KAIWEN SHENG

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EDUCATION

University College of London **London, UK**
MRes in Biosciences, Neuroscience Track Expected Sept 2022

Peking University **Beijing, CN**
BS in Computer Science Jun 2020

PROJECTS

Automatic Parameter Tuning for Detailed Neuron Models **Jan 2020 - Present**

- Proposed a domain-adaptive and self-trainable (DAST) deep learning framework to infer biophysical and topological properties of neuron, circuit and network.
- Accurately and efficiently inferred biophysical properties of 450+ neurons across 20+ brain regions of the mouse and those of a microcircuit with 3 neurons in *Cancer Borealis*.
- Achieved 100% accuracy in inferring topological synaptic connectivity of a network in CA1 region of the mouse.
- Outperformed SOTA methods in terms of accuracy and sample in efficiency in inferring both biophysical and topological properties.

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

- Su, L.*, Wang, W.*, **Sheng, K.**, Liu, X., Du, K., Tian, Y., & Ma, L. Siamese Network-Based All-Purpose-Tracker, a Model-Free Deep Learning Tool for Animal Behavioral Tracking. Frontiers in Behavioral Neuroscience, 48. (* equally contributed)
- **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*.
- Su, L., Wang, W., **Sheng, K.**, Liu, X., Du, K., Tian, Y., & Ma, L. (2021). SNAP-Tracker, a model free deep learning tool for animal behavioral tracking. (under review)
- 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*. (under review)
- 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).

PRESENTATIONS

Posters

- A General LSTM-based Deep Learning Method for Estimating Neuronal Models and Inferring Neural Circuitry, *3rd Chinese Computational and Cognitive Neuroscience Conference*, Shenzhen, China, June 2021.

WORKING EXPERIENCE

Group Leader of Research Group — **Beijing Academy of Artificial Intelligence**
Life Simulation Research Center — Jun 2021 - Sept 2021
- Organized research cooperation among researchers and internships.
- Scheduled weekly discussions on the progress of research projects of the group members.

Software Development Engineer — **Beijing Academy of Artificial Intelligence**
Life Simulation Research Center — Jun 2020 - Sept 2021
- 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 — **Peking University**
Teaching Assistant — 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 — **Peking University**
Teaching Assistant — Feb 2019 - Jun 2019
- Provided references on reinforcement learning as supplementary material and designed exam papers.

LEADERSHIPS

Badminton Association in Peking University — **Peking University**
President — 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 — **Peking University**
Captain — Sept 2019 - Jun 2020
- Led weekly training and participated in competitions.

AWARDS

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

Languages	Python, C, C++, Java, MATLAB
Simulator	NEURON, NEST
Other	LaTex, Git