

What is Computer Science?

Amit Jain

Associate Professor
Department of Computer Science
College of Engineering
Boise State University

Introduction

- Computer science, like Engineering, builds upon a foundation of Mathematics and Science.
- Both computer science and physics are about how the world works at a rather fundamental level. The difference, of course, is that while in physics you're supposed to figure out how the world is made up, in computer science you create the world.
- Computer Science and Engineering deal precisely with the notion of “*how to.*” Science and Mathematics deal precisely with the notion of “*what is.*”
- Computer Science in turn now drives the research and practice in science, mathematics and engineering.

Introduction (continued)

- Computer Science involves finding how to decompose problems into manageable parts and how to work on those parts.
- Computer Scientists often use computer programming languages to write the steps for solving a problem, but the crux of the work is spending time discovering the steps needed to solve a particular problem.
- The computer revolution is a revolution in the way we think and in the way we express what we think.
- A computer language is not just a way of getting a computer to perform certain operations but rather it is a novel formal medium for expressing ideas about methodology.

Major Areas of Computer Science

- Algorithms and Data Structures
- Programming Languages
- Systems: Operating Systems, Architecture, Databases and Networking.

Algorithm Example

- Compute 2^n .
- Approaches: The simple way versus recursive doubling.

Software Engineering Example

- The Linux Operating System kernel:
 - Version 2.6.35: 12.1 million lines of code, 33320 files, about 100,000 developers
- The Space Shuttle:
 - 2.5 million parts, 230 miles of wire, 4.5 million lbs, 18,000 NASA employees.

Computer Science Careers

- Wide variety of careers: Software companies, Engineering companies, Biomedical companies, Investment companies etc.
- NASA, NSA, Google, Wall Street, Bioinformatics, Intel, Microsoft, Facebook, Twitter.
- Boise Metro Area: over 200 software companies

History

- Charles Babbage (1791-1871). Designed the first programmable computer (around 1822) called the Difference Engine. It had 25,000 parts, stood 8 feet tall and weighed fifteen tons.
- Countess Lovelace Ada (1815-1852). Collaborated with Charles Babbage. She was the first programmer! She understood and articulated the promise of a general purpose computer.
- Alan Turing (1912-1954). Defined the notion of a general purpose computer precisely. Led a team to build one of the first computers in the 1940s..
- Von Neumann (1903-1957). One of the early pioneers who also led a team to build a digital computer in the 1940s.

References

- *Is Computer Science Science?* By Peter J, Denning, Communications of the ACM, April 2005, Vol. 48, No. 4.
- *Just for Fun: The Story of an Accidental Revolutionary* by Linus Torvalds and David Diamond, HarperCollins, 2001.
- *What is Computer Science?* By James Thornton, <http://jamesthornton.com/wp/display/350/>