HAOWEN (JOHN) WEI

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EDUCATION

Columbia University Sep 2022 - May 2024

- Master of Computer Science (Thesis Track), GPA: 3.81/4.00
- Thesis: From Brain–Computer Interfaces to AI-Enhanced Diagnostics: Developing Cutting-Edge Tools for Medical and Interactive Technologies. Paper
- Brain-Computer Interfaces & Human-Computer Interaction

Worcester Polytechnic Institute Aug 2018 - May 2022

- Bachelor Of Computer Science & Electrical and Computer Engineering (Double Major), GPA: 3.91/4.00
- Mechanical Engineering (Minor)
- 2022 Second Best Undergraduate Major Qualification Project (IndexPen)

RESEARCH INTEREST

Brain-Computer Interfaces (BCI), Human-Computer Interaction (HCI), Virtual Reality (VR), Augmented Reality (AR), Deep Learning, Machine Learning, Computer Vision, Neuroimaging (fMRI, EEG), Brain Stimulation (TMS, TES), Signal Processing, Mobile and Ubiquitous Computing.

PUBLICATIONS

*** These Authors Contributed Equally.**

- Ziheng Li*, **Haowen Wei***, Ziwen Xie, Yunxiang Peng, June Pyo Suh, Steven Feiner, Paul Sajda. "PhysioLabXR: A software platform for real-time multi-modal, brain-computer interfaces and extended reality experiments." Journal of Open Source Software, Sep 2023. Paper, GitHub
- **Wei, Haowen***, Ziheng Li*, Alexander D. Galvan, Zhuoran Su, Xiao Zhang, Kaveh Pahlavan, and Erin T. Solovey. "IndexPen: Two-Finger Text Input with Millimeter-Wave Radar." Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 6, no. 2 (2022): 1-39. Paper, Video, Dataset
- Xie, Xing, **Haowen Wei**, and Yongjie Yang. "Real-Time LiDAR Point-Cloud Moving Object Segmentation for Autonomous Driving." Sensors 23, no. 1 (2023): 547. Paper
- Su, Zhuoran, Kaveh Pahlavan, Emmanuel Agu, and **Haowen Wei**. "Proximity Detection During Epidemics: Direct UWB TOA Versus Machine Learning Based RSSI." International journal of wireless information networks 29, no. 4 (2022): 480-490. Paper
- Cheng, Shiyu, Kaveh Pahlavan, **Haowen Wei**, Zhuoran Su, Seyed Reza Zekavat, and Ali Abedi. "A Study of Interference Analysis Between mmWave Radars and IEEE 802.11 AD at 60 GHz Bands." International Journal of Wireless Information Networks 29, no. 3 (2022): 222-231. Paper

Under Review:

- Ziheng Li*, **Haowen Wei***, Kuang Sun, David Li, Steven Feiner, Kaveri Thakoor. "Interactively Assisting Glaucoma Diagnosis with an Expert Knowledge-distilled Vision Transformer." (Under Review at CHI 2025)
- **Haowen Wei**, Ziheng Li, Xichen He, Ben Yang, Steven Feiner. "Efficient Text-Entry in Mixed Reality: Tap, Gaze & Pinch, SwEYEpe." (Targeting CHI 2025 Late-Breaking Work)

CONFERENCE PRESENTATIONS

- 2023 Brain & Human Body Modeling (BHBM) - Athinoula A. Martinos Center for Biomedical Imaging (Hybrid Local Conference): PhysioLabXR: A software platform in Python for multi-modal brain-computer interface and real-time experiment pipelines. **Haowen Wei**, Ziheng Li, Steven Feiner, Paul Sajda Link
- 2022 Brain & Human Body Modeling (BHBM) -Athinoula A. Martinos Center for Biomedical Imaging (Hybrid Local Conference): Hardware, real-time signalprocessing techniques, and data collection for TMS induced EMG responses with RenaLabApp. **Haowen Wei**, Mohammad Daneshzand Link
- 2021 Brain & Human Body Modeling (BHBM) - Athinoula A. Martinos Center for Biomedical Imaging (Hybrid Local Conference): Interplay between TES and EEG Interplay with boundary element fast multipole method (BEM-FMM) via Helmholtz reciprocity principle. Sergey Makarov, **Haowen Wei**, Aapo Nummenmaa Link

RESEARCH

PhysioLabXR: A software platform in Python for multi-modal brain-computer interface and real-time experiments May 2020 - Present
Co-Founder & Lead Software Engineer *Boston, MA, Worcester, MA, & New York, NY*

- Led development of data visualization, user interface, digital signal processing modules, and real-time TMS/fMRI visualizer.
- Developed a sensor fusion application for data collection, visualization, and real-time neural network inference.
- Implemented serial connections for non-Lab Streaming Layer sensors and created adaptable data collection interfaces.
- Created Brain-Computer Interface experiment paradigms (e.g., P300 Speller) to educate researchers.
- Maintained application operations and provided support to research labs at WPI and Columbia University.

Virtual Vitality: Augmenting Clinical Decisions via Expert-Informed Transformers April 2023 - Present
Project lead & Lead Software Engineer & Experimenter *New York, NY*

- Introduced the Area of Interest (AOI) Augmentation method for clinical image diagnosis, leveraging the attention layer from the vision transformer classifier to highlight the area of interest on the attention map. (Paper submitted to CHI 2025)
- Led a team in building an experimental paradigm from scratch in Unity and PhysioLabXR
- Conducted user study with 15 ophthalmologists.

IndexPen: Two-Finger Text Input with Millimeter Wave Radar Aug 2019 - Sep 2022
Project lead & Lead Software Engineer & Experimenter *Worcester, MA*

- Introduced IndexPen, a novel interaction technique for text input through two-finger in-air micro-gestures, enabling touch-free, effortless, tracking-based interaction designed to mirror real-world writing.
- Led the team to build the project from scratch, overseeing the entire data collection, analysis, and machine learning pipeline.
- Utilized mmWave Radar with Deep Learning (CNN+LSTM) for gesture motion detection. Presented the technical approach for the system, including radio frequency processing pipeline, neural network architecture, and detection algorithms.

LiDAR Moving Object Segmentation (MOS) of Point Cloud Sequences Mar 2021 - Sep 2022
Lead Software Engineer *Worcester, MA*

- Built the deep neural network to segmenting point cloud into two moving and non-moving categories by using deep learning andlabeling points bellows to a moving object different from static object; used SemanticKitti for dataset

A Comparative Study of Accuracy of BLE and UWB Signal Jun 2021 - May 2022
Lead Sotware Engineer *Worcester, MA*

- Introduced machine learning for time series "Signal to Noise Ratio" (SNR) from Blue Tooth; compareddistance estimation using BLE and UWB technology in epidemic
- Provided technical support to research team; set up data collection interface between hardware andcomputer
- Publication: Proximity Detection During Epidemics: Direct UWB TOA Versus Machine Learning Based RSSI

A Study of Interference Analysis Between mmWave Radars and IEEE 802. 11AD at 60GHz
. Oct 2020 - Sep 2021
Lead Sotware Engineer *Worcester, MA*

- Guided research team to use the Texas Instrument mmWave radar; took charge of the basic setup and data analysis.

WORK EXPERIENCE

Reserach Assistant Harvard Medical School Dec 2021 - Sep 2022, S ep 2024 - Present
Athinoula A. Martinos Center for Biomedical Imaging (TMS Lab) *Boston, MA*

- Led the development of an EEG, TMS, and EMG devices API for the research team, significantly enhancing the setup speed of the experiment pipeline.
- Perform modeling tasks for reconstructing brain signals.

Reserach Assistant Columbia University Aug 2022 - Present
LIINC Lab & CGUI Lab & AI4VIS Lab *New York, NY*

- Built multi-modal physiological data classifier, Unity experiment paradigm, and led the development of PhysioLabXR from scratch.
- Continuously working on multiple projects and currently in the process of publishing three articles to top conferences and journals.

Teaching Assistant Worcester Polytechnic Institute Aug 2020 - Jan 2022
ECE 2029 & ECE 3308 *Worcester, MA*

- Assisted students with daily homework tasks, solved homework and code problems, explained how to complete MATLAB and Verilog code, corrected exam assignments.
- Led students to design project flow to meet lab experiments

Reserach Assistant Worcester Polytechnic Insitute Oct 2019 - May 2022
CWINS Lab & HCI Lab & Embedded Lab *Worcester, MA*

- Led multiple projects and carries out four publications in top conferences and journals
- Provided software development assistant to other research teams from lab; worked on direct research relates to finger gesture motion detection using mmWave Radar. Work has been published in top conferences and Journals

SKILLS

Programming Language	Python, C#, Java, MATLAB, Verilog/FPGA, C/C++, SQL, JavaScript, HTLM
Research	Deep Learning, Machine Learning, Computer Graphics, Computer Vision, Real-time Signal Processing, Physiological Data Processing (EEG, fNIRS, fMIR), Eye Tracking, Image Processing, mmWave Radar,UWB Radar, Natural Language Processing, LiDAR Point Cloud Segmentation
Platform	Pytorch, TensorFlow, Unity3D, SOLIDWORKS, FPGA, Qt (Software) Operating System , Real-time Operating System (RTOS), FreeSurfer

AWARDS

- Dean's List of 2018, 2019, 2020, 2021, 2022 Academic Years