ZHIYU (KEVIN) SUN

Chattanooga, TN 37404 | zhiyu.sun.0403@gmail.com | +1 (423) 227-6974

EDUCATION

McCallie School Jun. 2027 (Expected)

- GPA: 4.2
- Advanced Courses: Numerical Analysis, Proofs; Graph Theory and Combinatorics, Linear Algebra, Multivariable Calculus, Differential Equation, AP Calculus, AP Statistics, AP Physics C, AP Chemistry, AP Bio

RESEARCH & PROJECTS

Research Assistant | Cystic Lung Cancer Modelling

Online May 2026-Present

- Under the supervision of Cornell Bowers PhD student Haoxuan Xu, and cooperate with the West China Hospital
- Built a binary classification model to distinguish preinvasive cystic lung adenocarcinoma (AIS/MIA) from invasive adenocarcinoma (IAC) using preoperative CT images, leveraging pretrained ResNet transfer learning with postoperative pathology as labels
- Conduct CT preprocessing and enhancement, address class imbalance using class-based weighting or balanced sampling, partition data by patient and perform stratified cross-validation
- Evaluate models via ROC-AUC, sensitivity, specificity, balanced accuracy, precision/recall, F1, and confusion matrices
- Plan to employ Grad-CAM and related methods to generate heatmaps, assess whether the model focuses on the cyst wall, solid component, pleural retraction, and other regions
- Aim to complete an end-to-end pipeline from preprocessing to interpretability analysis

Supervised Researcher | Structured Illumination Microscopy Project

Chattanooga, TN September 2025-March 2026

- Project Title: “Diffusion-Driven Bayesian Inference for Robust Inverse Problem Solving in Live-Cell Microscopy”
- Reconstructed clear endoplasmic reticulum structures from low-quality images without the need for paired training data or retraining
- Based on a Bayesian inference framework, employed a pre-trained denoising diffusion probability model (DDPM) as the image prior, combined with a measurement consistency likelihood term
- Trained the DDPM on the BioSR augmented reality endoskeleton image dataset (1,282 image patches) to learn a data-driven gradient scoring function
- Used the Diffusion Posterior Sampling (DPS) algorithm, introducing measurement consistency gradient correction during the inverse diffusion process, and support multiple degradation operators (Gaussian blur, anisotropic blur, random interpolation, etc.) without the need for retraining
- Generated a pixel-level uncertainty map to identify regions with low reconstruction confidence
- The same model and hyperparameters demonstrated consistent performance improvements across four different degradation operators, validating the generalizability of the prior
- Created a poster and presented the project at McCallie School

Independent Learner | Independent Study in Deep Learning and Modern AI

Online June 2025-Present

- Gain hands-on experience in end-to-end LLM training, covering data cleaning/instruction construction, pretraining, SFT, RLHF/DPO, LoRA/QLoRA fine-tuning, and evaluation

- Conduct fine-tuning experiments using PyTorch, Hugging Face Transformers, PEFT, and DeepSpeed/Accelerate; familiar with mixed-precision and distributed training
- Develop LLM agents using LangChain/LlamaIndex and the ReAct paradigm, enabling task planning, tool invocation, memory, and multi-turn conversations
- Integrate RAG with vector databases to ground AI agents in external knowledge, optimize prompts and retrieval strategies, and conduct a movie review sentiment analysis (IMDB)
- Currently learning end-to-end training of LLMs and LLM-powered agents

Learner & Researcher | CCIR 1-on-1 Research Mentorship Program

Online June - September 2025

- Attend online course on Differential Geometry instructed by Dr. Tsz Kiu Aaron CHOW (Assistant Professor at the Hong Kong University of Science and Technology, Croucher Postdoctoral Fellow at MIT)
- Reviewed books and papers, propose topics regarding minimal surface area and in the progress of writing a paper on minimal surface area

McCallie Rocket Engineering Project

Chattanooga, TN January - May 2026

- Developed a rocket state estimation model to track the general rocket trajectory, using Extended Kalman Filter
- Incorporated Inertial Measurement Unit and Global Positioning System data to estimate attitude, velocity, and position in a rocket

McCallie Engineering Project

Chattanooga, TN January - May 2026

- In a two-person team completed the prototyping and hardware integration of the 16-channel haptic navigation belt CopilotBelt (Teensy 4.1 + BNO085 IMU + ULN2803A driver array), replicating the Directional Sixth Sense experimental platform developed by Kaspar et al.
- Implemented a real-time haptic directional encoding algorithm based on absolute heading: angular resolution, independent control of 16 coin-type vibration motors via PWM, and system latency below the human perception threshold
- Completed functional validation testing across all 16 directions, confirming the prototype's ability to replicate the original study on the test bench; human trials have not yet been conducted
- Plan long-term wearability protocols, pre- and post-test experimental designs, and usability testing for blind and visually impaired users for future research, with the aim of advancing the application of haptic navigation in affordable consumer-grade hardware

EXTRA-CURRICULAR EXPERIENCE

Founder & President | McCallie School Rubik's Cube Club

Chattanooga, TN August 2025 - Present

- Break down the fundamental logic of Rubik's Cube solutions, help beginners get started, and increase club membership
- Offer advanced courses to improve speedcubing skills and coach members for competitions
- Organize fun games to foster teamwork

Core Member | McCallie School Math Interest Group

Chattanooga, TN August 2023 - Present

- Represent school in local & national competitions
- Organize proof-based problem solving & strategy games sessions; Group study modeling tools, HIMCM(Math Modeling Contest)

Core Member | McCallie School Climbing Varsity

Chattanooga, TN August 2023 - Present

- Hone rock climbing skills, promote climbing activities, and foster a spirit of sportsmanship and unity on campus
- Represent the school in competitive rock-climbing events

Volunteer | YMCA Y-CAP Chattanooga

Chattanooga, TN August 2023- Present

- Tutored students (ages 10-15) most of whom were from low-income or ethnic minority families
- Practiced pedagogy of math and science, and achieved 40+ hours per year

Violinist | McCallie School Symphony Orchestra

Chattanooga, TN August 2023- Present

- Rehearse every Tuesday evening and participates in end-of-semester school performances

AWARDS & HONORS

- AMC 12 Top 1%, Distinguished Honor Roll, Grade 10
- AIME Scored 8 / 15, Grade 10
- USA Computing Olympiad Gold, Grade 10
- HiMCM Honorable Mention, Grade 10,11
- AMC 10 Top 1% Distinguished Honor Roll, Grade 9
- Gauss Contests Outstanding Achievement, Grade 8

OTHER INFORMATION

- **Computing Techniques:** C++ (Intermediate), Python (Beginner), Matlab (Beginner)
- **Languages:** Chinese (native), English (proficient), Spanish (Beginner)
- **Hobbies:** Rock-climbing, Rubik's Cube Solving, Math/Statistics Reading