

# Zifang Zhao, PhD

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## Summary

My research focuses on understanding neural circuits underlying clinical conditions such as epilepsy and chronic pain through the development of minimally invasive, engineered bioelectronic technologies. I have published 21 peer-reviewed articles (11 as first author) and presented at over 20 conferences, including 11 invited or oral presentations. My work has an h-index of 15 with more than 1,000 citations, and I am a primary contributor to five patents.

## Education

- Peking University, Beijing, China** 2011.9 – 2017.11  
Neuroscience Research Institute  
Ph.D. Neuroscience. Advisor: You Wan
- *Thesis: Development of a novel closed-loop system and its application in neural network research.*
- Peking University, Beijing, China** 2007.9–2011.7  
School of Electronic Engineering and Computer Science  
B.S. Electrical Engineering  
School of Basic Medical Sciences  
B.S. Biomedical Experimentation

## Research Experience

- Research Associate, Cornell University, New York, United States** 2023.11-Now  
Department of Neurobiology and Behavior. Advisor: Antonio Fernandez-Ruiz
- *Developing a miniaturized wireless neural implant for monitoring behavior, electrophysiology, and electrochemistry data in a large cohort of rodents in a naturalistic environment.*
  - *Developing multimodal microfabricated neural interfaces for months-long tracking of the same groups of neurons.*
- Post-doctoral researcher, Columbia University, New York, United States** 2018.11-2023.10  
Department of Electrical Engineering. Advisor: Dion Khodagholy
- *Developed and tested organic electrochemical transistors for minimally invasive electrophysiological signal monitoring*
  - *Developed and characterized wireless low-power ionic communication with implantable devices*
  - *Developed an implantable neural interface with a conductive polymer electrode and embedded system for wireless data-logging*
  - *Participate in a joint project with Baylor Medical Center for intraoperative human*

### *ECoG recording*

These works resulted in four first-authorship papers, two in preparation, and one patent.

**Algorithm engineer, Lepu Medical Technology, Beijing, China**

2017.12– 2018.7

- *Develop a deep learning-based ECG abnormality detection algorithm*
- *Develop an online ECG quality assessment algorithm*
- *Prepare the test and report for FDA application*

This work resulted in 2 patents (2 more under review). AI-ECG platform got the FDA approval.

**Visiting graduate student, New York University Langone Medical Center, New York, United States**

2013.9-2015.10

Department of Neuroscience. Advisor: György Buzsáki

- *Developed a novel multiplexing then amplifier scheme for high channel count neural amplifier*
- *Participated in data processing of high-resolution Human ECoG*

This work resulted in one publication in Science Advances.

**Graduate student, Peking University, Beijing, China**

2011.9-2017.11

Neuroscience Research Institute. Advisor: You Wan

- *Developed high throughput non-linear synchronization detection of LFP signal*
- *Developed a multi-site 3D printed electrode to record from the entire pain matrix*
- *Studied the brain dynamic under acute laser-induced pain in rat*

This work resulted in 4 publications, 1 patent.

**Visiting graduate student, Keio University, Tokyo, Japan**

2012.7- 2012.8

Advisor: Masato Yasui, Yoshiro Sohma

- *Developed an automated analysis software for extracting water flow for coherent anti-stokes Raman scattering imaging data*
- *Patch-clamping*

## **Publications**

Full publication list: <https://scholar.google.com/citations?user=bL6RPnoAAAAJ&hl=en>

### **Papers in submission**

1. **Zhao, Z.**, Chang, HY., Park, J., Liu, C., Paudel, P., Fernandez-Ruiz, A., Oliva, A. A wireless modular platform for neuro-behavioral recording and closed-loop manipulation in small animals. (*Nature Methods, Accepted*).

### **Published in peer-reviewed journals**

1. Yang, CY\*, **Zhao, Z\***, Wu, HY\*, Tu, DY., Shao, S., Khodagholy, D., Fabiano, S. Organic electrochemical neuron for responsive neural intervention. *Nature Sensors*, **2026**.
2. Ferrero, J., Hassan, A., Yu, Z., **Zhao, Z.** Ma, L., Wu, C., Shao, S., Kawano, T., Engel, J., Doyle, W., Devinsky, O., Khodagholy, D., Gelinias, J. Closed-loop electrical stimulation to prevent focal epilepsy progression and long-term memory impairment. *Nature Neuroscience*, **2025**
3. Wisniewski, D., Ma, L., Rauhala., O. Cea., C. **Zhao, Z.**, Ranschaert,A., Gelinias, J.N., Khodagholy, D. Spatial control of doping in conducting polymers enables complementary, conformable,

- implantable internal ion-gated organic electrochemical transistors. *Nature Communications*, **2025**
4. **Zhao, Z.**, Yu, H., Wisniewski, D.J., Cea, C., Ma, L., M. Trautmann, E. M., Churchland, M. M., Gelinias, J. N., Khodagholy, D. Formation of anisotropic conducting interlayer for high-resolution epidermal electromyography using mixed-conducting particulate composite. *Advanced Science*. **2024**
  5. Cea, C.\* , **Zhao, Z.\***, Wisniewski, D., Spyropoulos, G., Polyravas, A., Gelinias, J., Khodagholy, D. Integrated internal ion-gated organic electrochemical transistors for stand-alone conformable bioelectronics. *Nature Materials*. **2023**
  6. Armada-Moreira, A, Dar., A, **Zhao, Z.**, Cea, C., Gelinias, J., Berggren, M., Costa, A., Khodagholy, D., Stavriniidou, D. Plant electrophysiology with conformable organic electronics: Deciphering the propagation of Venus flytrap action potentials. *Science Advances*. **2023**.
  7. Khodagholy, D., Ferrero, J.J., Park, J., **Zhao, Z.** and Gelinias, J. Large-scale, closed-loop interrogation of neural circuits underlying cognition. *Trends in Neurosciences*. **2022**
  8. Hassan, A.\* , **Zhao, Z.\***, Cea, C., Gelinias, J., Khodagholy, D. Single-unit resolution Neurogrid for clinical electrocorticography. *Advanced Science*. **2022**
  9. Silverá Ejneby, M., Jakešová, M., Ferrero, JJ., Migliaccio, L., Sahalianov, I., **Zhao, Z.**, Berggren, M., Khodagholy, D., Đerek, V., Gelinias, J.N., Głowacki, ED. Chronic electrical stimulation of peripheral nerves via deep-red light transduced by an implanted organic photocapacitor. *Nature Biomedical Engineering*. **2022**
  10. **Zhao, Z.**, Spyropoulos, G., Cea, C., Gelinias, J, Khodagholy, D. Ionic communication for implantable bioelectronics. *Science Advances*. **2022**
  11. Yao, D. R., Yu, H., Rauhala, O. J., Cea, C., **Zhao, Z.**, Gelinias, J. N., & Khodagholy, D. Anisotropic Ion Conducting Particulate Composites for Bioelectronics. *Advanced Science*. **2022**
  12. **Zhao, Z.**, Cea C., Gelinias, J., Khodagholy, D. Responsive manipulation of neural circuit pathology by fully implantable, front-end multiplexed embedded neuroelectronics, *Proceedings of the National Academy of Sciences of the United States of America*. **2021**
  13. Jastrzebska-Perfect, P., Chowdhury, S., Spyropoulos, G. D., **Zhao, Z.**, Cea, C., Gelinias, J. N., & Khodagholy, D. Translational neuroelectronics. *Advanced Functional Materials*. **2020**
  14. Jastrzebska-Perfect, P., Spyropoulos, G.D., Cea, C., **Zhao, Z.**, Rauhala, O.J., Viswanathan, A., Sheth, S.A., Gelinias, J.N. and Khodagholy, D., Mixed-conducting particulate composites for soft electronics. *Science Advances*. **2020**
  15. Ma, J.\* , **Zhao, Z.\***, A novel 3D-printed multi-drive system for synchronous electrophysiological recordings in multiple brain regions. *Frontiers in Neuroscience*. **2019**
  16. **Zhao, Z.**, Wan, Y. Electrophysiological signature of pain. *Advances in Pain Research: Mechanisms and Modulation of Chronic Pain*. **2018**
  17. Chen, W., Chi, Y.N., Kang, X.J., Liu, Q.Y., Zhang, H.L., Li, Z.H., **Zhao, Z.F.**, Yang, Y., Su, L., Cai, J. and Liao, F.F. Accumulation of Cav3.2 T-type Calcium Channels in the Uninjured Sural Nerve Contributes to Neuropathic Pain in Rats with Spared Nerve Injury. *Frontiers in molecular neuroscience*, **2018**
  18. **Zhao, Z. F.**, Li, X. Z., & Wan, Y. Mapping the Information Trace in Local Field Potentials by a Computational Method of Two-Dimensional Time-Shifting Synchronization Likelihood Based on Graphic Processing Unit Acceleration. *Neuroscience bulletin*. **2017**

19. Li, X\*, **Zhao, Z\***, Ma, J., Cui, S., Yi, M., Guo, H., & Wan, Y. (2017). Extracting Neural Oscillation Signatures of Laser-Induced Nociception in Pain-Related Regions in Rats. *Frontiers in neural circuits*. **2017**

20. Khodagholy, D\*, Gelinas, J.N\*, **Zhao, Z\***, Yeh, M., Long, M., Greenlee, J.D., Doyle, W., Devinsky, O. and Buzsáki, G. Organic electronics for high-resolution electrocorticography of the human brain. *Science Advances*. **2016**

21. Liu, F.Y., Sun, Y.N., Wang, F.T., Li, Q., Su, L., **Zhao, Z.F.**, Meng, X.L., Zhao, H., Wu, X., Sun, Q. and Xing, G.G. Activation of satellite glial cells in lumbar dorsal root ganglia contributes to neuropathic pain after spinal nerve ligation. *Brain research*. **2012**

\*These authors contributed equally.

## Patents

1. Khodagholy D, **Zhao Z**, Systems for ionic communication in electrolyte. US Patent App. 18/106,467, 2023
2. Hu C, Cao J, Liu C, **Zhao Z**, Zhang X, Wang B, inventors; Ecg information processing method and ecg workstation. United States patent application US 16/766,551. **2021** Sep 9.
3. **Zhao,Z.**, Li, Z., Zhang,Y., Zhou,W., Cao, H., Liu, C. Method for assessing electrocardiogram signal quality. US20200107786A1, **2020**
4. Tian,L., Zhang,X., Zhang, Y., **Zhao,Z.**, Su,Z., Cao,J. Artificial intelligence based interference recognition method for electrocardiogram. US20200121255A1 **2020**
5. Wan,Y., **Zhao,Z.**,Ma,J. CN107149472A: Electrode propeller suitable for information acquisition of multiple brain areas of rat. **2017**

## Fellowships

Cornell Neurotech Mong fellowship	2025
China Scholarship Council joint-PHD program	2013-2015

## Honors and Awards

I participated actively in STEM contests during college and received university honor.	
Prize of Computer Application Design Contest of Peking University	2010-2011
Innovation Award of Peking University	2010
Meritorious Winner of 2010 Interdisciplinary Contest in Modeling	2010
The First Prize of 2009 Contemporary Undergraduate Mathematical Contest in Modeling	2009
I contributed to social works besides curriculum, including volunteering for community service and organization of guitar association for music education and performances.	
Excellent Medical Student of Peking University	2008
“Red Building” Art Award of Peking University	2008
Excellent Student of Peking University Health Science Center	2007
Award of Social Work of Peking University	2007

## Professional activities

1. Reviewed 19 papers in peer-reviewed journals, including npj Flexible Electronics, Nature Communications, Communications Engineering, NeuroImage, IEEE transaction on microwave theory, Frontiers in Electronics, MicroMachines, American Journal of Physics, Nutrients, Life.
2. Review editor in Frontiers in Medical Technology. 2022-Present

## Presentations

1. Society for Neuroscience 2025 — Poster
2. Society for Neuroscience 2024 — Poster
3. 2024 Cornell NanoScale Science and Technology Facility Annual Meeting — Best Poster Award
4. The Brain Initiative Meeting 2023 — Poster
5. New York University Tech4Health Seminar — Invited Talk
6. Material Research Society 2023 Spring Meeting — Talk
7. Pu Yuan International Symposium on Future Technologies, Shanghai Jiao Tong University — Talk
8. Colgate University Physics & Astronomy Seminar — Invited Talk
9. 48<sup>th</sup> Northeast Bioengineering Conference — Talk + Poster
10. Material Research Society 2022 Spring Meeting — Talk
11. University of Southern California Viterbi School of Engineering Seminar — Invited Talk
12. Neuroelectronic Interfaces - Gordon Research Seminar 2022 — Poster
13. Material Research Society 2021 Fall Meeting —Talk
14. Neural Interfaces and Artificial Senses (NIAS) conference 2021— Talk(online, awarded Best Oral Contribution Prize)
15. Zusman Workshop 2021— Talk
16. Material Research Society 2020 Fall Meeting — Talk
17. BioEL 2019 — Talk
18. Cold Spring Harbor Asia 2016 — Poster
19. Society for Neuroscience 2015 — Poster
20. International Brain Research Organization 2015 — Poster
21. inter-Science of Learning Center Conference 2015 — Poster

## Teaching experiences

1. Co-advising MEng research programs in Electrical Engineering department. 2024.
2. Mentor for six high school summer research projects. 2015-2023.
3. Organized and taught special topics in neuroscience.
  - "Introduction for high-density neural interface and spike sorting", Beijing Normal University, 2018
  - "Signal processing and algorithms for neural data", Capital Medical University, 2018.
4. Organized and taught Matlab in Neuroscience Research Institution, Peking University, 2015.
5. Teaching assistant for Advanced Neuroscience (Peking University), 2011
6. Teaching assistant for undergraduate classes (Peking University): System anatomy, Physiology,

Advanced mathematics, Mathematic modelling, Neuroscience, Analog circuits experiment, Computer science, Organic chemistry, Inorganic chemistry. 2007-2011