HAOYU YANG

Sr. Research Scientist⋄ NVIDIA Corp.
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RESEARCH INTERESTS

- AI for Semiconductor Manufacturing
- Large AI Model Optimization
- High Performance VLSI Physical Design with Parallel Computing
- Machine Learning Security

EDUCATION

The Chinese University of Hong Kong, Shatin, N.T., Hong Kong *Aug. 2016 – Jul. 2020*
Ph.D, Department of Computer Science and Engineering
(GPA 3.8/4.0)

Tianjin University, Tianjin, P.R.China *Sep. 2011 – Jul. 2015*
B.S., Qiushi Honors Collage
(GPA 88.2/100)

National Tsinghua University, Taiwan *Sep. 2012 – Feb. 2013*
Visiting Student, Department of Electronic Engineering
(Grade A)

EXPERIENCE

NVIDIA Corp., Austin, TX *July. 12 2021 –*
11001 Lakeline Blvd #100, Austin, TX, 78717
Sr. Research Scientist
Research on AI semiconductor manufacturing, large machine learning model optimization and CUDA accelerated EDA.
Intern Mentorship: Mingjie Liu (UT Austin, 2022), Zhengqi Gao (MIT, 2023)

Cadence Design Systems, San Josè, CA *Mar. 22 2021 – July. 9 2021*
2655 Seely Ave, San Jose, CA 95134
Lead Software Engineer
Research and development on congestion aware placement algorithms.
Project: 2.5D Padding for congestion-aware global placement.

The Chinese University of Hong Kong, N.T., Hong Kong *Sept. 14 2020 – Mar. 1 2021*
Postdoctoral Fellow
Research on machine learning algorithms for VLSI design manufacturability, parallel computing and adversarial machine learning. Publish on top conferences and journals.
Project: Layout pattern generation, arithmetic logic detection, standard cell legalization

SELECTED AWARDS AND HONORS

- **Best Poster Award of Student Research Forum**
  By Asia and South Pacific Design Automation Conference, 2019, TOP3.
- **Nick Cobb Scholarship**
  By SPIE and Mentor Graphics, 2019, Worldwide *Solo Winner* for the contributions to VLSI lithography research.
- **Ph.D Studentship**
  By Chinese University of Hong Kong, 2016-2020.
- **The 3rd place in National Integrated Circuit Design**
  By Beijing Electronic Committee, 2014.
- **Merit Student, Excellent Graduate, Excellent dissertation**
  By Tianjin University, 2015.

PUBLICATIONS

Book Chapters

[B1] **Haoyu Yang**, Yibo Lin, Bei Yu, "Machine Learning for Mask Synthesis and Verification", in Machine Learning Applications in Electronic Design Automation, Springer, 2022.

Journal Papers

[J17] Xiaoxiao Liang, Yikang Ouyang, **Haoyu Yang**, Bei Yu, Yuzhe Ma, "RL-OPC: Mask Optimization with Deep Reinforcement Learning", accepted by IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**).

[J16] Ziyi Wang, Zhuolun He, Chen Bai, **Haoyu Yang**, Bei Yu, "Efficient Arithmetic Block Identification with Graph Learning and Network-flow", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 42, no. 08, pp. 2591–2603, 2023.

[J15] **Haoyu Yang**, Shuhe Li, Wen Chen, Piyush Pathak, Frank Gennari, Ya-Chieh Lai and Bei Yu, "DeePattern: Layout Pattern Generation with Transforming Convolutional Auto-Encoder", IEEE Transactions on Semiconductor Manufacturing (**TSM**), vol. 35, no. 1, pp. 67–77, 2022. (Best Paper Award)

[J14] Guojin Chen, Wanli Chen, Qi Sun, Yuzhe Ma, **Haoyu Yang**, Bei Yu, "DAMO: Deep Agile Mask Optimization for Full Chip Scale", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 41, no. 9, pp. 3118–3131, 2022.

[J13] Hao Geng, **Haoyu Yang**, Lu Zhang, Jin Miao, Fan Yang, Xuan Zeng, Bei Yu, "Hotspot Detection via Attention-based Deep Layout Metric Learning", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 41, no. 8, pp. 2685–2698, 2022.

[J12] Wei Zhong, Shuxiang Hu, Yuzhe Ma, **Haoyu Yang**, Xiuyuan Ma, Bei Yu, "Deep Learning-Driven Simultaneous Layout Decomposition and Mask Optimization", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 41, no. 3, pp. 709–722, 2022.

[J11] Guyue Huang, Jingbo Hu, Yifan He, Jialong Liu, Mingyuan Ma, Zhaoyang Shen, Juejian Wu, Yuanfan Xu, Hengrui Zhang, Kai Zhong, Xuefei Ning, Yuzhe Ma, **Haoyu Yang**, Bei Yu, Huazhong Yang, Yu Wang, "Machine Learning for Electronic Design Automation: A Survey", ACM Transactions on Design Automation of Electronic Systems (**TODAES**), vol. 25, no. 5, 2021.

[J10] **Haoyu Yang**, Wei Zhong, Yuzhe Ma, Hao Geng, Ran Chen, Wanli Chen, Bei Yu, "VLSI Mask Optimization: From Shallow To Deep Learning", Integration, the VLSI Journal, vol. 77, Mar., pp. 96–103, 2021.

[J9] Haocheng Li, Satwik Patnaik, Abhrajit Sengupta, **Haoyu Yang**, Johann Knechtel, Bei Yu, Evangeline F.Y. Young, Ozgur Sinanoglu, "Deep Learning Analysis for Split Manufactured Layouts with Routing Perturbation", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 40, no. 10, pp. 1995–2008, 2021.

[J8] Ran Chen, Wei Zhong, **Haoyu Yang**, Hao Geng, Xuan Zeng, Bei Yu, "Faster Region-based Hotspot Detection", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 41, no. 3, pp. 669–680, 2022.

[J7] **Haoyu Yang**, Shuhe Li, Cyrus Tabery, Bingqing Lin and Bei Yu, "Bridging the Gap Between Layout Pattern Sampling and Hotspot Detection via Batch Active Learning", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 40, no. 7, pp. 1464–1475, 2021.

[J6] Kang Liu, **Haoyu Yang**, Yuzhe Ma, Benjamin Tan, Bei Yu, Evangeline F. Y. Young, Ramesh Karri, Siddharth Garg, "Are Adversarial Perturbations a Showstopper for ML-Based CAD? A Case Study on CNN-Based Lithographic Hotspot Detection", ACM Transactions on Design Automation of Electronic Systems (**TODAES**), vol. 25, no. 5, 2020.

[J5] Hao Geng, Wei Zhong, **Haoyu Yang**, Yuzhe Ma, Joydeep Mitra and Bei Yu, "SRAF Insertion via Supervised Dictionary Learning", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 39, no. 10, pp. 2849-2859, 2020.

[J4] **Haoyu Yang**, Shuhe Li, Zihao Deng, Yuzhe Ma, Bei Yu and Evangeline F. Y. Young, "GAN-OPC: Mask Optimization with Lithography-guided Generative Adversarial Nets", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 39, no. 10, pp. 2822-2834, 2020.

[J3] **Haoyu Yang**, Jing Su, Yi Zou, Yuzhe Ma, Bei Yu, Evangeline F. Y. Young, "Layout Hotspot Detection with Feature Tensor Generation and Deep Biased Learning", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 38, no. 6, pp. 1175-1187, 2019.

[J2] **Haoyu Yang**, Luyang Luo, Jing Su, Chenxi Lin and Bei Yu, "Imbalance Aware Lithography Hotspot Detection: A Deep Learning Approach", Journal of Micro/Nanolithography, MEMS, and MOEMS (JM3), 16(3), 033504, 2017.

[J1] Zaifeng Shi, **Haoyu Yang**, Wenxiang Cong and Ge Wang, "An Edge-on Charge-transfer Design for Energy-resolved X-ray Detection", Physics in Medicine and Biology, 61(11):4183-4200, 2016.

Conference Papers

[C31] Tao Zhang, **Haoyu Yang**, Kang Liu, Zhiyao Xie, "APPLE: An Explainer of ML Predictions on Circuit Layout at the Circuit-Element Level", IEEE/ACM Asian and South Pacific Design Automation Conference (**ASPDAC**), Incheon, Jan 22-25, 2024.

[C30] Su Zheng, **Haoyu Yang**, Binwu Zhu, Bei Yu, Martin D.F. Wong, "LithoBench: Benchmarking AI Computational Lithography for Semiconductor Manufacturing", Neural Information Processing Systems (**NeurIPS**), New Orleans, Dec. 10–16, 2023.

[C29] Mingjie Liu, **Haoyu Yang**, Brucek Khailany, Haoxing Ren, "An Adversarial Active Sampling-based Data Augmentation Framework for AI-Assisted Lithography Modeling", IEEE/ACM International Conference on Computer-Aided Design (**ICCAD**), San Francisco, CA, Oct 29- Nov 2, 2023.

[C28] Guojin Chen, Zehua Pei, **Haoyu Yang**, Yuzhe Ma, Bei Yu, Martin Wong, "Physics-Informed Optical Kernel Regression Using Complex-valued Neural Fields", ACM/IEEE Design Automation Conference (**DAC**), San Francisco, CA, July 09-13, 2023.

[C27] Guojin Chen, **Haoyu Yang**, Bei Yu, "GPU Accelerated Matrix Cover Algorithm for Multiple Patterning Layout Decomposition", SPIE Intl. Symp. Advanced Lithography Conference, San Jose, Feb. 26–Mar. 02, 2023.

[C26] **Haoyu Yang**, Haoxing Ren, "Enabling Scalable AI Computational Lithography with Physics-Inspired Models", IEEE/ACM Asian and South Pacific Design Automation Conference (**ASPDAC**), Tokyo, Jan 16-19, 2023.

[C25] Mingjie Liu, **Haoyu Yang**, Zongyi Li, Kumara Sastry, Saumyadip Mukhopadhyay, Selim Dogru, Anima Anandkumar, David Pan, Brucek Khailany, Haoxing Ren, "An Adversarial Active Sampling-based Data Augmentation Framework for Manufacturable Chip Design", Neural Information Processing Systems ML for Systems Workshop, New Orleans, LA, Dec 3, 2022.

[C24] **Haoyu Yang**, Zongyi Li, Kumara Sastry, Saumyadip Mukhopadhyay, Mark Kilgard, Anima Anandkumar, Brucek Khailany, Vivek Singh, Haoxing Ren, "Generic Lithography Modeling with Dual-band Optics-Inspired Neural Networks", ACM/IEEE Design Automation Conference (**DAC**), San Francisco, CA, June 10–14, 2022.

[C23] **Haoyu Yang**, Kit Fung, Yuxuan Zhao, Yibo Lin, Bei Yu, "Mixed-Cell-Height Legalization on CPU-GPU Heterogeneous Systems", IEEE/ACM Proceedings Design, Automation and Test in Europe (**DATE**), Antwerp, Belgium, Mar 16–23, 2022.

[C22] Zhuolun He, Ziyi Wang, Chen Bai, **Haoyu Yang**, Bei Yu, "Graph Learning-Based Arithmetic Block Identification", IEEE/ACM International Conference on Computer-Aided Design (**ICCAD**), Munich, Germany, Nov 1–4, 2021.

[C21] Xiaopeng Zhang, **Haoyu Yang**, Evangeline F.Y. Young, "Attentional Transfer is All You Need: Technology-aware Layout Pattern Generation", ACM/IEEE Design Automation Conference (**DAC**), San Francisco, CA, Dec 5–9, 2021.

[C20] Yifeng Xiao, Miaodi Su, **Haoyu Yang**, Jianli Chen, Jun Yu, Bei Yu, "Low-Cost Lithography Hotspot Detection with Active Entropy Sampling and Model Calibration", ACM/IEEE Design Automation Conference (**DAC**), San Francisco, CA, Dec 5–9, 2021.

[C19] Wei Li, Guojin Chen, **Haoyu Yang**, Ran Chen, Bei Yu, "Learning Point Clouds in EDA", ACM International Symposium on Physical Design (**ISPD**), Mar. 21-24, 2021.

[C18] **Haoyu Yang**, Shifan Zhang, Kang Liu, Siting Liu, Benjamin Tan, Ramesh Karri, Siddharth Garg, Bei Yu, Evangeline F.Y. Young, "Attacking a CNN-based Layout Hotspot Detector Using Group Gradient Method", IEEE/ACM Asian and South Pacific Design Automation Conference (**ASPDAC**), Tokyo, Jan. 18–21, 2021.

[C17] Hao Geng, **Haoyu Yang**, Lu Zhang, Jin Miao, Fan Yang, Xuan Zeng, Bei Yu, "Hotspot Detection via Attention-based Deep Layout Metric Learning", IEEE/ACM International Conference on Computer-Aided Design (**ICCAD**), Nov. 2–5, 2020.

[C16] Guojin Chen, Wanli Chen, Yuzhe Ma, **Haoyu Yang**, Bei Yu, "DAMO: Deep Agile Mask Optimization for Full Chip Scale", IEEE/ACM International Conference on Computer-Aided Design (**ICCAD**), Nov. 2–5, 2020.

[C15] Wei Zhong, Shuxiang Hu, Yuzhe Ma, **Haoyu Yang**, Xiuyuan Ma, Bei Yu, "Deep Learning-Driven Simultaneous Layout Decomposition and Mask Optimization", ACM/IEEE Design Automation Conference (**DAC**), San Francisco, CA, July 19–23, 2020.

[C14] **Haoyu Yang**, Wen Chen, Piyush Pathak, Frank Gennari, Ya-Chieh Lai, Bei Yu, "Automatic Layout Generation with Applications in Machine Learning Engine Evaluation", ACM/IEEE Workshop on Machine Learning for CAD (MLCAD), Alberta, Canada, Sep. 3–4, 2019.

[C13] **Haoyu Yang**, Wei Zhong, Yuzhe Ma, Hao Geng, Ran Chen, Wanli Chen, Bei Yu, "VLSI Mask Optimization: From Shallow To Deep Learning", IEEE/ACM Asian and South Pacific Design Automation Conference (**ASPDAC**), Beijing, Jan. 13–16, 2020.

[C12] Haocheng Li, Satwik Patnaik, Abhrajit Sengupta, **Haoyu Yang**, Johann Knechtel, Bei Yu, Evangeline F.Y. Young, Ozgur Sinanoglu, "Attacking Split Manufacturing From a Deep Learning Perspective", ACM/IEEE Design Automation Conference (**DAC**), Las Vegas, NV, June 2–6, 2019.

[C11] Ran Chen, Wei Zhong, **Haoyu Yang**, Hao Geng, Xuan Zeng, Bei Yu, "Faster Region-based Hotspot Detection", ACM/IEEE Design Automation Conference (**DAC**), Las Vegas, NV, June 2–6, 2019.

[C10] **Haoyu Yang**, Piyush Pathak, Frank Gennari, Ya-Chieh Lai and Bei Yu, "DeePattern: Layout Pattern Generation with Transforming Convolutional Auto-Encoder", ACM/IEEE Design Automation Conference (**DAC**), Las Vegas, NV, June 2–6, 2019.

[C9] **Haoyu Yang**, Piyush Pathak, Frank Gennari, Ya-Chieh Lai and Bei Yu, "Hotspot Detection Using Squish-net", SPIE Intl. Symp. Advanced Lithography Conference, San Jose, CA, Feb. 24–28, 2019.

[C8] **Haoyu Yang**, Piyush Pathak, Frank Gennari, Ya-Chieh Lai and Bei Yu, "Detecting Multi-Layer Layout Hotspots with Adaptive Squish Patterns", IEEE/ACM Asian and South Pacific Design Automation Conference (**ASPDAC**), Tokyo, Jan. 21–24, 2019.

[C7] Hao Geng, **Haoyu Yang**, Yuzhe Ma, Joydeep Mitra and Bei Yu, "SRAF Insertion via Supervised Dictionary Learning", IEEE/ACM Asian and South Pacific Design Automation Conference (**ASPDAC**), Tokyo, Jan. 21–24, 2019. (Best Paper Award Candidate)

[C6] Hao Geng, **Haoyu Yang**, Xuan Zeng and Bei Yu, "Sparse VLSI Layout Feature Extraction: A Dictionary Learning Approach", IEEE Computer Society Annual Symposium on VLSI, Hong Kong, China, July 9–11, 2018.

[C5] **Haoyu Yang**, Shuhe Li, Yuzhe Ma, Bei Yu and Evangeline F. Y. Young, "GAN-OPC: Mask Optimization with Lithography-guided Generative Adversarial Nets", ACM/IEEE Design Automation Conference (**DAC**), San Francisco, CA, June 24–28, 2018.

[C4] **Haoyu Yang**, Yajun Lin, Bei Yu, Evangeline F. Y. Young "Lithography Hotspot Detection: From Shallow to Deep Learning", IEEE International System-on-Chip Conference (SOCC), Munich, Germany, September 5–8, 2017.

[C3] **Haoyu Yang**, Jing Su, Yi Zou, Bei Yu, Evangeline F. Y. Young "Layout Hotspot Detection with Feature Tensor Generation and Deep Biased Learning", ACM/IEEE Design Automation Conference (**DAC**), Austin, TX, Jun. 18–Jun. 22, 2017.

[C2] **Haoyu Yang**, Luyang Luo, Jing Su, Chenxi Lin, Bei Yu, "Imbalance Aware Lithography Hotspot Detection: A Deep Learning Approach", SPIE Intl. Symp. Advanced Lithography Conference, San Jose, CA, Feb. 26–Mar. 2, 2017.

[C1] Hang Zhang, **Haoyu Yang**, Bei Yu and Evangeline F. Y. Young, "VLSI Layout Hotspot Detection Based on Discriminative Feature Extraction", IEEE Asia Pacific Conference on Circuits & Systems, Jeju, Korea, Oct. 25–28, 2016.

PROFESSIONAL SERVICE

Technical Program Committee

- ACM/IEEE Design Automation Conference (DAC): 2022, 2023
- AAAI Conference on Artificial Intelligence (AAAI): 2023, 2024
- NeruIPS Dataset and Benchmark: 2023

Journal Reviewer

- ACM Transaction on Design Automation of Electronic Systems (TODAES)
- IEEE Transaction on Computer-Aided Design of Integrated Circuits and Systems (TCAD)
- IEEE Transactions on Software Engineering (TOSE)
- IEEE Transaction on Very Large Scale Integration Systems (TVLSI)
- Journal of Micro/Nanolithography, MEMS, and MOEMS (JM3)
- IEEE Transactions on Sustainable Computing (TSUSC)
- IET Cyber-Physical Systems: Theory & Applications
- IEEE ACCESS

Conference Reviewer

- ACM/IEEE Design Automation Conference (DAC)
- ACM International Symposium on Physical Design (ISPD)
- IEEE/ACM International Conference on Computer-Aided Design (ICCAD)
- IEEE/ACM Asia and South Pacific Design Automation Conference (ASPDAC)
- ACM Great Lakes Symposium on VLSI (GLSVLSI)

TECHNICAL SKILLS

Languages	LaTeX, Python, C/C++/CUDA
Operating Systems	Linux/UNIX
Teaching	CENG3420 Computer Organization, CENG4480 Embedded Systems