Alex Hicks

CS Education PhD Student

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Research Interests

Computer Science Education, Software Engineering, Automated Feedback Systems, Student Testing, Help-Seeking Behavior, Teaching Assistants, Office Hours

Education

Ph.D. in Computer Science **Expected May 2026**
Virginia Polytechnic Institute and State University *Blacksburg, VA*

- Dissertation: Supporting TA Office Hours through Test Validation and Log Data Analysis
- Advisors: Dr. Clifford Shaffer and Dr. Stephen Edwards
- Committee: Dr. Holly Matusovich, Dr. Chris Brown, and Dr. Raymond Pettit (UVA)

M.S. in Computer Science **August 2020 – December 2024**
Virginia Polytechnic Institute and State University *Blacksburg, VA*

Graduate Certificate in Engineering Education **August 2023 – May 2024**
Virginia Polytechnic Institute and State University *Blacksburg, VA*

B.S. in Computer Science and History **August 2016 – May 2020**
University of Virginia *Charlottesville, VA*

Honors and Awards

Fellow: Virginia Tech Academy of Outstanding Graduate Pedagogy 2025
Outstanding Instructor of Record: Department of Computer Science 2025
Outstanding Service Award: Department of Computer Science 2023
Davenport Leadership Fellowship: Virginia Tech 2021, 2024
Pratt Research Fellowship: Virginia Tech 2020, 2022
New Horizons Graduate Scholar: Virginia Tech 2020 – 2026

Teaching Experience

Instructor of Record

CS 3114/5040: Data Structures and Algorithms **Mean Evaluation: 5.40/6.00**
Department of Computer Science, Virginia Tech Summer 2025

Enrollment: Online undergraduate computer science students in their junior year (66) and graduate computer science and engineering students in their first year (2). Responsible as instructor of record for 3 hour course required for graduation.

Course content: Analysis of data structure and algorithm performance, sorting, searching, hashing, advanced tree structures and algorithms. Course projects require advanced problem-solving, design, and implementation skills.

Duties: Designing and delivering lectures, creating assessments, developing projects, mentoring students, managing course logistics including automated feedback systems and a large TA staff.

CS 5040: Intermediate Data Structures and Algorithms **Mean Evaluation: 5.15/6.00**
Department of Computer Science, Virginia Tech Fall 2024

Enrollment: Online graduate computer science and engineering students in their first year (45) of 513 with CS 3114.

CS 3114/5040: Data Structures and Algorithms **Mean Evaluation: 5.17/6.00**
Department of Computer Science, Virginia Tech Summer 2024

Enrollment: Online undergraduate computer science students in their junior year (71) and graduate computer science and engineering students in their first year (2).

CS 4104: Analysis of Algorithms **Mean Evaluation: 5.08/6.00**
Department of Computer Science, Virginia Tech Spring 2024

Enrollment: Undergraduate computer science and mathematics students in their senior year (46).

Course content: Data structures and algorithms from an analytical perspective rather than an implementation standpoint including discussion of algorithmic efficiency, comparisons of algorithms with respect to space and run-time requirements on both practical and theoretical bounds.

Duties: Designing and delivering lectures, developing problem sets, and mentoring students.

CS 3704: Intermediate Software Development **Mean Evaluation: 5.13/6.00**
Department of Computer Science, Virginia Tech Spring 2023

Enrollment: Undergraduate computer science and mathematics students in their junior year (67).

Course content: Software engineering processes, methods, and tools for the software development life cycle, requirement analysis, system design, and stakeholder communication through project-based learning.

Duties: Designing and delivering lectures, developing a semester-long project, mentoring student teams.

Graduate Teaching Assistant

CS 3114: Data Structures and Algorithms (Head GTA) Spring 2025
Managed course infrastructure including automated feedback, office hour queuing, and class forum systems
Mentored 21 UTA and GTAs in supporting over 500 students

CS 4104: Analysis of Algorithms Spring 2022
Supported course instruction by grading problem sets and assisting students in office hours

Undergraduate Teaching Assistant

CS 1501: Computational History (Student Instructor) Fall 2019
CS 4102: Algorithms Spring 2019, Fall 2019, Spring 2020
CS 2110: Software Development Methods (Head TA) Fall 2018

Research Experience

Graduate Research Assistant **June 2020 – Present**
Virginia Tech *Blacksburg, VA*

- **OpenDSA eTextbook System**
  - Led modernization of the OpenDSA eTextbook infrastructure by containerizing services and migrating to Rails 6 and Python 3.8 using a Docker-based architecture
  - Deployed the LTI 1.3 authentication protocol to support secure integration with LMS platforms
  - Provided long-term system maintenance, user support, and backend feature development for thousands of student users
  - Mentored undergraduate researchers in software design, deployment, and version control workflows
- **SPLICE: Standards, Protocols, and Learning Infrastructure for Computing Education**
  - Developed a searchable catalog of embedded learning objects, datasets, and instructional tools for computing education
  - Designed and implemented mechanisms to identify suspicious programming submission behaviors in large-scale datasets
  - Contributed to the deployment of a live LTI-enabled catalog of reusable smart learning objects for the CS education community
- **Problem Specification Misconceptions**
  - Enhanced the Web-CAT automated feedback system by integrating validation of student-authored test cases against instructor-provided reference implementations, enabling detection of conceptual misunderstandings in student solutions
- **Student-Teaching Assistant Interactions**
  - Conducted mixed-methods analysis of office hour interactions to identify gaps in TA training and student support practices
  - Designed interview protocols and coding schemes to characterize unsuccessful interactions
  - Developed a taxonomy of CS3-level office hour interactions to inform evidence-based TA training programs

Publications and Presentations

Journal Articles

[J1] Molly Domino, Alexandra Thompson, **Alexander Hicks**, Alan Jamieson, Khushi Parajuli, Bob Edmison, Stephen H. Edwards, and Clifford A. Shaffer. "How Can We Know When We See It? A Systematic Review of Cognitive Control Skills and Behaviors". *ACM Transactions on Computing Education*, Revise and Resubmit.

Conference Papers

[C1] **Alexander Hicks**, Stephen H Edwards, Cliff Shaffer. "Your Tests Are Lying to You: Validating Student Tests Against Reference Implementations to Reinforce Specification Alignment". *2025 ASEE Annual Conference & Exposition*, Under Review.

[C2] **Alexander Hicks**, Kwasi Manu Biritwum-Nyarko, Nolan Platt, Sheikh Moonwara Anjum Monisha, Cliff Shaffer. "Classifying Student Questions in CS3 Office Hours: A Taxonomy for Understanding Help-Seeking Patterns". *2025 ASEE Annual Conference & Exposition*, Under Review.

[C3] Samane Bayatkandi, Kwasi Manu Biritwum-Nyarko, **Alexander Hicks**, Cliff Shaffer. "WIP: From Debugger to Oracle: How Students Position LLMs in Their Project Workflows". *2025 ASEE Annual Conference & Exposition*, Under Review.

[C4] Zhangqi Duan, Nigel Fernandez, **Alexander Hicks**, Andrew Lan. "Test Case-Informed Knowledge Tracing for Open-ended Coding Tasks". *15th International Learning Analytics and Knowledge Conference*, March 2025.

[C5] **Alexander Hicks**, Cliff Shaffer. "WIP: Exploring Office Hour Interactions in an Data Structures and Algorithms Course". *2024 ASEE Annual Conference & Exposition*, June 2024.

Workshop Papers

[W1] **Alexander Hicks**, Yang Shi, Arun Balajiee Lekshmi Narayanan, Wei Yan, Samiha Marwan. "The Necessity of Detecting Student Cheating for Student Modeling in Programming Assignments". *Eigth Educational Data Mining in Computer Science Education (CSEDM) Workshop*, July 2024.

[W2] **Alexander Hicks**, Cliff Shaffer. "Containerizing an eTextbook Infrastructure". *Fifth Educational Data Mining in Computer Science Education (CSEDM) Workshop*, June 2021.

[W3] **Alexander Hicks**, Kamil Akhuseyinoglu, Cliff Shaffer, and Peter Brusilovsky. "Live Catalog of Smart Learning Objects for Computer Science Education". *Sixth SPLICE Workshop: Building an Infrastructure for Computer Science Education Research and Practice at Scale*, August 2020.

Invited Presentations

[P1] **Alexander Hicks**. "SPLICE Catalog of Smart Learning Content". Tenth SPLICE Workshop: Technology and Data Infrastructure for CS Education Research, May 2024.

[P2] **Alexander Hicks**. "SPLICE Catalog of Smart Learning Content". Ninth SPLICE Workshop: Technology and Data Infrastructure for CS Education Research at the 55th ACM Technical Symposium on Computer Science Education, March 2024.

[P3] **Alexander Hicks**. "Live Catalog of Smart Learning Objects for Computer Science Education". Seventh SPLICE Workshop: CS Education Infrastructure for All III: From Ideas to Practice at the 52nd ACM Technical Symposium on Computer Science Education, March 2021.

Work and Project Experience

Meals on Wheels **August 2019 – August 2024**

Developer and Maintainer *Charlottesville, VA*

- Developed a web application to manage volunteers and track customer records as part of a Computer Science capstone project
- Provided ongoing maintenance and implemented new features to support additional Meals on Wheels chapters
- Collaborated with staff and volunteers to gather requirements and ensure the application met organizational needs

McKesson Corporation **June 2019 – August 2019**

Software Engineering Intern *Irving, TX*

- Implemented new API endpoints and redesigned the user interface for an internal tracking portal
- Collaborated in an Agile development environment, participating in sprint planning, code reviews, and iterative feature development

The Library Corporation **June 2018 – August 2018**

Cybersecurity Intern *Inwood, WV*

- Conducted a vulnerability and risk assessments to identify cybersecurity gaps across software and infrastructure
- Assisted in reviewing system configurations and access controls to support remediation planning
- Documented findings and provided recommendations to improve organizational security practices

Mentorship

Supervised or mentored over 50 students in Computer Science at Virginia Tech, providing guidance on research projects, software development initiatives, and independent studies.

Current

Kwasi Biritwum-Nyarko, PhD student, Computer Science, Virginia Tech

Samane Bayatkandi, MS student, Computer Science, Virginia Tech

15 BS students, Computer Science, Virginia Tech

Previous

Khairatun Hissan, PhD student, Computer Science, Clemson University

Adeyemi Aina, MS student, Computer Science, Virginia Tech

Connor Burch, MEng student, Computer Science, Virginia Tech

Connor Brodish, MEng student, Computer Science, Virginia Tech

Hyunjin An, MEng student, Computer Science, Virginia Tech

31 BS students, Computer Science, Virginia Tech

1 BS student, Computer Engineering, Virginia Tech

Service

Professional Service

Reviewer: RESPECT Conference	2025 – Present
Reviewer: Studies in Engineering Education Journal	2024 – Present
Reviewer: ITiCSE Conference	2024 – Present
Reviewer: ASEE Annual Conference & Exposition	2024 – Present
Reviewer: IEEE ASEE Frontiers in Education Conference	2024 – Present
Reviewer: SIGCSE Virtual	2024 – Present
Reviewer: SIGCSE Technical Symposium	2023 – Present
Working Group Member: CSSPLICE - Smart Learning Content and Protocols	2023 – Present
Student Volunteer: SIGCSE Technical Symposium	2023
ACM Student Research Competition Judge: SIGCSE Technical Symposium	2022, 2023

Institutional Service

Small Groups Coordinator: New Horizons Graduate Scholars	2023 – 2025
Graduate Student Advisory Board: Center for Equity, Virginia Tech College of Engineering	2023 – 2025
Small Group Leader: New Horizons Graduate Scholars	2022 – 2023
Peer Mentor: New Horizons Graduate Scholars	2021 – 2023
Senator: Virginia Tech Graduate Student Association	2020 – 2021

Departmental Service

Diversity Committee: Virginia Tech Computer Science	2023 – 2025
Advisor: Virginia Tech Computer Science Graduate Council	2023 – 2025
Coordinator: Digital Education Reading Group at Virginia Tech	2023 – 2024
President: Virginia Tech Computer Science Graduate Council	2022 – 2023
Graduate Program Committee: Virginia Tech Computer Science	2022 – 2023
Vice President: Virginia Tech Computer Science Graduate Council	2021 – 2022

Community Service

Judge: Blue Ridge Highlands Regional Science Fair	2022, 2023

Professional Memberships

American Society for Engineering Education	2023 – Present
Association of Computing Machinery Special Interest Group in Computer Science Education	2020 – Present
Association of Computing Machinery	2020 – Present

Professional Development

CMU LearnLab Summer School Computing Education Research Track Participant	2023

Certifications

Center for the Integration of Research, Teaching, and Learning (CIRTL) Practitioner	Expected 2026
Center for the Integration of Research, Teaching, and Learning (CIRTL) Associate	2025