What is Computer Science?

It’s **NOT** just programming
It’s **NOT** just today’s technology (Java, .NET,...)

Encompasses full range of activities related to computers:
• theory & algorithm development,
• software engineering: software requirements, design, maintenance
• devising computing solutions for cutting edge problems
A Fast Changing Field

7 years ago there were no iPhones
Today there are over 100,000 people writing iPhone apps

But there are basic principles that don't change
Our goal:
- Preparing students to be life-long learners,
- Starting from fundamental, enduring principles.
What do computer scientists do?

• Design and build software, hardware, networks, and robots
  – In every industry
  – In every size business
  – In every size team
Why choose a career in CS?

MONEY Magazine and Salary.com researched hundreds of jobs, considering their *growth*, *pay*, *stress-levels* and *other factors*. These careers ranked highest.

1. Software Engineer  
2. College professor  
3. Financial adviser  
4. Human Resources Manager  
5. Physician assistant  
6. Market research analyst  
7. Computer IT analyst  
8. Real Estate Appraiser  
9. Pharmacist  
10. Psychologist

## Will there be jobs?

<table>
<thead>
<tr>
<th>Job</th>
<th>Growth 2012-2022</th>
<th>% Growth 2012-2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Systems Analysts</td>
<td>127,700</td>
<td>25%</td>
</tr>
<tr>
<td>Computer Network Architects</td>
<td>20,000</td>
<td>15%</td>
</tr>
<tr>
<td>Software Developer</td>
<td>222,600</td>
<td>22%</td>
</tr>
</tbody>
</table>
What is the Computer Science Department like?

Big

- About 40 full time faculty members
- 259 declared undergrad majors (A.Y. 2012/2013)
- 131 u.g. majors graduated (A.Y. 2012/2013)
What is the Computer Science Department like?

And growing

Declared Majors

<table>
<thead>
<tr>
<th>Year</th>
<th>Majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>'10</td>
<td>100</td>
</tr>
<tr>
<td>'11</td>
<td>150</td>
</tr>
<tr>
<td>'12</td>
<td>200</td>
</tr>
<tr>
<td>'13</td>
<td>250</td>
</tr>
<tr>
<td>'14</td>
<td>350</td>
</tr>
</tbody>
</table>
Size is a problem

<table>
<thead>
<tr>
<th>Level</th>
<th>2010 / 11</th>
<th>2012 / 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1xx</td>
<td>70</td>
<td>138</td>
</tr>
<tr>
<td>2xx</td>
<td>44</td>
<td>75</td>
</tr>
<tr>
<td>3xx</td>
<td>40</td>
<td>63</td>
</tr>
<tr>
<td>4xx</td>
<td>25</td>
<td>32</td>
</tr>
</tbody>
</table>
Size is

An advantage

- Active student groups
  - USACCS
  - WCS
- Resources and Activities
  - The CAVE
  - HackerSpace
  - HackRU

See [www.cs.rutgers.edu/~lou](http://www.cs.rutgers.edu/~lou) for urls
Warning

Computer Science takes a particular way of thinking
- For some people it is natural
- Many people can learn it, with hard work
- For some people it is very, very hard

Be prepared to bail out
Our Curriculum
Two Undergraduate Degrees

• BA
  – Three required math courses (Calc 1&2, Linear Algebra)
  – Six required CS courses
  – Five Elective CS courses
Two Undergraduate Degrees

- BS
  - Three required math courses (Calc 1&2, Linear Algebra)
  - Six required CS courses
  - Two semester science course with labs
  - Seven elective CS courses

BS = BA + 2 science courses + 2 more CS electives

About 80% of CS majors do BS degree
Electives

- Software Methodology; Software Engineering
- Systems Programming
- Programming Languages; Compilers
- Numerical Analysis and Computing
- Intro to Imaging and Multimedia; Graphics
- Information and Data Management; Implementation
- Internet Technology
- Computer Architecture II
- Operating Systems Design
- Distributed Systems: Concepts and Design
- Computer Security
- Formal Languages and Automata
More Electives

- Topics Courses (vary)
  - Cryptography
  - Data mining
  - Probabilistic Algorithms
- Independent Study
- Selected Courses offered by Mathematics or Electrical and Computer Engineering
- Access to graduate courses for good students (at professor’s discretion) -- a dozen students each term
CS 395: Internship in CS

Counts toward CS major requirements

CS majors have done internships at Johnson & Johnson, Merck, SEI, AT&T, Citicorp, Google, others
Elective Tracks

• Computer Security
• Software Engineering and Information Management
• Computer and Software Systems
• Graphics and Vision
• Artificial Intelligence and Cognitive Science
• Computing Concepts and Themes (Theory)
BS/MS Program

http://www.cs.rutgers.edu/undergraduate/bsms.whtml

• Selective (GPA > 3.75)
• Finish all but two CS courses for BS
• Undergrad courses must include:
  – Software Engineering
  – Completion of two DCS graduate courses
• 30 additional DCS graduate credits for MS
• Benefits
  – no GRE required for grad admission
  – shorter time (5 yrs) possible
  – it is an honor (very few do it)

(But if you take the GRE and are admitted, you can follow exactly the same plan on your own.)
Admission to CS Major

• To be admitted to the CS major you must
  – Get C or better in
    • CS 111 Intro to CS
    • CS 112 Data Structures
    • CS 205 Discrete Structures 1
    • Calc 1 and 2
  – With at most 1 retake per course
Example First Semester Classes

- CS 111: Intro to Computer Science
- Math 151: Calculus 1
- Physics 203, 205: General Physics (or Chemistry)
- Byrne Seminar
  - Learning to Create Beautiful Artwork with Polynomiography (Kalantari)
  - Global Health for Children and Adults: Immunization, Education & Informatics (Kulikowski)
  - What it Takes to Make a Digital Computer (Metaxas)
### Introductory CS course offerings

<table>
<thead>
<tr>
<th>If you are interested in</th>
<th>Consider taking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using computers in everyday life</td>
<td>CS 110</td>
</tr>
<tr>
<td>Using computers in business, going to business school</td>
<td>CS 170</td>
</tr>
<tr>
<td>Programming computers as a mathematician or scientist</td>
<td>CS 107</td>
</tr>
<tr>
<td>Being a Computer Science major or minor</td>
<td>CS 111</td>
</tr>
</tbody>
</table>