Sarah J. Bolton, Ph.D.

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Assistant Professor, Department of Computer and Cyber Sciences
Director, Academy Center for Cyberspace Research
United States Air Force Academy
Teaching Focused Curriculum Vitae | Colorado Springs, Colorado | sarah.bolton.compsci@gmail.com

TEACHING PHILOSOPHY

My teaching is grounded in the conviction that future officers and technical leaders need durable conceptual understanding, not memorized syntax. I design courses around evidence based pedagogy: frequent low stakes retrieval practice, clear scaffolding for learners across a wide range of preparation, and operational and real world examples that make abstract concepts concrete. I treat course design as systems design, with explicit attention to learning outcomes, assessment integrity, and genuine learning in a generative AI environment. My goal is for cadets to leave a course able to reason about the material on their own, transfer what they learned to unfamiliar problems, and lead technical work in operational settings.

EDUCATION

Doctor of Philosophy, Computer Science 2023
Air Force Institute of Technology, Wright Patterson AFB, Ohio

Master of Science, Computer Science 2018
Air Force Institute of Technology, Wright Patterson AFB, Ohio

Bachelor of Science, Computer Science 2012
University of Arizona, Tucson, Arizona

CURRENT ACADEMIC ROLE

Assistant Professor and Director, ACCR Sep 2023 to Present
Department of Computer and Cyber Sciences, United States Air Force Academy
Teaches and mentors over 120 cadets per year across the computer science and cyber curriculum. Serves as Course Director and Vice Chair across the core sequence, directs the Academy Center for Cyberspace Research, coordinates the Cadet Summer Research Program (approximately 70 cadet internships annually), and serves as ABET Lead for CS and Cyber Science Student Outcome 2.

COURSES TAUGHT AND DIRECTED

CS110 — Introduction to Programming (Python)
Foundations of programming, problem solving, and algorithmic thinking. Emphasizes clear mental models for variables, control flow, functions, and basic data structures through frequent low stakes practice.

CS210 — Programming Fundamentals (C) · *Course Director*
Programming fundamentals taught in C. As Course Director, I oversee course structure, assessments, and multi section coordination to ensure consistent learning outcomes for cadets, many of whom encounter C and systems level concepts for the first time in this course.

CS220 — Data Structures and Systems Programming · *Course Director and Vice Chair*
Arrays, lists, stacks, queues, trees, hash tables, and related systems concepts. I focus on helping cadets understand why specific data structures are chosen and how they affect performance and maintainability, with paired programming exercises grounded in operational examples.

CS380 — Design and Analysis of Algorithms · *Incoming Course Director and Vice Chair*

Classic algorithm design paradigms and complexity analysis. Emphasizes reasoning about tradeoffs and connecting algorithms to cyber and operationally relevant scenarios.

CS426 — Languages and Machines · *Vice Chair*

Compilers and automata theory. Explores models of computation and their role in compilers and language design, highlighting how formal models underpin the tools cadets will encounter in modern software and cyber environments.

CS314 — Quantum Computation · *Vice Chair*

Introduction to quantum computing concepts and applications for cadets in the CS and Cyber Science majors.

CS472 — Autonomous Systems Integration · *Vice Chair*

Senior level course on integrating autonomy into operational systems, with attention to safety, decision making, and human and machine teaming.

CS405 / CyS405 — Computer Science and Cyber Science Colloquium · *Faculty Lead*

Senior level colloquium series. I curate guest speakers from across the Department of Defense, industry, government, and academia. Topics span operational mission environments, ethics and decision making, career paths, and practical life skills beyond graduation.

CS499 — Senior Capstone Support

Supports senior capstone work across the CS and CyS senior sequence.

PEDAGOGY AND COURSE DESIGN

- Course design built on evidence based pedagogy: retrieval practice, spaced repetition, low stakes formative assessment, and clear scaffolding for learners across a wide range of preparation.
- Active attention to assessment integrity and genuine learning outcomes in a generative AI environment, including autograder design that resists prompt based shortcuts.
- Use of operational and real world examples drawn from cyberspace operations, aerospace systems, and intelligence missions to anchor abstract concepts.
- Structured course materials with consistent templates, explicit objectives, and accessible help pathways.
- Co lead on departmental curriculum review work, including the CS471 artificial intelligence redesign focused on Bloom's Taxonomy alignment and modern AI systems outcomes.

TEACHING DEVELOPMENT AND RECOGNITION

- Dean's Teaching Certificate, United States Air Force Academy.
- Course Design Institute, 2025.
- Mastery of Teaching Certification Community (MTCC), Cohort 8.

MENTORING AND CADET DEVELOPMENT

Cadet Summer Research Program

As Coordinator of the Cadet Summer Research Program (CSRP), I match approximately 70 cadets per year with summer research internships at DoD laboratories, federally funded research and development centers, and industry partners. I work with cadets to identify research interests, prepare them for placement, and integrate their summer experiences back into the classroom and colloquium during the academic year.

Doctoral Advising

Dissertation Chair, Capitol Technology University:

- Patrick Moore, "Using AI to Mine Data and Provide Easily Interpretable Goal Oriented Insights: A Comparative Study"
- Balasubramani Venugopal, "Beyond the Horizon: The Future of Scalable and Secure Satellite Communications"

Dissertation Committee Member, Capitol Technology University:

- Refat Zamkhshri, Ph.D. (2026), "Satellite Ground Station Cybersecurity Challenges and Controls Effectiveness"

Colloquium and Speaker Series

Faculty lead for the senior CS and CyS Colloquium. I curate speakers that connect classroom concepts to real missions, highlight diverse career paths in computing and cyber, address ethics and decision making, and provide practical guidance beyond graduation.

SCHOLARSHIP OF TEACHING AND LEARNING

Bolton, S., Phan, T., and Crowl, M. (2026). Retrieval practice in action: Reflections on repeated testing in an introductory programming course. *USAFA Scholarship of Teaching and Learning Conference*.

Active interest in computer science education research, including retrieval practice in introductory programming, autograder design, and instructional approaches that preserve genuine learning in a generative AI environment.

SELECTED RESEARCH

Research interests span machine learning applied to aerospace and cyber data, cyber operations, and computer science education. Full publication list is available in the Academic CV. Recent and representative work:

- Bolton, S., et al. (2023). ADS-B classification using multivariate LSTM and FCN models. The Journal of Supercomputing, 79, 2281 to 2307.
- Bolton, S., et al. (2023). Multi sensor aircraft classification. CSCE 2023.
- Bolton, S., et al. (2023). Aircraft classification using flight phase identification. IEEE NAECON 2023.
- Owen, L. R., Smith, J. B., Shin, E., and Bolton, S. (2026). Predictive modeling of G induced loss of consciousness using physiological data and machine learning. Submitted to NAECON 2026.

PROFESSIONAL PROFILES

Teaching site: sjbolton.github.io/teaching-site

Google Scholar: scholar.google.com/citations?user=2_rtff4AAAAJ

LinkedIn: linkedin.com/in/sarah-bolton-547a2019