.media.mit.edu/?cat=5)

- Electronic Popables -
  [http://www.youtube.com/watch?feature=player_embedded&v=AI-6wMlaVTc](http://www.youtube.com/watch?feature=player_embedded&v=AI-6wMlaVTc)

- Learn more & DIY from Sparkfun -
  [http://learn.sparkfun.com/curriculum](http://learn.sparkfun.com/curriculum)
1. Robotic Arm Manipulation, Dave Coleman
2. Computer Animation Making Imagination Reality, Joseph Paul Kubala
3. Visualizing Physical Therapy with Electroluminescence Wire, Alice Chien
4. Leveraging Crowds and Clouds, Jeffery Hoehl
5. Implications of Cloud Computing for Residential Supports and Services, Jeffery Hoehl
6. Boulder Food Rescue, Rhonda Hoenigman
7. MeYouBook, Houman Farokhzad
8. Topical Trends, Ogheneovo Dibie
9. Designing a Sociotechnological Intervention to Improve Snacking in Low Socioeconomic Families, Danish U. Khan
10. Curing Writer's Block with Bayesian Statistics, Robert Lindsey
Closing Remarks

Prof. Katie Siek
Assistant Professor
Department of Computer Science
University of Colorado Boulder
Faculty Sponsor of CU Women in Computing