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

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
Selected Demo on markso.ng/demo/criticality

- 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.
- Built a **serverless JavaScript** web application for live simulation and experimental visualization, with **Canvas-based rendering**, interactive parameter controls, synchronized application state, and responsive accessible frontend design.
- 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, risk-averse, noise, momentum-reversion, and multiple **adversarial strategies**.
- 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 caps, cooldowns, adversary active windows) and enforced risk controls.
- 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; Demo: markso.ng/demo/canvas Oct 2025

- Placed **Top 5 out of 32 teams** in the 2025 AI Hackathon; awarded a **$500 prize**.
- Built the **ReAct AI Agent** for real-time assistance, with **OpenAI** model routing, and an **asynchronous backend** integrating 26 tools for **RAG** uploads and Canvas LMS integration, with frontend-backend communication over **WSS**.
- Developed frontend using **React (Ant Design)**, achieving faster navigation and improved usability over Canvas.

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