

# Siwen Wang

## Education

### **M.S., Bioengineering**

UC San Diego

**December 2022**

GPA: 3.71/4.0

Thesis: Advancing the neurophysiological understanding of stress, a study based on recorded Electroencephalography (EEG) data in real-world classroom

### **B.S., Systems Engineering and Design**

University of Illinois at Urbana-Champaign

**May 2021**

GPA: 3.52/4.0

Minor: Computer Engineering

## Research Experience

### **Swartz Center for Computational Neuroscience**

Part-time Researcher

**UC San Diego**

**Oct 2024 – Ongoing**

*Advisor: Tzyy-Ping Jung*

*Project: Building a foundation Large EEG Model (LEM)*

- Collaborating with international researchers from Xiamen University, HongKong University and UC San Diego on the development of a next generation Large EEG Model
- In the process of curating a large uniform EEG database for LEM pre-training
- Preliminary result: fine-tuning on downstream stress detection dataset reached balanced accuracy 85%, beating traditional LDA classifier by 7% with 4 times less datapoint used for prediction

### **Swartz Center for Computational Neuroscience**

Graduate Research Assistant

**UC San Diego**

**May 2021 – Dec 2022**

*Advisor: Tzyy-Ping Jung*

*Project: Towards designing the next generation health wearables: A machine learning approach for stress detection using resting state Electroencephalography (EEG) data*

- Collaborated with Microsoft Research on the pre-development of an EEG-based stress monitoring headband
- Preprocessed and analyzed 100 trials of EEG data with FIR filter, artifact subspace reconstruction (ASR), Fast Fourier Transform (FFT) and Independent Component Analysis (ICA)
- Supported the implementation of traditional machine learning models (Random Forrest, SVM) to detect stress based on EEG data. Classification accuracy reached >78% with 3 channels

### **Mobility & Fall Prevention Lab**

Graduate Researcher

**University of Illinois at Urbana-Champaign**

**May 2021 – April 2022**

*Project: Improving EEG-based anxiety detection algorithm: Anxiety detection using Adaptive Mixing Independent Component Analysis (AMICA)*

- Designed a novel anxiety detection pipeline that uses AMICA as an unsupervised learning tool for creating classification labels for the training set
- Reached 75% Accuracy with binary classification using the Random Forrest classifier

Undergraduate Researcher

**September 2019 – May 2021**

*Project: Towards designing a novel testing bed for emotional state monitoring and manipulation in hospitals: A pilot study on anxiety state monitoring and manipulation in VR using EEG data*

- Designed a closed-loop system for sensing the user's anxiety state using EEG data to achieve real-time VR environment manipulation for the purpose of rehabilitation
- Developed Python scripts for real-time EEG data visualization, processing, biomarker computation and anxiety state visualization with latency less than 0.3 second

## Illinois Geometry Lab

Undergraduate Researcher

University of Illinois at Urbana-Champaign

January 2019- August 2019

*Project: A big data approach to analyze the time and energy tradeoff of Uber's Vertical Take-Off and Landing aircraft (VTOLs)*

- Performed the time and energy trade-off analysis on a subsample of 130 million taxi trip datasets in Chicago using Python Pandas package
- Designed simulations using Unity game engine to visualize 100 potential air taxi trips
- Proposed 778 optimal heliports location by analyzing building heights and number of taxi trips

## Publications

- **Wang, S.**, Okubo, R., Liao, G., Ku, C., Sowers, R., & Hernandez, M. E. Designing a closed loop system to achieve real-time evaluation and manipulation of state anxiety while walking in virtual reality. *Proceedings of the 2021 10th International IEEE/EMBS Conference on Neural Engineering (NER)*, 2021, 45-48.  
<https://doi.org/10.1109/NER49283.2021.9441253>
- Liao, G., **Wang, S.**, Wei Z., Liu, B., Okubo, R., and Hernandez, M. E., Online classifier of AMICA model to evaluate state anxiety while standing in virtual reality. *2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, 2022, pp. 381-384, doi: 10.1109/EMBC48229.2022.9871843
- Chang, CY., Hsu, C., Wu, YC., **Wang, S.**, D, Tsui., Jung, TP. Online Mental Stress Detection Using Frontal-channel EEG Recordings in a Classroom Scenario. *arXiv preprint arXiv:2405.11394*
- Tang J, Sun T, and **Wang S.** Neural Signal Operated Intelligent Robot: Human-guided Robot Maze Navigation through SSVEP. *arXiv preprint arXiv:2410.11867*

## Teaching Experience

### K-12 International School Teacher

Qingdao Academy, Shandong, China

Computer Science Instructor

Feb 2023 – Ongoing

- Designed and taught the world's first K-12 brain-computer interface curriculum, past students who completed the course got accepted to UC Berkeley, UC San Deigo, University of Toronto and National University of Singapore
- Supervised 4 students for the development of a novel EMG speller (classification accuracy 85%) and a Neural Operated Robot based on SSVEP (offline classification accuracy ~94%)
- Taught U.S. undergraduate curriculum courses, AP Computer science principles and AP Computer Science A to 40 students, student satisfaction rate >97%

### Graduate Teaching Assistant

UC San Diego

Biosystems and Control (BENG 122A)

September 2021- December 2022

- Mentored and led the discussion weekly for 50+ students on topics in Laplace transform, controller design and frequency analysis
- Provided feedback and recommendations for students' final project design

## Computational Skills

- Python (Pandas, PyTorch)
- MatLab (EEGLab)