CS303E: Elements of Computers and Programming

Consider Computing

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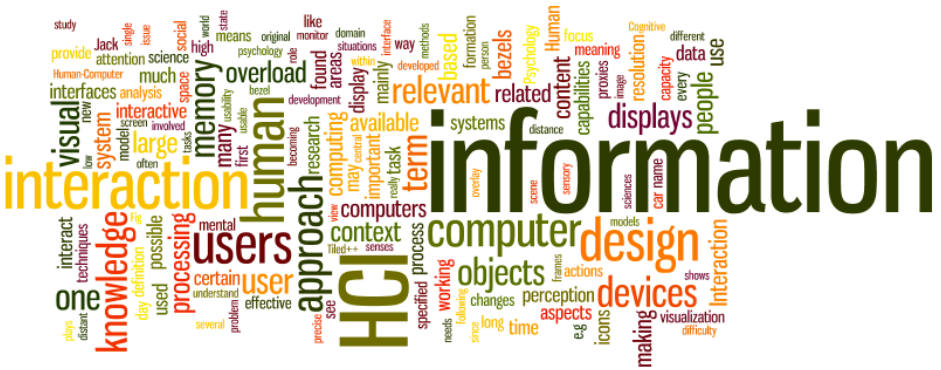
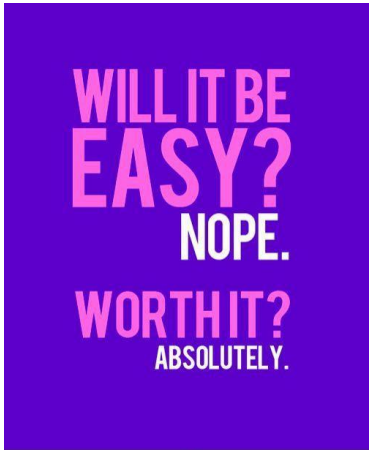
Regardless of your field of study, you live in the digital information age.



The Elements of Computing certificate program will:

- Teach you computational modes of thought.
- Provide you with knowledge of computer science that employers find valuable.
- Support study in other disciplines requiring computational proficiency.



- Courses are taught at a comparable level to the courses for CS majors
- Courses are time consuming, hence require excellent time management skills on the part of the student
- Courses are in high demand and almost all courses are waitlisted, so start the process early
- You will strengthen your resume and your chances of getting a technical job if you obtain the Elements of Computing Certificate

Elements Courses

Two Core Courses:

- CS 303E Elements of Computers and Programming
- CS 313E Elements of Software Design

Upper Division Elements Elective Course Options

- CS 324E Elements of Graphics and Visualization
- CS 327E Elements of Databases
- CS 329E Topics in Elements of Computing
  - Elements of Data Visualization
  - Elements of Mobile Computing
  - Elements of Programming Languages
  - Elements of Software Engineering
  - Elements of Web Programming
  - Elements of Data Analytics
  - Elements of Game Development
- CS 330E Elements of Software Engineering I
- CS 331E Elements of Software Engineering II

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- The Summit supercomputer has a theoretical peak speed of 200 petaflops (200×10^{15} floating point operations per second).

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- Analyis firm Gartner estimates that by 2025 there will be over 100 billion devices connected to the internet, the so-called "Internet of Things."
- In 2017, Schur's Theorem (for 5) was proven using a software system at UT. The proof considers 3.4×10^{112} cases, took 36 CPU years to prove and requires 5 petabytes (5×10^{15} bytes) of storage.

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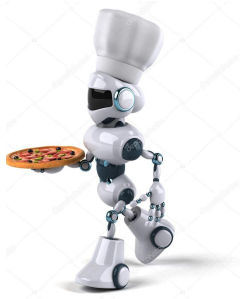
Smithsonian's online magazine describes nine surprising tasks robots are currently performing including: cooking dinners, filling prescriptions, checking guests into hotels, training athletes, and even riding camels.



Video games constitute a larger entertainment industry than Hollywood.

Automated systems out-compete the best human experts at chess, Go, and Jeopardy!

Every Minute of Every Day

- Google receives 2,276,867 search queries
- Americans use 18,264,840 megabytes of wireless data
- Amazon makes $222,283 in sales
- U.S. users send 3,567,850 text messages
- YouTube users upload 400 hours of new videos ...
- and watch 4,146,600 videos

- Facebook Messenger users share 216,302 photos
- The Weather Channel receives 13,888,889 forecast requests
- Siri answers 99,206 requests

How Much Data?

"It is estimated that the amount of data collected over the five millenia since the invention of writing up to 2003 is about 5 exabytes. Since 2013, humans generate and store the same amount of data every day."
–Data Science, Kelleher and Tierney, p. 9

Our current output of data is roughly *2.5 quintillion bytes a day.*

Big Bucks

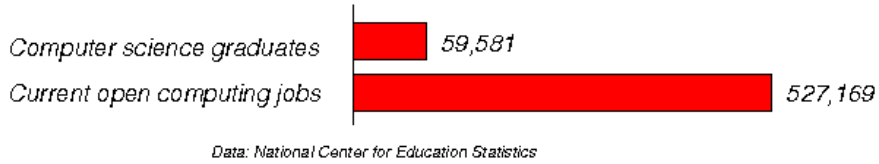
A 2016 study by *The Economist* estimated that the software industry in the U.S. contributed:

- **To GDP:** $465.3 billion in direct value-added; $1.06 trillion in total value-added
- **R&D:** $52 billion in R&D investment by SW companies
- **Jobs:** 2.5 million direct jobs; 9.8 million total jobs

- **Wages:** average annual wage for SW developer of $108,760, twice the national average

We Need More Computer Scientists

There are almost 10 times more U.S. computing jobs open right now than there were students who graduated with computer science degrees.



Data: National Center for Education Statistics

The White House predicted that this year, there would be 1.4 million CS-related jobs available, and only about 400,000 CS science graduates who have the skills necessary to apply for those jobs.

High demand = high salaries.

Jobs in CS

According to the Bureau of Labor Statistics, these CS-related jobs will grow much more rapidly than the general economy:

Database Administrator	15% by 2022
Software Developer	22% by 2022
Web Application Developer	23% by 2022
Computer Systems Analyst	25% by 2022
Mobile App Developer	32% by 2022
Market Research Analyst	32% by 2022
Information Security Analyst	37% by 2022

This compares to an average of 12% growth in most fields.

What an Opportunity!

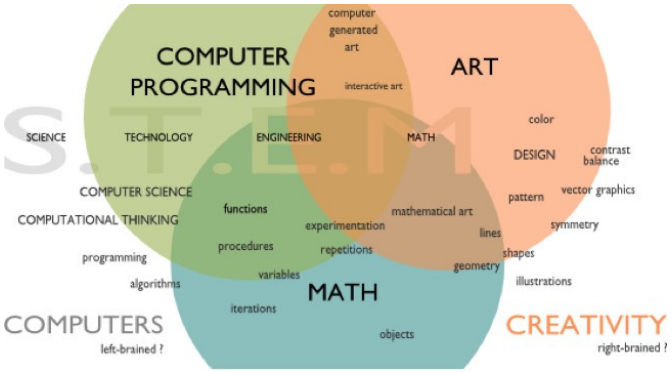
Computer Science should be an attractive career option for many young people:

1. Computer science job openings are projected to multiply in the coming years.
2. Computer science salaries are more than twice the national average
3. Computer science professionals can work in a wide range of industries
4. Job satisfaction among computer science professionals is very high

Computer Science is now the largest department at UT Austin with over 2000 undergraduate majors.

Demystifying CS

CS is so much more than programming. Whatever your interests, it's likely that computing fits in.



The computational thinking that underpins CS is fundamental to success in many fields!

Opportunities in CS are Diverse

Programming not your thing? Consider the *7 Coolest Computer Science Degree Jobs of the Future*:

- **Food Engineer:** use 3D printing technology to create culinary masterpieces
- **Personal Web Manager:** monitor online presence and reputation
- **Commercial Civilian Drone Operator:** fly the digital skies
- **Digital Currency Advisor:** manage involvement in crypto-currencies
- **Virtual Reality Designer:** develop commercial VR experiences
- **Digital Locksmith:** circumvent failed security protocols
- **AI Expert:** develop and deploy smart technologies

Societal Benefits of CS

Computer scientists:

- build robots that perform delicate surgery
- create clothing that helps the blind navigate their environment
- write software for cochlear implants that let the deaf hear
- create secure databases to record human rights abuses while shielding the victim's identity
- create tools to help ordinary people raise extraordinary amounts of money for important causes

CS303E is a first step on the path to becoming computer literate.

Work hard, but enjoy the ride!