YINGJIE LI

https://lyj1201.github.io/yingjieli/
(435) 695-3478 ⋄ yingjie.li@utah.edu

EDUCATION & EMPLOYMENT

University of Utah *2020-present*
Ph.D. (candidacy), Computer Engineering (Advisor: Prof. Cunxi Yu)
Research interests: Hardware-software codesign, EDA, machine learning
Cornell University *2018-2019*
M.Eng, Electrical and Computer Engineering
Huazhong University of Science and Technology *2014-2018*
B.S., Electrical and Computer Engineering (Honor)

EMPLOYMENT

NVIDIA Research (upcoming) *Summer 2023*
Research Intern, *ML/RL for EDA*
DELL EMC, Shanghai, China *2019-2020*
Hardware Engineer

AWARDS

American Physics Society DLS Best Poster Honorable Mention (2022)

DAC Young Student Fellow, 2020 (**winning presentation**), 2021, 2022

Outstanding Graduates, Huazhong University of Science and Technology, 2018

PUBLICATIONS

2023

- **Yingjie Li***, Shanglin Zhou*, Cunxi Yu, and Caiwen Ding. *Physics-aware Roughness Optimization for Diffractive Optical Neural Networks.* DAC'2023.
- Nan Wu, **Yingjie Li**, Cong "Callie" Hao, Steve Dai, Cunxi Yu and Yuan Xie. *Gamora: Graph Learning based Symbolic Reasoning for Large-Scale Boolean Networks.* DAC'2023.
- Jiaqi Yin, **Yingjie Li**, Daniel Robinson, Cunxi Yu. *RESPECT: Reinforcement Learning based Edge Scheduling on Pipelined Coral Edge TPUs.* DAC'2023.
- Minhan Lou, **Yingjie Li**, Cunxi Yu, Berardi Sensale-Rodriguez, Weilu Gao. *Effects of interlayer Reflection and Interpixel Interaction in Diffractive Optical Neural Networks.* Optical Letter. Jan 2023.

2022

- Walter Lau Neto, **Yingjie Li**, Pierre-Emmanuel Gaillardon, and Cunxi Yu. *FlowTune: End-to-end Automatic Logic Optimization Exploration via Domain-specific Multi-armed Bandits.* IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD'22).
- **Yingjie Li***, Ruiyang Chen*, Minhan Lou, Jichao Fan, Yingheng Tang, Berardi Sensale-Rodriguez, Cunxi Yu, Weilu Gao. *Physics-aware Complex-valued Adversarial Machine Learning in Reconfigurable Diffractive All-optical Neural Network.* Laser & Photonics Reviews. Vol 16, July 2022. (IF:13.2)

- **Yingjie Li**, Ruiyang Chen, Weilu Gao, and Cunxi Yu. *Physics-aware Differentiable Discrete Codesign for Diffractive Optical Neural Networks.* The International Conference on Computer-Aided Design (ICCAD'22).
- **Yingjie Li**, Minhan Lou, Ruiyang Chen, Jichao Fan, Berardi Sensale Rodriguez, Weilu Gao and Cunxi Yu. *LightRidge: An Agile Co-designing Framework for Diffractive Optical Neural Networks.* First Workshop on Open-Source Computer Architecture Research (OSCAR) held in conjunction with ISCA (ISCA'49), June 2022.
- Ruiyang Chen, **Yingjie Li**, Minhan Lou, Jichao Fan, Yingheng Tang, Berardi Sensale-Rodriguez, Cunxi Yu, Weilu Gao. *Physics-aware Complex-valued Adversarial Machine Learning in Reconfigurable Diffractive All-optical Neural Network.* Conference on Lasers and Electro-Optics (CLEO'22).
- **Yingjie Li**, Ruiyang Chen, Minhan Lou, Jichao Fan, Yingheng Tang, Berardi Sensale-Rodriguez, Cunxi Yu, Weilu Gao. *Invited: Physics-aware Adversarial Machine Learning: An Experimental Study in Diffractive Optical Neural Networks.* 3rd ROAD4NN Workshop @ Design Automation Conference *(DAC'22).* San Francisco, July 2022.
- Jiaqi Yin, **Yingjie Li**, Cunxi Yu. *Combinatorial RL-based Scheduling for Pipelined Edge TPUs.* TinyML Research Symposium 2022 (TinyML'22).

2021

- **Yingjie Li**, Minhan Lou, Ruiyang Chen, Jichao Fan, Berardi Sensale Rodriguez, Weilu Gao and Cunxi Yu. *LightRidge: End-to-end Photonic Compiler Framework for Diffractive Optical Neural Networks.* 2nd ROAD4NN Workshop @ Design Automation Conference *(DAC'21 ROAD4NN).* San Francisco, December 2021.
- **Yingjie Li**, Cunxi Yu. *Late Breaking Results: Physical Adversarial Attacks of Diffractive Deep Neural Networks.* IEEE/ACM 58th Design Automation Conference (DAC'21).
- **Yingjie Li**, Ruiyang Chen, Berardi Sensale Rodriguez, Weilu Gao, and Cunxi Yu. *Multi-task Learning in Diffractive Deep Neural Networks via Hardware-software Co-design.* Spinger Nature *Scientific Reports*, 11, 11013 (2021).
- Walter Lau Neto, Matheus Trevisan Moreira, **Yingjie Li**, Luca Amaru, Cunxi Yu, and Pierre-Emmanuel Gaillardon. *SLAP: A Supervised Learning Approach for Priority Cuts Technology Mapping.* IEEE/ACM 58th Design Automation Conference (DAC'21).

PROJECTS

- **Algorithmic Discovery via Reinforcement Learning for Synthesis and Verification** A series of research works performed on leveraging machine learning techniques in improving and discovery novel algorithms and design flows for synthesis and verification, such as **(1)** domain-specific multi-armed bandits in optimizing synthesis flows as permutation testing problem, which outperforms state-of-the-art baselines at post-routing stages; **(2)** reinforcement learning based imitation learning to discover novel scheduling algorithm at polynomial time complexity but achieve near-optimal solutions (e.g., ILP); **(3)** explainable supervised learning based technology mapping algorithm that outperforms ABC technology mapper; **(4)** DAG-aware synthesis orchestration that explores novel DAG-aware synthesis algorithm design concept to improve both quality-of-results and runtime.

  Publications: *DAC'21, TCAD'22, TinyML'22, DAC'23 (under review)*

- **LightRidge: End-to-end photonic compiler framework for optical neural networks** This work is the first effort in building modern Physics Compiler, specifically, a *photonic compiler* framework to deal with fundamental optical physics and emerging optical computing system emulations(`https:`

//ycunxi.github.io/lightbridge/index.html). It features with a) heterogeneous HPC accelerated physics engines, b) highly versatile and flexible optical physics modelling, c) user-friendly front-end APIs, d) and backend hardware deployment supports. This enables a complete full-stack design and exploration from ML algorithms, to hardware-software codesign and multi-task learning (MTL), finally to the hardware and device level.
Publications: *Nature Scientific Report 2021, ROAD4DNN@DAC21, OSCAR@ISCA22, ASPLOS'23 (under review)*

- **Agile Device-to-System Co-Optimization for Optical Neural Networks** This work realizes quantization with arbitrary digits in Hardware-Software Codesign in Optical Neural Networks. Exploring the best algorithm for Gumbel-Softmax with LightRidge, we can train the model with quantization for the hardware to close the gap between simulation and experiments.
Publication: ICCAD'22, DAC'23 (under review)

- **Physical Adversarial Attacks of Diffractive Deep Neural Networks** To study vulnerability and robustness of optical neural networks, we develop the first adversarial attack formulations over optical physical meanings, and provide a comprehensive analysis of adversarial robustness of D2NNs under practical adversarial threats over optical domains. This is also the first work on analyzing adversarial robustness of complex-valued neural networks.
Publications: *DAC'21, ROAD4NN@DAC'22, LPR'July 2022.*

SERVICES

Reviewer: DAC 2021, ICCAD 2022, DATE 2023, DAC 2023.

Journal Review:
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)
Light: Science & Applications - Nature (LSA)

TEACHING EXPERIENCE

ECE/CS 3700 – Digital System Design, Teaching Assistant, Fall'22, Fall'21

SKILLS

Programming skills: Python, BASH, LaTeX, C/C++

Platforms: Linux (RHEL, Ubuntu)