

# Xuyue Zhang

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Department of Electrical and Computer Engineering, Rice University

## EDUCATION & ACADEMIC EXPERIENCES

- **School of Life Sciences, Tsinghua University** (Aug 2020 - Jun 2024)
  - Bachelor of Science (B.S.) in Biological Sciences
  - GPA: 3.91/4.0
- **Department of Neurobiology, Harvard Medical School** (Jun - Sep 2023)
  - Student intern in Prof. Bernardo Sabatini's lab
- **School of Engineering and Applied Sciences, Harvard University** (Jul 2024 - Jun 2025)
  - Research scholar in Prof. Jia Liu's lab
- **Department of Electrical and Computer Engineering, Rice University** (Aug 2025 - Present)
  - Ph.D. in Electrical and Computer Engineering

## PUBLICATIONS & PRESENTATIONS

- X. Lin, **X. Zhang**, J. Chen, J. Liu. "Material Selection and Device Design of Scalable Flexible Brain-Computer Interface: A Balance Between Electrical and Mechanical Performance." *Submitted to Advanced Materials*, 2024
- X. Lin, **X. Zhang**, Z. Wang, et al. "Plastic-elastomer Heterostructure for Robust Flexible Brain-computer Interfaces." *bioRxiv*, 2025
- S. Liu, B. Yang, A. Serper, **X. Zhang**, T. Wheatcroft, B. Sabatini. "Time to Stop: Neural Mechanisms of Action Termination." *HHMI Science Meeting 2023*. (Oral Presentation)
- S. Liu, **X. Zhang**, B. Yang, B. Sabatini. "Searching for the Mechanism that Turns Oral Cooling into a Reinforcing Stimulus in Thirsty States." *Life Sciences, Basic Medicine, and Pharmaceutical Science Forum of Tsinghua University*, 2023 (Oral Presentation)

## RESEARCH EXPERIENCE (in order of relevance)

- **Jia Liu Lab** School of Engineering and Applied Sciences, Harvard University  
*Research Scholar* (Jul 2024 - Present)  
*Field: Flexible brain-machine interfaces, Neural probes, Electrical signal processing and analysis*  
**On-going Project: Long-term Monitoring of Treatment Processes Using a Robust and Flexible Brain-Machine Interface**
  - Monitoring brain activities during drug therapy and rehabilitation for neurological disorders
  - Analyzing neuronal signals through the whole process
  - Optimizing the algorithms and constructing a database better for the long-term recording**Finished Project: Reviewing Material Selection and Device Design of Scalable Flexible Brain-Computer Interface**
  - Focused on material selection and innovative design for flexible brain-machine interfaces to optimize performance
  - Analyzed key electrical and physical parameters in neural probe structure and circuit design to improve overall functionality
- **Bo Hong Lab** School of Biomedical Engineering, Tsinghua University  
*Undergraduate Research Intern* (Sep 2023 - Jun 2024)  
*Field: Brain-Machine Interfaces, Cyborg Systems, Epileptic Network Analysis, Neurodynamic Modeling*  
**Project 1: High-throughput Observation and Neurodynamics Modeling of In Vitro Epileptic Network**
  - Developed an in-vitro neural network system on multi-electrode array (MEA) and induced epilepsy
  - Identified key events of epilepsy, as well as E/I balance and neuron group connectivity in the system
  - Verified that epileptic events resulted from alteration of network via neurodynamic modeling based on connectivity
  - Applied Simulation-Based Inference (SBI) and Bayesian Inference methods to optimize parameters in models

## Project 2: Clinical Brain-Machine Interface Experiments on Paraplegic Patients

- Assisted in follow-up visits and trained paraplegic patients using brain-machine interfaces
- Analyzed clinical MEG and ECoG data

### • Bernardo Sabatini Lab

Department of Neurobiology, Harvard Medical School

*Summer Intern Student*

(Jun 2023 - Oct 2023)

*Field: Systems and Computational Neuroscience, Neural Coding, Control Systems*

### Project 1: Investigating the Mechanisms of Licking Termination in Mice

- Built a real-time closed-loop system to detect the last licks and interrupt licking termination based on live data
- Trained machine learning models and found the most optimal in determining the termination with high accuracy
- Applied implantation, retrograde tracing, and immuno-staining to collect data and execute manipulation

### Project 2: Investigating the Connection between Cold and Thirst Regions in Brain Network

- Discovered that activating thirst regions inhibit dopamine release in response to cold stimuli in specific conditions
- Identified key areas potentially connecting cold and thirst regions using whole-brain labeling and screening

### • Kun Li Lab

School of Life Science, Tsinghua University

*Undergraduate Research Intern*

(Aug 2022 - Sep 2023)

*Field: Behavioral and Circuit Neuroscience, Social Behavior, Social Anxiety Disorder*

### Project: Sexually Dimorphic Neural Mechanism of Rxfp3 for Social Fear

- Constructed social fear model mice through social fear conditioning, achieving both high efficiency and specificity
- Verified the role of Rxfp3 in social fear male and female using fiber photometry and optogenetic manipulation
- Identified brain areas effected by Rxfp3 in social fear

## SELECTED UNDERGRADUATE COURSEWORK (4.0 for most listed; \*\*\* indicating online courses)

- **Engineering:** Physical Chemistry, Physics for Scientists and Engineers, Signals and Systems, Physiological System Simulation and Modeling, Neural Modeling and Data Analysis, System and Computational Neuroscience, Principle of Analogue Electronics\*\*, Principles of Neural Engineering\*\*
- **Mathematics, Statistics & Computer Sciences:** Calculus, Linear Algebra, Probability and Statistics, Introduction to Causal Inference, Pattern Recognition and Machine Learning, Introduction to Bayesian Inference, Multivariate Statistical Analysis, Bioinformatics, Data Structures and Algorithms\*\*
- **Biology & Neuroscience:** Biochemistry, Physiology, Genetics, Molecular Biology, Cell Biology, Fundamental Neuroscience, Current Research of Neuronal Disorders, Structure and Function of the Nervous System, Neuroanatomy\*\*
- **Psychology & Sociology:** Abnormal Psychology, Cognitive Psychology, Research Methods in Psychology, Physiological Psychology, Economic Sociology

## SELECTED AWARDS & EXTRACURRICULAR ACTIVITIES

### Awards & Honors:

- National Scholarship (7 out of  $\approx$  400 eligible students) Fall 2022
- Five Star Volunteer of Tsinghua University (Top 1 %) Fall 2022
- 28th China National Biology Olympiad, Silver medal (Top 0.5 % in China) Aug 2019

### Leadership & Activities

- Member, Tsinghua Xuetang Life Science Program (25 out of 90 students eligible) Sep 2021 – Jun 2024
- Minister and Team Leader, Student Volunteering Club of Cyrus Tang, Tsinghua University May 2022 – Jun 2024
- Member, Wispring Foundation (NGO focusing on education in poverty-stricken areas) Sep 2023 – Present

## SKILLS

### • Experimental & Analytical:

- **Engineering:** In-vitro cyborg system construction, neurodynamics and non-linear modeling, closed-loop system development, embedded system design, signal processing
- **Computational Analysis:** Machine learning, machine/deep learning (TensorFlow, PyTorch), imaging processing, brain mapping, statistical and multivariate analysis, Bayesian inference, simulation-based inference
- **Biological Experiments:** Electrophysiology recording, rodent experiment, cell culture, immunostaining
- **Programming & Software:** MATLAB, Python, C/C++, R, LaTeX, Arduino, ImageJ, Adobe Photoshop & Audition & Illustrator
- **English Proficiency:** TOEFL (108)