Vincent **Pei-Huan Tsai**

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Research Interests

- **Computer Architecture & System Design**
- **Electronic Design Automation**

Summary

- **3 research experiences targeting publication during undergraduate study.**
- **2 international Electronic Design Automation (EDA) competition experiences with awards.**
- **Excellent academic performance (ranked 2nd/196 in the department).**

Education

National Taiwan University (NTU) *Taipei, Taiwan*

B.S. Electrical Engineering (EE) *Sep. 2018 - Jun. 2022*

- **GPA:** overall: 4.27/4.30, major: 4.27/4.30, ranking: 2/196 (Top 1%).
- **Selected Graduate Courses:** Machine Learning (A+), Physical Design for Nanometer ICs (A+), Advanced Topics in Software Systems Design and Implementation (A+), Convex Optimization (A+).
- **Selected Undergraduate Courses:** Algorithms (A+), Systems Programming (A+), Operating Systems (A+), Computer Networks (A+), Computer Architecture (A+), Integrated Circuit Design (A+).

Publications (* indicates equal contribution)

- Jhen-Syuan Wu*, **Pei-Huan Tsai***, and Chung-Wei Lin, "A Verification Methodology for Compatibility of Autonomous Lane-Changing Hybrid Systems," *IEEE/IFIP International Conference on Dependable Systems and Networks 2023*, Under review.
- Pan-Yang Su*, **Pei-Huan Tsai***, Yu-Kang Lin*, and Hung-Yu Wei, "Valuation-Aware Federated Learning: An Auction-Based Approach for User Selection," *IEEE Vehicular Technology Conference 2022-Fall*.

Research Experience

Undergraduate Researcher, Cyber-Physical Systems Lab, Prof. Chung-Wei Lin

Lane Changing Compatibility Checking *Nov. 2021 - Present*

- Designed an algorithm framework for lane changing compatibility verification, checking compatibility issues of current vehicle controllers.
- **First-author paper** submitted to IEEE/IFIP International Conference on Dependable Systems and Networks 2023.

Undergraduate Researcher, IRIS Lab, Prof. Hui-Ru Jiang

Timing Calculation Engine Development *Sep. 2020 - Sep. 2021*

- Implemented RC reduction algorithm and accelerated the timing calculation process by a factor of two.
- **Awarded No. 2 in 2021 ACM TAU Timing Contest.**

MCMM Timing Engine Development *Sep. 2021 - Present*

- Develop an algorithm framework for multi-corner multi-mode timing calculation.
- Devise an effective scheduling algorithm and a data structure for information sharing.

Undergraduate Researcher, Wireless and Mobile Network Lab, Prof. Hung-Yu Wei

Mechanism Design of Network Resource Allocation Using Game Theory *Jan. 2022 - Oct. 2022*

- Utilized mechanism design to select users for the central server in federated learning.
- **First-author paper** presented at 2022 IEEE 95th Vehicular Technology Conference.

Undergraduate Researcher, Electronic Design Automation Lab, Prof. Yao-Wen Chang

Algorithmic Design and Optimization for Placement & Routing *Feb. 2021 - Nov. 2021*

- Participated in International Conference on Computer-Aided Design (ICCAD) 2021 CAD Contest Problem B: Routing with Cell Movement Advanced with a **pure-undergraduate team** (where most teams consist of graduate students).
- **Top 10 in the world and No. 1 in Taiwan** for International Conference on Computer-Aided Design (ICCAD) 2021 CAD Contest Problem B: Routing with Cell Movement Advanced.

Working Experience

Software Engineering Intern, Cadence, Inc. *Hsinchu, Taiwan*
Error Pattern Rectification *July. 2022 - Sep. 2022*
- Devised and implemented a fast engineering change order (ECO) method to improve the current tool.
- Achieved **more than 100% speedup with better results** in some cases compared with Cadence's ECO tool.

Teaching Assistant, NTU, Algorithms *Taipei, Taiwan*
Student Mentoring *Mar. 2022 - Jun. 2022*
- Co-designed one programming assignment for the course.
- Implemented an auto-grading script to grade programming assignment scores of 73 students.
- Lectured 4 recitation classes (including midterm/final exam reviews).

Research Assistant Internship, Academia Sinica, Prof. Wen-Lian Hsu *Taipei, Taiwan*
Sentence Reduction and Text Summarization *Jun. 2020 - Sep. 2020*
- Devised an algorithm for sentence reduction and explored its application on text summarization.

Honors & Awards

2019-2022 **Dean's List Award (6 times)**. Awarded to students with top 5% GPA each semester.

2021 **Top 10 for International Conference on Computer-Aided Design (ICCAD) 2021 CAD Contest Problem B**.

2021 **No. 2 for 2021 ACM TAU Timing Contest**.

2021 **NTUEE-1975 Innovation and Entrepreneurship Fund**. Awarded to students with outstanding research performance or extraordinary competition results each year.

2021 **Irving T. Ho Memorial Scholarship**. Awarded to 3-5 outstanding NTUEE students each year.

2020 **NTUEE60 Scholarship**. Awarded to 2 outstanding NTUEE students each year.

2019 **Pan Wen Yuan Foundation Scholarship**. Awarded to 3 outstanding NTUEE students each year.

Selected Projects

An Exploration of DLL Hijacking (Python)
Final Project of Introduction to Information Security Course [*demo*] *Jun. 2021*
- Explored a method of planting Trojan Virus in video games, and proposed several defending approaches.

Fixed-outline Floorplanning (C++)
Homework of Physical Design for Nanometer ICs Course [*code*] *Spring 2021*
- Designed and implemented floorplanning algorithms, and **performed the best in the graduate course** (rank: 1/53).

Universal Joystick (C)
Final Project of Electrical Engineering Lab (Embedded System) Course [*code*][*demo*] *Spring 2022*
- Designed and implemented a game joystick with gesture control in ARM Mbed OS.

Skills

- **Programming Languages:** C/C++, Python, MATLAB, Verilog, Assembly.
- **Development Tools:** Git, Docker.

Extracurricular Activities

Volunteer, Taipei Municipal Minzu Junior High School *Taipei, Taiwan*
Student Mentoring *Mar. 2020 - Apr. 2020*
- Tutored one student for his homework and tests.
- Prepared student for his vocational high school admission test.