CompSci 6
Programming Design and Analysis
http://www.cs.duke.edu/courses/spring09/cps006

Professor Robert C. Duvall
http://www.cs.duke.edu/~rcd
What is Computer Science?

What is it that distinguishes it from the separate subjects with which it is related? What is the linking thread which gathers these disparate branches into a single discipline? My answer to these questions is simple --- *it is the art of programming a computer*. It is the art of designing efficient and elegant methods of getting a computer to solve problems, theoretical or practical, small or large, simple or complex.

C.A.R. (Tony) Hoare
C.A.R. (Tony) Hoare (b. 1934)

- Won Turing Award in 1980
- Knighted by Queen Elizabeth in 2000
- Developed mechanism and theory for concurrent processing
Computer Science and Programming

* Computer Science is more than programming
  - The discipline is called *informatics* in many countries
  - Elements of both science and engineering
  - Elements of mathematics, physics, cognitive science, music, art, and many other fields

* To some programming is an art, to others a science, to others an engineering discipline
What is Computer Science?

- Computer science is no more about computers than astronomy is about telescopes.

  Edsger Dijkstra

- Computer science is not as old as physics; it lags by a couple of hundred years. However, this does not mean that there is significantly less on the computer scientist's plate than on the physicist's: younger it may be, but it has had a far more intense upbringing!

  Richard Feynman
Computer Science is a young discipline

- First computer science department formed in 1962

Samuel D. Conte
Professor emeritus of computer science and mathematics was the founding department head of the nation’s first computer science program. October 1962.
Computer Science is Diverse

- **Artificial Intelligence**
  - thinking machines

- **Scientific Computing**
  - weather, cars, heart, modeling

- **Theoretical CS**
  - analyze algorithms, models

- **Computational Geometry**
  - build and animate 3D models

- **Architecture**
  - hardware-software interface

- **Software Engineering**
  - engineering, science

- **Operating Systems**
  - the soul of the machine

- **Graphics**
  - from Windows to Hollywood

- **Databases**
  - organize and retrieve information

- **Many other subdisciplines**

CompSci 6
Artificial Intelligence

Roomba

Mars Rover

CMU’s Sandstorm
Graphics

The Incredibles from Pixar

3D Representation of the Heart

CompSci 6
Medical, Genomics Applications
Devices
What is Computer Science?

- What does a computer scientist do?
- What does a programmer do?
- What does a consultant do?
- What does a systems administrator do?
- What do you want to do?
What does this position entail?

- Do you want to build quantitative models millions of people will use, based on data from the world's largest online laboratory? Are you passionate about formulating relevant questions and producing solutions to initially ill-defined problems? Do the challenges and opportunities of terabytes of data excite you? Can you think abstractly and apply your ideas to the real world? Can you contribute to the big picture and are not afraid to handle the details?

- We are looking for people with the right blend of vision, intellectual curiosity, and hands-on skills, who want to be part of a highly visible, entrepreneurial team
What is this about?

- Ideal candidates will have a track record of creating innovative solutions, and typically a Ph.D. in computer science, physics, statistics, or electrical engineering. Significant research experience is desired in fields including active learning, probabilistic graphical models and Bayesian networks, data mining and visualization, Web search and information retrieval, judgment and decision making, consumer modeling, and behavioral economics.

- What is data mining? What is machine learning?
Jobs in Computer Science

- Jobs are plentiful and satisfaction is high
  - Money Magazine ranks "Software Engineer" #1 among "Top 10 Best Jobs"
  - Five of their top six choices for the "the next job boom" are computer related
  - Fortune Magazine ranks Google #1 among "100 Best Companies To Work For"

- You can impact the world
  (from Google jobs announcements)
  - Have you imagined applying your education and experience to benefit millions of people around the world?
  - Are you looking to work with really smart people and amazing technology in one of the most inspiring work environments on the planet?
  - Do you have a passion for innovation and want to help shape the future?
Why is programming fun?

What delights may its practitioner expect as a reward?

First is the sheer joy of making things

Second is the pleasure of making things that are useful

Third is the fascination of fashioning complex puzzle-like objects of interlocking moving parts

Fourth is the joy of always learning

Finally, there is the delight of working in such a tractable medium. The programmer, like the poet, works only slightly removed from pure thought-stuff.

Fred Brooks
Scientists and Engineers

- **Scientists build to learn, engineers learn to build**
  
  – Fred Brooks

- Duke Alum
- Chair of Computer Science at UNC
- Turing Award Winner