# Computer Science

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## Introduction to Computer Science

Computers continue to transform society, causing sweeping changes throughout the worlds of business, entertainment, manufacturing, science, and technology. These changes profoundly affect the way people carry out everyday activities, such as working, shopping, banking, traveling, entertainment, and social networking.

Computer science investigates the fundamental concepts supporting such applications: concepts related to a computer executing programs that operate on data to solve a real-world problem. That means the study of computer science provides a framework for understanding current and future applications.

Depending on goals and interests, computer science majors have various opportunities upon graduation. Demand for computer science graduates remains extremely high, with substantial job growth projected for many years. Strong communication skills, fostered by computer science along with other liberal arts courses, prepare students for the demands of understanding and communicating the needs of technical and non-technical (e.g., legal, managerial, end user) aspects of computing applications and their use.

Because studying computer science provides a perspective for evaluating the feasibility of potential applications, these majors also are strongly positioned to achieve breakthroughs in applying computing to new endeavors. Even with recent advancements, many fundamental questions raised within this academic field remain unanswered, making computer science a fertile ground for pioneering research.

In addition to applications in business, engineering, and entertainment, computing is increasingly important to the natural sciences and to health professions. As a result, many students with interest in those areas pursue a second major or minor in computer science to complement their primary interests.

## Computer Science Major

Computer science majors take courses that provide experience in programming, algorithm development, and data structuring in a variety of languages. The curriculum culminates in a capstone course on the design and implementation of programming languages. In addition, majors choose among electives in advanced topics including natural language processing, parallel computing, AI and machine learning, computer networks, computer security, database systems, image processing, operating systems, software engineering, and simulation. In many of these courses, students work in team settings to develop substantial software applications, an important experience for careers after graduation.

A Bachelor of Arts requires nine and one-half units of computer science and two units of mathematics. A Bachelor of Science requires 11 and one-half units of computer science and three units of mathematics. Students majoring in related disciplines, including economics, business, or sciences, also can fulfill requirements for a minor in computer science.

## Learning Environment

Teaching and scholarly work in computer science are supported by campus resources. Dedicated labs with current Mac, Windows, and Linux systems connected via the campus network are used by students and faculty in computer science.

Computer science major courses are usually limited to 20 students each, providing ample time for interaction among students and faculty. Special topics courses are offered to reflect current directions in the field.

Students are encouraged to pursue independent study and research projects with the faculty, and the department has established an honors program to promote faculty-student collaboration on research projects.

A number of students participate in research projects every summer, supported either by external grants held by faculty members or by the Undergraduate Research Committee. Unlike institutions with graduate programs in computer science, Richmond undergraduates participate in the University's research and scholarly endeavors and showcase their work at the annual Student Symposium.

## Student Research Projects

Recent student research projects include:

- "Sensing Framework & Data Collection"
- "Understanding the Reasoning Underlying Deep Learning Models for Image and Voice Classification"
- "Network Security Seminar"
- "Framework Smartphone Sensing"
- "Argumentative Structures"
- "Automated Fact-checking"
- "Music Programming and Analysis"
- "Web Scraping & Data Visualization"

## URISE and SMART

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**URISE:** University of Richmond Integrated Science Experience is a pre-first year program which aims to increase the number of students from groups traditionally underrepresented in science and math disciplines. It achieves this objective by focusing on skill development, providing authentic research experiences, and building a community of support.

**Science, Math, and Research Training (SMART)** combines introductory biology and chemistry with a coordinated calculus course.

## Student Conferences and Competitions

Each year, the Department of Computer Science endeavors to sponsor students to conferences and competitions like the Grace Hopper Celebration of Women in Computing and the International Collegiate Programming Contest. Campus student groups include the Association of Computing Machinery and Upsilon Pi Epsilon National Honor Society in Computer Science.

## Computer Science Graduates of the University of Richmond

Most computer science graduates move directly into software developer, systems analyst, or consultant roles. Several surveys have shown that these graduates earn the highest starting salaries of any undergraduate major at the University. The U.S. Bureau of Labor Statistics projects very strong demand through 2028 for job candidates with bachelor's degrees in computer science.

Those outstanding students who aspire to a career in research usually pursue a doctorate in the discipline after graduation. The University of Richmond ranks well among American peer institutions in the number of graduates who have gone on to very competitive graduate institutions and earned a Ph.D. in computer science.

## Recent Graduate Employment

- Amazon
- CapitalOne
- Cisco
- Deloitte Consulting
- GE Security
- Google
- Facebook
- FBI
- Genworth Financial
- IBM
- Intel
- Lockheed Martin
- Microsoft
- Moody's Analytics
- Palantir Technologies
- SunTrust
- Raytheon
- Tableau
- Timmons Group
- Unisys

## Graduate School Acceptances

- California Institute of Technology
- Carnegie Mellon University
- College of William & Mary
- Cornell University
- Massachusetts Institute of Technology
- Princeton University
- Stanford University
- University of California, Berkeley
- University of California, San Diego
- University of North Carolina
- University of Southern California
- University of Texas
- University of Virginia
- Yale University

## Distinguished Alumni

**Gregory Morrisett, '89**, received a Ph.D. in computer science from Carnegie Mellon University in 1995 and joined the faculty at Cornell University. In 1998, he was one of 100 young scientists awarded a Sloan Foundation Fellowship, and in 1999 he received one of 38 NSF Faculty Early Career Development grants awarded in the computer science systems area. After holding the position of Allen B. Cutting Professor in Computer Science at Harvard University from 2004-2015, Dr. Morrisett is now now Dean and Vice Provost of Cornell Tech.

**Erin Brady, '10**, received a Ph.D. in Computer Science from University of Rochester in 2015, and is an Assistant Professor of Computer Science at Indiana University - Purdue University in Indianapolis.

**Robin Givens, '06**, received a Ph.D. in Computer Science from William & Mary in 2018, and is on the Computer Science faculty at Randolph-Macon College.

**Matt Der, '10**, received a Ph.D. in Computer Science from the University of California, San Diego in 2015, and is the Director of the Center for Machine Learning at CapitalOne.

## Faculty Areas of Specialty

- Algorithms
- Applied Artificial Intellegence
- Argumentation
- Artificial Intelligence
- Audio Signal Processing
- Computer and Systems Security
- Computer Networks
- Data Mining
- Data Science
- Digital Health
- Human Computer Interaction
- Knowledge-Based Systems
- Machine Learning
- Markov Chains
- Music Informatics
- Natural language processing
- Operating Systems, and Databases
- Probability
- Randomized Algorithms
- Recommendation Algorithms
- Robotics
- Simulation
- Statistical Physics
- Stochastic Processes
- Theoretical Computer Science
- Ubiquitous Computing

**Office of Admission**
(804) 289-8640

admission.richmond.edu

**Dr. Douglas Szajda**, Computer Science Coordinator
(804) 287-6671 • dszajda@richmond.edu

preengineering.richmond.edu

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