Kai-Chun (Kevin) Chang

https://kevinchang73.github.io
kevin.kaichun.chang@gmail.com
Kai-Chun (Kevin) Chang | kevinchang73

Research Interests

My main research interest lies in the design, modeling, verification, and safety of **cyber-physical systems (CPS)**, especially for (but not limited to) the application to **autonomous vehicles** and **transportation systems**. I am also interested in **electronic design automation (EDA)**, with a focus on timing analysis and optimization, physical design optimization, and machine learning for EDA.

Education

National Taiwan University (NTU) *Taipei, Taiwan*
B.S. in Electrical Engineering (EE) *Sep. 2018 – June 2022*

- Cum. GPA: **4.26/4.30**, last-60-credits GPA: **4.28/4.30**, major GPA: **4.25/4.30**, ranking: **4/196 (2%)**
- **CPS/EDA** related courses (all with an **A+** grade): Introduction to Intelligent Vehicles (ranked **No. 1** in the class), Introduction to EDA, Physical Design for Nanometer ICs, Logic Synthesis and Verification, Computer-Aided VLSI System Design
- **Algorithms/Mathematics** Courses (all with an **A+** grade): Algorithms (ranked **No. 1** in the class), Data Structure, Data Structure and Programming, Convex Optimization, Discrete Mathematics, Differential Equation, Signals and Systems

Publications

[1] **Kevin Kai-Chun Chang**, Xiangguo Liu, Chung-Wei Lin, Chao Huang and Qi Zhu, "A Safety-Guaranteed Framework for Neural-Network-Based Planners in Connected Vehicles under Communication Disturbance", submitted to *Design, Automation and Test in Europe Conference (DATE)*, April 2023

[2] **Kevin Kai-Chun Chang**, Chun-Yao Chiang, Pei-Yu Lee, and Iris Hui-Ru Jiang, "Timing Macro Modeling with Graph Neural Networks", in *Proceedings of 59th Design Automation Conference (DAC)*, July 2022

Research Experience

IRIS Lab (Prof. Iris Hui-Ru Jiang) *Taipei, Taiwan*
Research Assistant *Sep. 2022 – Present*
Undergraduate Researcher *July 2020 – Aug. 2022*

- Proposed a novel timing macro modeling approach based on graph neural networks (GNNs), which achieved **10% macro model size improvement** in comparison with the state-of-the-art work while preserving extremely high timing accuracy (**less than 0.1ps timing error**). *[DAC'22]*
- Incorporating the correlations between design corners and extending the GNN-based framework to various advanced node timing analysis and multi-corner multi-mode (MCMM) models.

Laboratory of Prof. Chung-Wei Lin *Taipei, Taiwan*
Research Assistant *Sep. 2022 – Present*
Undergraduate Researcher *Jan. 2022 – Aug. 2022*

- Working with Professors Qi Zhu (Northwestern University) and Chao Huang (Liverpool University).
- Proposing a safety-guaranteed framework for NN-based planners in connected vehicle environments, which achieves **100% safe rate** under communication disturbance while remaining high efficiency.

Honors and Awards

1st Place in Bachelor's Thesis Award – NTU *July 2022*
College Student Research Creativity Award – National Science and Technology Council (Taiwan) *July 2022*
Travel Grant to DAC 2022 – Foundation for the Advancement of Outstanding Scholarship *July 2022*
Academic Excellence Award (5 times) – EE Dept. at NTU *Fall '18 – Fall '21*
Irving T. Ho Memorial Scholarship – EECS College at NTU *Fall 2021*
Research Grant for College Students – National Science and Technology Council (Taiwan) *July '21 – Feb '22*
3rd Place in Special Research Project Award – EE Dept. at NTU *July 2021*
Bachelor Scholarship – Taiwan Semiconductor Manufacturing Co., Ltd. (TSMC) *Spring 2021*

Service

Journal Reviewer – IEEE TCAD (2021, 2022)

Conference Reviewer – ASP-DAC (2022), ISPD (2022, 2023)

Work Experience

Synopsys, Inc. *Taipei, Taiwan*
Technical-Engineering Intern in Digital Design Group *July 2021 – Aug. 2021*

- Provided a thorough analysis on 3D IC routing strategies that effectively guides the development of related tools in the world-leading EDA company.

EE Dept. at NTU *Taipei, Taiwan*
Teaching Assistant *Feb. 2021 – June 2021*

- **Algorithms** (EE4033): Lectured 4 recitation classes, graded 6 assignments, and received several positive comments from students on the semester course feedback survey.
- **Computer Architecture** (EE4039): Designed a lab demonstrating memory hierarchy and gave an in-depth lecture about advanced dynamic random-access memory (DRAM) technologies.

Selected Projects

Graph-based Interchange Management *[project link]*
Course Final Project of Introduction to Intelligent Vehicles *Jan. 2022*

- Formulated the highway interchange management problem and converted it into a constraint graph.
- Based on the graph and the simulated annealing, our framework guaranteed safety and outperformed the first-come-first-serve strategy by 10% in terms of the time required for all the vehicles to pass.

Learning Weights and Thresholds of Threshold Logic Networks *[project link]*
Course Final Project of Logic Synthesis and Verification *Jan. 2022*

- Proposed two neural-network-based approaches, the function-based method and the network-based method, to determine weights and thresholds of a threshold logic network with given input-output relations.
- Achieved near 80% accuracy in the function-based method and 70% to 90% accuracy in the network-based method.

Macro Legalization *[project link]*
Course Final Project of Physical Design for Nanometer ICs *Jun. 2021*

- Proposed a graph-based macro legalization algorithm flow which combines iterative refinement and simulated annealing.
- Ranked No.1 in the final report writing.

Technical Skills

Programming: C/C++(STL), Python, Tcl/Tk, Verilog, Go

Developer Tools: Git, Docker, LaTex

Leadership and Volunteer Activities

MakeNTU *[website] Taipei, Taiwan*
General Coordinator *Oct. 2020 – May 2021*

- Led 100+ staffs and managed over 1 million NTD budget to hold MakeNTU, one of the largest Makeathon contests in Taiwan.
- Designed multiple plans to meet sponsors' requirements, remain within budget, and even adapt to COVID-19 precaution policies.

NTU Changhua Family Service Camp *Changhua, Taiwan*
General Coordinator *Aug. 2019 – Jan. 2020*

- Led 60+ volunteers to hold a winter camp for 80 students from a rural elementary school in our hometown.