# Xiyun Hu

huxiyun@unc.edu 984-363-0710 https://www.linkedin.com/in/xiyunhu-unc/
https://erhxyun.github.io/Personal-Portfolio/

## EDUCATION

**University of North Carolina at Chapel Hill** 08/2023 - 05/2027
*B.S in Computer Science & B.S in Statistics and Analytics*

- **Curricular GPA**: 3.76/4.00
- **Awards & Honors**: Honors Carolina, Dean's List (Fall 2023 & Spring 2024 & Fall 2024 & Spring 2025 & Spring 2026)
- **Relevant Coursework**: Artificial Intelligence; Deep Learning; Machine Learning; Computer Organization; Bioalgorithms; Data Structure and Analysis; System Fundamentals; Foundation of Software Engineering; AI-driven Smart Connected Health; Models of Languages and Computation; Algorithms and Analysis; Introduction to Optimization

## RESEARCH INTERESTS

Multimodal Computational Mental Health; Trustworthy and Evidence-Grounded Generative AI; Agentic AI and Patient Simulation; Human-Centered AI for Health; Privacy-Preserving Clinical AI Systems

## SKILLS

- **Programming:** Python (NumPy, Pandas, Matplotlib), Java, C, C#, TypeScript, R, HTML, CSS, JavaScript
- **Framework and Tools:** MERN stack, PyTorch, MySQL, MATLAB, Linux, Unity, Blender
- **Language:** Mandarin (Native), English (Working Proficiency), French (Conversational)

## PUBLICATIONS

### Conference Proceedings

- **X. Hu***, X. Xue*, H. Shao, Q. Xue, Z. Jia, Y. Li, J. Aikat, and J. Nie, "ERIC: Grounding AI Patients Across Diverse Mental Health Spectra in Real-World Behavioral Evidence," under review at the ACM CHI Conference on Human Factors in Computing Systems (CHI'27), 2026.
- **X. Hu***, X. Xue*, H. Shao, Q. Xue, Z. Jia, Y. Li, J. Aikat, and J. Nie, "EdgeCare: Designing and Evaluating State-Aware On-Device Conversational Support for Mental Health," under review at the ACM CHI Conference on Human Factors in Computing Systems (CHI'27), 2026.
- S. Cao, W. Zhang, J. Wu, **X. Hu**, Y. Yang, J. Chen, and Z. Feng, "A Phase Boundary for LLM Verify–Repair in University Course Planning: Theory, Certification, and the DegreePlan-Multi Benchmark," under review at the 41st AAAI Conference on Artificial Intelligence (AAAI'27), 2026.
- S. Cao, Y. Ma, R. Chen, J. Wu, **X. Hu**, J. Chen, C. Zhang, and Y. Yang, "Composition and Closure: Causal Tests of Linguistic Operators in Transformers," under review at the International Conference on Learning Representations (ICLR 2027), 2026.

### Workshops

- **X. Hu**, X. Xue, Y. Lyu, H. Shao, and J. Nie, "Evidence-Grounded Mapping of Multimodal Human Sensing to Psychological Transdiagnostic Dimensions," accepted by the 4th International Workshop on Human-Centered Sensing, Modeling, and Intelligent Systems (HumanSys'26), 2026.

* denotes equal contribution.

## ACADEMIC EXPERIENCE

**Networked Intelligence & Cyber-Embedded Systems Lab** Chapel Hill, NC, USA
*Research Assistant* 03/2026 – Present

- Conduct research on trustworthy and evidence-grounded AI for mental health across multimodal sensing, AI agents, and conversational systems.
- Led a first-author HumanSys workshop benchmark mapping GLOBEM sensing, EMA, and questionnaire evidence to transdiagnostic B-HiTOP profiles.
- Designed a multi-agent AI Patient framework integrating GLOBEM, StudentLife, and ExtraSensory into evidence-grounded synthetic mental health profiles.
- Co-developed **EdgeCare**, an on-device conversational mental health system using Llama 3.2, Faster-Whisper, Piper, and task-specific LoRA adapters.
- Developed emotion-aware interaction and system evaluation for **EdgeCare**, including vocal affect detection, deployment, latency, memory, and power benchmarking.

**Advanced Computational Medicine Lab** Chapel Hill, NC, USA
*Research Assistant* 12/2025 - Present

- Conduct research on machine learning and neural modeling methods for biomedical and physiological time-series data, with a focus on spiking neural networks and temporal dynamics.
- Investigate oscillation-modulated spiking neural network architectures to study robustness, long-range temporal dependency learning, and working memory mechanisms in noisy biological signals.
- Design and execute controlled experimental evaluations across multiple datasets (e.g., ECG, neuromorphic event streams, speech, and sequential benchmarks) to assess generalization, robustness, and computational efficiency.
- Analyze model behavior under perturbations, including input noise, network-level noise, and adversarial attacks, to understand stability and failure modes in biologically inspired neural systems.
- Collaborate with lab members to connect algorithmic findings with biological interpretation and clinical relevance, emphasizing reproducibility and transparent evaluation.

**Data Analysis Agentic AI Project, UNC Chapel Hill** Chapel Hill, NC, USA
*Research Assistant* 08/2025 - 12/2025

- Designed and developed an agentic AI system to study how structured workflows and human-in-the-loop controls affect reliability and hallucination in AI-assisted data analysis.
- Investigated planning–execution–reflection pipelines using LLM agents, emphasizing transparent intermediate representations (plans, schemas, step-level outputs) to support user inspection and intervention.
- Built an interactive research front-end using React and TypeScript to enable hypothesis specification, dataset staging, schema validation, and iterative refinement of analysis plans.
- Conducted systematic experiments on error modes in LLM-based data reasoning, comparing free-form generation with structured, agent-mediated workflows.
- Collaborated with back-end researchers to integrate FastAPI services and WebSocket-based real-time updates, enabling synchronized human–AI collaboration during analysis.

## PROJECTS

**AI Patient: Evidence-Grounded Mental Health Simulation – Multi-Agent AI System** Chapel Hill, NC, USA
*Research Project* 06/2026 - Present

- Designed a multi-agent architecture for constructing evidence-grounded AI patients from multimodal behavioral, self-report, demographic, and digital-phenotyping data for mental health professional training.
- Audited, aligned, and preprocessed two versions of the longitudinal GLOBEM dataset, producing 525 valid participant-wave records with complete Feature, EMA, Weekly, PRE/POST, and demographic data while preserving source-level provenance.
- Developed an Evidence Builder that transforms heterogeneous GLOBEM variables into 31 clinically interpretable evidence groups, including 18 PRE/POST survey groups, 6 EMA and weekly assessment groups, and 7 digital-phenotype domains.
- Built a deterministic Scenario Context Agent by temporally standardizing and harmonizing StudentLife and ExtraSensory, producing 3.9 million traceable context frames and 11,365 reusable scenario templates.
- Formulated a finite combinatorial mapping framework connecting 31 multimodal evidence groups to 45 B-HiTOP items across six psychopathology spectra, with spectrum-level factorization and clinical constraints designed to reduce effective search complexity.
- Designed an LLM-based clinical scoring pipeline that estimates 45 item-level B-HiTOP scores, aggregates them into six spectrum-level profiles, and preserves evidence-to-state traceability for each generated AI patient.
- Developed a multidimensional evaluation framework covering data quality, provenance, psychometric validity, evidence-state compatibility, computational efficiency, and therapist-rated clinical authenticity, with clinician ratings designed to inform future reward modeling.

**EdgeCare: On-Device Conversational AI Therapist** Chapel Hill, NC, USA
*Research Project* 04/2026 - Present

- Co-developed EdgeCare, an on-device conversational AI system that conducts natural voice-based screening across 37 transdiagnostic dimensions and provides bounded psychotherapeutic interventions, including structured cognitive behavioral therapy, mindfulness, and breathing exercises.
- Engineered a fully local voice-processing pipeline on an NVIDIA Jetson Orin, integrating VAD-controlled recording, Faster-Whisper speech recognition, a quantized Llama 3.2 model with task-specific LoRA adapters, and Piper speech synthesis to support private and offline interaction.
- Implemented a reinforcement-learning-based dialogue policy using Q-tables to personalize question selection, while deterministic workflow controllers govern response segmentation, dimension scoring, validation, dialogue transitions, and intervention routing.
- Developed an emotion-aware module that combines lexical and acoustic cues to identify vocal affect, sarcasm, and text–voice incongruence, triggering bounded, non-judgmental clarification or intermission activities without modifying screening scores.
- Built the embedded interaction and session-management infrastructure, including GPIO buttons, status LEDs, automated model loading, persistent session records, systemd-based startup and shutdown, and fault-tolerant online-to-offline operation.
- Benchmarked the production inference pipeline across Jetson Orin, laptop CPU/GPU, and NVIDIA RTX PRO 6000 Blackwell platforms, measuring adapter-level latency, memory consumption, GPU utilization, and power, while validating all structured output contracts.

**Carolina Correlations: Patient Care Early Alert System** Chapel Hill, NC, USA
*Hackathon Project* 03/2026

- Built an end-to-end machine learning system to identify patients at risk of care fragmentation and surface individualized risk scores through an interactive dashboard.
- Developed Python and SQL data pipelines to clean, integrate, and feature-engineer multi-source patient records for downstream predictive modeling.
- Evaluated XGBoost and LightGBM models on predictive performance and interpretability, and translated model findings into actionable recommendations.
- Presented the system and statistical analysis to judges and industry mentors at ASA DataFest.
- Received the **Best Statistical Analysis Award** among competing university teams.

**CyberNeuro: Brain Network Chart – Multi-Agent AI System** Chapel Hill, NC, USA
*Research Project* 02/2026 – Present

- Co-developed NeuroAgent, an autonomous multi-agent AI system that orchestrates analysis, statistical validation, and literature cross-referencing of neuroimaging biomarkers to prevent scientific hallucinations.

- Built a database query pipeline integrating PubMed search, a merged OpenAlex + Crossref open internet search, and a web scraping agent to capture neuroimaging data from the UK Biobank.
- Developed a Visualizer agent enabling users to interactively edit and refine visualization charts generated during analysis, providing dynamic control over data presentation.
- Collaborated on a TypeScript + Vite + FastAPI + CopilotKit frontend featuring real-time agent progress tracking and user intervention capabilities for modifying agent tool parameters mid-execution.
- Deployed specialized HAI-DEF models (MedGemma1.5:4b, TxGemma-27B) via Ollama alongside a FastMCP server exposing scientific tools including BOLD-to-CFC, normative analysis, and statistical correlation functions.

**Little Green Leaves Official Web Platform** Chapel Hill, NC, USA
*Website Application Project for Non-Profit Organization* 08/2025 - 12/2025

- Led the design and development of a web-based platform supporting a long-running grassroots social program providing sustained, one-to-one support to under-resourced children.
- Translated nonprofit operational workflows and impact reporting requirements into a structured and transparent digital system for public communication.
- Designed system architecture and front-end structure with emphasis on clarity, trust, and long-term maintainability, supporting bilingual (Chinese/English) audiences.
- Implemented user-centered interface components to present longitudinal impact data, program narratives, and milestones in an accessible and interpretable format.
- Conducted iterative development informed by stakeholder feedback, balancing technical constraints with real-world organizational needs.
- Focused on ethical, human-centered design principles in the development of digital infrastructure for social good.

**Mixed Reality Systems for Interactive Experiments** Chapel Hill, NC, USA
*Technical Research Project* 05/2025 - 08/2025

- Designed and implemented mixed reality (MR) environments to support interactive configuration and monitoring of complex experimental scenarios.
- Developed real-time control interfaces enabling dynamic adjustment of system parameters during experimental runs.
- Built modular software components to support reproducibility and rapid iteration across different experimental configurations.
- Implemented networking and synchronization mechanisms to enable distributed observation and real-time collaboration.
- Integrated visualization tools to support interpretation of system state and experimental outcomes.
- Focused on system robustness, latency, and reliability in interactive, real-time environments.

## PROFESSIONAL EXPERIENCE

**Becton Dickinson** Durham, NC, USA
*Software Engineering Intern* 05/2025 - 12/2025

- Engineered a Unity-based mixed reality application to support user studies on healthcare products, enabling interactive simulations and immersive user testing.
- Designed and implemented a custom control panel UI integrating multi-window video feeds, enabling efficient monitoring and real-time configuration of test environments.
- Migrated core Virtual Training Modules from JavaScript to TypeScript, enhancing code scalability and reliability across immersive training platforms.
- Added networking support for real-time remote observation, enhancing collaborative testing workflows across distributed users, mirroring online multiplayer synchronization principles.
- Identified and resolved over 600 bugs uncovered during the codebase migration and optimization, strengthening code quality, testing coverage, and maintainability.

**Chapel Thrill Escape** Chapel Hill, NC, USA
*Software Engineer Intern* 04/2024 - 09/2024

- Developed and evaluated interactive web features, including real-time customer support functionality, to improve system responsiveness and user interaction.
- Built an AR/VR-based virtual tour using 3D modeling to explore immersive interface design and spatial navigation.
- Conducted performance optimization experiments by restructuring image loading pipelines and implementing lazy loading, achieving a 25% reduction in page load time.
- Redesigned site navigation and information structure based on user interaction patterns, leading to a measurable increase in engagement.

## LEADERSHIP EXPERIENCE

**Web Development Lead, HackNC 2024** 05/2024 - 08/2024

- Served as a core web development lead for the official HackNC 2024 hackathon website, coordinating design and implementation efforts within a 22-person team.
- Helped define interface structure and visual direction aligned with the event's theme, ensuring consistency across pages and components.
- Guided layout organization and navigation decisions to support clarity, usability, and scalability for a public-facing event.
- Contributed to technical decision-making and task coordination to integrate dynamic content (e.g., FAQ and information sections) into a cohesive system.