LEKANG YUAN

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EDUCATION

Tsinghua University, Beijing, China   *Sept. 2021 – Present*
M.S. in Data Science and Information Technology
Advisor: Prof. Qionghai Dai

Tsinghua University, Beijing, China   *Aug. 2017 – Jun. 2021*
B.Eng. in Automation
Minor in Technological Innovation and Entrepreneurship

PUBLICATIONS

1. Yuanlong Zhang*, **Lekang Yuan***, Qiyu Zhu*, Jiamin Wu, Tobias Nöbauer, Rujin Zhang, Guihua Xiao, Mingrui Wang, Hao Xie, Qionghai Dai and Alipasha Vaziri. A Systematically Optimized Miniaturized Mesoscope for large-scale calcium imaging in freely moving mice. ***Nature Biomedical Engineering, 2024.*** *[PDF]*

2. **Lekang Yuan**, Yuanlong Zhang, Hanyun Xu, Jiamin Wu, Guihua Xiao, Hao Xie, and Qionghai Dai. Large Scale Neuron Recording under Deep Nucleus Stimulation in Freely Behaving Mice. ***Biophotonics Congress: Optics in the Life Sciences, 2023*** *[Link]*

3. Yuanlong Zhang*, Xiaofei Song*, Jiachen Xie*, Jing Hu*, Jiawei Chen, Xiang Li, Haiyu Zhang, Qiqun Zhou, **Lekang Yuan**, Chui Kong, Yibing Shen, Jiamin Wu, Lu Fang and Qionghai Dai. Large depth-of-field ultra-compact microscope by progressive optimization and deep learning. ***Nature Communications, 2023*** *[Link]*

4. **Lekang Yuan**, Zhen Xie, Ye Wang, Xiaowo Wang. DeSP: a systematic DNA storage error simulation pipeline. ***BMC Bioinformatics, 2022,*** *[Link]*

RESEARCH EXPERIENCE

Pico: Ultra-compact wireless miniscope   *Oct. 2022 - Present*

- Initiated the development of the world's smallest wireless mesoscopic microscope, spearheading the design of a novel wireless acquisition hardware platform and structural components.

- Achieved a system merely 7mm in height, offering single-cell resolution across a 5mm diameter field of view, enhancing imaging throughput by 50-fold compared with previous wireless systems.

- Exploring pioneering applications in neuroscience, including neural recording of multiple mice simultaneously and in complex environments.

DeepDefinite: Accurate neuron extraction method beyond the background limit through self-supervision   *Dec. 2022 - Nov. 2023*

- Compiled a large, diverse hybrid 1p-2p ground truth dataset with 259 videos spanning various imaging configurations, species, and brain regions.

- Devised a self-supervised algorithm for neuron extraction, achieving superior accuracy and a processing speed up to 13 times faster than traditional methods.

- Developed a cloud-based web application and a Fiji plugin to democratize access to the algorithm

SOMM: Systematically optimized miniaturized microscope for mesoscale functional imaging in freely moving rodents   *Dec. 2021 - May 2023*

- Optimized the design of a miniaturized mesoscope, achieving a $3.6 \times 3.6mm^2$ field of view, 300um depth of field, and 4um resolution by co-optimizing diffractive optics and computational algorithms.

- Conducted extensive characterization of the system's imaging performance and validated the signal authenticity against two-photon ground truth recordings.

- Performed behavioral experiments demonstrating the ability to capture over 3000 neurons during social interactions and sensory stimulation, including the first-ever simultaneous imaging of the cortex and hippocampus in free-moving mice.

Virtual reality and mobile platform-based apparatus for enhanced neural imaging during environmental navigation *Oct. 2020 - Jul. 2021*

- Developed a virtual reality apparatus using Unity and Raspberry Pi for whole-cortex, single-cell resolution neural recording during virtual navigation.

- Innovated a mobile platform mounted with desktop-level microscopy, driven by mice using an air-floating ball, enabling high-throughput imaging with authentic proprioceptive feedback. Awarded the second prize in the Tsinghua University's Challenge Cup.

DeSP: Systematic DNA data storage error simulation pipeline *Apr. 2020 – Mar. 2021*

- Led a team of 15 to encode the ancient Tsinghua bamboo slips into 11430 strands of DNA and successfully retrieved the data. With insights obtained from the experiments, designed a DNA storage error Simulation Pipeline (DeSP), providing the community with a versatile Python-based tool for systematic redundancy optimization *in silico*.

Innovative Tech Solutions *Apr. 2018 – Mar. 2021*

- Led the development of innovative projects including utilizing smartphones as extended I/O devices for computers to enhance productivity, integrating flexible electronics in smart fitness gear, and employing computer vision for virtual coaching in piano and diving training.

PATENTS

1 Xiaowo Wang, **Lekang Yuan**, Ye Wang. DNA Channel Simulation and Coding Optimization Method and Device, CN202111307148.6

2 Qionghai Dai, **Lekang Yuan**, Hao Xie, Yipeng Li. Mobile Observation System and Method for Animal Experiments Based on a Mobile Platform, CN202110521754.1

3 Yuang Zhang, **Lekang Yuan**, Jingtong Wang, Yong Ren. Smart Fitness Wear Based on Flexible Sensors, CN202010447605.0

SKILLS

Software: Matlab, Python, PyTorch, Arduino, C++, Labview, Unity, Bonsai, Java

Hardware: KiCAD, Altium, PCB/SMT, Solidworks, 3D Printing, CNC

Optics: Miniscope, Fluorescence Microscopy, Computational Imaging, Two-Photon Microscopy

Neurobiology: Neural Imaging, Behavior device setup, Data Analysis