

Ziliang Yin

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EDUCATION

Shenzhen University

September 2022 - June 2025

Mphil, Integrated Circuit Engineering

Average Score: 81.7/100

Core Courses: *Matrix Theory and Method, Random Process, Digital Signal Processing, Machine Learning, Digital Integrated Circuit Design, Integrated Circuit Back End Design, VLSI Design Introduction, Design of Analog IC*

South China University of Technology

September 2017 - June 2021

BEng, Electrical Engineering and Automation

Average Score: 84.4/100

Core Courses: *Circuit Principle, Analog and Digital Electronics, Automatic Control Theories, Power Electronics, Electromagnetic Fields, Signals and Systems, Electrical Machinery, Electric Power Systems*

RESEARCH INTERESTS

Biomedical signal processing;

Algorithm & hardware development

Brain-computer interfaces

Wearable devices

PUBLICATIONS

[J] **Z. Yin**, and W. Shi, "WPCT: A Lightweight EEG Physiological Artifact Denoising Architecture for Single-Channel BCI Applications", **IEEE Transactions on Circuits and Systems I: Regular Papers**, 2024, Under Review

[C] **Z. Yin**, W. Shi and K. Liu, "An EEG Signal Processing System Design with Approximate Operations", **2023 IEEE International Conference on Integrated Circuits, Technologies and Applications (IEEE ICTA)**, Hefei, China, 2023, Published

RESEARCH EXPERIENCE

Algorithm and Hardware Development for Single-channel SSVEP-based BCI

August 2024 - Now

Natural Science Foundation of Guangdong Province, China, (2023A1515010761)

- Carry out *channel selection* and *stimuli design* for an SSVEP-based BCI system (in progress).
- Design a lightweight neural network, combined with digital signal processing methods, that efficiently extracts brain information (in progress).
- Propose a *high-performance hardware* architecture that implements the feature extraction and classification network (in progress).

Algorithm and Hardware Development for the Removal of Physiological Artifacts from Single-Channel EEG

October 2023 - August 2024

Natural Science Foundation of Guangdong Province, China, (2023A1515010761)

- Developed a lightweight algorithm, WPCT, that removes *EOG and EMG artifacts*, and *corrects baseline drift* simultaneously from single-channel EEG, which is useful in *real-time single-channel BCI* signal preprocessing.
- Proposed an architecture that implements the WPCT algorithm in *digital circuits*. Significantly reduced the hardware scale with a new *area-efficient rotation ordering* for two-sided Jacobi SVD calculation of tall matrices.
- Configured the proposed architecture in four ways: Haar-16, Haar-32, Db2-16, and Db2-32. Their artifact removal performance and hardware performance were analyzed and compared, enabling the selection of *optimal configuration* for specific applications.

Digital System Development for Emotion Recognition Based on Long Short-Term Memory (LSTM) Network

December 2022 - September 2023

National Natural Science Foundation of China, (61974095)

- Designed an *EEG signal processing* system with an application to *emotion recognition*, which includes three primary modules: preprocessing, feature extraction, and emotion classification.
- Used the *energy ratio* of different frequency bands as input feature. Trained an *LSTM network* for dual-label classification of *16 emotions*, with an average accuracy of 64.5% on the DEAP dataset.
- Deployed the system using *digital circuits*. Minimized redundant logic. Adopted piecewise linear approximation for nonlinear operations to reduce complexity.

PROJECT EXPERIENCE

- Research on Low-Power Pattern Recognition AI Edge Chip Design and Hardware Efficiency Optimization** December 2022 - Now
 Natural Science Foundation of Guangdong Province, China, (2023A1515010761)
- **Main Work:** Draft research proposal, feasibility report, technical guidelines; Algorithm & hardware co-design of a preprocessing module for single-channel EEG; UPF design for SVM & FFT modules.
- Research on Core Technologies for High-Efficiency, Ultra-Low Power Brain-Computer Interface/Neural Signal Detection Chips** November 2022 - December 2023
 National Natural Science Foundation of China, (61974095)
- **Main Work:** Design replication; Design of an 1024-point radix-2 FFT; Draft research report; Development and hardware implementation of an LSTM network for emotional recognition using EEG.

TEACHING EXPERIENCE

- **Teaching assistant for Introduction to Electronics Engineering** undergraduate course (Fall 2022)
- **Teaching assistant for Digital Integrated Circuits** undergraduate course (Spring 2023)

AWARDS

- **Academic Scholarship of Shenzhen University** (Top 10%) 2022 - 2023
- **Kang Dewei Innovation Scholarship** (Top 8%) 2018 - 2019
- **Outstanding Student Leader** (Top 5%) 2019 - 2020
- **Outstanding Intern in Power Grid** (Top 10%) 2018 - 2019

LEADERSHIP EXPERIENCE

- Shenzhen University Student Union** October 2022 - September 2023
 Member, Practice Department
- South China University of Technology Student Union** May 2018 - July 2019
 Secretary, Department of Manpower and Liaison
- Student Innovation and Entrepreneurship Club of SCUT** March 2018 - August 2018
 Member, Outreach Practice Department

SKILLS

- Programming:** Matlab, Python, C++, Verilog
Language: English, Chinese

REFERENCE

Associate Prof. Weiwei Shi, IEEE Member
 Shenzhen University
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