

Zhuozheng SHI

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EDUCATION

University of California Los Angeles **09/2023 - 6/2028**
Bioscience PHD – Bioinformatics Interdepartmental Program; **Graduate Dean's Scholar Award**

University of Tokyo **10/2021 - 9/2023**
Master of Science in Bioengineering; **SEUT Scholarship**

Thesis Title: Statistical and Machine Learning Systems based on Stochastic Resonance for Analyzing Weak Electronic and Magnetic Bio-signals.

Award: Best Student Award of Department of Bioengineering (専攻長賞)

Relevant courses: Basic Biology, Machine Learning, Bioinformatics & Molecular Genetics, Cell Biology, Bioelectronics, Radiation Biology, Chemical Bioengineering, DNA Information Analysis, Molecular Biochemistry

University of California San Diego **9/2017 - 6/2020**

Bachelor of Science in Computer Science;

Relevant courses: Bioinformatics, Advanced Data Structure & Design, Algorithm & Systems Analysis, Statistics, Artificial Intelligence, Software Engineering, Data Science, Database System, Numerical Analysis, and Machine Learning

RESEARCH EXPERIENCE

University of Tokyo, Tokyo, Japan **10/2021 - 9/2023**
MSc Researcher; Advisor: Dr. Hitoshi TABATA

- Examined a bistable stochastic resonance-based intelligent system for the analysis of weak biomedical signals.
- Designed an MCG analysis framework utilizing stochastic resonance to understand QRS complex and disease variants, reserving more MCG information than traditional preprocessing methods, demonstrating unprecedented noise robustness up to 10 times of the environmental noise, and being the first application of SR in clinical QRS detection scenario in MCG.
- Employed an asymmetric stochastic resonance system to denoise and ResNet to classify power spectra density data to achieve >99% accuracy compared to other data processing and denoising techniques.
- Designed and implemented a physical reservoir computing system using time-delayed feedback overdamped bistable stochastic resonance as the intrinsic nonlinear equation to chronologically identify node information. Demonstrated unprecedented strong short-term memory, nonlinearity, and noise robustness; significantly benefitting signal processing and fault diagnosis.

Institute of Computing Technology, Chinese Academy of Sciences, Beijing, China **9/2020 - 1/2021**
Visiting Research Student; Advisor: Dr. Dongbo BU

- Developed an approach to filling gaps of genome scaffolds by optimizing time and space complexity for these searching algorithm via probabilistic searching of optical maps against an assembly graph.
- Wrote the code in C++, treated and processed DNA data utilizing a deep understanding of biology, and implemented dynamic programming and search algorithms.
- Demonstrated enhanced algorithm performance by significantly decreasing time complexity and increasing gap filling accuracy.

Institute of Computing Technology, Chinese Academy of Sciences, Beijing, China **7/2018 - 9/2018**
Research Assistant; Advisor: Dr. Dongbo BU

- Optimized Alpha Go Zero through parallel programming during self-play reinforcement learning, and improved learning speed up to 50% depending on server performance.
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PUBLICATIONS

Shi, Z., Liao, Z., Tabata, H. (2022). Enhancing performance of convolutional neural network based epileptic electroencephalogram signal classification by asymmetric stochastic resonance. *IEEE Journal of Biomedical and Health Informatics* (2023). DOI: 10.1109/JBHI.2023.3282251

Shi, Z., Liao, Z., Tabata, H. (2022). Boosting learning ability of overdamped bistable stochastic resonance system based physical reservoir computing model by time-delayed feedback. *Chaos, Solitons & Fractals* 161: 112314. DOI: 10.1016/j.chaos.2022.112314

Liao, Z., Wang, J., **Shi, Z.**, Lu, L., Tabata, H. "Revolutionary Potential of ChatGPT in Constructing Intelligent Clinical Decision Support Systems." *Annals of Biomedical Engineering* (2023): 1-5. DOI: 10.1007/s10439-023-03288-w

Huang, B., Wei, G., Wang, B., Ju, F., Zhong, Y, **Shi, Z.**, Sun, S., Bu, D. (2021) Filling gaps of genome scaffolds via probabilistic searching optical maps against assembly graph. *BMC Bioinformatics* 22(1): 1-17. DOI:10.1186/s12859-021-04448-2

PROJECTS

Wet Lab Experiment in PDZD8 Degradation and Calcium Transient Imaging 8/2022

- Performed traditional RNAi knock-down, overexpression, and degradation using an auxin-induced degron system of the endoplasmic reticulum membrane protein PDZD8.
- Quantified changes in Ca^{2+} dynamics following genetic manipulations in mouse embryonic fibroblast cells.

Protein and Peptide in Biomolecular Big Data Systems 9/2018 – 12/2018

- Conducted a search using biomolecular big data systems and utilized binary search and dynamic programming to obtain peptide match scores, de novo sequencing using spectrum peaks, determine protein identity, and identify peptide variants.

Python AI Projects 1/2019 - 3/2019

- Designed and implemented path finder in complicated map by A* search, 2048 game auto runner achieving 8192 blocks by Max-Min algorithm and Alpha-Beta pruning, Gomoku bot player by Monte Carlo Tree search, Sudoku solver for 16*16 sudoku puzzles by Constraint Solving, and Blackjack action evaluation by Q learning

Android Project, PersonalBest 1/2019 - 3/2019

- Designed and implemented a step counting program through Google Fit API that sends notifications upon reaching a specific goal in Android Studio under Agile Software Process. Incorporated friends and chatting system using Firestore

Applications of Data Modeling and Data Analysis 9/2019 - 12/2019

- Used PCA, and TF-IDA, and similarity calculation in a class competition on Amazon user view classification and ranked 5th out of 500 students. Predicted the winning rate for PUBG using different strategies and identified the most influential features that determined popularity in the App store.

Computer Vision and Computer Graphics Projects 9/2019 - 3/2020

- Performed classification of MNIST dataset using CNN, moving object detection using optical flow, and created a world in OpenGL using Bezier curve, collision detection, particle effects, and procedurally generated terrain.
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WORK EXPERIENCE

Maimeng Technology, Beijing, China

Data Scientist Intern

8/2020 - 11/2020

- Employed normalization, standardization, Fourier Transform to process students' and lecturers' voices, and used LSTM network and K-means developed speaker diarization and speaker verification models in PyTorch. Speakers were clustered without providing the number of speakers and the model demonstrated 94% accuracy.

University of California San Diego, CA, USA

Tutor

3/2020 - 6/2020

- Designed an AI assignment for CSE 150B: Artificial Intelligence: Search and Stats (e.g., Gomoku and Sudoku) and did grading for assignments and exams
 - Held discussion sessions and tutoring hours to help students with class assignments and answer specific questions.
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SKILLS

Computer Language: Python, R, C++, C, Java, Assembly Language, Bash Script, MATLAB, MySQL, and Android Studio

Algorithms and Analysis Methods: normalization, standardization, probability, Fourier Transform, bandpass filter, stochastic resonance, wavelet transform, PCA, Harris Corner, regressions, TF-IDA, max-min algorithm, dynamic programming, sorting algorithms, searching algorithms, perceptron, KNN, K-means, naïve Bayes, graphs, red-black tree, decision tree, random forest, optical flow, SVM, MCTS, reinforcement learning, adaboost, CNN, RNN, reservoir computing, GAN, LSTM

Language: English (Bilingual), Mandarin (native), Japanese (Advanced Intermediate)