KAIWEN SHENG

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EDUCATION

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

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

PROJECTS

A computational framework to investigate the functional specificity of cortical neurons **University College London**
Advised by Prof. Michael Häusser and Dr. Brendan Bicknell Dec 2021 - Present

- Extended the synaptic learning rule proposed by Bicknell & Häusser (2021) to arbitrary neuronal morphologies and biophysical mechanisms.
- Accelerated the computational framework 10 times.

Inferring Neural Properties from Neural Data across Scales **Beijing Academy of Artificial Intelligence**
Advised by Dr. Kai Du and Prof. Tiejun Huang Jan 2020 - Present

- Proposed a domain-adaptive and self-trainable (DAST) deep learning framework to infer biophysical and topological properties at neuron, circuit and network scales.
- Accurately and efficiently inferred biophysical properties of 550+ neurons across 20+ brain regions of mice and those of a microcircuit with 3 neurons of *Cancer Borealis*.
- Achieved 100% accuracy in inferring monosynaptic connectivity of networks in the CA1 region of mice.
- Outperformed SOTA methods in terms of accuracy and sample efficiency in inferring both neural properties at neuron, microcircuit and network scales.

A Human Perception-based Criterion for Cell Membrane Segmentation **Beijing Academy of Artificial Intelligence**
Advised by Dr. Kai Du and Prof. Tiejun Huang Aug 2020 - March 2022

- Helped design, organize perceptual experiments, and analyzed subjects' result.
- Manually annotated cell membranes of electron microscopy images.

A General-Purpose Tracker for Animal Behavior Analysis **Beijing Academy of Artificial Intelligence**
Advised by Dr. Kai Du and Dr. Lei Ma Aug 2019 - March 2022

- Performed accuracy comparison between SNAP-tracker, DeepLabCut and LEAP.
- Analyzed animal behavior based on the tracking results of SNAP-tracker.
- Developed a GUI-based toolkit to facilitate non-computer-experts for animal behavior analysis.

PUBLICATIONS

- **Sheng, K.**, Zhang, S., Beau, M., Qu, P., Yang, L., Liu, X., He, L., Ma, L., & Du, K. (2022). DAST: a General Deep Learning Framework for Inferring Neural Properties of Neurons, Microcircuits, and Networks. (in Preparation).
- Shi, R., Wang, W., Li, Z., He, L., **Sheng, K.**, Ma, L., ... & Huang, T. (2022). U-RISC: an annotated ultra-high-resolution electron microscopy dataset challenging existing deep learning algorithms. *Frontiers in Computational Neuroscience*, *21*.
- Su, L.*, Wang, W.*, **Sheng, K.**, Liu, X., Du, K., Tian, Y., & Ma, L. (2022). 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*.
- 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

Leader of Application Research Team — **Beijing Academy of Artificial Intelligence**
Life Simulation Research Center — Jun 2021 - Sept 2021

- Organized research cooperation among researchers and interns.
- 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++, MATLAB
Simulator NEURON, NEST