Hongming (Chip) Li

Ph.D. Candidate in Educational Technology
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RESEARCH SUMMARY

Ph.D. candidate investigating complex learning and interaction phenomena through a convergent approach of **rigorous empirical inquiry and computational system development**. My research leverages AI/Machine Learning (NLP/LLMs), Learning Analytics, and HCI principles to analyze educational data and **design, build, and evaluate technological interventions** that enhance both learning outcomes and teaching effectiveness. This approach has yielded **7+ functional research prototypes/systems** (using Python, modern JavaScript frameworks, serverless architecture, cloud platforms) that serve as both research instruments and scalable real-world applications, supporting STEM+C skill development and AI literacy across diverse educational contexts. Technical expertise demonstrated through **production-grade infrastructure development** including serverless API gateways, edge computing deployments, and distributed systems; analytical capabilities further validated by **top-tier rankings (Kaggle Master, Global Top 1%)** in data-intensive challenges, complementing scholarly contributions to educational technology research.

EDUCATION

University of Florida — Aug 2023 - Present
Ph.D., Educational Technology — Florida, USA
Advisor: Dr. Anthony Botelho

Johns Hopkins University — Aug 2022 - Aug 2023
Master of Science, Learning Sciences and Technologies — Maryland, USA
Advisor: Dr. Richard Weisenhoff

University of Southampton — Sep 2021 - Sep 2022
Master of Science (with Merit), Education — Hampton, UK
Advisor: Dr. John Woollard

Capital Normal University — Sep 2016 - Jun 2020
Bachelor of Education, Elementary Education and Linguistics — Beijing, China
Advisor: Dr. Fengxia Zhang

RESEARCH INTERESTS

- **Analyzing:** Educational Data Mining, Learning Analytics, Multimodal Data Analysis & Causal Inference
- **Applying:** Natural Language Processing, LLMs, Machine Learning & Human-Computer Interaction
- **Ensuring:** AI Safety, Responsible AI, Trustworthy AI & Explainable AI
- **Investigating:** Computer-Supported Collaborative Learning (CSCL) & Learning Sciences
- **Building:** Human-AI Interaction, System Design & Development, Learning Engineering & Instructional Design

FUNDING, FELLOWSHIPS AND OTHER RESEARCH AWARDS

Innovation in Design Award — Mar 2026
National AI Literacy Day

Emerging Learning Technology Award — Oct 2025
Association for Educational Communications and Technology (AECT) DELT

Best Paper Nominee — Jul 2025
The 26th International Conference on Artificial Intelligence in Education (AIED 2025)

Innovation and Responsibility in AI-Supported Education (iRAISE) Travel Scholarship — Mar 2025
The 39th Annual AAAI Conference on Artificial Intelligence (AAAI 2025)

School of Teaching and Learning Travel Award — Oct 2024
University of Florida

Doctoral Consortium Graduate Student Travel Support recipient — Jul 2024
The 17th International Conference on Educational Data Mining (EDM 2024)

OpenAI, InterLearn: Advancing Fair, Inclusive, and Adaptive Educational Technologies — Apr 2024 - Apr 2025
Principal Investigator: Dr. Anthony Botelho — (Award # 0000001997, $5,000)
Co-PI: **Hongming (Chip) Li**

- Investigating the use of large language models (LLMs) in the educational context to address challenges of fairness and representativeness, focusing on developing explainable AI (XAI) for personalized student feedback.
- Aiming to enhance AI-based feedback systems by analyzing differences between human-written and AI-generated content and creating a taxonomy of effective feedback types.

- Creating AI tools that offer safe, reliable, and educationally sound feedback, fostering improved learning outcomes for students.

PUBLICATIONS

* Corresponding author † Those authors contributed equally

Conference Proceedings (Peer-Reviewed Conference)

- **Li, H.***, Kuang, H., & Botelho, A. F.* (2026, June). Can We Trust AI's Self-Assessment? Evaluating and Improving LLM Confidence Calibration in Educational Dialogue Coding. In *Proceedings of the 27th International Conference on Artificial Intelligence in Education (AIED 2026)*, Seoul, South Korea. (***Acceptance Rate: 16.7%***)
- **Li, H.***, Esmaeiligoujar, S., Adhami, N., Li, H., & Huang, R.* (2026, June). 'I Spend All My Energy Preparing': Balancing AI Automation and Agency for Self-Regulated Learning in SmartFlash. In *Proceedings of the International Conference of the Learning Sciences (ICLS) at the International Society of the Learning Sciences Annual Meeting (ISLS 2026)*, Irvine, CA, USA.
- Rahimi, S.*, **Li, H.**, Esmaeiligoujar, S., & Ercan, D. (2026, June). Rubric-Guided Generative AI for Scalable Creativity Assessment in Educational Games. In *Proceedings of the International Conference of the Learning Sciences (ICLS) at the International Society of the Learning Sciences Annual Meeting (ISLS 2026)*, Irvine, CA, USA.
- Zhang, S.*, **Li, H.***, Lee, S.*, Lee, J.-E., Schroeder, N. L., & Botelho, A. F.* (2026, June). Assessing Student Collaboration with Multimodal Data and Large Language Models. In *Proceedings of the International Conference of Computer-Supported Collaborative Learning (CSCL) at the International Society of the Learning Sciences Annual Meeting (ISLS 2026)*, Irvine, CA, USA.
- Zhang, S.*, Zambrano, A. F.*, **Li, H.***, Lee, S.*, Lee, J.-E., & Botelho, A. F.* (2026, June). Modeling and Analyzing Collaborative Dialogue States in Mathematics Problem-Solving through ONA and Hidden Markov Models. In *Proceedings of the International Conference of Computer-Supported Collaborative Learning (CSCL) at the International Society of the Learning Sciences Annual Meeting (ISLS 2026)*, Irvine, CA, USA.
- Lee, S.*, Zhang, S., **Li, H.**, Lee, J.-E., Closser, A., & Botelho, A. F.* (2026, June). Flexibility Before Fluency: Exploring Flexible Strategies Emerge through Collaborative Problem-Solving. In *Proceedings of the International Conference of Computer-Supported Collaborative Learning (CSCL) at the International Society of the Learning Sciences Annual Meeting (ISLS 2026)*, Irvine, CA, USA.
- Lee, S.*, **Li, H.***, Zhang, S., Zhong, Z., Lee, J. E., & Botelho, A. F.* (2025, July). So What? Unpacking the Complexities in Collaborative Problem Solving with AI-Augmented Sense-Making. In *Proceedings of the 26th International Conference on Artificial Intelligence in Education (AIED 2025)*, Palermo, Italy. (***Acceptance Rate: <16%***) https://doi.org/10.1007/978-3-031-98462-4_54
- Zhang, S.*, **Li, H.***, Lee, S.*, Schroeder, N. L.*, & Botelho, A. F.* (2025, July). VETTING AI for Deeper Learning: Constraining LLMs to Encourage Student Inquiry. In *Proceedings of the 26th International Conference on Artificial Intelligence in Education (AIED 2025)*, Palermo, Italy.
- Rahimi, S.*, Ercan, D., Gao, R., Esmaeiligoujar, S., Babaee, M., **Li, H.**, Zhang, S., Lee, S., Closser, A., & Botelho, A. F. (2025, July). ProductiveMath: A Generative-AI-Powered App to Support Productive Failure Teaching. In *Proceedings of the 26th International Conference on Artificial Intelligence in Education (AIED 2025)*, Palermo, Italy. ***Best Paper Nominee (Late Breaking Results)***.
- Li, H.*, Xing, W., Lyu, B., Zhu, W., Liu, Z., & **Li, H.**. (2025, July). An Automated Aesthetic Assessment Framework of Mathematical Story Images Validated by Click Counts. In *Proceedings of the 12th ACM Learning @ Scale Conference (L@S 2025)*, Palermo, Italy. https://doi.org/10.1145/3698205.3733923
- Hwang, W., **Li, H.**, Aguinalde, A. P., Zhang, Y., Shin, J.*, Crippen, K., & Carroll, B. (2025, July). Building an Explainable Recommender System for Engineering Students' Work-Integrated Learning (WIL). In *Proceedings of the 18th International Conference on Educational Data Mining (EDM 2025)*, Palermo, Italy. https://doi.org/10.5281/zenodo.15870223 [HTML]
- **Li, H.***, & Botelho, A. F.* (2025, June). Balancing the imbalance: Enhancing MOOC discussion forum urgency prediction with LLM-generated data augmentation. In *Proceedings of the Computer-Supported Collaborative Learning (CSCL) at the International Society of the Learning Sciences Annual Meeting (ISLS 2025)*, Helsinki, Finland. https://doi.org/10.22318/cscl2025.111336
- **Li, H.***, Fang, Y., Zhang, S., Lee, S., Wang, Y., Trexler, M., & Botelho, A. F.* (2025, March). ARCHED: A human-centered framework for transparent, responsible, and collaborative AI-assisted instructional design. In *Proceedings of the iRAISE 2025: Innovation and Responsibility for AI-Supported Education at the 39th AAAI Annual Conference on Artificial Intelligence (AAAI 2025)* (**Spotlight Paper**), Philadelphia, PA, USA. ***Awarded the iRAISE Travel Scholarship.*** https://doi.org/10.48550/arXiv.2503.08931
- **Li, H.***, Zhang, S.*, Lee, S.*, Lee, J.E.*, Zhong, Z.*, Weitnauer, E.*, & Botelho, A. F.* (2024, July). Math in motion: Analyzing real-time student collaboration in computer-supported learning environments. In *Proceedings of the 17th International Conference on Educational Data Mining (EDM 2024)*, 533–541, Atlanta, GA, USA. https://doi.org/10.5281/zenodo.12729878 [HTML] [pdf]
- **Li, H.***, Lee, S.*, & Botelho, A. F.* (2024, July). This paper was written with the help of ChatGPT: Exploring the consequences of AI-driven academic writing on scholarly practices. In *Proceedings of the 17th International Conference on Educational Data Mining (EDM 2024)*, 542–550, Atlanta, GA, USA. https://doi.org/10.5281/zenodo.12729880 [HTML] [pdf]
- Zhang, S.*, Li, H.*, **Li, H.***, Botelho, A. F.*, & Israel, M.* (2024, July). Investigating the dynamic change of pre- and in-service teachers' experiences, attitudes, and perceptions through CS autobiography using topic modeling. In *Pro-*

ceedings of the 17th International Conference on Educational Data Mining (EDM 2024), 921–926, Atlanta, GA, USA. https://doi.org/10.5281/zenodo.12729999 [HTML] [pdf]
- **Li, H.***, & Botelho, A. F.* (2024, July). Developing explainable AI systems to support feedback for students. In *Proceedings of the 17th International Conference on Educational Data Mining (EDM 2024)*, 998–1002, Atlanta, GA, USA. https://doi.org/10.5281/zenodo.12730029 [HTML] [pdf]
- **Li, H.***, & Botelho, A. F.* (2024, June). Fine-tuning large language models for data augmentation to detect at-risk students in online learning communities. In Clarke-Midura, J., Kollar, I., Gu, X., & D'Angelo, C. (Eds.), In *Proceedings of the 17th International Conference on Computer-Supported Collaborative Learning (ISLS 2024)* (pp. 441-442). International Society of the Learning Sciences, Buffalo, NY, USA. https://doi.org/10.22318/cscl2024.208036 [pdf]
- **Li, H.*†**, & Zhao, H†. (2022, June). Applying an online learning platform to enhance students' online education classroom learning experience during COVID-19. In *Proceedings of the 2022 8th International Conference on Humanities and Social Science Research (ICHSSR 2022)* (pp. 2837-2842), Chongqing, China. Atlantis Press. https://doi.org/10.2991/assehr.k.220504.515 [pdf]

Conference Presentations (Peer-Reviewed but Non-Archival)

- Rahimi, S.*, Esmaeiligoujar, S.*, **Li, H.*** (2026, April). Creativity assessment and machine creativity using generative AI in a sandbox physics game. In *the American Educational Research Association (AERA) Annual Meeting 2026*, Los Angeles, CA, USA.
- Lee, S.*, Zhang, S., **Li, H.**, & Botelho, A. F.* (2026, April). Designing for procedural flexibility with collaborative digital whiteboards: A case study of middle school algebra. In *the American Educational Research Association (AERA) Annual Meeting 2026*, Los Angeles, CA, USA.
- **Li, H.***, Lee, S.*, Zhang, S.*, & Botelho, A. F.* (2025, October). When AI agents battle: Can their debates transform learning and spark critical thinking? In *the Association for Educational Communications and Technology (AECT) International Convention 2025*, Las Vegas, NV, USA.
- **Li, H.***, Zhang, S.*, Lee, S.*, Trexler, M.*, & Botelho, A. F.* (2025, October). LOGEN AI: Implementing a transparent human-AI collaborative tool for enhanced instructional design. In *the Association for Educational Communications and Technology (AECT) International Convention 2025*, Las Vegas, NV, USA.
- Zhang, S.*, **Li, H.***, Lee, S.*, Schroeder, N. L.*, & Botelho, A. F.* (2025, October). Investigating student interactions with general and filtered ChatGPT. In *the Association for Educational Communications and Technology (AECT) International Convention 2025*, Las Vegas, NV, USA.
- Hwang, W.*, **Li, H.***, & Shin, J.* (2025, October). Co-Designing an Explainable AI Educational Recommender System: A Student-Centered Approach. In *the Association for Educational Communications and Technology (AECT) International Convention 2025*, Las Vegas, NV, USA.
- Lee, S.*, **Li, H.***, Zhang, S., Zhong, Z., Lee, J. E., & Botelho, A. F.* (2025, July). So What Now? AI-Augmented Sense-Making in Action: An Interactive Dashboard for Collaborative Mathematics Learning. In *the 26th International Conference on Artificial Intelligence in Education (AIED 2025) Interactive Events Track*, Palermo, Italy.
- Rahimi, S.*, Esmaeiligoujar, S.*, Gao, R.*, Celik, D.*, **Li, H.***, & Botelho, A. F.* (2025, April). Supporting teachers to prepare for productive failure using an AI-powered algebra problem generator. In *the American Educational Research Association (AERA) Annual Meeting 2025*, Denver, CO, USA.
- Rahimi, S.*, Celik, D.*, Gao, R.*, Esmaeiligoujar, S.*, **Li, H.***, & Botelho, A. F.* (2025, April). Using generative AI for automated human-creativity assessment and machine creativity in a sandbox game. In *the American Educational Research Association (AERA) Annual Meeting 2025*, Denver, CO, USA.
- Rahimi, S.*, **Li, H.***, Celik, D.*, Esmaeiligoujar, S.*, Gao, R.*, & Botelho, A. F.* (2025, March). An Automated Human-Creativity Assessment and Machine Creativity in a Sandbox Game Using Generative AI. In *the Society for Psychology of Aesthetics, Creativity, and the Arts Annual Conference (APA Division 10)*, New Haven, CT, USA.
- **Li, H.***, Zhang, S.*, Lee, S.*, & Botelho, A. F.* (2024, October). AI-enabled chatbots in educational practice: A systematic review from 2017 to 2023. In *the Association for Educational Communications and Technology (AECT) International Convention 2024*, Kansas City, MO, USA.

Journal Articles

- Rahimi, S., **Li, H.**, Esmaeiligoujar, S., Ercan, D., & Botelho, A. (2026). A rubric-guided multimodal approach using high-capacity LLMs provides psychometrically sound creativity assessment in learning games. *Creativity Research Journal*. https://doi.org/10.1080/10400419.2026.2638384
- Lee, S., Baral, S., **Li, H.**, Cheng, L., Zhang, S., Thorp, C. S., St. John, J., Thompson, T., Heffernan, N., & Botelho, A. F.* (2025). Developing a feedback taxonomy for math: A synergy of perspectives through data mining methods. *Journal of Educational Data Mining, 17*(2), 1-23. https://doi.org/10.5281/zenodo.16684563
- Wang, H., Song, C.* & **Li, H.** (2024). Application of social media communication for museum based on the deep mediatization and artificial intelligence. *Scientific Reports*, *14*(1), 28661. http://doi.org/10.1038/s41598-024-80378-2 [pdf]
- Liu, B., Li, M., Ji, Z., **Li, H.**, & Luo, J.* (2024). Intelligent productivity transformation: Corporate market demand forecasting with the aid of an AI virtual assistant. *Journal of Organizational and End User Computing (JOEUC)*, *36*(1). https://doi.org/10.4018/JOEUC.336284 [pdf]
- Yuan, R., **Li, H.**, Sun, Z.*, & Zhang, H. (2023). Application of graph convolutional network in the construction of knowledge graph for higher mathematics teaching. *Sensors and Materials*, *35*(12), 4269–4269. https://doi.org/10.18494/sam4340 [pdf]
- Wang, M., Shao, Y., Fu, S., Ye, L.*, **Li, H.***, & Yang, G. (2022). The influence of college students' innovation and entrepreneurship intention in the art field of art film and television appreciation by deep learning under entrepreneurial psychology. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.900176 [pdf]

- Wang, Z., Cai, L.*, Chen, Y., **Li, H.**, & Jia, H. (2021). The teaching design methods under educational psychology based on deep learning and artificial intelligence. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.711489 [pdf]

Invited Talks

- **Li, H.** , Zhang, S.(2025, August). *ARCHED: A Human-Centered Framework for Transparent, Responsible, and Collaborative AI-Assisted Instructional Design*. Invited guest lecture for the Graduate User Modeling course (Topic: Chain-of-Thought prompting in AI-assisted design) at Worcester Polytechnic Institute (WPI), Worcester, MA. Host: Dr. Neil Heffernan.

Dissertations and Theses
Master's Thesis, Education, University of Southampton

- **Li, H.** (2023). Post-pandemic reflections: A literature review of the digital divide in online learning in the pandemic. Advisor: Dr. John Woollard. https://doi.org/10.35542/osf.io/qug4h [pdf]

EXPERIENCE ON RESEARCH AND GRANT PROJECTS

CHECKPOINT: AI-Powered Assessment Platform Jul 2025 - Present
(The Learning Engineering Tools Competition Catalyst Prize) Principal Investigator: Dr. Anthony Botelho
Research Assistant, Lead Developer, & Human-AI Interaction Researcher — Nuxt/Vue, TypeScript, LLM Systems, Cloud Deployment

- Implemented the platform's **end-to-end system architecture** across four core modules (teacher authoring, student runtime, analytics, and support pages), enabling reliable delivery across **5 production release cycles**.
- Co-designed the product and research workflow with educator and research stakeholders through iterative interviews and usability studies, then translated findings into release-scoped hypotheses, UX revisions, and analytics/report refinements.
- Built **LLM generation pipelines with Context Engineering** for misconception-focused item generation and targeted regeneration (prompt/version control, retrieval-aware context assembly, and schema-constrained outputs), improving generation consistency and reducing manual revision overhead for educators.
- Implemented **multi-agent workflows** with tool-calling and structured outputs (standards retrieval, misconception targeting, regeneration controls), making AI behavior more observable, debuggable, and reproducible for evaluation.
- Engineered secure AI-serving infrastructure and research telemetry, including authenticated access, request/payload validation, safe rendering, and rate-limiting safeguards, strengthening both trustworthy classroom deployment and the platform's role as a **deployable research instrument**.

LOGEN AI: AI-Powered Instructional Design Assistant Oct 2024 – Present
University of Florida Principal Investigator: Dr. Anthony Botelho
Research Assistant & Lead Developer & UX Researcher — Vue.js, Python, OpenAI API, Firebase, Node.js, Cloudflare Workers

- Designed and developed a full stack AI-powered learning objective generation platform using **Vue.js**, **Vite** and **Node.js**, implementing a modern component architecture with optimized performance.
- Engineered integration with **OpenAI API** and custom models, implementing prompt engineering and context management to generate learning objectives aligned with Bloom's Taxonomy and other educational frameworks.
- Implemented **Cloudflare Workers** as API proxy with comprehensive logging system, utilizing **D1 SQL database** for secure request/response storage and **KV storage** for IP-based rate limiting to prevent abuse, creating a research-ready dataset while ensuring platform security.
- Designed and conducted iterative user research through interviews and usability testing with education faculty members, analyzing feedback to improve the platform's user experience and functionality.
- Built data collection and analytics system using **Firebase** to track user interactions and objective quality, enabling continuous improvement of the AI suggestions and interface design based on actual usage patterns.
- Implemented accessibility features following WCAG guidelines, ensuring the tool is usable for educators with diverse needs through screen reader compatibility and keyboard navigation support.

VETTING Chat AI Assistant Validation and AI Safety Tool in Education Aug 2024 - Present
University of Florida Principal Investigator: Dr. Anthony Botelho
Research Assistant & Full-Stack Developer & UX Designer — HTML, CSS, JavaScript, Firebase, Node.js, Express.js

- Developed a validation tool for AI educational assistants, utilizing traditional **HTML/CSS/JavaScript** for the front-end and **Firebase** for the back-end, including Authentication and Firestore database.
- Implemented secure identity verification features and built a modular framework using **Node.js** and **Express.js** to enable rapid deployment of conversational AI tools for educational research purposes.
- Accelerated research timelines providing a ready-to-use platform for testing AI assistants in educational settings, facilitating studies on AI's effectiveness in teaching.

National Science Foundation, EAGER: Orchestrating Productive Collaboration Among Students in Mathematics with Multimodal Machine Learning Sep 2023 - Present
(NSF Award # 2331379) Principal Investigator: Dr. Anthony Botelho
Research Assistant

- Developed and refined data preprocessing workflows for the EAGER project, utilizing Python and R to cleanse and structure extensive JSON data from an online math learning platform, laying the groundwork for multimodal machine learning analysis.

- Enhanced data interpretability through strategic feature engineering, enabling effective time series analysis and pattern detection in student collaboration within mathematics education.
- Implemented unsupervised machine learning techniques, including sophisticated clustering algorithms, to identify and analyze emergent patterns in student interactions during collaborative math problem-solving activities.

Bill and Melinda Gates Foundation - PRODUCTIVE: AI-Powered Math Problem Generator for Supporting Teachers in Productive Failure Implementation May 2024 - Dec 2025
(Gates Foundation Award # 080555) Principal Investigator: Dr. Seyedahmad (Ahmad) Rahimi
Research Assistant & Full-Stack Developer & UX Designer — React, Firebase, JavaScript, HTML/CSS

- Developed a full-stack web application using **React** for the front-end and **Firebase** suite (Authentication, Firestore, Storage) for the back-end, enabling teachers to generate and share productive failure scenarios in mathematics.
- Implemented comprehensive user authentication and authorization systems, including email/password and OAuth login methods, and designed role-based access controls to differentiate between teachers and students.
- Integrated social features such as messaging, commenting, and liking using Firebase's real-time database capabilities, enhancing user engagement and fostering a collaborative educator community.
- Developed integration with LLMs API for generating contextually relevant math problems that align with Kapur's framework of productive failure, including problem complexity assessment, prior knowledge activation, and affective engagement through story-based scenarios.

Instructional Design and Engagement Analytics (IDEA) Oct 2022 - Aug 2023
Instructional Resource Center, Johns Hopkins University Mentor: Dr. Wenting Weng

- Generated insightful data reports for the Panopto learning video tool and Canvas learning management system, utilizing data visualization tools and data mining techniques to uncover trends and patterns that inform instructional strategies and enhance student outcomes.
- Conducted quantitative analysis, including cluster analysis, using RStudio to examine the data and derive actionable insights for improving the teaching and learning process.
- Created independent course content to guide instructors in leveraging new technologies and applying data analytics to optimize course design and delivery.

Integrating Technology into Teaching and Learning Oct 2021 - Dec 2021
Teachers College, Columbia University Supervisor: Dr. Irina Lyublinskaya

- Analyzed the use of different technological tools to help design the teaching and learning process.
- Conducted a literature review of the literature analyzing TPCK and other theories that support the integration of technology and education.
- Designed a final project on the use of online educational technology to enhance student learning experiences.

DEVELOPMENT EXPERIENCE

VIABLE Lab LLM API Router & Developer Portal - AI Infrastructure Feb 2025 - Present
Lead System Architect & DevOps Engineer — Cloudflare Workers, Hono.js, D1 SQL, JavaScript, GitHub Actions

- Architected a **production-scale LLM gateway** serving 6 educational platforms with processed request data, achieving cost optimization through intelligent provider routing and real-time pricing analysis across **12 LLM models** with dynamic cost tracking ranging from **$0.50 to $225** per million tokens.
- Engineered comprehensive **educational content vetting pipeline** with multi-stage safety validation, pedagogical filtering, and context-aware verification against academic guidelines, implementing automated retry mechanisms with 3-tier context truncation strategy to ensure appropriate educational responses.
- Designed and published **1,427-line OpenAPI 3.0 specification** with comprehensive developer documentation, enabling seamless integration for educational technology developers and reducing API adoption complexity through standardized OpenAI-compatible interface and intelligent model aliasing system.
- **Built enterprise-grade developer portal** with interactive model catalog showcasing 12+ AI models, real-time availability tracking, provider information display, and intelligent model filtering system, improving developer experience and reducing integration time by 40% through unified documentation platform.
- **Developed browser-based encryption utility** with AES-256-GCM client-side encryption for sensitive educational content, supporting multiple input formats and secure prompt handling, enabling educators to safely utilize AI services while maintaining data privacy compliance.
- **Implemented automated documentation deployment pipeline** using GitHub Actions with multi-stage CI/CD workflow, generating static documentation sites from OpenAPI specifications, and deploying to GitHub Pages with custom domain configuration and integrated analytics tracking across 4 portal sections.
- Built enterprise-grade observability infrastructure with **25-field analytics schema** tracking cross-provider usage patterns, token consumption metrics, processing performance, and detailed LLM call traces, enabling data-driven cost optimization and platform performance analysis across distributed educational environments.
- Implemented scalable serverless architecture with global edge deployment, distributed rate limiting, comprehensive error handling, and multi-provider failover capabilities, designed for extensibility to support future educational technology integrations and third-party developer adoption.

VIABLE Lab Research Website Sep 2024 - Present
Full-Stack Developer & UX Designer & DevOps Engineer — Vue.js, Vite, GitHub Actions, Node.js

- Architected and implemented a modern research laboratory platform using **Vue.js** and **Vite**, featuring dynamic component architecture and automated build optimization that reduced initial load time by 40%.
- Engineered robust CI/CD pipelines using **GitHub Actions**, implementing parallel workflows for automated deployment and data synchronization with intelligent retry mechanisms and conflict resolution.
- Designed and implemented an intuitive user interface with **PrimeVue**, incorporating advanced animations, accessibility features, and responsive layouts that achieved WCAG 2.1 compliance and optimal user experience across all devices.
- Enhanced website performance through modular component design and progressive enhancement techniques, implementing lazy loading, smooth transitions, and adaptive dark mode support that improved user engagement metrics by 45%.

GraspableMath Collaborative Learning Dashboard Jun 2024 - Present
Front-End Developer — Vue.js, D3.js, RESTful APIs

- Built an interactive dashboard using **Vue.js** to visualize real-time student collaboration data from the GraspableMath platform, allowing educators to monitor and assess group learning activities effectively.
- Developed an AI-enhanced analytics pipeline using **Cloudflare Workers** for serverless computation, integrating Google Gemini and OpenAI GPT to extract learning patterns, improve interpretability, and provide personalized instructional recommendations for educators.
- Integrated **D3.js** for dynamic data visualization, creating charts and graphs that display collaborative metrics such as participation rates, problem-solving steps, and peer interactions.
- Enabled teachers to identify collaboration patterns and intervene promptly, resulting in student engagement and collaborative problem-solving skills.

TEACHING AND RELATED EXPERIENCE

University of Florida Florida, USA
Research Assistant Aug 2023 - Present

- Conducted multimodal data mining and machine learning research to explore explainable artificial intelligence (AI) and large language models (LLMs) and human-computer interaction (HCI) applications in education, employing quantitative analysis methods, including causal inference and regression modeling, to derive meaningful insights and advance research projects.
- Collaborated with interdisciplinary teams to process and analyze complex educational datasets, applying state-of-the-art learning analytics techniques to identify patterns, trends, and opportunities for enhancing AI-driven educational interventions and personalized learning experiences.
- Contributed to the dissemination of research findings by coauthoring research papers that showcase the potential of AI and large language models in transforming educational practices, presenting results at conferences and submitting manuscripts to high-impact journals in the field of educational technology.

Teaching Assistant Aug 2023 - Dec 2023

- Participated in the course: (IDS 2935) Making Sense - Understanding the World with Data and AI (Quest 2)
- Engaged with students in discussions, offering insights and guidance on AI and data-related topics.
- Evaluated and provided in-depth analyses of student lab assignments, focusing on NLP and machine learning models, to foster critical thinking and technical proficiency.
- Offered personalized feedback to students, enhancing their understanding of complex concepts and their practical applications.

Carey Business School, Johns Hopkins University Maryland, USA
Graduate Assistant Oct 2022 - Aug 2023

- Collaborated with Instructional designers and technologists to develop universally designed educational content.
- Advocated for the inclusion of special needs learners in course development processes.
- Provided ongoing technological support for courses across three academic terms.
- Enhanced accessibility features for learners with special needs.

Johns Hopkins University Advanced Academic Programs Maryland, USA
Instructional Designer Assistant Oct 2022 - May 2023

- Conducted data-driven research focused on the application of analytics in instructional design.
- Authored comprehensive data usage guidelines specific to Canvas and Panopto platforms.
- Designed professional development courses for university instructors, including creating storyboards and workshops.
- Enabled faculty to leverage educational data for improving teaching and learning processes.

Pingxiang University Jiangxi, China
Research Assistant and Teaching Assistant Oct 2020 - Apr 2021

- Participated in the course: College English II, Introduction to Intelligent Education
- Aided professors in grading and providing feedback on assignments while also supervising and guiding students through homework completion.
- Facilitated class presentations and ensured seamless classroom operations.
- Supported professors in lesson planning and instructional delivery by integrating multimedia technology to enhance student engagement and learning outcomes.
- Contributed to cutting-edge AI in education initiatives and conducted research on educational practices and higher.

MENTORSHIP

Undergraduate Senior Projects

Bar-Nur, E. B., Qiu, S., Said, O. J., Steinbrecher, R., & Voigt, C. G. (Fall 2025). *Learning Nutrition: AI-Powered Full-Stack Educational Assessment Platform*. University of Florida CIS/CEN 4914 Senior Project. (Guided data acquisition, database design, API development, and front-end/back-end integration.)

Mosley, K. S., Ramirez, A., & Vazquez, M. (Spring 2025). *SmartGator: AI-Integrated Google Colab Extension*. University of Florida CIS/CEN 4914 Senior Project. (Supervised the development of a Chrome extension that integrates AI agents for intelligent workflow assistance and contextual feedback.)

PROFESSIONAL SERVICE

Leadership and Organizational Service

- **Web Chair**, *International Conference on Educational Data Mining (EDM) 2026 Organizing Committee* — Jun 2026
- **Co-Director**, *UF College of Education 2025 Research Symposium Committee* — Apr 2026
- **Session Host**, *International Society of the Learning Sciences Annual Meeting (ISLS 2025)* — Jun 2025
- **Technology Chair**, *UF College of Education 2025 Research Symposium Committee* — Mar 2025
- **Student Volunteer**, *International Society of the Learning Sciences Annual Meeting (ISLS 2024)* — Jun 2024
- **Technology Chair**, *UF College of Education 2024 Research Symposium Committee* — Mar 2024
- **Programme Representative**, *University of Southampton* — Sep 2021 - Jul 2022
- **Vice President**, *Capital Normal University Student Union* — Sep 2016 - May 2020

Conference Reviewer

- International Conference on Educational Data Mining (EDM)
- Technical Symposium on Computer Science Education (SIGCSE TS)
- AAAI/ACM Conference on Artificial Intelligence, Ethics, and Society (AIES) Student Program
- Annual Meeting of the Association for Computational Linguistics (ACL) Student Research Workshop (SRW)
- Annual Conference on Neural Information Processing Systems (NeurIPS) Position Papers Track
- International Conference on Artificial Intelligence in Education (AIED)
- International Conference on Learning Representations (ICLR) Workshop on AI for Children
- International Conference on Computer-Supported Collaborative Learning (CSCL/ISLS)
- International Conference on Artificial Intelligence and Statistics (AISTATS)
- American Educational Research Association Annual Meeting (AERA)
- Association for Educational Communications & Technology International Convention (AECT)
- British Educational Research Association Annual Conference (BERA)
- International Conference of the Learning Sciences (ICLS/ISLS)
- Learning Analytics and Knowledge Conference (LAK)

Journal Reviewer

- Cognitive Computation
- Discover Computing
- BMC Psychology
- Australian Journal of Psychology
- Discover Artificial Intelligence
- Scientific Reports
- Journal of Learning Analytics (JLA)

PROFESSIONAL MEMBERSHIPS

Association for the Advancement of Artificial Intelligence (AAAI) — Jan 2025 - Present
Association for Computing Machinery (ACM) — Jun 2024 - Present
International Society of the Learning Sciences (ISLS) — Apr 2024 - Present
American Educational Research Association (AERA) — Jan 2024 - Present
Association for Educational Communications and Technology (AECT) — Aug 2023 - Present
British Educational Research Association (BERA) — Jul 2022 - Present
National Education Union (NEU) — Jul 2022 - Jul 2023

OTHER AWARDS AND RECOGNITIONS

Best Impact Award — May 2022
University of Southampton 2022 Academic Awards
Outstanding Academic Scholarship — Oct 2019
Capital Normal University
Special Scholarship for Social Engagement — Oct 2019
Capital Normal University

Pioneer Leadership Award for Outstanding Undergraduate May 2019
Beijing Municipal Education Commission
Distinguished Student Leader Award May 2019
College of Elementary Education, Capital Normal University
Distinguished Student Leader Award May 2018
Capital Normal University
Silver Performance Award Nov 2017
Beijing College Student Drama Festival

COMPETITIONS

Kaggle Competition Global Ranking: 1,156 / 205,271 (Top 1%)
Data Science Competitions Master

Competition: Home Credit - Credit Risk Model Stability Feb 2024 - May 2024
Gold Medal *Home Credit Group*

- Achieved 17th place out of 3858 teams (Top 1%) in a competition focused on predicting clients' likelihood of defaulting on loans and developing stable credit risk models over time.
- Conducted feature engineering based on the competition data. The competition provided 465 native features including personal information (gender, age, education, etc.), consumption records (monthly consumption amount, reasons for consumption restrictions, etc.), and credit card information (issuing bank, level, etc.). Derived features include:
  - Aggregate Features: Aggregate features that summarize the consumption level of each user, reflecting the user's situation from different perspectives. For a continuous variable, taking mean, std, min, max; for a discrete variable, taking count, last, and nunique.
  - Diff Features: Statistic of the change in the user's historical consumption data, which can reflect whether there has been a change in behavioral patterns in the recent period.
- Utilized LightGBM and CatBoost models to solve this problem, as decision tree models usually perform well in risk control issues. These types of models have demonstrated excellent performance in various tasks and are well suited to the data characteristics of this competition. Employed groupkfold to divide the samples into five segments of test sets based on the week_num of the samples for thorough testing and to avoid overfitting, improving the robustness of the model.
- Collaborated with the team and developed models to maximize prediction accuracy and stability, achieving a final score of 0.56521.

Competition: LLM Prompt Recovery Feb 2024 - Apr 2024
Silver Medal *Kaggle & Google*

- Achieved 97th place out of 2175 teams (Top 5%) in a competition aimed at restoring large model prompts used for text transformation, employing Sharpened Cosine Similarity as the evaluation metric.
- Generated 14,000 training samples using large language models (Gemma, Gemini, GPT, Llama) combined with prompts, and fine-tuned the Mistral 7B model using transformers and LoRA framework.
- Employed few-shot learning with carefully selected reference samples, achieving a similarity score of 0.6539.
- Actively engaged in discussions, devised iterative model improvement tasks, and organized brainstorming sessions to drive competition progress while ensuring maximum enhancement of predictive accuracy.
- **Highlights:** *Generating training samples to fine-tune the Mistral 7B model in the face of lack of training data and exploiting the full potential of the model through a well-designed few-shot learning strategy.*

Competition: HMS - Harmful Brain Activity Classification Jan 2024 - Apr 2024
Silver Medal *Harvard Medical School & Sunstella Foundation*

- Achieved 86th place out of 2767 teams (Top 4%) in a competition focused on detecting and classifying epileptic seizures and harmful brain activities through automated EEG analysis, utilizing Kullback-Leibler divergence as the metric.
- Extracted 17,089 training samples based on unique EEG IDs and engineered features by combining spectrograms provided by organizers with mel-spectrogram features extracted using the librosa package.
- Developed models using ResNet34, EfficientNetB0, and EfficientNetB1 architectures, employing group k-fold cross-validation based on patient IDs to enhance robustness and prevent overfitting.
- Collaborated with the team to devise iterative model improvement tasks, organize brainstorming sessions, and develop models to maximize prediction accuracy, achieving a score of 0.348374.

SKILLS

- **Programming Languages:** Python, JavaScript, TypeScript, R, SQL, HTML/CSS
- **Research & Quantitative Methods:** Learning Analytics, Educational Data Mining, Experimental Design (A/B Testing), Statistical Modeling, Regression Analysis, Hidden Markov Models (HMM), Causal Inference, Model Evaluation (RMSE, Correlation, Calibration), Reliability & Agreement Analysis
- **Agent Systems & LLM Engineering:** Agent Skills (Modular Capability Packaging), Multi-Agent Orchestration, Tool-Calling Frameworks, Model Context Protocol (MCP), Structured Outputs (JSON Schema), LLM Routing & Cost Optimization, Multi-Provider Integration (OpenAI, Gemini, Claude), Safety/Vetting Pipelines, Controlled Generation

- **LLM Representation & Interpretability:** Activation/Hidden-State Analysis, Layer-wise Representation Probing, Steering Vectors (Activation Steering), Representation Similarity Analysis
- **Machine Learning & Deep Learning:** PyTorch, TensorFlow, Scikit-learn, Hugging Face, Fine-Tuning (LoRA), Clustering, Time-Series Modeling, Predictive Modeling
- **Full-Stack Web Engineering:**
  - Front-end: React, Vue.js, Nuxt.js, Tailwind CSS, D3.js, Vite
  - Back-end: Node.js (Express, Hono), FastAPI, Flask
  - Databases: PostgreSQL, MySQL, MongoDB, Firestore, SQLite, Redis
  - API Design: RESTful APIs, OpenAPI 3.0 Specification, Webhooks, Serverless Functions
- **Cloud, Edge & Infrastructure Engineering:** Cloudflare (Workers, AI Gateway, D1, KV, R2), AWS (EC2, Lambda, API Gateway, S3, RDS, Bedrock), Google Cloud (Compute Engine, Cloud Functions, Cloud SQL), Firebase, Supabase
- **DevOps & Production Systems:** CI/CD (GitHub Actions), Docker, Distributed Systems, Rate Limiting, Observability & Logging, CORS Management, API Security, Automated Documentation Deployment
- **Security & Privacy Engineering:** AES-256-GCM Encryption, Client-Side Cryptography, Secure Prompt Handling, Educational Data Privacy Compliance
- **Human-Centered AI & Educational Technology:** HCI Principles, Explainable AI (XAI), Learning Analytics Dashboards, Accessibility (WCAG), Instructional Design (Articulate 360)
- **Languages:** Mandarin Chinese (native), English (fluent)