Computing & Software Engineering

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Today's Agenda

- About Me

- Part I – What is Computing?

- Part 2 – Computing at SCU

- Part 3 – Software Engineering

- Wrap Up

About You

About Me

Academic Background	Industry Background

• BS in Computer Science from Purdue University (2002)
 	
• MS in Software Engineering from SCU (2005)
 	
• Ph.D. in Information & Computer Science from UC Irvine (2013)
 	
• Joined SCU in 2011 as a department lecturer
	• Lockheed Martin (2002-2015)
	  • Satellite Software Programmer – 4 years
	  • Flight Software Liaison – 3 years
	  • Requirements Lead (Navy Reentry Systems) – 4 years
	  • Systems Engineer Lead (Missile Systems) – 2 years
	
	• ARMUS Corp (present)
	  • Requirements & Process Manager
	  • Customer Liaison for engineering requirements
	  • Corporate process improvement

Part 1
What is Computing?

What is Computing to you?

What is Computing?

- Analysis, design and development of computer systems

- It is not just about programming or cool gadgets

- It teaches you how to think more methodically

- Computing is about how to solve problems more effectively

- Let's build a table…

Computing includes…

Computing includes a variety of fields:

- Mathematics

- Computer science

- Computer engineering

- Information science

- Electrical engineering

Questions you might be thinking

What is a computer professional?

Can I be the next Steve Jobs?

What will my day to day life be like?

Will I have to sit in front of a computer all day?
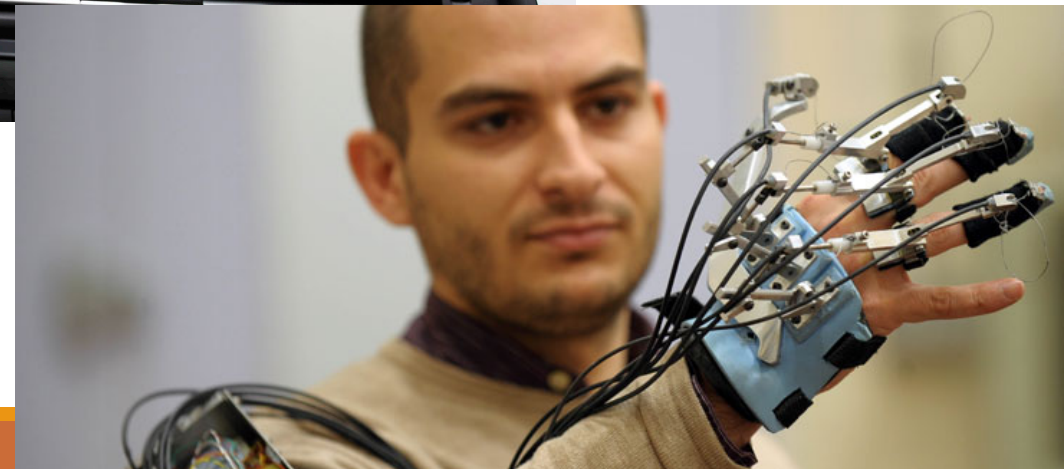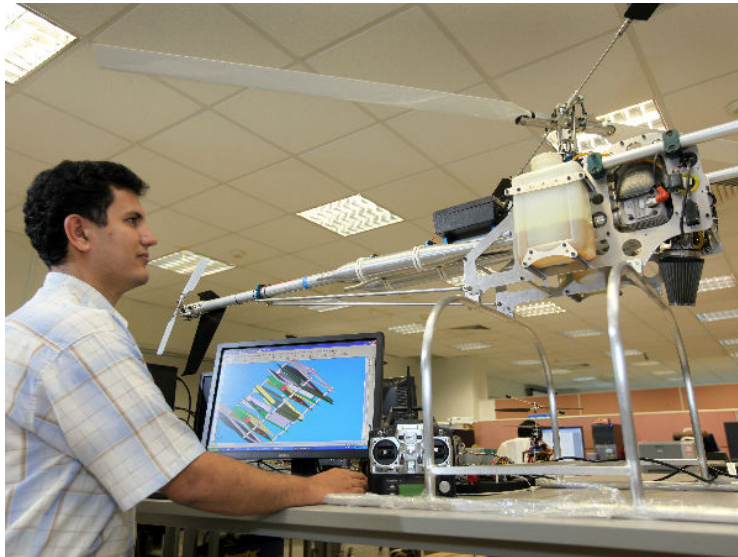
What kind of people will I work with?

Will I have to become a nerd too?

Will it be too hard?

Will I enjoy this career?

Others?

Some answers to these questions

And more

FUN, COOL, and EXCITING
– Cutting edge projects
– Exciting and talented people
– All over the world, in every sector
– Significant impact on society and our planet

My thoughts on working with CEs

- Creative

- Optimizing and refining better solutions

- Intelligent

- Continuously thinking "outside the box"

Why Study Computing?

Intellectually interesting

- Logical reasoning and mathematical thinking

- Finding solutions

Computing supports and links to most other areas of study

- Computing and neuroscientists – the brain

- Computing and Biologists – Bioinformatics

- Computing and Meteorologists – weather prediction

Why Study Computing?

Computing develops life-long learning skills … "Change is the only constant"

– Continuous learning – it never ends even after college is over ☺

– Exponential growth makes many predictions look foolish

False Predictions

"I think there is a world market for maybe five computers"
- -- Thomas J. Watson, founder and Chairman of IBM, 1943.

"Computers in the future may weigh no more than 1.5 tons"
- Popular Science, 1949

"640K ought to be enough for anybody"
- Bill Gates, 1981.

Biggest Advantages of Computing

Computing teaches problem solving

- Decomposition of a problem, abstraction, reusable concepts, modular design

- You can apply these skills to anything you do in life

- There are always new methods being investigated – never a dull moment

Computing builds team work and leadership skills

- Plan, organize, control, lead complex projects

- Learn to deal with mix of talents

- Estimate and deal with risk

Future Applications

Self-driving car

Personalized Healthcare
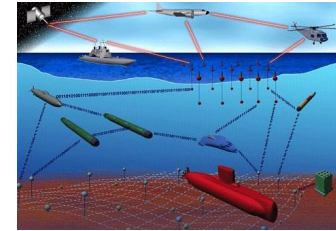
Transforming the nation's defense

Internet of Things
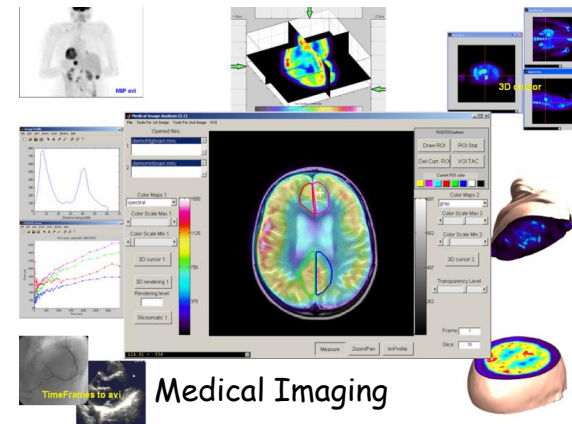
Medical Imaging

True Story

Computer Science Vs Computer Engineering

Computer Science

- Often more mathematical

- Computability theory

- Algorithmic complexity

- Data Structures

- Programming

Computer Engineering

- Often more hardware-oriented

- Image and signal processing

- Computer graphic cards / processing

Creativity

Computing is the only tech field in which you can create a product from scratch and commercialize it independently

Degree Production vs Job Openings
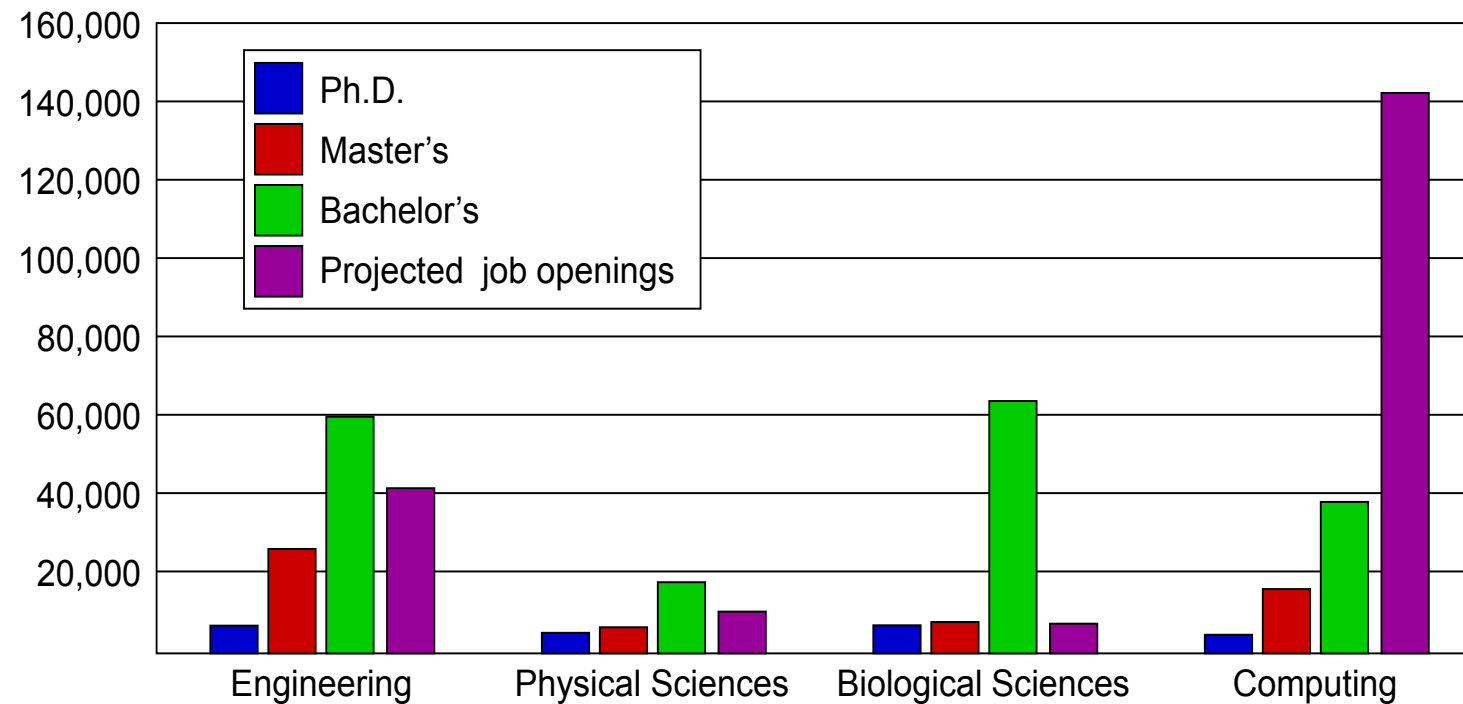
Part 2
Computing at SCU

Computing Degrees at SCU

Undergraduate degrees (BS)

- Computer science and engineering (CSE)

- Web design and engineering (WDE)

- Mathematics and computer science

Graduate degrees (MS & Ph.D.)

- Computer science and engineering (CSE)

- Software Engineering

Undergraduate CSE

- Combination of computer science and computer engineering

- Focuses on theoretical and practical aspects of computing

- Design and construction of both hardware and software systems

  – Computer networks, operating systems, compilers, software engineering, embedded programming, Web programming, robotics, 3D animation

Undergraduate WSE

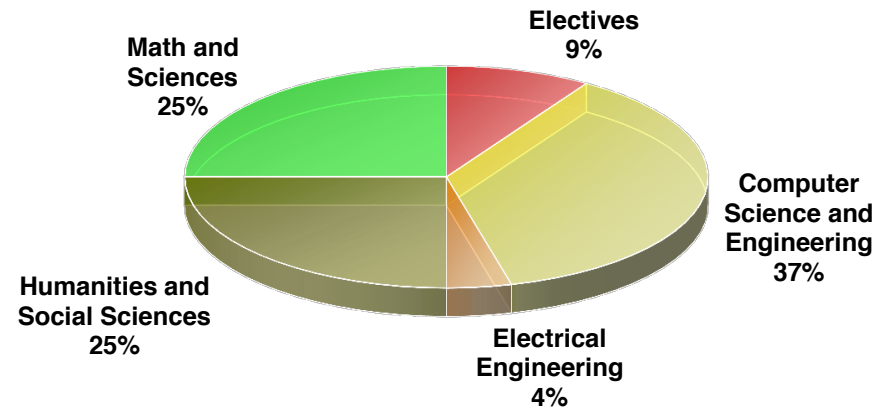- New major started in 2009
  - One of the first such programs in the country

- Combines computing with other disciplines:
  - Graphic arts
  - Communication
  - Sociology

- What will these specialized graduates do?

  – Improve Web infrastructure

  – Develop interactive, multimedia content

  – Analyze the huge amount of information on the Web (Big data)

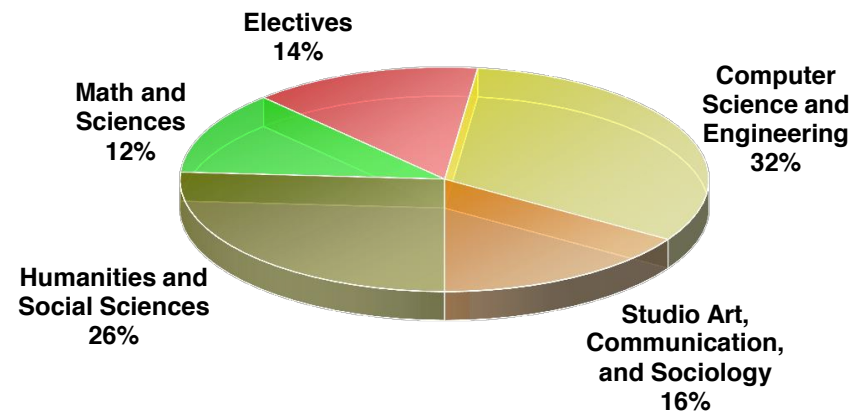 – Understand the societal impact of the Web

Video

https://www.ted.com/talks/ margaret_gould_stewart_how_giant_websites_design_for_you_and_a_billion_others_too? language=en

Coursework

Math and Sciences 25%

Electives 9%

Computer Science and Engineering 37%

Humanities and Social Sciences 25%

Electrical Engineering 4%

Computer Science and Engineering

Electives 14%

Math and Sciences 12%

Computer Science and Engineering 32%

Humanities and Social Sciences 26%

Studio Art, Communication, and Sociology 16%

Web Design and Engineering

Part 3
What is Software Engineering?

Let's suppose that…

You were asked to design the next big app to be a direct competitor to Facebook. Where would you start in designing this app?

Why SW Engineering is important

- Visibility in to the computing products we build

- Everything in life has software

- The role of software is specifically to meet the needs of human beings

- Everything we do revolves around software!

Video

https://www.youtube.com/watch?v=7OObGFLDPtw

Software Engineering is an important engineering discipline

Large basis in theory
- Mathematical basis, algorithms, formal languages and modeling

Large basis in practice
- The birth of architecture, design, and requirements largely resulted from a collective of common practices

Many techniques exist to:
- Engineer software requirements
- Engineer software architecture models
- Engineer software design models
- Engineer software testing using virtual simulation approaches

Questions?