

Cheng-Yu (Mike) Tsai

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Education

Georgia Institute of Technology

Doctor of Philosophy in Electrical and Computer Engineering

- Advisor: Dr. Sung-Kyu Lim

Atlanta, Georgia, USA

Aug. 2024 - current

National Taiwan University

Master of Science in Computer Science and Information Engineering

- Advisor: Dr. Chia-Lin Yang
- Thesis: A Performance Analytical Model for DNN Training with Focus on Memory Subsystem
- Key words: Deep Neural Network, training, bandwidth, cache capacity, analytical model, data reuse

Taipei, Taiwan

Feb. 2019 - Jun. 2021

National Taiwan University

Double degree of B.S.E in Electrical Engineering & B.S. in Computer Science and Information Engineering

- GPA: 3.96/4.3 (3.84/4.0)
- Rank: 49/190 (26%)
- Awarded Presidential Award (semester GPA within top 5%) twice

Taipei, Taiwan

Sep. 2014 - Jan. 2019

Research Interests

- Primary** Electronic Design Automation (EDA), Computer architecture
- Secondary** Software Performance Modeling and Analysis, Computer Network, Distributed Computing, Scientific Computing,

Research Projects

A Performance Analytical Model for DNN Training with Focus on Memory Subsystem

Exploring the tradeoffs between cache capacity and memory bandwidth in DNN workloads

- Devised a software-controlled cache scheme model data reuse across DNN layers in DNN workloads.
- Analyzed tradeoffs between cache capacity and bandwidth in ResNet, MobileNet, GNMT, and Transformer and drew some insights from the experiment results.

MS Thesis

Feb '19 - Jun '21

Standard Cell Delay Calculator

A model to swiftly estimate the delay of a post-layout standard cell (MOS + parasitic R/C)

- More than 10x faster than SPICE transient simulation, 100x faster than bi-section setup time simulation, while maintaining more than 0.9 of correlation coefficient and sub-ps accuracy with SPICE.
- Integrated graph theory, transient pre-characterization, layout dependent effect (LDE) estimation, asymptotic waveform evaluation, calculation on RC network and simplification, etc., into a single program to estimate propagation delay from a detailed standard parasitic format (DSPF) file.

Internal Project at TSMC

Jun '22 - Jul '23

Working Experience

Taiwan Semiconductor Manufacturing Company (TSMC)

Engineer, Custom Design Flow Development Department, Design Technology Platform (DTP), R&D

- Built a **delay calculator**, which takes DSPF as input and calculates the timing within a standard cell. The tool is 10-100x faster than commercial tool without license while maintaining >0.9 correlation.
- Build a **fully automated flow** for process design kit (PDK) quality check, covering pre-sim, layout, LVS, DRC, RCX. 20x speedup is observed than traditional manual flow.
- Designed and maintained an **Automatic Quality Checking (QC) system** that runs specified scripts and generates an HTML report. This system assures developers and managers that the latest code can function as expected without them having to run their tests.
- Related tools: Virtuoso, HSPICE, Calibre, Custom Compiler, IC Validator, Innovus, StarRC, ADE, PrimeWave

Hsinchu, Taiwan

Jul. 2021 - Jul. 2024

National Taiwan University

Taipei, Taiwan

Part-time worker, Division of Network Management, Computer & Information Networking Center

Apr. 2018 - Jan. 2021

- Built and maintained **VisQWL**: a Visualization framework for monitoring the Quality of campus-wide WireLess service. The heat map can easily pinpoint the hot spot of Wi-Fi usage, guide the system administrators about resource arrangement, and provide a tool to deal with user complaints.
- Skills: SNMP, Kibana, Elasticsearch, data visualization, wireless network, map data processing
- The work was published in a regional conference TANet30, and is online serving at <https://ccnet.ntu.edu.tw/wireless/> (Chinese only)

Teaching Experience

Computer Architecture

National Taiwan University

Three-credit mandatory course for third-year undergraduate students

Fall '19 and Fall '20

- Offering a Verilog training lecture to enable students to be capable of working on their projects
- Introducing Verilog projects, clarifying students' confusion throughout the process, and grading their projects upon submission
- Drafting midterm and final exams and grading them
- Offering office hours for students to ask questions
- Setting up presentation and video recording devices for the lecturer

Honors & Awards

2024 **DTP Best Patent Award**, TSMC

Hsinchu, Taiwan

2022 **DTP Outstanding Procedure Innovation Award**, TSMC

Hsinchu, Taiwan

2016 **Presidential Award**, National Taiwan University

Taipei, Taiwan

2015 **Presidential Award**, National Taiwan University

Taipei, Taiwan

Extracurricular Activities & Leadership & Teaching

Equipment Team, NTU Tainan Alumni Association (TAA)

Taipei, Taiwan

Long-term Support and Senior Consultant/Leader

Jul. 2015 - Apr. 2021

- This team is responsible for all the hardware for hosting stage performances. The equipment comes in four major fields: stage lighting, public address (PA) system, photography, and video recording.
- Having mastered all four fields, I coordinated the crew assigned with various responsibilities and made sure they could 1) have smooth communication with performers before the event, 2) set up the equipment within often tight time budget, and 3) correctly operate the devices to meet the performers' requirements.
- Leading and training the staff of this team whose personnel is replenished on a yearly basis. My apprentices span over 6 generations
- Designed technical lectures and hands-on training to teach newcomers so that they can work independently during real events. I have taught at least 10+ lectures in this group.
- Built up a sustainable lecture and training framework that can be passed down for generations even after I left NTU
- I have a series of documentary videos on this team in my YouTube channel

NTU Public Address (PA) Team

Taipei, Taiwan

Network Administrator and Director of Equipment

Sep. 2017 - Aug. 2018

- Built a radius server so that the shared Wi-Fi could be more secure, manageable, and traceable.
- Enhanced the logging system to better handle network security events.
- Managing, maintaining, and purchasing new equipment for this team
- Taught 7 lectures, including "Decibel and Phase" (3 times), "Introduction to the Systems in the Auditorium", "Introduction to the Network System of PA Team", "Introduction to X32 (a digital mixer)", "Introduction to Photography"

NTUEE badminton department team

Taipei, Taiwan

Coach

Sep. 2017 - Jan. 2021

- Taught new members badminton skills and served balls to them.
- Taught experienced members tactics about the plays and pointed out their weaknesses and possible ways of improvement.

Night of NTU Tainan Alumni Association

Taipei, Taiwan

Event General Coordinator

Oct. 2015 - Mar. 2016

- Ranked as one of the top three nights in NTU, famous for its high-quality drama, this event consists of about 80 drama performers, 20 dancers, and 70 workers. I was one of the three highest leaders of this event.
- The main responsibility was to arrange resources and the schedule to ensure the event could be held successfully