

Lingfei Kong

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EDUCATION

Boston University, Boston, MA, US

09/2024-05/2026

MS in Electrical and Computer Engineering

Core Courses: *Design by Software, Computer Engineering Fundamentals, Introduction to Learning from Data, Computational Optical Imaging, Adv Topics Elec/Comp Eng, Cloud Computing, Deep Learning*

Wuhan University (WHU), Wuhan, China

09/2019-06/2023

BS in Physics

Core Courses: *Linear Algebra, Calculus I/II, Ordinary Differential Equations, Probability and Statistics, Methods of Mathematical Physics, Quantum Mechanics, Electrodynamics, Theoretical Mechanics, Atomic Physics, General Physics I-IV, Computational Physics, C Programming Language*

RESEARCH EXPERIENCE

EEG-based brain-computer interface for motor imagery classification, Wuhan, China

06/2023-09/2023

Research Assistant, Supervised by Prof. Dejan Markovic, UCLA

- Developed a leakage-controlled EEG decoding pipeline for BCI Competition IV Dataset 2a (9 participants, 22 channels), incorporating artifact-trial rejection, 4–40 Hz band-pass filtering, temporal resampling, and fold-specific normalization estimated exclusively from training data.
- Implemented EEGNet in PyTorch and designed controlled temporal-aggregation ablations—including parameter-free temporal averaging, high-resolution attention, and position-aware residual attention—to distinguish gains from temporal aggregation from those attributable to learned attention.
- Conducted subject-specific stratified 4-fold evaluation with nested validation and early stopping. Temporal averaging improved mean accuracy/Macro-F1 from 54.51%/52.33% to 60.14%/58.06%, while the best attention variant achieved 60.91%/59.03%, indicating that most gains arose from temporal aggregation rather than attention alone.
- Extended the study to cross-subject generalization using nested leave-one-subject-out evaluation, with inner GroupKFold model selection restricted to source participants. The source-only baseline achieved 41.63% accuracy and 33.89% Macro-F1, highlighting substantial inter-subject distribution shift.
- Introduced transductive unsupervised Euclidean Alignment using only unlabeled EEG from each held-out target participant, improving cross-subject accuracy/Macro-F1 to 50.88%/48.55% (+9.24/+14.66 percentage points). Improvements were observed for all 9 participants and were significant in paired subject-level tests (two-sided Wilcoxon, $p = 0.0039$).

Memristor-Based Neural Network Simulation, Wuhan, China

11/2022-05/2023

Advisor: Prof. Yong Liu, Wuhan University

- Built a device-aware neural-network simulation framework: a fully connected MNIST classifier with an adjustable hidden layer, used to study how memristor device non-ideality propagates into network-level recognition performance.
- Modeled memristor artificial synapses by quantizing continuous network weights into discrete conductance states and injecting ~10% random resistance fluctuation derived from the group's NbOx device measurements; compared an ideal continuous-weight network against binary, unipolar, and bipolar memristor models.
- Evaluated through accuracy/iteration curves (OriginPro), residual analysis, and confusion matrices on 10,000 MNIST test samples; controlled hidden-layer size and training iterations to separate device-level effects from training dynamics.
- Findings: the ideal continuous-weight model achieved the highest recognition ($\approx 92\%$ at 100 hidden nodes, 10 epochs); weight discretization reduced accuracy and increased training time; adding device fluctuation degraded both accuracy and stability, and the unipolar model showed smaller accuracy variation than the bipolar model ($\approx 75\%$ vs. 70–80% at

200 hidden nodes).

WORK EXPERIENCE

East China Institute of Optoelectronic Integrated Devices, Suzhou, China

07/2026-present

Research Staff, BCI & Embodied Intelligence Division

Project 1, BCI Data & Algorithm Platform

- Contributed to the development of an EEG/BCI data and algorithm platform, establishing workflows for EEG data acquisition, standardization, quality control, and integration with downstream model development.
- Implemented and evaluated data-processing and model-training workflows across EEG datasets and experimental tasks, investigating cross-task model adaptation and the robustness of neural-signal models under heterogeneous data conditions.
- Supported the development of the platform prototype and training environment, integrating EEG data management, model development, and downstream BCI application workflows.

Project 2, Clinical BCI Study & Experimental Paradigm Development

- Designed and implemented EEG-based experimental paradigms for a hospital-partnered clinical BCI study, translating findings from BCI and experimental-psychology literature into executable human-subject protocols.
- Developed Go/No-Go tasks and defined stimulus presentation, trial structure, behavioral measures, and EEG recording procedures; iteratively refined the experimental program based on clinical-site and equipment constraints.
- Supported ethics review, participant procedures, EEG acquisition, and preliminary analysis of behavioral and electrophysiological responses to neurostimulation.

Project 3, EEG Acquisition Software Development

- Developed Windows host software for an EEG acquisition device, implementing device communication, EEG data reception and parsing, real-time waveform visualization, channel selection, and device-status controls.
- Integrated EEG acquisition, visualization, and data-management functions to support downstream BCI experiments and signal analysis.

PUBLICATIONS

- **Kong, L.** et al. "Current Study on Brain Computer Interface with Virtual Reality in Upper Limb Rehabilitation." *2023 International Conference on Medical Imaging, Sanitation, and Biological Pharmacy* 2023

PROJECT EXPERIENCE

AI-Assisted Policy Synthesizer: Auto-Generating OPA Guardrails from Cloud Policies, Boston

09/2025-11/2025

- Developed an AI-assisted system that translated cloud security requirements and 100+ AWS rules into executable OPA/Rego policies.
- Used an LLM to extract key rule elements into a structured format and convert them into standardized Rego templates.
- Deployed the workflow with Python, AWS Lambda, Step Functions, and S3, and integrated GitHub Actions to support reproducible testing and continuous compliance enforcement.

Simulation and Control of an Assistive Wheelchair-Mounted Robotic Arm, Boston

01/2025-05/2025

- Developed a Webots simulation of a wheelchair-mounted Neuronics IPR robotic arm, implementing inverse-kinematics-based reaching, grasping, object transfer, wrist rotation, and gripper control.
- Built a modular control interface integrating keyboard commands, gaze-based input, and preprogrammed motions to accommodate users with different levels of upper-body mobility.

SKILLS

- Languages & Tools: C, Python, PyTorch, MATLAB, Verilog, SQL, Git, CAD
- Certificate: AWS Cloud Practitioner
- Platforms: Jupyter, SPICE, AWS