Zixuan Song

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EDUCATION

Washington University in St. Louis St. Louis, MO
B.S. in Computer Science + Mathematics GPA: 3.76/4.00 Aug 2023 – May 2026
B.A. in Biology (Neuroscience) Dean's List (All Semesters)

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

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.
- Designed and validated custom **PyTorch algorithms** for neural data, achieving over **90% accuracy** in early disease-onset prediction tasks and with 99% reduction in execution time.
- Enhanced experimental **hardware and software reliability**, eliminating recurring system failures.
- Presented research outcomes at **NEXTEN 2024** and led the preparation of a **peer-reviewed manuscript**.

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 an international team of Ph.D.-level researchers at **Tencent Quantum Lab**, contributing to the **TensorCircuit** project through feature development, documentation, and collaborative code review.
- 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 initiative** on quantum computing and quantum-enhanced ML, designing seminar curricula, onboarding materials, and mentoring new researchers.

PROJECTS

HackWashU 2025 (AI Hackathon) St. Louis, MO
Skandalaris Center & HackWashU; ai.marksong.tech, github.com/MarkSong535/canvas_ai 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.

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