

# KAIWEN SHENG

sheng\_kaiwen@pku.edu.cn

www.linkedin.com/in/KaiwenSheng

GitHub: @holmosaint

## EDUCATION

### University College of London

MRes in Biosciences, Neuroscience Track

London, UK

Expected Nov 2022

### Peking University

BS in Computer Science

Beijing, CN

Jun 2020

## PROJECTS

### Automatic Parameter Tuning for Detailed Neuron Models

Jan 2020 - Present

- Proposed CNN+Temporal architecture and a deep learning framework to estimate parameters of neural models.
- Achieved performances 3-10 times more accurate than state-of-the-art algorithms.
- Applied the algorithm on experimental electrophysiological data and equipped the framework with a calibration module for fine-tuning on specific data.
- Designed a training protocol to infer neural connectivity within a network which is both scalable to the size of the network and the number of neural recordings.
- Proved theoretical limitations of deep learning on automatic parameter tuning task and presented a Bayesian-based estimation algorithm overcoming limitations of deep learning.

### A Human Perception-based Evaluation Criterion for Cell Membrane Segmentation

Aug 2020 - Present

- Pointed out inappropriate criteria for cell membrane segmentation in the machine learning field.
- Helped design, organize perceptual experiments, and analyzed subjects' results of human cell segmentation criterion.
- Participated in designing a new criterion based on human perception and evaluated empirical results.

### A General-Purpose Tracker for Animal Behavior Analysis

Aug 2019 - Present

- Utilized a pre-trained DNN as the feature extractor and Siamese tracker to perform the tracking procedure, evaluate animal behavior and automatically generate labels for raw video streams.
- Improved accuracy 2-100 times higher than state-of-the-art algorithms.
- Developed a GUI-based toolkit to facilitate non-computer-experts for animal behavior analysis.

### Automatic Scheduler for Tensor Operations on Heterogeneous Systems

Apr 2019 - Aug 2019

- Scheduled tensor operations under TVM achieving speed 1.83-2.21 times faster than CuDNN and MKL-DNN.
- Hand-crafted tensor operators on GPUs and CPUs to promote performance.
- Performed experiments on heterogeneous systems and analyzed results.
- Published code available on GitHub: <https://github.com/KnowingNothing/FlexTensor>.

## PUBLICATIONS

- **Sheng, K.**, Qu, P., Yang, L., Liu, X., He, L., Ma, L., & Du, K. (2021). A General LSTM-based Deep Learning Method for Estimating Neuronal Models and Inferring Neural Circuitry. *bioRxiv*.
- Shi, R., Wang, W., Li, Z., He, L., **Sheng, K.**, Ma, L., ... & Huang, T. (2021). U-RISC: an ultra-high-resolution EM dataset challenging existing deep learning algorithms. *bioRxiv*.
- Shi, R., Wang, W., Li, Z., He, L., **Sheng, K.**, Ma, L., ... & Huang, T. (2020). Human Perception-based Evaluation Criterion for Ultra-high Resolution Cell Membrane Segmentation. *arXiv preprint arXiv:2010.08209*.
- Zheng, S., Liang, Y., Wang, S., Chen, R., & **Sheng, K.** (2020, March). FlexTensor: An Automatic Schedule Exploration and Optimization Framework for Tensor Computation on Heterogeneous System. In *Proceedings of the Twenty-Fifth International Conference on Architectural Support for Programming Languages and Operating Systems* (pp. 859-873).

## WORKING EXPERIENCE

### Software Development Engineer

Life Simulation Research Center

Beijing Academy of Artificial Intelligence

Jun 2020 - Present

- Developed an automatic tool for parameter estimation and optimization for computational neural models.
- Published a preprint paper of the tool on bioRxiv.

## TEACHING EXPERIENCE

## Compiler Practice

Teaching Assistant

Peking University

Feb 2020 - Jun 2020

- Guided students to work through each stage of compiler design, including symbol table construction, type check, intermediate representation generation, register allocation.

## Algorithm Design and Analysis Seminar

Teaching Assistant

Peking University

Feb 2019 - Jun 2019

- Provided references on reinforcement learning as supplementary material and designed exam papers.

## LEADERSHIPS

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### Badminton Association in Peking University

President

Peking University

Sept 2019 - Jun 2020

- Organized badminton competitions at Peking University and scheduled friendly matches among colleges.
- Popularized badminton through social media at Peking University.

### Badminton Team of Peking University

Captain

Peking University

Sept 2019 - Jun 2020

- Led weekly training and participated in competitions.

## AWARDS

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Yanhong Li Scholarship of Peking University

Sept 2019

Excellent Research of Peking University

Sept 2019

Ke Chuanglong Scholarship of Peking University

Sept 2018

Merited Student of Peking University

Sept 2018 & Sept 2017

May Fourth Scholarship of Peking University

Sept 2017

## SKILLS

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Languages

Python, C, C++, Java, MATLAB

Simulator

NEURON, NEST

Other

LaTeX, Git