HAOYU YANG

Sr. Research Scientist⋄ NVIDIA Corp.
11001 Lakeline Blvd #100, Austin, TX, 78717

RESEARCH INTERESTS

- AI/LLM for Semiconductor Manufacturing
- AI/LLM for Design Automation
- High Performance VLSI Physical Design with Parallel Computing
- AI for Multi-Physics Simulation and Inverse Design

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 Research, Austin, TX *July. 12 2021 –*
11001 Lakeline Blvd #100, Austin, TX, 78717
Research Scientist
Lead research effort on AI semiconductor manufacturing, computational lithography, GPU/AI accelerated EDA.
PhD/Research Intern Mentorship:
Mingjie Liu (UT Austin, 2022), Zhengqi Gao (MIT, 2023), Guojin Chen (CUHK, 2024), Yun-Da Tsai (National Taiwan University, 2025), Conner Liu (UT Austin, 2025). All result in impactful research projects with publication in top tier conferences.
Service: Topic Chair and Review Committee for NVIDIA Academic Research Grant, Technical Programme Committee (AAAI, DAC, NeurIPS)
External Collaboration: Arizona State University (Photonic Device and Photonic IC Design Automation), UT Austin (AI for Thermal Deisgn), TSMC, ASML (AI for Computational Lithography), National Taiwan University (LLM-Aided Chip Design)

Cadence Design Systems, San Josè, CA *Mar. 22 2021 – July. 9 2021*
2655 Seely Ave, San Jose, CA 95134
Lead Software Engineer

The Chinese University of Hong Kong, N.T., Hong Kong *Sept. 14 2020 – Mar. 1 2021*
Postdoctoral Fellow

Peking University, Beijing, China *July. 2019 – Oct. 2019*
Research Intern

Cadence Design Systems, San José, CA *July. 2018 – Oct. 2018*
Software Engieering Intern

ASML Brion, San José, CA *Sept. 2017 – Dec. 2017*
Data Scientist Intern

SELECTED AWARDS AND HONORS

- **Best Poster Award of Student Research Forum**
  By Asia and South Pacific Design Automation Conference, 2019, TOP3.
- **Nick Cobb Scholarship**
  10000USD 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.

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

[J18] Pingchuan Ma, **Haoyu Yang**, Zhengqi Gao, Duane S. Boning and Jiaqi Gu, "PIC2O-Sim: A Physics-Inspired Causality-Aware Dynamic Convolutional Neural Operator for Ultra-Fast Photonic Device FDTD Simulation", APL Photonics, Feb 11, 2025.

[J17] Xiaoxiao Liang, Yikang Ouyang, **Haoyu Yang**, Bei Yu, Yuzhe Ma, "RL-OPC: Mask Optimization with Deep Reinforcement Learning", IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (**TCAD**), vol. 43, no. 01, pp. 340–351, 2024.

[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

[C44] **Haoyu Yang**, Haoxing Ren, "Code, Not Canvas: Multi-Agent Layout Generation Beyond Vision Models", IEEE/ACM Asian and South Pacific Design Automation Conference (**ASPDAC**), Hong Kong, Jan 19-22, 2026.

[C43] Hongjian Zhou, **Haoyu Yang**, Gangi Nicholas, Haoxing Ren, Huang Rena, Jiaqi Gu, "Automated Routing-Informed Placement for Large-Scale Photonic Integrated Circuits", ACM/IEEE International Conference on Computer-Aided Design (**ICCAD**), Munich, Germany, Oct 26-30, 2025.

[C42] Cong Jiang, Yujia Wang, Dan Feng, **Haoyu Yang**, Kang Liu, "Generalizable Lithographic Hotspot Detection Using Asynchronous Meta-Learning with Only One Shot", ACM/IEEE Design Automation Conference (**DAC**), San Francisco, CA, June 22-25, 2025.

[C41] Pingchuan Ma, Zhengqi Gao, Meng Zhang, **Haoyu Yang**, Haoxing Ren, Rena Huang, Duane Boning, Jiaqi Gu, "MAPS: Multi-fidelity Ai-augmented Photonic Simulation And Inverse Design Infrastructure", IEEE/ACM Proceedings Design, Automation and Test in Europe (**DATE**), Lyon, France, Mar

31-Apr 2, 2025.

[C40] Pingchuan Ma, Zhengqi Gao, Amir Begovic, Meng Zhang, **Haoyu Yang**, Haoxing Ren, Rena Huang, Duane S. Boning, Jiaqi Gu, "BOSON-1: Understanding and Enabling Physically-Robust Photonic Inverse Design with Adaptive Variation-Aware Subspace Optimization", IEEE/ACM Proceedings Design, Automation and Test in Europe (**DATE**), Lyon, France, Mar 31-Apr 2, 2025.

[C39] **Haoyu Yang**, Qijing Huang, Nathaniel Pinckney, Walker Turner, Wenfei Zhou, Yanqing Zhang, Chia-Tung Ho, Chen-Chia Chang, Haoxing Ren, "ChipVQA: Benchmarking Visual Language Models for Chip Design", IEEE/ACM Proceedings Design, Automation and Test in Europe (**DATE**), Lyon, France, Mar 31-Apr 2, 2025.

[C38] **Haoyu Yang**, Haoxing Ren, "GPU-Accelerated Inverse Lithography Towards High Quality Curvy Mask Generation", ACM International Symposium on Physical Design (ISPD), Austin, TX, Mar 16-19, 2025.

[C37] Guojin Chen, **Haoyu Yang**, Bei Yu, Haoxing Ren, "Intelligent OPC Engineer Assistant for Semiconductor Manufacturing", AAAI Conference on Artificial Intelligence (**AAAI**), Philadelphia, PA, Feb 25-Mar 4, 2025.

[C36] Guojin Chen, **Haoyu Yang**, Haoxing Ren, Bei Yu, David Z. Pan, "Differentiable Edge-based OPC", ACM/IEEE International Conference on Computer-Aided Design (**ICCAD**), Newark, NJ, Oct 27-31, 2024.

[C35] **Haoyu Yang**, Anthony Agnesina, Haoxing Ren, "Optimizing Predictive AI in Physical Design Flows with Mini Pixel Batch Gradient Descent", ACM/IEEE International Symposium on Machine Learning for CAD (MLCAD), Snowbird, UT, Sept 9-11, 2024.

[C34] **Haoyu Yang**, Haoxing Ren, "ILILT: Implicit Learning of Inverse Lithography Technologies", International Conference on Machine Learning (**ICML**), Vienna, Austria, Jul 21-27, 2024.

[C33] Xiaoxiao Liang, **Haoyu Yang**, Kang Liu, Bei Yu, Yuzhe Ma, "CAMO: Correlation-Aware Mask Optimization with Modulated Reinforcement Learning", ACM/IEEE Design Automation Conference (**DAC**), San Francisco, June 23-27, 2024.

[C32] Wei Li, Rongjian Liang, Anthony Agnesina, **Haoyu Yang**, Chia-Tung Ho, Anand Rajaram, Haoxing Ren, "DGR: Differentiable Global Router", ACM/IEEE Design Automation Conference (**DAC**), San Francisco, June 23-27, 2024.

[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.