Zixuan Song

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EDUCATION

Washington University in St. Louis - Double Degree (pending administrative process) St. Louis, MO
Bachelor of Science in CS+Math GPA: 3.76/4.0 Aug. 2024 – May. 2026
Bachelor of Arts in Biology (Neuroscience) Dean List of all four semesters

COURSEWORK HIGHLIGHTS

- Chem 261&262 Organic Chemistry; Biol 451 General Biochemistry;
- Biol 3057 Physiological Control Systems; Biol 4030 Biological Clocks;
- Biol 3411 Principles of the Nervous System; Biol 404 Neurophysiology Lab;
- CSE 247 Data Structure and Algorithms; CSE 347 Analysis of Algorithms;
- SDS 493 Statistics; SDS 495 Stochastic Processes; Math 429 Linear Algebra

PUBLICATIONS

Li, S., Peng, X., Pang, R., Li, L., **Song, Z.** & Ye, H. Information preference and information supply efficiency evaluation before, during, and after an earthquake: Evidence from Songyuan, China. *Int. J. Environ. Res. Public Health* **18**, 13070 (2021). https://doi.org/10.3390/ijerph182413070

Schneider, A.*, Chitalia, J.*, **Song, Z. (M.)*** & Hengen, K. Hunting in the Urban Jungle: Unveiling Complex Predatory Behaviors in Mice Through Ecologically-Inspired Environments. Poster presented at NEXTEN 2024, Saint Louis, Missouri (16 September 2024).

*Denotes co-first authorship

Zhuang, Y., Xian, Y., Chao, Y., Ma, L., Li, L., Wu, C., Liu, Z. & **Song, Z.** EGC-GS: Enhanced Geometric Constraints for Monocular Gaussian SLAM. Submitted to *IEEE Robotics and Automation Letters* (2025).

RESEARCH & INTERNSHIP

Data Analysis and Animal Behavioral Studies in Complex Settings;
Algorithm Design and Application of the Brain Criticality Hypothesis St. Louis, MO
Research Assistant; The Hengen Lab; Principal Investigator Prof. Keith Hengen Jan. 2024 – Ongoing

- Implemented DeepLabCut pipeline to automate mice tracking in behavioral videos, reducing processing time from weeks to 3 days, and demonstrated core technical skills, including Python, DeepLabCut, YOLO, and vectorization
- Developed data labeling and verification system to improve the training of data set quality for computer vision models
- Optimized MLE, XGBoost, Transformer, and MoE models for behavior classification, achieving better accuracy through hyperparameter tuning
- Created YOLO-based cockroach tracking system using newly annotated datasets, significantly improving the detection reliability
- Designed unsupervised learning pipeline (t-SNE/UMAP) to identify novel mouse hunting strategies
- Built data visualization tools, including interactive website for conference presentations (NEXTEN 2024) and presented at NEXTEN 2024
- Verified findings with various statistical methods (including LMM, ANOVA, Tukey HSD)
- Analyzed neural recordings data from Alzheimer's disease mouse models, focusing on the Brain Criticality Hypothesis with DCC, d_2, and d_β metrics with the correlation with other factors including sleep deprivation
- Contributed to the development and optimization of d_2 Python algorithm and correction of existing d_2 algorithm in untested edge cases
- Designed d_β Python algorithm, benchmarked, and found a sanity test method for d_β algorithms
- Conducted surgical preparations including tetrode construction and animal monitoring

- Improved hardware and software design for mice sleep-deprivation experiment which was previously constantly causing experimental failures and hardware failures of experimental devices
- Conducted mice's roach hunting experiments, including mice handling pre- and post- experiment
- Built experimental devices for mice behavioral experiments and improved the design of the devices
- Currently leading animal hunting behavior manuscript preparation for the expected preprint publication in November 2025

Surgical Techniques, In Vivo Neural Recording, Experimental Design, Data Analysis, and Scientific Writing (Biology 404 Neurophysiology Lab) St. Louis, MO
Supervised by Dr. Mitchell Kundel Aug. 2024 – Dec. 2024

- Designed experiment procedure, hypothesis, gained outputs, and evaluations based on the measurements
- Performed mouse tracheostomy and cochlear electrode implantation surgery, successfully recording auditory neural activity in anesthesia management along with team members
- Isolated bullfrog sciatic nerve through precise dissection, including decapitation, skinning, and tissue removal to prepare for electrophysiological measurement
- Conducted crayfish tail ablation and recorded neuromuscular activity, analyzing the resultant electrophysiological data
- Compiled surgical data into waveform graphs and co-authored three detailed manuscripts analyzing experimental findings and potential research directions
- Developed advanced surgical abilities and academic writing skills through repeated operations and literature-based investigation

Research Intern at Tencent Quantum Lab Shenzhen, China
Research Intern; Teaching Assistant Sep. 2022 – Sep. 2023
Some work available on https://github.com/tencent-quantum-lab/tensorcircuit

- Researched current machine learning models and translated them into quantum ML models (such as ensemble)
- Debugged code and ported the code for macOS computers and Metal (Apple Silicon API) support
- Researched error mitigation algorithm of raw physical quantum machines (such as HAMMER)
- Delivered lectures and designed assignments for understanding of quantum computing based machine learning and quantum algorithm design

Synthesis and Evaluation of Melanin-Combine Photosensitizers Dongduan, China
Researcher; Tsinglan High School Lab Aug. 2024 – Dec. 2024

- Researched melanin-combined photosensitizers and synthesized melanin-combined photosensitizers
- Applied to Chinese herbal medicines and evaluated anti-bacterial effects with analysis of the SOSG test
- Used techniques such as DNA sequencing, cell culture growing, PCR, and synthesis of melanin-combined photosensitizers

TECHNICAL SKILLS

Programming: Python, Java, R, Machine Learning (algorithms including CNN, ensemble, kernel methods; frameworks including TensorFlow and TensorCircuit)
Laboratory Techniques: PCR, Gel electrophoresis, DNA sequencing, NMR, Mass Spectroscopy, IR Spectroscopy, cell/bacterial culture, Neuron activity recordings (voltage clamp), animal handling
Languages: Chinese [Mandarin (fluent)] and English

AWARDS

Summer Undergraduate Research Guided Experience (SURGE) St. Louis, MO
WashU Office of Undergraduate Research (OUR) May. 2025 – Ongoing

- Awardee with $5,400 stipend for summer research with intensive research training and mentorship
- Presentation experience at WashU Fall Undergraduate Research Symposium 2025
- One of the 172 awardee for the 2025 program