Zixuan Song

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EDUCATION

Washington University in St. Louis — May. 2026 — St. Louis, MO
Bachelor of Science in Computer Science and Mathematics — Dean's List (all semesters)
Bachelor of Arts in Biology (Neuroscience) — Major GPA 3.79/4.00

Coursework Highlights
Data Structures and Algorithms; Analysis of Algorithms; Introduction to Data Science; Linear Algebra;
Introduction to Artificial Intelligence; Probability; Stochastic Processes; Algorithms for Computational Biology
Theory of Artificial Intelligence and Machine Learning; Multi-Agent System; Introduction to Quantum Computing

SKILLS

Languages: Python, C++, Java, JavaScript, R
Frameworks: PyTorch, TensorFlow, Flask, React (Ant Design), TensorCircuit
Tools & Platforms: Git, Docker, Linux, IBM LSF, Metal API, Hyperopt, WebSocket, Kubernetes, AWS
Data & ML: Data Engineering, MLOps, Model Optimization, Computer Vision, Time-Series Analysis, RAG
Core Concepts: Distributed Systems, Statistical Modeling, Data Visualization, Asynchronous Programming

EXPERIENCE

Research Assistant — The Hengen Lab, Washington University in St. Louis — St. Louis, MO
Algorithm Design and Application of the Brain Criticality Hypothesis — Jan 2024 – Present
- Developed an automated **behavior-tracking pipeline** using **DeepLabCut (DLC)** and **YOLO**, deployed on a **IBM Spectrum LSF** cluster to parallelize processing and reduce analysis time from several weeks to **3 days**.
- Designed a labeling and retraining system that automated task assignment, integrated new annotations for **computer vision (CV)** model retraining, and reallocated workloads based on performance metrics. Deployed on **AWS EC2** for orchestration, **Kubernetes** for distributed training and validation, and **AWS S3** for data storage.
- Implemented and optimized advanced **machine learning models** (**XGBoost**, **Transformer**, **Mixture-of-Experts**) for behavioral classification, employing **Hyperopt** for large-scale hyperparameter optimization.
- Enhanced experimental **hardware and software reliability**, eliminating recurring system failures.

Research Intern — Tencent Quantum Lab — Shenzhen, China
Research Intern & Teaching Assistant — Sep 2022 – Sep 2023
Selected contributions available on github.com/tencent-quantum-lab/tensorcircuit
- Collaborated with researchers at **Tencent Quantum Lab** and contributed to the **TensorCircuit** project.
- Developed and validated new **TensorCircuit** functionalities with extensive **pytest**-based unit tests, strengthening code reliability and integration coverage across quantum simulation modules.
- Assisted in **release engineering** for the **macOS (Apple Silicon)** build, resolving packaging dependencies, implementing the **Metal API** backend, and ensuring stable cross-platform GPU acceleration.
- Optimized **tensor contraction** performance in **C++** and Python bindings, improving throughput by over **30%** and extending interoperability for large-scale hybrid simulations.
- Researched and implemented **error-mitigation algorithms** (HAMMER, zero-noise extrapolation) on real NISQ hardware, improving stability and fidelity in quantum–classical experiments.
- **Led a 12-member training** on quantum computing and quantum-enhanced ML

PROJECTS

Robustness of Information Aggregation in LMSR-Based Prediction Markets — St. Louis, MO
CSE 5106 Multi-Agent Systems — Jan. 2026 – Ongoing
- Implemented an **LMSR market maker** and end-to-end **prediction-market simulator** in Python (NumPy), producing reproducible run artifacts (CSV/JSON) and plots (Matplotlib).
- Built heterogeneous **trading agents** including informed (Bayesian), risk-averse, noise, momentum/mean-reversion, and multiple **adversarial strategies** (budgeted, adaptive, pump-and-dump).
- Defined robustness and convergence metrics for information aggregation, including **KL divergence / total-variation distance**, convergence time (rolling threshold), and recovery time after adversarial shocks.
- Evaluated **market defenses** (transaction fees, order-size/position caps, cooldowns, adversary active windows) and enforced risk controls to prevent pathological trading.
- Built an experiment framework with parameter sweeps and multi-seed evaluation, generating suite-level summaries and comparison tables (CSV/Markdown); added sanity tests with **pytest**.

HackWashU 2025 (AI Hackathon) — St. Louis, MO
Skandalaris Center & HackWashU; ai.marksong.tech, marksong.tech/school/washu/canvas/ — Oct 2025
- Placed **Top 5 out of 32 teams** in the 2025 AI Hackathon; awarded a **$500 prize**.
- Built the **ReAct AI Agent**, enabling reasoning–action workflows for real-time academic assistance.
- Developed model routing for **OpenAI** and implemented an **asynchronous backend** integrating 22 Canvas LMS tools for content retrieval and 4 vector store tools for **RAG (Retrieval-Augmented Generation)** uploads.
- Developed UI/UX using **React (Ant Design)**, achieving faster navigation and improved usability over Canvas.