

Hao-Wei (Howard) Liang

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EDUCATION

University of California, Berkeley

Berkeley, CA

M.Eng. in Electrical Engineering and Computer Sciences

Aug. 2023 – May 2024

- Coursework: Digital Integrated Circuit Design, Integrated Circuit Devices

National Taiwan University (NTU)

Taipei, Taiwan

B.S. in Electrical Engineering, GPA: 4.23/4.3, Major: 4.25/4.3

Sep. 2018 – Jan. 2023

- Coursework: Computer-aided VLSI System Design, Digital Integrated Circuit Design, Computer Architecture
FPGA Lab, Electronics, Switching Circuit and Logic Design, Signals and Systems, Algorithms, Machine Learning

EXPERIENCE

Lab for Data Processing Systems

EE Dept., NTU, Taiwan

Undergraduate Research Program, advised by Prof. Yi-Chang Lu

Feb. 2021 – Sep. 2022

- Designed an ASIC accelerator to speed up Monte Carlo (MC) simulations for Heston Model option pricing.
 - Implemented Uniform and correlated/uncorrelated bivariate Gaussian distribution random number generators.
 - Constructed Python functions to visualize/verify the quality of random numbers and the accelerator performance.
 - Designed four-stage pipeline for each of the Heston Model MC core data path to achieve 50x speedup.
- Applied Stochastic Weight Averaging, improving the Pytorch basecaller, Bonito, accuracy from 97.98% to 98.18%.

Energy-Efficient Circuits and Systems Lab

EE Dept., NTU, Taiwan

Undergraduate Research Program, advised by Prof. Tsung-Te Liu

Sep. 2021 – Jan. 2023

- Researched for keyword spotting and digital speech processing on edge devices.
 - Studied and evaluated the pros and cons of various machine learning models for hardware implementation.
 - Assisted in and experienced the TSMC 180nm tape-out flow of the keyword spotting module.
- Built and optimized a Python framework for voice activity detection algorithms simulation and evaluation.

Research Center for Information Technology Innovation

Academia Sinica, Taiwan

Part-Time Research Assistant, advised by Prof. Hsiang-Yun Cheng

Apr. 2022 – Feb. 2023

- Studied and briefed research papers for in-memory and near-memory processing systems.
- Developed near-memory processing architecture for recommendation system training accelerator.
 - Utilized heterogeneous memory hierarchy (HBM and DIMM) to leverage data locality.
 - Proposed to address workload imbalance between processing elements by optimizing data allocation.

PROJECT

Digital Audio Tape Recorder | *System Verilog, FPGA*

Nov. – Dec. 2021

- Constructed a device that records sound using a microphone into SRAM and can play and pause the audio.
- Utilized the IP modules on FPGA such as audio CODEC through I2C and I2S protocol.
- Implemented mode switch, the recorded audio can be switched to fast, slow, and reversed motion at any time.
- Supported basic signal processing filters for the recorded audio.

Image Processing/Displaying Filter | *Verilog, Design Compiler, Innovus*

Jun. – Jul. 2021

- Constructed an ASIC chip that stores the input image in on-chip SRAM and processes it with different operations.
- Supported median filter with zero padding, census transform, and moving or scaling up/down the filtering region.
- Implemented control to display the filtering region in raster-scan order after every operation is completed.
- Applied pipeline design to shorten critical path and improve PPA performance by 30%.

RISC-V Processor | *Verilog, Design Compiler*

May – Jun. 2021

- Constructed a RTL hardware implementation of single cycle RISC-V processor.
- Supported 13 essential instructions including arithmetic operations, branching, and interaction with memory.
- Designed a mult/div module by reusing a 64-bit shift register and a 32-bit add/sub ALU.

ADDITIONAL INFORMATION

Programming Languages: Verilog, System Verilog, Python, C++, MATLAB, RISC-V Assembly

VLSI Related Tools: NC-Verilog, Design Compiler, Innovus, PrimeTime, Virtuosio, SPICE, Lint, EPS

Awards: NTU Dean's List Award (top 5% students in a semester) * 5 semesters

Honor: Graduate Representative (top ten students of four years in NTU EE)