Mengzhan "Jhan" Liufu

JhanLiufu | mengzhan-liufu | my-site | mliufu@caltech.edu | +1 773.997.6747

Experience

Research Intern at Hoffmann lab Feb 2024 - July 2025

Transfer learning on the edge, microcontroller, self-calibrating BCIs.

Reaearch Intern at Yu lab Sept 2021 - Aug 2025

Fourier-based and DNN-based online phase estimation, FPGA, phase-locked brain stimulation.

Reaearch Intern at Tian lab Sept 2023 - July 2025

Bioelectronics, biological modulation, pixel-less artificial vision.

Skills

Programming	Python, C/C++, Rust, SQL, R, Matlab
Machine learning	PyTorch, TensorFlow, scikit-learn, HuggingFace; Time-series modeling, self-supervised learning, transfer learning
Data Analysis	Pandas, NumPy, SciPy, Matplotlib
Software Tools	Git, Docker, Linux/Unix, Jupyter, VS Code
Firmware	FPGA, MSP430

Projects

Rapid online adaptation with Hypernetwork and Contrastive Learning Github

- Built **HyperUDA**, a zero-shot domain adaptation framework for DNNs using hypernetworks
- Built **SupportNet**, a few-shot adaptation framework using contrastive learning and attention
- Deployed on **MSP430** to build self-calibrating brain-computer interface (**BCI**)

Online phase estimation for phase-locked brain stimulation Github

- Built **CLC**, a closed-loop brain stimulation system using Fourier-based phase estimation
- Built **DCTNet**, a DNN for online phase estimation. Deployed on **FPGA** for real-time validation

Fault-tolerant DNNs for fault-prone RRAM deployment Github

- Developed **DropConnect**, a framework for training **RRAM**-fault tolerant DNNs
- Injected Linear Bottleneck layer into DNNs to improve fault tolerance

Pixel-less artificial vision with hot-carrier bioelectronic interfaces Github

- Developed ML methods for pixel-less pattern recognition and cursor tracking
- Helped design and fabricate hot-carrier optoelectronic materials

"Barcoding" cells using nanodiamond quantum sensor Github

- Built an algorithm to track living cells using paired nanodiamonds as quantum sensor

Education

2025 - present PhD (Computational Science) at **Caltech** (GPA: /4.0)
2021 - 2025 BS (Computer Science, Physics) and BA (Economics) at **UChicago** (GPA: 3.74/4.0)

References

Henry Hoffmann	Department Chair, Dept of CS, UChicago	hankhoffmann@cs.uchicago.edu
Jai Yu	Assistant Professor, Dept of Psyc, UChicago	jaiyu@uchicago.edu
Bozhi Tian	Professor, Dept of Chemistry, UChicago	btian@uchicago.edu

Publications

[1] **Mengzhan Liufu**, Xueqian Deng, and Juan Chen. "Understanding implicit and explicit sensorimotor learning through neural dynamics". In: *Frontiers in Computational Neuroscience* (2022). URL: https://www.frontiersin.org/journals/computational-neuroscience/articles/10.3389/fncom.2022.960569/full.

[2] Jingyue Xu, Chen Yang, **Mengzhan Liufu**, Shuai Chang, Jinpeng Chen, Feng Lu, Alkis M. Hadjiosif, Adrian M. Haith, Xueqian Deng, and Juan Chen. "Effects of Different Feedback Conditions on Sensorimotor Adaptation Revealed in a Mirror Reversal Paradigm". In: *Journal of Behavioral and Brain Science* (2023). URL: https://www.scirp.org/journal/paperinformation?paperid=126865.

[3] **Mengzhan Liufu**, Zachary M. Leveroni, Sameera Shridhar, Nan Zhou, and Jai Y. Yu. "Optimizing real-time phase detection in diverse rhythmic biological signals for phase-specific neuromodulation". In: *in press at JNE* (2024). URL: https://www.biorxiv.org/content/10.1101/2024.08.24.609522v1.full.pdf.

[4] Emadeldeen Hamdan, **Mengzhan Liufu**, Yingyi Luo, Ryan Forelli, Zachary M. Leveroni, Sameera Shridhar, Nan Zhou, Seda Ogrenci, Nhan Tran, and Ahmet Enis Cetin Jai Y. Yu. "Real-time Instantaneous Phase Estimation Using a Deep Dual-Branch Complex Neural Network". In: *under review at TBE* (2025).

[5] Pengju Li, **Mengzhan Liufu** ..., and Bozhi Tian. "Self-Organized Nanoplasmonic Artificial Leaf for Hot-Carrier Bioelectronic Interfaces". In: *under review at Nature Photonics* (2025).

Awards

- NK Cheung Chemistry Research Fellowship (2024)
- Fellowship in application of machine learning in biological and health sciences (2024)
- Training Fellowship in Theory and Computation for Next Generation Neuroscientists (2023)
- Quad Faculty Research Grant (2023)
- Quad Summer Undergraduate Research Scholarship (2023)
- Jeff Metcalf Fellowship (2022)
- UChicago Data Science Institute Summer Research Scholarship (2022)
- UChicago Dean's List (2022)