KAIWEN SHENG

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EDUCATION

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

Peking University **Beijing, CN**
BS in Computer Science 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. (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 **Beijing Academy of Artificial Intelligence**
Life Simulation Research Center 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 **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