Li Shen, PhD.

Address: Zilkha Neurogenetic Institute, University of Southern California, Los Angeles, 90033, USA

Phone: +1 (323)401-9880 **Email:** shen938@usc.edu https://www.linkedin.com/in/li-shen-amy/

Summary

Biomedical engineering Ph.D., experienced neuroscientist and neuroengineer with 10 years of research in developing and utilizing innovative techniques to decipher brain circuits underlying sensory and emotions, bringing out 8 publications in top journals with 158 citations; proficient in programming, data analysis and machine learning.

Education

- Ph.D. of Biomedical Engineering (2010-2017), Tsinghua University, China
- Bachelor of Biomedical Engineering (2006-2010), Tsinghua University, China

Technical skills

- Proficient with C/C++, Python, Matlab, Java and Labview
- A strong experience building and programming experimental instrumentations
- Proficiency with animal surgery, and in vivo electrophysiological recording experiments.
- Proficiency with neurological data analysis, including acoustic signals, video-based behavior data and high bandwidth in vivo recording data.
- Experience with microscopy and optics
- Proficiency with neurological experimental skill, including optogenetics, pharmogenetics manipulation and behavioral test, in vivo fiber photometry calcium imaging, histology and anatomical tracing technique

Research Experience

➢ Postdoctoral Scholar & Research Associate (2017-, University of Southern California, Mentor: Prof. Li I. Zhang and Prof. Huizhong W. Tao)

- Built up **awake single cell electrophysiology recording system** from mice, including **data acquisition** with Optrode, *NI* card, or *Open Ephys*, **hardware programming** with *Labview*, **spike sorting** and **data analysis using *Matlab* and Python**.
- Utilizing this platform, optogenetic/pharmogenetic manipulation and behavioral assays, we discovered a novel auditory pathway to **transfer auditory cues into aversive emotion**, revealed **anxiety, fear learning, defense and parental behavior** related neural circuits, resulting in 5 publications in top journals, including *Nature Neuroscience* and *Neuron*.
- Developed **automatic real-time closed-loop behavior control toolbox with video-based animal tracking using Python and *Arduino*,** published in *bioRxiv*.
- Developed **automatic video-based animal licking detection using Python and *Matlab***, developed **self-stimulation behavior test setup using Python and *Arduino***, utilizing this method and other novel approaches to study reward learning related neural circuits. The manuscript is in revision.

➢ Graduate Student (2010-2017, Lab of Neural Engineering, Tsinghua University, Mentor: Prof. Bo Hong)

- With ***in vivo*** **single cell extracellular recording in rat**, revealed the temporal dynamic and frequency properties of **stimulus-specific adaptation in the auditory midbrain** neurons which show stronger response to rare sound than common sounds; Built up a **two-layer tonotopically-organized feedforward neural network** to simulate the neuronal architecture for novel sound processing. Work resulted in 2 publications and were highlighted in *The Oxford Handbook of the Auditory Brainstem* in large paragraph.
- Built a **neural-based mechanistic model** for stimulus specific adaptation **(**Cooperated with Dr. John Rinzel, New

York University). Results were presenting in 2014 *Meeting of the Association for Research in Otolaryngology in San Diego.*

- With *in vivo* recording and **system identification** methods, depicted **spectro-temporal receptive field** of rat auditory midbrain and revealed the **hierarchical representation for the natural sound statistics.** Using **local neuronal correlation** to study the **functional connectivity of neighboring neurons in rodent auditory midbrain**. Results were orally presented in 2015 *Advances and Perspectives in Auditory Neurophysiology in Chicago.*

➢ Visiting scholar, CINACS International Graduate Research Group, University Medical Center Hamburg-Eppendorf, Germany. (2010, 2012, Mentor: Prof. Andreas K. Engel)

- **Multiple sites *in vivo* simultaneously recording** in ferret inferior colliculus and superior colliculus to study auditory and visual **cross-modal** processing

➢ Exchange student, Johns Hopkins University, USA. (2009, Mentor: Prof. Xiaoqin Wang)

- Designed and performed **psychophysical** experiments on human subjects and **mathematical modeling** of self-generated sound perception

Publications

- Zhang G, **Shen L**, Tao C, Peng B, Jung A, Li Z, Tao HW, Zhang LI (2020). Medial Preoptic Area Antagonistically Mediates Stress-induced Anxiety and Parental Behavior. *Nature Neuroscience*. In press.
- Zhang G, **Shen L**, Li Z, Tao HW, Zhang LI. Track-Control (2019). An automatic video-based real-time closed-loop behavioral control toolbox. *bioRxiv* doi: 10.1101/2019.12.11.873372.
- Wang X, Chou X, Peng B, **Shen L**, Huang JJ, Zhang LI, Tao HW (2019). A cross-modality enhancement of defensive flight via parvalbumin neurons in zonal incerta. *eLife*. 8: e42728.
- Zhang G, **Shen L**, Zhong W, Xiong Y, Zhang LI, Tao HW (2018). Transforming Sensory Cues into Aversive Emotion via Septal-Habenular Pathway. *Neuron*. 99: 1016-1028.
- Chou X, Wang X, Zhang Z, **Shen L**, Zingg B, Huang J, Zhong W, Mesik L, Zhang LI, Tao HW (2018). Inhibitory gain modulation of defense behaviors by zona incerta. *Nature Communications*. 9:1151.
- Zhang G, Sun W, Zingg B, **Shen L**, He J, Xiong Y, Tao HW, Zhang LI (2018). A Non-canonical Reticular-Limbic Central Auditory Pathway via Medial Septum Contributes to Fear Conditioning. *Neuron*.97:406-417.
- **Shen L**, Zhao L, Hong B (2015). Frequency-specific adaptation and its underlying circuit model in the auditory midbrain. *Frontiers in Neural Circuits*. 9:55.
- Zhao L, Liu Y, **Shen L**, Feng L, Hong B (2011). Stimulus-specific adaptation and its dynamics in the inferior colliculus of rat. *Neuroscience*. 181(5):163-174.

Selected conference presentations

- **Li Shen**, Yili Yan, Ning Guo, Bo Hong. Functional connectivity for spectrotemporal processing of neighboring neurons in inferior colliculus. 2015 *Advances and Perspectives in Auditory Neurophysiology (APAN),* Chicago, USA, Oral presentation
- **Li Shen**, Zitian Yu, Bo Hong, John Rinzel. A minimal neuromechanistic model for stimulus specific adaptation (SSA). Abstract of 2014 *MidWinter Meeting of the Association for Research in Otolaryngology (ARO)*, San Diego, USA, Poster presentation

Awards

2015. Comprehensive Excellent Scholarship of Tsinghua University

2014. Third Prize in Beijing Biomedical Engineering Academic Speech Contest

2011. Academic Excellent Scholarship of Tsinghua University

2010. Excellent Undergraduate Award of Tsinghua University