CSCI0150
(AKA CS15)
A Gateway to Computer Science
Computer Science (1/2)

- CS15 is a start to understanding computer science
  - for your own intellectual interest
  - for its enrichment of other fields
  - for its combination of scientific, engineering, art and design concepts and practices, and as a “mode of thought” – “computational thinking”
Computer Science (2/2)

- IT, or information technology including CS, is key to the “knowledge economy”

- Some examples of CS in action, to illustrate the breadth of our field and its applications, follow
Stunning Special Effects

WALL-E

Finding Dory
Immersive Virtual Reality

● Researchers can create fully immersive 3D environments via head-tracked stereo glasses, enabling realistic “field geology” on Mars!

● A state-of-the-art new “Cave”, the YURT (YURT Ultimate Reality Theater), at 180 George Street about to be generally available
  ○ much higher quality (e.g., 100Mpixels) and much more comfortable than Oculus Rift and other VR gear
  ○ but way more expensive!
Augmented Reality

- Creates virtual elements “on top of” the real world, blending a digital reality with an existing one!
- Example: Microsoft HoloLens
  - special glasses that create a mixed reality out of holograms
  - still in development
The Internet and Social Networks

- Facebook
  - 1.5 billion active users worldwide
  - over 70 billion pieces of content (links, pictures, etc.) shared each month
  - 150,000 messages sent per minute
  - open source API allows users to write their own Facebook applications
Dilemmas of the Digital Age (1/4)

- Machines continue to replace human labor and decision-making
  - machines have increased human productivity while reducing demand for routine, repetitive jobs
  - as middle-skilled, task-intensive jobs disappear, income gap widens
  - but new jobs are being created, old jobs “upskilled” to be more interesting
    - education is key to economic survival
Dilemmas of the Digital Age (2/4)

● Dangers of yielding too much control to algorithms, some too complex to be understood by most people
  ○ instability in the stock market due to trading algorithms
  ○ self-piloting vehicles (autopilot on planes, driverless cars…)
  ○ nuclear power plans

● Cyberfraud, Cybercrime, Cyberwarfare
  ○ offense has the advantage over defense
  ○ schools in Russia, China, North Korea (at least) teach hacking…we’ve gone well beyond amateur hacking

● Brown is strong in cybersecurity technology and policy
Dilemmas of the Digital Age (3/4)

- Big Data
  - “data mining”, “machine learning”, statistics-based algorithms for detecting patterns, anomalies, etc.
  - search
  - real-time language translation
  - face recognition
  - gesture recognition for user interfaces
  - credit card fraud detection
  - crime and terrorism anticipation
  - but what about privacy?!?

Spielberg’s “Minority Report” with Tom Cruise
Dilemmas of the Digital Age (4/4)

- Big data & personal privacy
  - information now more accessible than ever
  - threat to privacy represented by increasing storage of personally identifiable information – is there any real “anonymous data”?!?
  - Google search results influencing voter decision-making
  - NSA/Snowden Controversy; what about Google, Facebook, Microsoft and their data collection and use of that data – digital stuff is permanent, and you have no control over how it is used (Sun’s Scott McNealy – “privacy is dead, get over it!”)

- Need an educated government, citizenry
Guest Speakers

Cryptography

Seny Kamara
Today’s Lecture

Robot-Human Communication

Stefanie Tellex
Tuesday’s Lecture
Q: Why is this happening?
Office: CIT 507
email: seny@brown.edu
Computer Science at Brown Works on Hard Questions (1/6)

• What technologies will help to shrink the size of computers?
• How can we make computers more secure?
• What policies will reduce cybercrime and avoid cyberwar?
Computer Science at Brown Works on Hard Questions (2/6)

• How can we build intelligent, autonomous, general-purpose robots capable of completing a variety of tasks?

Intelligent Robots

George Konidaris
Computer Science at Brown Works on Hard Questions (3/6)

• How can computers understand language to answer questions and hold conversations?
Computer Science at Brown Works on Hard Questions (4/6)

• How can graphics, vision, and interaction techniques further our ability to edit and explore the visual world?
Computer Science at Brown Works on Hard Questions (5/6)

• How can we understand and model the way humans interact with computers?

Human-Computer Interaction

Jeff Huang
Computer Science at Brown Works on Hard Questions (6/6)

• How do we build new programming languages?
• How can we improve domains like security and networking?
• How can we improve teaching computer science?
CS: So Much More Than Programming! (1/2)

- Computers are our only universal machine, through the magic of software…

- Programming is a means to an end, much like mathematics is…but they are both also fascinating topics in their own right!

- Big push to learn how to “code”, but there is no “royal road” to programming or CS – it requires serious, sustained effort
CS: So Much More Than Programming! (2/2)
Why Should **You** Study Computer Science?

- For fun and intellectual excitement
- A really exciting era is just beginning
  - CS still a young discipline, computers just starting to act intelligently
- Fundamental “mode of thought”
- An increasingly important component of all other fields
- Despite outsourcing, plenty of interesting jobs for qualified people, in established companies and start-ups, in research labs and academia