Wei-Hsien (Willy) Lee

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EDUCATION

University of Kansas
Lawrence, KS
Ph.d. in Bioengineering (GPA 4.0/4.0)
Aug. 2020 – Jan. 2025

Duke University
Durham, NC
Master of Science in Biomedical Engineering
Aug. 2018 – May. 2020

Sun Yat-Sen University
Guangzhou, CN
Bachelor of Science in Biomedical Engineering
Jun. 2014 – Jun. 2018

EXECUTIVE SUMMARY

- Experienced Bioengineer specializing in cross-functional BCI pipeline development including real-time neural signal processing (**MATLAB, Python**), machine learning (**TensorFlow, PyTorch**), and computational neuroengineering.
- Expertise in experimental protocol design, firmware and software development (**C++ and C**), non-human primate electrophysiology, large-scale neural data modeling (**Cloud Platforms**), and precision motor decoding.
- Strong collaboration skills to bridge peripheral stimulation circuitry and photoacoustic imaging systems to deliver insights into neurophysiological processes.

SKILLS

Programming Languages/ Machine Learning
- Time-series signal decoding and feature extraction from **neural** and **EMG data**
- Deep learning model development using **TensorFlow** and **PyTorch**
- Real-time signal processing and closed-loop control systems

Electrophysiology
- Large-scale data analysis
- In-vivo **electrophysiology** and **extracellular recording** of neural signals
- Electrical stimulation/ photoacoustic imaging protocol development and operation

Modeling
- Medical device design and **prototype** with Auto CAD, Solidworks, 3D printing, and COMSOL Multiphysics
- Software development for task protocol design with **Simulink** and **PyQt**

Device Development
- Experience in device development integrating engineering design, clinical need, market analysis, and regulatory considerations

RESEARCH EXPERIENCE

Randy Nudo Lab at University of Kansas Medical Center
Kansas City, KS
Postdoctoral research fellow
Jan. 2025 – present
- Designed and executed electrophysiology experiments in chronically implanted non-human primates (NHPs), integrating behavioral training, sensorimotor task paradigms, and synchronized neural and behavioral data acquisition.
- Conducted peripheral electric stimulation and analyzed stimulus evoked neural activity at scale.
- Utilized photoacoustic imaging to investigate functional connectivity and intracortical dynamics in both resting-state and task-relevant conditions.

Precision Neural Dynamics Lab at University of Kansas Medical Center
Kansas City, KS

Brain-Computer Interface (BCI) Research Assistant   *Aug. 2020 – Jan. 2025*
- Planned electrode implantation for non-human primates (NHP), leveraging 3D cortical modeling to optimize craniotomy.
- Co-developed WaveLimit, a high-performance spike sorting algorithm for multimodal neural recordings outperforming the modern spike sorters (Ironclust, Trideclous, Spiking Circus) by both quality (~3X units) and speed (2X faster).
- Designed and implemented a cross-system communication pipeline for BCI experiments, showcasing expertise in both **MATLAB** and **Python** to optimize real-time neural data acquisition and enable precise control of robotic arm movements.
- Analyzed fine-wire EMG data to show distinct recruitment of motor neurons during precision movement control.
- Experienced in Deep learning architectures including **TensorFlow** and **PyTorch**. Built an advanced data analysis framework using **deep learning** techniques to decode precision movements and to extract the underlying neural dynamics in collaboration with Dr. Pandarinath Lab at Georgia Tech.

Nerve regeneration Lab at Duke University   Durham, NC
Regenerative Science Project Research Assistant   *Nov. 2018 – May. 2020*
- Designed a **high-throughput** multidimensional cell-carrying microfluidic device using Polydimethylsiloxane (PDMS) and photolithography techniques.
- Performed **3D modeling** and fluid-electric field distribution analysis using Solidworks and COMSOL Multiphysics for comprehensive evaluation of the microfluidic device.
- Optimized in-vitro electrical field stimulation (EFS) paradigms to enhance macrophage phenotype expression and validate stimulation device performance in neural regeneration assays.

Big Ideas Lab at Duke University   Durham, NC
Summer Internship Research Assistant   *May. 2019 – Aug. 2019*
- Conducted human factors study on skin tone effect to ECG data quality, including human subject recruiting, experimental design, data acquisition, and data analysis.
- Bench-tested commercial wearables (Apple Watch, Fitbit, Garmin) vs. clinical ECG standards for human factors research.

LeLun Lab at Sun Yat-sen University   Guangzhou, CN
Nanotechnology Projects Research Assistant   *Aug. 2016 – May. 2018*
- Designed a novel fabrication pipeline of microneedle using Magnetorheological Drawing Lithography (MRDL).
- Built simulation models, analyzed statistical results of magnetic force in microneedle using COMSOL modeling software.
- Conducted bench testing to optimize penetration parameters for transdermal drug delivery, achieving a 15% increase in drug diffusion rate under controlled conditions.

WORK EXPERIENCE

MeDomino Insights   Remote
Assistant Product Manager   *Dec. 2021 – May. 2022*
- Optimized natural language processing (NLP) pipeline to improve efficiency of data processing. Designed a healthcare data platform bridging the clinicians and key opinion leaders to automate treatment recommendations.
- Evaluated and reconstructed the in-house data labeling platform on over 10 rare disease models to enhance accuracy.

IQVIA   Remote
Marketing Associate Intern   *Jun. 2022 – Aug. 2022*
- Analyzed market datasets to identify unmet clinical needs and showcase pharmaceutical client de novo product potential.
- Synthesized field insights into actionable go-to-market strategies for medical devices in APAC.

First people's Hospital of Guangdong, Department of Neurosurgery   Foshan, CN
Data Optimization Analyst, Summer Intern   *Sep. 2017 – Oct. 2017*
- Processed and optimized SEEG (stereotactic electroencephalography) signals for clinical diagnostics in MATLAB, enhancing signal clarity and reliability for epilepsy treatment.
- Conducted literature reviews on advanced diagnostic methodologies, integrating findings to propose innovative strategies for SEEG-based epilepsy diagnosis.
- Proposed strategic workflow improvements for SEEG analysis, reducing processing time while improving accuracy.

LEADERSHIP AND EXTRACURRICULAR ACTIVITIES

President of Graduate Engineering Association ambassador at University of Kansas   *Sep. 2022 - Apr. 2024*

- Led the organization of the Research Showcase to foster student-faculty collaboration and increase visibility of cutting-edge research across departments.
- Encouraged student engagement and well-being by organizing cultural roundtables and wellness events for over 100 graduate students.
- Advocated for graduate student needs through university-wide committees, influencing policy discussions on funding and academic support.

Team leader of Design Health Fellowship   *Aug. 2019 – May. 2020*

- Demonstrated project management skills with a cross-disciplinary team in identifying unmet needs in the gastric tube market through comprehensive stakeholder interviews and market analysis within a given timeline.
- Developed potential business models, aligning design solutions with market demands and presenting findings to industry experts for feedback.
- Conceptualized and prototyped a flexible gastric tube to address usability challenges, incorporating user-centered design principles with modeling technique including various fluid dynamics and 3D modeling.
- Coordinated engineering, clinical, and business expertise to develop a unified prototype that met both clinical and business goals.

PROFESSIONAL ACTIVITIES

- Innovative biotechnology panel presenter, 'A novel spatiotemporal strategy to inspire understanding of neural control of movement', Innovation Festival by BioKansas, 2024
- Poster presenter, 'Improving BCI accuracy with multiple neural dimensions for a single degree of freedom', Society for Neuroscience, 2023.
- Poster presenter, 'Identifying distinct neural features between the initial and corrective phases of precise reaching using AutoLFADS', Neural Control of Movement, 2023.
- Oral and poster presentation, 'Understanding neural dynamics under precision movement control', Engineering Graduate Research Showcase Symposium, University of Kansas, 2022.

JOURNAL ARTICLES

Google Scholar: https://scholar.google.com/citations?hl=en&user=z0uJLfkAAAAJ.

- **W.H Lee** et al., Identifying distinct neural features between the initial and corrective phases of precise reaching using AutoLFADS. *(Journal of Neuroscience 44 (20), 2024)*
- KC Schwartze, **W.H Lee** et al., Initial and corrective submovement encoding differences within primary motor cortex during precision reaching. *(Journal of Neurophysiology, 2024)*
- Z Chen, R Ye, **W.H Lee** et al., Magnetization-induced self-assembling of bendable microneedle arrays for triboelectric nanogenerators. *(Advanced Electronic Materials 5 (5), 2019)*
- Z. Chen, Y Lin, **W.H Lee** et al., Additive Manufacturing of Honeybee-inspired Microneedle for Easy Skin Insertion and Difficult Removal. *(ACS Applied Materials & Interfaces 10 (35), 2018)*
- **W. Lee** et al., A controlled force and depth of portable microneedle puncture drug delivery assisting device. *(Patent, CN)*

Awards

- Outstanding Doctoral Researcher in BioEngineering, University of Kansas, 2025.
- School of Engineering Travel Award, University of Kansas, 2024.