

Mitchell Gerhardt

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RESEARCH INTERESTS

AI-infused qualitative methods; accountable and auditable analysis pipelines; transcription and automatic speech recognition; participatory AI systems for engineering and computing education; course AI policy and academic integrity

EDUCATION

- Ph.D. in Engineering Education**, Virginia Tech, GPA: 3.95/4.00 May, 2027 (expected)
 PhD Candidate (advanced to candidacy Fall 2025)
 Dissertation (three manuscripts): accountability by design in AI-infused qualitative research – transcription and ASR, refutable reflexivity, and decision models vs. prompt-engineered LLMs
 Committee: Andrew Katz (Chair), David Knight, Nicole Pitterson, and Alexandra Werth
 2025 NSF GRFP Honorable Mention
 2025 Google PhD Fellowship Nominee
 2023-2024 Davenport Fellowship Awardee
- M.S. in Computer Science**, Virginia Tech, GPA: 3.90/4.00 December, 2026 (expected)
 Committee: Sara Hooshangi (Chair), Andrew Katz, Sanmay Das
 Coursework: *Machine Learning*, *Natural Language Processing*, *Computer Education Research*, *AI Tools for Software Engineering*, *Applied Design and Assessment of Educational Environments in Engineering*
- Graduate Certificate: Cognition and Education**, Virginia Tech, GPA: 4.00/4.00 May, 2025
- B.S. in Electrical Engineering**, Virginia Tech, GPA: 3.69/4.00 Dec., 2020
 Graduated Magna Cum Laude and Dean's List
 Pratt Engineering Scholarship, Donald and Madeline Stewart Scholarship, and Konrad-Steinmetz Scholarship for Engineering Leadership Awardee
 Hardware Team Lead for [AutoDrive Design Team](#)

BOOK CHAPTERS

- In Press **Leveraging Large Language Models in Engineering Education Research: Methods and Applications**
2027 International Handbook of Engineering Education Research Methods (Sage)
Mitchell Gerhardt, Gabriella Coloyan Fleming, Siqing Wei, and Andrew Katz

JOURNAL PUBLICATIONS

- Submitted **Improving Engineering Education GAI Qualitative Research Workflow Quality: Techniques and Documentation Strategies**
Studies in Engineering Education - Special Issue on GAI in Methods
Mitchell Gerhardt and Andrew Katz
- Submitted **Decade-Long Analysis of Skills Across 1 Million Graduate-Level Job Advertisements**
Trends in Higher Education
Mitchell Gerhardt, Shawn Sun, Andrew Katz, David Knight, Jessica Deters, Maura Borrego, Riya Budhathoki, and Herman Ronald Clements III

Submitted	Refutable Reflexivity: A Theoretical and Visual Model for LLM-Infused Qualitative Research <i>International Journal of Qualitative Methods</i> - Special Issue on Artificial Intelligence in the Analysis of Qualitative Data Mitchell Gerhardt, Kylee Shiekh, Andrew Katz, and Benjamin E. Chaback
In Preparation	The Problem With Prompting: Using Decision Models for Traceable and Justifiable GenAI-Infused Qualitative Data Analysis <i>Organizational Research Methods</i> Mitchell Gerhardt and Andrew Katz
In Preparation	What is Appropriate AI Use? Perceptions of Addictive AI Use Among STEM Graduate Student Coders <i>Computers & Education: Artificial Intelligence</i> Mitchell Gerhardt, Andrew Katz, and Sara Hooshangi
In Preparation	Revisiting Transcription in the Age of AI: A Critical Review of Transcription in Qualitative Research <i>International Journal of Qualitative Methods</i> - Special Issue on Digital Transformation in Qualitative Research Mitchell Gerhardt, Alexandra Werth, and Soyeon Kim
In Preparation	What Should Graduate Engineering Students Learn About Generative AI? A Critical Review of GAI Competency in Engineering Graduate Education <i>European Journal of Engineering Education</i> Mitchell Gerhardt and Jenni Case
April, 2025	Collaborative (In)decision: A Preliminary Investigation of the Differences in Undergraduate Engineering Capstone Students' Collaborative Behaviors [Paper] <i>International Journal of Engineering Education</i> - Special Issue for Capstone Design, Volume 41(4), pp. 872–888 Mitchell Gerhardt, Mayar Madboly, Nicole Pitterson, Emily Dringenberg, and Benjamin Ahn
Nov, 2024	Using Generative Text Models to Create Qualitative Codebooks for Student Evaluations of Teaching [Paper] <i>International Journal of Qualitative Methods</i> - Volume 23 Andrew Katz, Mitchell Gerhardt, and Michelle Soledad

PEER-REVIEWED CONFERENCE PUBLICATIONS

Submitted	The Jagged Edge of Adoption: Comparing GenAI Adoption Between Coding and Non-Coding STEM Graduate Students <i>Symposium on Educational Advances in Artificial Intelligence (EAAI-27)</i> Mitchell Gerhardt, Sara Hooshangi, Sanmay Das, and Andrew Katz
Submitted	WIP: The Challenge of Any Technology? Intergenerational Sense-Making About GenAI Systems in Engineering Education <i>2027 ASEE Annual Conference & Exposition</i> - Toronto, ON, Canada Mitchell Gerhardt, Kylee Shiekh, Benjamin E. Chaback, and Andrew Katz
Accepted	Mechanical Engineering Students' Perspectives on Career Goals, Skills, and Industry <i>36th Australasian Association for Engineering Education (AAEE) Annual Conference</i> - Oct., 2026 Herman Ronald Clements III, Jessica Deters, Mitchell Gerhardt, Shawn Sun, David Knight, Maura Borrego, Andrew Katz, and Riya Budhathoki

June, 2026	It's like "X": How Engineering Faculty Metaphors Construct (and Constrain) GAI Understanding in Engineering Education [Paper] 2026 ASEE Annual Conference & Exposition - Charlotte, NC Mitchell Gerhardt , Kylee Shiekh, Andrew Katz, and Benjamin E. Chaback
June, 2026	Understanding the Master's Engineering Workforce Landscape: Employer Demands and Student Goals [Paper] 2026 ASEE Annual Conference & Exposition - Charlotte, NC Herman Ronald Clements III, Mitchell Gerhardt , Shawn Sun, Riya Budhathoki, Maura Borrego, Jessica Deters, Andrew Katz, and David Knight
June, 2026	When Can AI be Used Anyway? An Analysis of Engineering Faculty's Generative AI Policies [Paper] 2026 ASEE Annual Conference & Exposition - Charlotte, NC Benjamin E. Chaback, Andrew Katz, and Mitchell Gerhardt
April, 2026	Inside the Mental Models: Instructor's Conceptions on Generative Artificial Intelligence 2026 ASEE St. Lawrence Section Conference - Ithaca, NY Kylee Shiekh, Benjamin E. Chaback, Mitchell Gerhardt , Andrew Katz
June, 2025	Automated Analysis of Knowledge Types in Computer Science Textbooks: A Natural Language Processing Approach to Understanding Epistemic Climate [Paper] 2025 ASEE Annual Conference & Exposition - Montreal, QC, Canada Mitchell Gerhardt and Andrew Katz
June, 2025	Beyond Calculations: Engineering Judgment as Epistemic Cognition in Engineering Education [Paper] 2025 ASEE Annual Conference & Exposition - Montreal, QC, Canada Mitchell Gerhardt , Michael Robinson, and Brian Faulkner
June, 2024	Reimagining Behavioral Analysis in Engineering Education: A Theoretical Exploration of Reasoned Action Approach [Paper] 2024 ASEE Annual Conference & Exposition - Portland, OR Mitchell Gerhardt , Nicole Pitterson, Emily Dringenberg, and Benjamin Ahn
June, 2024	Why do capstone students choose to perform behaviors? Differing prevalence in collaborative choices [Paper] Capstone Design Conference - Knoxville, TN Mitchell Gerhardt , Nicole Pitterson, Emily Dringenberg, and Benjamin Ahn

TEACHING AND MENTORING

UNDERGRADUATE TEACHING AND MENTORING

Undergraduate Research Mentor

2025 - Present

IDEAS Lab, Virginia Tech and Werth Research Group, Cornell University

Advise graduate and undergraduate researchers across two groups on study design, qualitative coding, and computational text analysis, meeting regularly to review drafts and troubleshoot analyses

Students actively contributing to LLM-infused qualitative papers by evaluating different LLM outputs for prompt, context, and harness engineering

GUEST LECTURING AND CLASSROOM INSTRUCTION

Guest Lecturer, ME 397/379M *Qualitative Research Methods*
University of Texas at Austin (Dr. Maura Borrego)

Nov., 2025 & Nov., 2026 (scheduled)

“Large Language Models in Qualitative Engineering Education Research: Technical Methods and Methodological Considerations”

- Examined human versus machine pattern recognition, researcher positionality, translational challenges between software and social-science conventions, and shifting definitions of “intelligence”
- Addressed methodological questions about computational approaches to qualitative work and implications for research practice
- Instructor feedback: “Students were honestly blown away... for many of them it was the highlight of the semester”; invited back by the instructor for the Fall 2026 cohort

Invited Presentation, Department Meeting

Sept., 2026

Virginia Tech Department of Agricultural, Leadership, and Community Education

“Responsible GenAI Use: GenAI, Course Policy, and Academic Integrity in ALCE” presented to approximately thirty faculty and graduate students on GenAI course policy and academic integrity

Guest Lecturer, GRAD 5004: Graduate Teaching Assistant Workshop

Feb., 2026 & Sept., 2026

Virginia Tech (Dean Kevin Edgar)

“Scholarly Ethics,” presented to incoming graduate teaching assistants (approximately 75 in the Fall 2026 cohort) on academic integrity, honor system processes, instructor responsibilities, generative AI use, and contemporary research on cheating

Guest Lecturer, ECE Graduate Student Seminar

Dec., 2025

University of Pittsburgh

“AI Research Ethics in Engineering Education” co-presented with Andrew Katz to ECE graduate students and faculty

K-12 AND COMMUNITY EDUCATION

Academic Tutor, Big Brothers Big Sisters of Metropolitan Detroit

Aug., 2021 - June, 2023

Assisted a rotating group of 5-10 middle school students, primarily in math and ELA topics, weekly over Zoom during the COVID-19 pandemic, learning critical engagement and adaptability strategies necessary to bridge differences in background and pedagogical resonance

K-12 Engineering Outreach

2018 - 2020

AutoDrive Design Team, Virginia Tech

Designed and led demonstrations for students in local school districts explaining autonomous-vehicle subsystems, adapting technical content across elementary through high-school audiences

TEACHING CENTER APPOINTMENT AND FACULTY DEVELOPMENT

Workshop, 2026 Virginia Tech Teaching Symposium

Aug., 2026

“Finding your AI Balance: A Reflective Workshop on Faculty Assumptions about AI in Teaching and Learning”

Co-Facilitator

Sept., 2025 & May, 2026

Fulbright Brazil International Collaboration

Virginia Tech and Brazilian Universities Partnership, with Dr. Andrew Katz and Dr. Dayoung Kim

- Selected by Fulbright Brazil for two multi-day faculty development programs for >80 engineering faculty from dozens of Brazilian universities: INOVA.USP, São Paulo, Brazil (Sept. 23–25, 2025) and Virginia Tech Arlington Campus, Arlington, VA (May 18–21, 2026)
- Led modules on assessment transformation, institutional policy development, and faculty–student relationship dynamics under GenAI; every respondent rated the program highly and would recommend it, with the modules I led among the highest rated for helpfulness
- Led three sessions in Arlington (“AI Capabilities Update,” “Pedagogy Challenges in the AI Era: Apply-Then-Consult,” and “What Could Go Wrong: Implementation Reality Check”) and developed the workshop’s through-line, the “Moving Target Paradox,” later presented as a poster at the 2026 NY Upstate DBER Conference
- Reworked U.S.-based research assumptions to fit Brazilian institutional contexts

Workshop Lead, Virginia Tech Graduate Instructors

March, 2026

- Initiated and led a three-student team designing a participatory workshop for graduate instructors on writing generative AI course policies
- Received IRB approval to study the workshop's implementation and effectiveness, with results in preparation
- Leveraging networks and existing partnerships with the Graduate Honor System (GHS), the Center for Excellence in Teaching and Learning (CETL), the center for Technology-Enhanced Learning and Online Strategies (TLOS), and departmental leadership to host and market the event.

Graduate Assistant to the Director for Special Programs

Aug., 2024 - May, 2025

Center for Excellence in Teaching and Learning (CETL), Virginia Tech

Blacksburg, VA

Worked with Dr. Tiffany Shoop on various teaching and learning initiatives:

- Helped plan the Practitioner and Scholar rollout of [CIRTL](#) at Virginia Tech, reviewing CIRTL offerings and course structures across disciplines and proposing a Graduate School setup
- Helped organize the 17th annual Conference on Higher Education Pedagogy ([CHEP](#)), reviewing submissions, coordinating sessions, and building a Python application to automate post-conference booklet production
- Reviewed empirical research on Collaborative Online International Learning to support faculty training development

Classroom Observation and Instructional Consultation

Aug., 2024 - May, 2025

Center for Excellence in Teaching and Learning (CETL), Virginia Tech

Blacksburg, VA

- Observed and collected mid-semester student feedback in >15 courses across disciplines and helped prepare the reports instructors received
- Developed familiarity with the range of instructional approaches used across a university curriculum, and with how faculty interpret and act on evidence about their own teaching

Faculty Workshop, Interactive Lecturing

Feb., 2025

Center for Excellence in Teaching and Learning, Virginia Tech

Developed and presented a workshop for approximately thirty faculty on strategies for student engagement

GRADUATE RESEARCH MENTORING

Interim Graduate Mentor

IDEAS Lab, Department of Engineering Education, Virginia Tech

Fall, 2026 - Present

Coordinating the lab's graduate students during the principal investigator's parental leave, facilitating research meetings, reviewing drafts, and unblocking ongoing analyses

Mentor, NSF Graduate Research Fellowship Program Applications

Cornell University

Fall, 2025

Provided reviews, feedback, and mentorship to Cornell graduate students applying for NSF GRFP

RESEARCH EXPERIENCE

Research Assistant

Aug., 2025 - Present

Department of Engineering Education, Virginia Tech

Blacksburg, VA

[NSF Award #2339702](#): "CAREER: Minds and Machines: Exploring Engineering Faculty Member Mental Models of Generative AI and Instructional Decisions"

- Conducting qualitative interviews with faculty to understand how perceptions of GenAI shape instructional decisions, assessment practices, and workplace norms around GenAI use
- Developing LLM-based qualitative workflows to scale aspects of qualitative data analysis and make them available to fellow researchers
- Comparing human, prompt-engineered LLM, and decision-model labels on a five-dimension codebook across 34 CS instructors' interviews

Research Assistant

May., 2025 - Present

[Department of Engineering Education](#), Virginia Tech

Blacksburg, VA

Assisted [NSF Award #2433099](#): “Collaborative Research: Research: The Engineering Master’s Workforce: Leveraging NLP Techniques to Understand Employer Demands and Student Goals”:

- Created a Python-based workflow to manage DuckDB-based database to analyze over one million, graduate-level jobs spanning 2010-2022
- Implemented extraction mechanisms to pull qualification information, tasks and responsibilities, skills and knowledge, and technologies from job postings
- Currently applying open-source large language models (LLMs) to add flexibility and granularity to job posting extractions

Principal Investigator, Graduate Student Survey Research

May, 2025 - Present

Multi-institutional

Ithaca, NY

IRB-approved multi-institutional study examining STEM graduate students’ GenAI use patterns

- Designed and distributed Qualtrics survey across six R1 institutions collecting 370+ responses examining nuanced patterns of GenAI adoption beyond reductive “cheating” narratives
- Applying mixed methods approach combining descriptive statistics, correlation analyses, demographic studies, and planned qualitative interviews
- Investigating workplace socialization processes, community norms around GenAI use, and shifting definitions of legitimate expertise in graduate education contexts

Ethnographic Researcher

Fall, 2025

[Cornell University Science & Technology Studies](#)

Ithaca, NY

Independent ethnographic study of Science Studies Reading Group (SSRG) feedback practices

- Conducted 15+ weeks of participant observation examining how different feedback formats (facilitated dialogues, “ping pong” discussions) shape scholarly collaboration and expertise networks
- Produced 10,000-word analytical ethnography applying STS frameworks to understand epistemic cultures, knowledge production practices, and organizational dynamics in interdisciplinary research communities
- Analyzed conversational patterns, turn-taking behaviors, and collaborative meaning-making in academic workplace settings
- Working on methodology paper explicating study and decision-making for contributions to studying workplace knowledge practices in EER

Research Assistant

Jan., 2024 - July, 2024

[Department of Engineering Education](#), Virginia Tech

Blacksburg, VA

Assisted [NSF Award #2300977](#): “Design for Sustainability: How Mental Models of Social-Ecological Systems Shape Engineering Design Decisions”:

- Developed a novel natural language processing (NLP) methodology for generating qualitative codebooks from large datasets (e.g., students’ instructor evaluations)
- Co-authored a journal publication in the *International Journal of Qualitative Methods* outlining the extract, embed, cluster, and summarize (EECS) workflow
- Contributed to ongoing refinement and improvement of the NLP-based methodology for analyzing qualitative data
- Applied open-source LLMs to preserve data security and privacy while maintaining analytical rigor

Research Assistant

Aug., 2023 - Jan., 2024

[Department of Engineering Education](#), Virginia Tech

Blacksburg, VA

Assisted [NSF Award #2217523](#): “Collaborative Research: Collaboration in Engineering Student and Practitioner Teams: A Study of Beliefs about Effective Behaviors”:

- Designed and implemented a pilot study to examine the frequency and prevalence of collaborative behaviors in senior engineering capstone teams

- Co-authored a conference paper for the 2024 Capstone Design Conference about why students choose certain collaborative behaviors
- Expanded the conference paper into an accepted journal article based on the preliminary findings from the project
- Developed foundation for future research on student collaborative decision-making within engineering design contexts

PROFESSIONAL EXPERIENCE

Global Product Development Engineering

June, 2021 - June, 2023

General Motors

Warren, MI

Software Engineer - Software Defined Vehicle

- Responsible for developing next-gen software infrastructures and technology for software-defined vehicles
- Key implementation role in mobile app development, in-vehicle interfaces, and back-end deployment
- Established and applied testing protocols including CI/CD pipelines, automated build processes, and testing mechanisms

Infotainment Technical Program Manager

- Part of an integral team to plan, execute, and deliver leading-edge technology to our customers
- Worked with global partners, external suppliers, and internal teams to track, drive, support, and report vehicle readiness metrics

Complexity Optimization Engineer

- Engaged in measuring, managing strategy, and reducing program hardware and software complexity
- Optimized tactics for efficient build combinations and part reuse across programs and vehicle subsystems

Autonomy Systems Research

May, 2019 - Dec., 2020

Caterpillar Inc.

Peoria, IL and Blacksburg, VA

Software Engineer I

- Implemented a control interface for autonomy simulation platform using ROS, teleoperation control, and robot modeling software
- Validated and integrated sensor data on large-scale machinery into algorithms for mapping and navigation via complex data structures
- Developed CI/CD protocols and workflows for software distribution using Docker, ROS, and the C++ testing framework

GRANTS & AWARDS

Co-Principal Investigator

Fall, 2025

Bridging the Conversational AI Gap: Synthetic Dataset Generation for Engineering Education Dialogue

Cornell Center for Social Sciences (CCSS) Seed Grant (\$4,500), Cornell University - 10-month project

- Mapping the ASR landscape this grant required became Manuscript 1 (Revisiting Transcription in the Age of AI); the fine-tuning question remains open
- Developing method for creating synthetic speech datasets preserving conversational phenomena critical to workplace learning research (overlapping speech, strategic pauses, collaborative turn-taking)
- Applying synthetic data to study feedback literacy in design studios and facilitated dialogues about research group culture and inclusion
- Publicly archiving all synthetic audio, generation parameters, and evaluation results in Cornell CSSR Data & Reproduction Archive for reproducible research across institutions

Nominee

May, 2025

Google PhD Fellowship in Human-Computer Interaction

Nominated by Virginia Tech for national fellowship

SELECT PROJECTS

laya-wrapper [Code] Sept., 2026 - Present
Local workbench for iterating on decision model question sets for figurative-language coding of qualitative data

- Built a FastAPI + Next.js application over a shared Python package, letting researchers edit decision-question sets on a flowchart or table, preview the exact prompts the model receives, and check them against a token budget
- Implemented gold-label tooling that embeds coded segments, ranks exemplars by centroid similarity and margin against neighboring codes, and maps positions via PCA, feeding exemplars directly into indicator questions
- Supports cached per-question reruns, live AUROC/precision/recall/F1 metrics, weight and threshold tuning fit to gold labels, false-positive/negative disagreement review, and side-by-side run comparison

Transcript Mapping [Code], [Web] Aug., 2026 - Present
Knowledge-graphing approach to mapping features contained in interview transcripts

- Codes interview transcripts into a property graph so that a claim and the evidence for it stay attached, illustrating how qualitative transcripts might provide traversable context for LLMs
- Stack: Next.js 14, TypeScript, Neo4j 5, react-force-graph-2d, bun, Docker Compose, GitHub Pages
- Public demo runs on synthetic data matching the structure of the real graph without reproducing any of its content

OverleafMCP [Code] Aug., 2026 - Present
Model Context Protocol server for LLM-assisted editing of Overleaf projects, forked from mjoyo2/OverleafMCP

- Added support for faster LLM segmentation, reading, and writing of Overleaf files, plus screenshot and snapshot features for figure and layout adjustments
- Built a citation checker verifying consistent formatting, retrievable citations, and up-to-date preprint/published versions

DEX Disaggregated Memory Index Reproduction Spring, 2026
Empirical reproduction and stress testing of DEX (Lu et al., VLDB 2024), a B+-tree for disaggregated memory, on a 4-node CloudLab cluster for CS 6204

- Reproduced DEX's near-linear throughput scaling across five workloads under Zipfian and uniform distributions on AMD EPYC d6515 nodes, confirming key trends from the original despite hardware differences (RoCE v2 vs. InfiniBand, single-socket vs. dual-socket)
- Diagnosed and resolved multiple hardware-portability bugs including a NIC on-chip SRAM allocation failure requiring hugepage-backed fallback, a memcached TCP saturation bug causing silent multi-node startup failures, and an early-exit measurement issue masking valid throughput windows
- Developed a CXL projection model using Intel MLC NUMA latency measurements and per-operation RDMA decomposition, finding minimal DEX gains under CXL ASIC because DEX's three core mechanisms compensate for RDMA-specific costs that CXL largely eliminates

pres [\[Code\]](#)

April, 2026 - Present

Python CLI that scaffolds, previews, and exports Quarto RevealJS presentations and 24x36-inch academic posters for the IDEEAS Lab

- Built an interactive wizard (Typer, questionnaire, Pydantic) that generates decks from brand-themed templates and reusable partials, with department-specific logos and color palettes driven by a single brand configuration file
- Developed a Playwright-based capture pipeline that screenshots slides, fragment reveals, and animation frames, with an automated report flagging content overflow, console errors, and failed requests so coding agents can visually verify slide edits
- Implemented single-file export that inlines reveal.js, fonts, images, and CDN libraries into a self-contained HTML deck presentable without internet access
- Added LAN preview with QR code for phone and tablet review, PDF export, and a pytest suite with GitHub Actions CI

Between the Lines

Fall, 2025

React + TypeScript bookstore e-commerce application developed for CS 5244: Web App Development

- Built full-stack e-commerce site using React + TypeScript with Vite, evolving from Figma and static HTML/CSS into a complete bookstore application with shopping cart, category browsing, and checkout functionality
- Developed Java servlet backend running on Tomcat to handle categories, books, and order processing with RESTful API design
- Implemented state management using React Context providers with useReducer pattern for order state, including persistent cart state via localStorage
- Integrated Formik/Yup for form validation with custom validators for phone numbers and credit cards, ensuring robust client-side validation throughout checkout flow

Ducky

Fall, 2025

AI-powered software developer assistant built with Streamlit providing intelligent development support through specialized features for CS 5740: AI Tools for Software Engineers

- Developed ReAct-pattern agent system with sandboxed tool execution capabilities, enabling GenAI agents to autonomously perform file operations, code editing, and multi-step task completion with security through path validation
- Implemented dual interface architecture: rich web interface with Monaco editor integration and CLI interface, supporting persona-based agent behaviors across software development roles (planning, development, QA, operations)
- Integrated RAG (Retrieval Augmented Generation) using local sentence-transformers for offline-capable document queries and comprehensive LLM integration with OpenAI-compatible APIs supporting function calling and streaming responses
- Have since expanded these ideas to applications using academic papers, qualitative transcripts, and other knowledge graphing/ontology engineering tasks

Epistemic Climate Analysis in CS Education [\[Code\]](#)

Sept., 2024 - June, 2025

Sociotechnical analysis of knowledge representation in computer science textbooks using STS frameworks and computational methods

- Developed novel methodology analyzing epistemic climate in CS textbooks using large language models, examining how different knowledge types shape students' understanding of legitimate expertise and disciplinary identity
- Created comprehensive coding scheme for 12 knowledge types (procedural, conceptual, historical, etc.) grounded in engineering education research and STS literature on epistemic cultures
- Generated insights about knowledge hierarchies in undergraduate CS education, revealing sociotechnical dimensions of how textbooks as material artifacts shape epistemic thinking

Graduate Courses Analysis Tool [Web], [Code]

Nov., 2023 - May, 2025

Full-stack web application for College of Engineering Associate Dean for graduate enrollment patterns

- Developed tool extracting structured course data from PDF timetables, identifying underenrolled graduate courses for strategic enrollment analysis and resource allocation decisions
- Technology Stack: React/Tailwind frontend, FastAPI backend, PyMuPDF for PDF processing, AWS S3 for production storage, Docker for deployment and maintenance
- Implemented automated ETL pipeline for processing university course enrollment data at scale with cross-listing identification and data enrichment via VT Timetable API

SERVICE

Associate Chair, Panelist, & Facilitated Discussion Mediator

Virginia Tech Graduate Honor System

Aug., 2023 - Present

- Serve as a trained facilitator for academic integrity discussions between faculty and students, mediating resolution of potential honor code violations through structured dialogue
- Manage GHS review panels that evaluate evidence and determine outcomes in academic integrity cases, upholding university standards while ensuring fair process
- Help educate the graduate community on academic integrity standards, ethical research practices, and honor system processes; for example, revised panelist training program and materials and led GHS website redesign
- Collaborate with diverse stakeholders including faculty, administrators, and students across disciplines to resolve cases arising each semester
- Leadership team nominated for 2026 Student Organization Leadership Award

Web Master

ASEE National Graduate Studies Division

June, 2025 - Present

Currently serving as the website maintainer for the ASEE National Graduate Studies Division

Division Board Search Committee Member

ASEE National Graduate Studies Division

Spring, 2026

Served on the search committee for the new board of the ASEE National Graduate Studies Division, facilitating the nomination, voting, and election process

Graduate Student Search Committee Member

Department of Graduate and Professional Studies

Summer, 2025

Served on faculty search committee for GHS chair position, evaluating candidates and participating in selection process

Graduate Ambassador

Department of Engineering Education

Aug., 2024 - May, 2025

Reviewer, Studies in Engineering Education

Sept. 2026

Reviewer, ASEE Annual Conference

May 2024, 2025, 2026

Reviewer, Frontiers in Education Conference

May 2026

Reviewer, International Journal of Qualitative Methods

Nov., 2024 & Sept., 2025

Reviewer, College of Engineering Torgersen Research Excellence Award

May, 2025

Reviewer, Capstone Design Conference

May, 2024

President Emeritus, Hillel at Virginia Tech

Dec., 2018 - Dec., 2020

INVITED TALKS AND CONFERENCE PRESENTATIONS

Conference Presentation, 2026 NEASTE Regional Conference

Oct., 2026

“Are We Talking About the Same Summer? Mentor-Mentee Perception Alignment and the Question of AI in Engineering Internships” - with Dr. Maggie Webb; work with a Rice University bridge program examining how students recognized differences between how practitioners and instructors orient toward AI in engineering internships

- Conference Presentation**, 2026 ASEE Annual Conference - Charlotte, NC June, 2026
 “It’s like ‘X’: How Engineering Faculty Metaphors Construct (and Constrain) AI Understanding in Engineering Education” [Slides] - Examining how the metaphors engineering faculty reach for shape what they take GenAI to be, what those framings foreclose, and the dangers of discourse standardization in faculty development
- Re-presented by invitation to the Upstate NY DBER Network, hosted by Cornell University (virtual), Oct., 2026
- Panelist**, 2026 ASEE Annual Conference - Charlotte, NC June, 2026
 “Impact of Generative AI Applications on Current Doctoral Practices and Implications for the Future” - Panel discussion on how GenAI is reshaping doctoral research practices, advising relationships, and disciplinary norms
- Conference Poster**, 2026 NY Upstate DBER Conference May, 2026
 Cornell University
 “Doomed by Design: The Moving Target Paradox of Faculty AI Development” - Arguing that the varied backgrounds, access levels, institutional policies, and attitudes faculty developers encounter make broadly applicable AI guidance untenable, requiring context-specific approaches
- Conference Presentation**, 2026 ASEE St. Lawrence Section Conference April, 2026
 “Inside the Mental Models: Instructor’s Conceptions on Generative Artificial Intelligence”
- Panelist**, Virginia Tech Engineering Education Admitted Students Day March, 2026
- Invited Presentations**, Cornell DBER Research Group (2 presentations) Oct., 2025
 Cornell University
 Presented technical background of large language models, AI history, and sociotechnical applications in engineering education research; demonstrated how computational methods intersect with critical perspectives on workplace learning and expertise
- Conference Presentation**, 2025 ASEE Annual Conference June, 2025
- “Automated Analysis of Knowledge Types in Computer Science Textbooks: A Natural Language Processing Approach to Understanding Epistemic Climate” - exploring the use of LLMs to evaluate types of knowledge described in computer science textbooks
 - “Beyond Calculations: Engineering Judgment as Epistemic Cognition in Engineering Education” - arguing for greater psychological interrogation of “engineering judgment”
- Invited Student**, Board of Visitors May, 2025
 Virginia Tech
 Discussed research on GenAI adoption in higher education and ongoing projects examining workplace technology integration with university leadership
- Panelist**, 2024 Capstone Design Conference June, 2024
 Panel discussion examining teamwork dynamics and collaborative practices in capstone engineering workplace contexts
- Conference Presentation**, 2024 ASEE Annual Conference June, 2024
 “Reimagining Behavioral Analysis in Engineering Education: A Theoretical Exploration of Reasoned Action Approach” - Examining decision-making in engineering student workplace teams
- Conference Poster**, 2024 Capstone Design Conference June, 2024
 “Why do capstone students choose to perform behaviors? Differing prevalence in collaborative choices”
- Panelist**, Virginia Tech Interdisciplinary Capstone (IDC) course Oct., 2023
 Discussion of engineering industry workplace practices and career pathways with capstone students

TECHNICAL SKILLS

Qualitative Methods: Ethnography, participant observation, interviews (semi-structured, episodic, key informant, ethnographic), qualitative coding techniques, grounded theory, symbolic interactionism, ethnomethodology, thematic analysis, discourse and conversational analysis, content analysis, phenomenology, phenomenography

Quantitative Methods: Model selection, exploratory & confirmatory factor analysis, survey design, correlational analyses, triangulation of qualitative and quantitative data

Theoretical Frameworks: Engineering expertise, sociology of expertise, technology acceptance models/diffusion of innovations, Science & Technology Studies (STS), epistemic cultures, epistemic thinking, social construction of technology, engineering studies, academic integrity and cheating, human-computer interactions (HCI), cognitive-behavioral frameworks, consciousness studies

Computational Methods: Natural language processing, large language models (LLMs), prompt/context/harness engineering, LLMs for qualitative research, retrieval-augmented generation (RAG), knowledge graphing/ontology engineering, agent-based systems, computational text analysis

Programming & Tools: Python, R, JavaScript, C++, SQL, React, FastAPI, Docker, Git, Jupyter notebooks, PyTorch, scikit-learn, MCP, HuggingFace Transformers, AI-based programming systems, ROS, Quarto

Data Management: DuckDB, MySQL, AWS S3, Azure, version control, reproducible research practices