

TIANFENG LU

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EDUCATION

Zhejiang University, *Chu Kochen* Honors College

B.S. in Biology Science *cum laude* (major)

Information and Computing Science (minor)

August 2019-June 2023

Major GPA: 3.97/4.00, 1st in the major

Overall GPA: 3.89/4.00, 1st in the major

INTERNSHIP AND WORK

Washington University in St. Louis

Departments of Developmental Biology & Neuroscience, *Student Intern*

August 2023-present

Tsinghua University

IDG/McGovern institute, *Visiting Student (for dissertation)*

July 2022-July 2023

Zhejiang University

Department of Cell Biology, School of Medicine, *Undergraduate Student Intern*

August 2020-July 2023

Zhejiang University

Life Sciences Institute, *Undergraduate Student Intern*

June 2020-August 2020

MANUSCRIPTS AND PUBLICATIONS

1. P. Dong, Y. Li, Y. Wang, Q. Zhao, **T. Lu**, T. Guo, J. Ma, B. Yang, H. Wu, H. Huang (2024). Fat body-derived cytokine Upd2 controls disciplined migration of tracheal stem cells in *Drosophila*. *elife* **13**:RP100037. <https://doi.org/10.7554/eLife.100037.1>
2. Y. Li, **T. Lu**[#], P. Dong, J. Chen, Q. Zhao, Y. Wang, T. Xiao, H. Wu, Q. Zhao and H. Huang (2024). A single-cell atlas of *Drosophila* trachea reveals glycosylation-mediated Notch signaling in cell fate specification. *Nature Communications*, **15**, 2019. <https://doi.org/10.1038/s41467-024-46455-w>
3. Y. Li, P. Dong, Y. Yang, T. Guo, Q. Zhao, D. Miao, H. Li, **T. Lu**, F. Xia, J. Lyu, J. Ma, T. B. Kornberg, Q. Zhang and H. Huang (2022). Metabolic control of progenitor cell propagation during *Drosophila* tracheal remodeling. *Nature Communications*, **13**, 2817. <https://doi.org/10.1038/s41467-022-30492-4>

MAJOR COURSEWORK

- Molecular Biology(99)
- Cell Biology(94)
- Neurobiology(88)
- Genetics(92)

MINOR COURSEWORK

- Data Structures and Algorithms(98)
- Point Set Topology/Algebraic Topology(93/94)
- Ordinary Differential Equations(89)
- Probability Theory/Mathematical Statistics(95/97)
- Algebra II/Algebra III(85/78)
- Numerical Algebra(92)
- Differential Manifolds(86)
- Commutative Algebras and Algebraic Geometry(97)

RESEARCH INTERESTS

Computational Biology, Gene Regulation Networks, Systems Neuroscience, Neural Networks

AI for Science, Deep Generative Models, Statistical Learning

SKILLS

- Advanced programming in R, Python, C/C++
- Expertise in Geometry, Algebra and Statistics
- Analysis of multi-omics data
- Analysis of neural recordings and behavior data
- Deep learning

RESEARCH EXPERIENCE

Neural coordination mechanisms of behavioral variability

August 2023-present

Mentored by Dr. Geoffrey Goodhill

School of Medicine, Washington University in St. Louis

- I am analyzing 2-photo and lightsheet imaging Ca^{2+} recordings to reveal neural dynamics in zebrafish underlying behavioral variability. The neural population co-fluctuations explain the variability in sensorimotor transformation. Formal analysis of neural network model also recapitulates the biological findings.

Cell classification in cardiovascular disease

February 2022-July 2023

Mentored by Dr. Hai Huang

School of Medicine, Zhejiang University

- We utilize scRNA-seq and scATAC-seq to study gene regulation networks in human cardiovascular disease. Coronary endothelial dysfunction undertakes a profound change in metabolism, immunity and cell identity.
- A universal theory framework for cell type identification among multiple single cell RNA-seq samples, including SOTA methods as scran-MNN, CCA, harmony, scmap, Symphony, scArches, CaSTLe, etc.

A Single-cell Atlas of Drosophila Larva Trachea

May 2021-June 2023

Mentored by Dr. Hai Huang

School of Medicine, Zhejiang University

- A single cell atlas depicts heterogeneity of tracheal cells during morphogenesis. Innovated bioinformatic analyses further resolve cell fate plasticity of tracheoblasts across metabolic conditions.
- Evidence *in silico* reveals key regulators that control tracheal cell identities and developmental trajectory.
- Reacting to high sugar diet induced glycosylation, aberrancy in Notch signaling perturbs cell fate determination in tracheal development.

Neural Dynamics in Awake-Sleep/Anesthesia Transitions

July 2022-July 2023

Mentored by Dr. Zengcai Guo

School of Medicine, Tsinghua University

- We use widefield microscope to capture cortex-wide neural dynamics during invertible loss of consciousness in sleep or anesthesia process and identify key signature for the transition.
- Machine learning methods are exploited to analyze high dimensional neural recordings. Statistical properties of complicated networks are highlighted for identification of key characteristics in the transition. Relationship among neural representation, behavior and EEG during such transition is also discussed.
- Deep probabilistic generative models, such as VAE and DDPM, are established and optimized for long time sequences, enhancing inference of behavior evidence and underlying neural dynamics.

Metabolic control of Drosophila trachea stem cell

August 2020-March 2022

Mentored by Dr. Hai Huang

School of Medicine, Zhejiang University

- A bioinformatics analysis pipeline for bulk RNA-seq and ChIP-seq data is established to resolve the transcription response towards metabolic change in progenitor cells during tracheal remodeling.
- Our result reveals a series of potential regulation targets of transcription cofactor Yki, building a bridge among metabolic state, signal transduction and development.

Scientific research training I

June 2020-August 2020

Mentored by Dr. Cunki Ye

Life Sciences Institute, Zhejiang University

- I constructed plasmids, cloned target gene sequences and transformed *S. cerevisiae* to express fusion proteins (NLS-GST-GFP). The location change of this enzyme had a significant impact on their survival in adversity.

SELECTED AWARDS AND HONORS

Yongping Scholarship

2022

First Class Scholarship for Top talents in Basic Sciences

2021, 2022

Academic Excellence Award & Zhejiang University Scholarship

2020, 2021, 2022

Second Class Prize in China High School Biology Olympiad

2018