

YINGJIE LI

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EDUCATION & EMPLOYMENT

University of Utah Doctor of Philosophy, Computer Engineering Advisor: Cunxi Yu	<i>2020-present</i>
DELL EMC, Shanghai, China Hardware Engineer	<i>2019-2020</i>
Cornell University M.Eng, Electrical and Computer Engineering	<i>2018-2019</i>
Huazhong University of Science and Technology B.S., Electrical and Computer Engineering (Honor)	<i>2014-2018</i>

PROJECTS

Quantization in Optical Neural Network with Gumbel_Softmax (NeurIPS 2021):

This work Realizes quantization with arbitrary digits in Hardware-Software Codesign in Optical Neural Network. Exploring the best algorithm for Gumbel_softmax with LightRidge, we can trained the model with quantization for the hardware to close the gap between simulation and experiments.

LightRidge: End-to-end photonic compiler framework for optical neural networks This work proposes the first photonic compiler framework to deal with optical emulation and optical system hardware design. **It features with high-performance kernels optimal GPU, highly versatile and flexible optical physical modelling and user-friendly front-end APIs and back-end hardware deployment supports.** <https://ycunxi.github.io/lightbridge/index.html>

RubikONN: Multi-task Learning with Physics-aware training:

The system will deal with multiple tasks with no hardware cost overhead than system for one task by rotating the implemented layers. Two domain-specific physics-aware training algorithms **RotAgg** and **RotSeq** are proposed to train the rotating hardware system. It can improve the energy and cost efficiency by $4\times$ compared to the state-of-art approaches.

Physical Adversarial Attacks of Diffractive Deep Neural Networks (LBR in 58th DAC):

Explore the adversarial attacks in Optical Neural Networks, with our proposed three attack approaches, the accuracy with the pre-trained D2NNs model on MNIST-10 dataset will degrade a lot from 95.4% to $\leq 20\%$. By defending algorithm, the robustness of the model is improved by more than **400%**.

Real-time Multi-Task Diffractive Deep Neural Networks via Hardware-Software Co-design:

Propose a novel hardware-software codesign which realized a **real-time** multi-task learning without requiring any indication of which ML task is deployed, improve the hardware efficiency by **75%**.

PUBLICATIONS

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. *ROAD4NN@DAC'21*.

Yingjie Li, Weilu Gao, and Cunxi Yu. Rubik's Optical Neural Networks: Multi-task Learning with Physics-aware Training. *NeurIPS 2021*. (under review)

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. *Scientific Reports*.

Yingjie Li, Cunxi Yu. Late Breaking Results: Physical Adversarial Attacks of Diffractive Deep Neural Networks. *DAC'21*. (to appear)