

Yanghonghui Chen

Tel: +(86) 13396886608 | Email: yanghonghui.21@intl.zju.edu.cn | github.com/Yonghonghui

EDUCATION

University of Illinois Urbana-Champaign

Urbana US

Bachelor of Science in Electrical Engineering - GPA: 3.88/4.0

September 2021 - now

Zhejiang University

Haining China

Bachelor of Engineering in Electrical Engineering - GPA: 3.95/4.0

September 2021 - now

Relevant coursework: Neural Interface Engineering (A), Neural Circuits and Systems (A+), Embedded DSP Laboratory (A+), Digital Signal Processing (A), IoT and Cognitive Computing (A), Probability with Engineering Applications(A)

In progress: Applied Parallel Programming, Machine Learning, Control Systems

PUBLICATION

Chenchen Ding, Zhengwu Liu, Jianshi Tang, **Yanghonghui Chen**, et al. (2024). Enhancing Accuracy of RRAM-based Heterogeneous Processing via Fixed Parameter Disturbance Training for Multimodal Brain-Computer Interfaces. IEEE International Electron Devices Meeting. (Under Review)

RESEARCH EXPERIENCES

Optimized Convolutional Layer Implementation Using CUDA

Course Project (Advisor: Prof. Volodymyr Kindratenko)

October 2024 - December 2024

Keywords: CUDA, Parallel programming, GPU acceleration, Convolutional neural networks (CNNs)

- Designed and implemented the forward pass of convolutional layers for a modified LeNet-5 architecture using CUDA, optimizing performance for deep learning tasks such as image classification and object detection.
- Implemented a GPU-based forward convolution with a structured Prolog-Kernel-Epilog approach, ensuring memory management, convolution computation, and output transfer, while matching CPU implementation correctness and optimizing performance using Nsight profiling tools.
- Applied advanced GPU programming techniques to optimize the implementation, including streams, GEMM kernels, and kernel fusion, to achieve a target inference time of ≤ 80 ms for 10,000 images from the Fashion MNIST dataset.

RRAM-based Heterogeneous Processing for Multimodal Brain-Computer Interfaces

The University of Hong Kong (Advisor: Dr. Zhengwu Liu)

May 2024 - July 2024

Keywords: RRAM, Multimodal brain-computer interface, EEG, Compute-in-memory, FDT

- Simulated representative heterogeneous processing paradigm of P300 signal recognition in Python by using resistive random-access memory (RRAM) with and without fixed parameter disturbance training (FDT).
- Contributed to combining the BCIC IV IIa and the P300 RSVP datasets and designing an RRAM-based multimodal recognizer that integrates components of the pre-trained EEGNet, CSP (Common Spatial Pattern), and a modality-fused classifier to create the multimodal settings.
- Achieved 2.83% higher accuracy using multimodal BCI with FDT than that without FDT and significantly outperformed the MI-alone and P300-alone results by 8.19% and 13.20%, respectively.

Raspberry Pi Based IoT System as a Private Chatbot

Course Project (Advisor: Prof. Deming Chen)

March 2024 - May 2024

Keywords: IoT System, Raspberry Pi, Machine Learning, Deep Learning

- Developed an IoT system using Raspberry Pi 4 as a private chatbot with face detection and speaker recognition to guarantee privacy and personal conversations as well as interactions.
- Implemented MTCNN with ResNet and dlib-based face recognition, achieving better performance with the latter; trained the system with one hundred face images for live recognition.
- Built a custom residual neural network with Keras for speaker recognition, achieving 96% accuracy.
- Integrated a server-client architecture using Google Cloud for accelerated processing and implemented speech recognition and TTS for user interaction.

Multiplayer Action Game on FPGA: Crazy Arcade

Course Project (Advisor: Prof. Zuofu Cheng)

March 2024 - May 2024

Keywords: SystemVerilog, FPGAs, System-on-a-chip, MicroBlaze CPU, VGA

- Used FPGA for real-time operations, integrating MicroBlaze CPU for game logic and keyboard input processing.

➤ Developed various modules in SystemVerilog to manage player movements, bomb mechanics, life counts, and game states, interacting through a system bus.		
➤ Incorporated background music by PWM for sound generation, featuring distinct tracks for different game stages.		
Cheat-Machine for Game 2048		
Course Project (Advisor: Prof. Thomas Moon)		March 2024 - May 2024
<i>Keywords: Embedded DSP, Real-time Signal Processing, Image Processing, Android Studio</i>		
➤ Developed an app in Android Studio to analyze a live game of 2048, recognizing board digits using image processing.		
➤ Employed efficient template matching for multi-digit recognition, using grayscale conversion, Canny edge detection, and perspective transformation to preprocess images. Used python packages to evaluate the workflow of the application.		
➤ Built an AI engine with an Expecti-max Search algorithm to recommend the optimal move, focusing on corner placement strategies.		
➤ Achieved high accuracy in digit recognition (100% when properly aligned) and consistent AI performance, reaching 1024 tile in 75% of simulations.		
Simulating Neuron Circuit Design		
Course Project (Advisor: Prof. Jont Allen)		December 2023
<i>Keywords: Neuron Simulation, Hodgkin-Huxley Model, Circuit Simulation</i>		
➤ Designed an electronic circuit based on the Hodgkin-Huxley model to simulate neuron action potentials.		
➤ Conducted electrical pulse stimulation to observe and analyze neuronal signaling pathways.		
➤ Optimized circuit performance by adjusting component parameters to achieve clear action potential observations.		
Hook&Hair Structure 3D-Printing based on Path Control and 4D Printing Experiment Exploration		
Zhejiang University (Advisor: Prof. Guanyun Wang)		June 2023 - August 2023
<i>Keywords: 3D printing, Grasshopper, Rhino, FDM, Path-planning, 4D printing</i>		
➤ Developed 3D printing techniques for complex hook and hair structures using Rhino and Grasshopper for path planning, generating G-codes for customized printing paths instead of traditional FDM (Fused Deposition Modeling) methods.		
➤ Accomplished applications including hooked ball-mitten toys and hairy objects, requiring precise path control to avoid defects and achieve intricate designs.		
➤ Conducted experiments in 4D printing, modeling deformable planar objects in Fusion360 that transform into stereoscopic shapes when heated.		
Over-the-Air-Computation Based Federated Learning Model Establishment & Simulation		
Zhejiang University (Advisor: Prof. Howard Yang)		April 2022 - April 2023
<i>Keywords: Edge Computing, Federated Learning, OFDM, Over-the-air Computing, Simulink, Machine Learning, Neural Networks</i>		
➤ Explored an innovative approach to utilizing private data from distributed databases to train shared models, ensuring user privacy while making use of the data.		
➤ Set up an over-the-air-computation-based communication model in Simulink which could transmit and receive massive data gradients between federated users effectively.		
➤ Combined Machine Learning models like Linear Regression and Deep Learning models like neural networks in MATLAB codes with communication models in Simulink to implement effective edge-computing models.		
➤ Improved the model to adapt to the Large-scale applications by exploiting and modifying existing OFDM Communication Systems.		
HONORS		
Dean's List (Top 20%)	UIUC	Fall 2023
Scholarship from Zhejiang University (Top 8%)	Zhejiang University	2021-2022, 2022-2023 and 2023-2024 Academic Years
Academic Excellence Award	Zhejiang University	2021-2022, 2022-2023 and 2023-2024 Academic Years
Outstanding Performance in Social Work Award	Zhejiang University	2021-2022 Academic Year
Recognition for Outstanding Performance, 2022 Undergraduate Summer Research Program	Zhejiang University	Summer 2022
Recognition for Academic Poster Exhibition, 2022 Undergraduate Summer Research Program	Zhejiang University	Summer 2022

SKILLS

Programming Languages: Python, C/C++, MATLAB, System Verilog, CUDA, LC-3 assembly
Softwares: Visual Studio Code, Jupyter Notebook, MATLAB, Rhino, Android Studio
Hardwares: 3D Printing, PCB design

EXTRA-CURRICULAR ACTIVITIES

- | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|---------------------------|
| Drone Club | <i>Zhejiang University</i> | September 2021 - now |
| <ul style="list-style-type: none">➤ Collaborated with a diverse team to design and develop an autonomous drone.➤ Led the mechanical group, honing skills in manufacturing drone components using carbon fiber. | | |
| Illinois Space Society | <i>University of Illinois at Urbana-Champaign</i> | September 2023 - May 2024 |
| <ul style="list-style-type: none">➤ Built my own L1 rocket from designing the rocket structure in Open Rocket, modeling and 3D printing the nosecone & fin sets, installing all the parts, and evaluating the functionality to the final launch. | | |