JING MAI

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Ph.D. Candidate ◇ School of Computer Science ◇ Peking University

RESEARCH INTERESTS

- Optimization methods for ASIC designs. [DAC'25, ISPD'25, ICCAD'24, ASP-DAC'23]
- Modeling and Optimization for FPGA CAD. [ISEDA'24, TCAS-I'24, ASICON'23, ASP-DAC'23, TCAD'23, JEIT'23, DAC'22]
- GPU-assisted methods for physical design. [DAC'21]

EDUCATION

Peking University **Sept. 2021 – Present**
Ph.D. student at School of Computer Science Beijing, China
Supervisor: Prof. Yibo Lin

Chinese University of Hong Kong (CUHK) **Sept. 2020 – June 2021**
Visiting Student at Department of Computer Science and Engineering Hong Kong, China
Topics: Electrostatics-based global placement for FPGAs
Supervisor: Prof. Bei Yu

Peking University **Sept. 2017 – June 2021**
B.Sc. in Computer Science, Outstanding Undergraduate Graduates in Beijing (top %1) Beijing, China
Experience: Student Cluster Competition team of Peking University (2019 – 2021)

PUBLICATIONS

Refereed Conference Papers

[C1] **RUPlace: Optimizing Routability via Unified Placement and Routing Formulation.**
Yifan Chen, **Jing Mai**, Zuodong Zhang, Yibo Lin.
Design Automation Conference ***(DAC 2025)***.

[C2] **LEGALM: Efficient Legalization for Mixed-Cell-Height Circuits with Linearized Augmented Lagrangian Method.**
Jing Mai, Chunyuan Zhao, Jinwei Chen, Zuodong Zhang, Zhixiong Di, Yibo Lin, Runsheng Wang, and Ru Huang.
International Symposium on Physical Design ***(ISPD 2025)***.

[C3] **MORPH: More Robust ASIC Placement for Hybrid Region Constraint Management.**
Jing Mai, Zuodong Zhang, Yibo Lin, Runsheng Wang, and Ru Huang.
International Conference on Computer-Aided Design ***(ICCAD 2024)***. [paper] [slides]

[C4] **OpenPARF 3.0: Robust Multi-Electrostatics Based FPGA Macro Placement Considering Cascaded Macros Groups and Fence Regions.**
Jing Mai, Jiarui Wang, Yifan Chen, Zizheng Guo, Xun Jiang, Yun Liang, and Yibo Lin.
International Symposium of Electronics Design Automation ***(ISEDA 2024, Best Paper Award)***. [paper] [slides]

[C5] **OpenPARF: An Open-Source Placement and Routing Framework for Large-Scale Heterogeneous FPGAs with Deep Learning Toolkit.** (**Invited Paper**)
Jing Mai*, Jiarui Wang*, Zhixiong Di, Guojie Luo, Yun Liang and Yibo Lin.
International Conference on ASIC ***(ASICON 2023)***. [paper] [slides] [code]

[C6] **A Robust FPGA Router with Concurrent Intra-CLB Rerouting**.
Jiarui Wang, **Jing Mai**, Zhixiong Di, Yibo Lin.
Asia and South Pacific Design Automation Conference ***(ASP-DAC 2023)***. [paper] [slides]

[C7] **MacroRank: Ranking Macro Placement Solutions Leveraging Translation Equivariancy**.
Yifan Chen, **Jing Mai**, Xiaohan Gao, Muhan Zhang, Yibo Lin.
Asia and South Pacific Design Automation Conference ***(ASP-DAC 2023)***. [paper] [slides]

[C8] **Multi-Electrostatic FPGA Placement Considering SLICEL-SLICEM Heterogeneity and Clock Feasibility**.
Jing Mai, Yibai Meng, Zhixiong Di, Yibo Lin.
Design Automation Conference ***(DAC 2023)*** [paper] [slides]

[C9] **Ultrafast CPU/GPU Kernels for Density Accumulation in Placement**.
Zizheng Guo*, **Jing Mai***, Yibo Lin.
Design Automation Conference ***(DAC 2021)*** [paper]

Journal Papers

[J1] **A Robust FPGA Router with Optimization of High-Fanout Nets and Intra-CLB Connections.**
Xun Jiang, Jiarui Wang, **Jing Mai**, Zhixiong Di, and Yibo Lin.
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems ***(TCAD 2024)***. [paper]

[J2] **LEAPS: Topological-Layout-Adaptable Multi-Die FPGA Placement for Super Long Line Minimization.**
Zhixiong Di, Runzhe Tao, **Jing Mai**, Lin Chen, Yibo Lin.
IEEE Transactions on Circuits and Systems I: Regular Papers ***(TCAS-I 2024)***. [paper]

[J3] **Multi-Electrostatic FPGA Placement Considering SLICEL-SLICEM Heterogeneity, Clock Feasibility, and Timing Optimization**.
Jing Mai, Jiarui Wang, Zhixiong Di, Yibo Lin.
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems ***(TCAD 2023)***. [paper]

[J4] **OpenPARF: An Open-Source Placement and Routing Framework for Large-Scale Heterogeneous FPGAs with Deep Learning Toolkit.**
Jing Mai*, Jiarui Wang*, Zhixiong Di, Yibo Lin.
Journal of Electronics and Information Technology ***(JEIT 2023)***.

[J5] **Critique of "Planetary Normal Mode Computation: Parallel Algorithms, Performance, and Reproducibility" by SCC Team From Peking University.**
Yihua Cheng, Zejia Fan, **Jing Mai**, Yifan Wu, Pengcheng Xu, Yuxuan Yan, Zhenxin Fu, Yun Liang.
IEEE Transactions on Parallel and Distributed Systems ***(TPDS 2021)***.

Book Chapters

[B1] **Deep Learning Framework for Placement, Machine Learning Applications in Electronic Design Automation.** (**Invited Book Chapter**)
Yibo Lin, Zizheng Guo and **Jing Mai**
Springer, 2023, edited by Haoxing Ren and Jiang Hu.

(denotes alphabetical ordering or equal contribution)*

PROFESSIONAL EXPERIENCE

Research Intern at ByteDance AML — June 2024 – Present
Topics: Code generation and autogpt applications with large language models — Beijing, China
Mentor: Liang Xiang & Rui Long

AWARDS

- ACM SIGDA CADathlon Contest at ICCAD 2024 (Olympic games of EDA), First Place — Oct 2024
- IEEE/ACM MLCAD 2023 FPGA Macro-Placement Contest, Second Place — Sept 2023
- EDA Elite Challenge **EDA 设计精英挑战赛**, Second Prize — Dec 2021
- Beijing Challenge Cup Competition **北京市挑战杯**, Second Prize — May 2021
- The 43rd ACM-ICPC Asia Regional Competition, Gold Award — Oct 2018

HONORS

- Honors for Merit Student **三好学生**, *Peking University* — Sept 2023
- Ubiquant Scholarship **九坤奖学金** (top 15%) — Sept 2023
- Industry Contribution Award **产业贡献奖**, *Department of Design Automation and Computer System* — April 2023
- Honors for Outstanding Undergraduate Graduates in Beijing **北京市优秀毕业生** (top 1%) — May 2021
- Honors for Outstanding Undergraduate Graduates in Peking University **北京大学优秀毕业生** — May 2021
- Xiaomi Scholarship **小米奖学金** — Dec 2020
- Honors for Merit Student **三好学生**, *Peking University* (top 5%) — Dec 2020
- Honors for Merit Student **三好学生**, *Peking University* (top 5%) — Dec 2019
- Honors for Outstanding Academic Performance **优秀科研奖**, *Peking University* — Dec 2018

OPEN-SOURCE CONTRIBUTION

OpenPARF [code] Sept. 2021 – Present
PKU-IDEA Group, advised by Prof. Yibo Lin Beijing, China
• An SOTA open-source placement and routing framework for large-scale heterogeneous FPGAs with deep learning toolkit `PyTorch`.

INVITED TALKS

• *Modeling and Robust Optimization of Placement Problems under Complex Constraints* Cadence Inc. Aug. 2024

SOCIAL ACTIVITIES

• Associate captain of the ice hockey team *Fire kirin* 火麒麟 in Peking University 2023 – 2024
• Staff of the ACM-ICPC World Final 2018

SKILLS

Programming Languages and Softwares
C/C++, Python, Pytorch, Go, LaTeX, Git, Docker, Data Analysis/Visualization(Pandas), JavaScript/HTML
Machine Learning and GPU
PyTorch, JAX, CUDA, XLA, MLIR, Triton
Languages
Mandarin, Cantonese, English, Japanese
hobbies
Ice hockey, Badminton

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