Chenghao Feng

CONTACT INFORMATION

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RESEARCH INTERESTS

Silicon photonics, design, simulation, and testing of photonic integrated circuits (PIC) for digital computing and interconnect, photonic neuromorphic computing

EDUCATION

The University of Texas at Austin, Austin, TX

Ph.D. student, Department of Electrical and Computer Engineering (Aug. 2018-Present)

- Advisor: Ray T. Chen
- Co-advisor: David Z. Pan

Nanjing University, Nanjing, China

B.S. in Physics, (2014-2018)

HONORS AND AWARDS

Provost's International Graduate Excellence Fellowship. UT Austin	2018 - 2021
Zheng Gang Scholarship. Nanjing University	2017
Dalian Institute of Chemical Physics, Chinese Academy of Sciences' Scholarship.	2016
Top-notch Program Scholarship. Nanjing University	2015 - 2017

EXPERIENCE

The University of Texas at Austin, Austin, TX, USA. **August, 2018 - present**

Graduate research assistant

- **Photonic neural chip:** Worked on photonic neural chip tape-out for novel optical neural network(ONN) architectures using Advanced Micro Foundry (AMF); collaborated on the full-stack schematic design, layout, validation, tape-out of photonic neural chips using Lumerical Interconnect, Synopsys optodesigner, and PyTorch. Testing the performance of the photonic neural chip.
- **Electronic-photonic digital computing chip:**,Worked on electronic-photonic digital computing chip tape-out for photonic logic functional units using AIM photonics; worked on the design, layout, validation, tape-out, performance evaluation, and high-speed measurement of the digital computing circuits. Proposed and experimentally demonstrated the photonic version of comparator, multiplexer/demultiplexer and decoder.
- **Electronic-photonic digital full adder:** Collaborated on the architecture design, high-speed measurement, and performance evaluation of an electronic-photonic full adder fabricated by AIM photonics. Collaborated on proposing the idea of electronic-photonic arithmetic logic unit.
- **Modeling of Silicon photonic modulators** Investigated high-speed properties of the microresonator-based modulators and evaluated their effects on optical digital computing. Provided the solutions to increase the optical bandwidth of the microresonator-based modulators and the accuracy of the optical computing circuits.

Nanjing University, Nanjing, China. **August, 2017 - June, 2018**

Undergraduate research student

- **Arbitrary Complex Brag Grating Waveguide:** Developed and optimized codes to design the arbitrary complex Brag grating waveguide using inverse-design algorithms. Improved the

simulation time complexity and scale down the size of the structure. Improved the simulation accuracy.

Major Journal Publications

1. **Chenghao Feng**, Zhoufeng Ying, Zheng Zhao, Jiaqi Gu, David Z. Pan, and Ray T. Chen, "Toward high-speed and energy-efficient computing: A WDM-based scalable on-chip silicon integrated optical comparator", Laser and Photonics Reviews 2021, 15, 2000275
2. Zhoufeng Ying, **Chenghao Feng**, Zheng Zhao, et al. "Sequential logic and pipelining in chip-based electronic-photonic digital computing", IEEE Photonics Journal, 2020, 12(6): 1-11.
3. **Chenghao Feng**, Zhoufeng Ying, Zheng Zhao, Jiaqi Gu, David Z. Pan, and Ray T. Chen. "Wavelength-division-multiplexing (WDM)-based integrated electronic–photonic switching network (EPSN) for high-speed data processing and transportation" Nanophotonics, vol. 9, no. 15, 2020, pp. 4579-4588.
4. Zhoufeng Ying, **Chenghao Feng**, Zheng Zhao, et al. Electronic-photonic arithmetic logic unit for high-speed computing[J]. Nature communications, 2020, 11(1): 1-9.
5. **Chenghao Feng**, Zhoufeng Ying, Zheng Zhao, Rohan Mital, David Z. Pan and Ray T. Chen. "Analysis of microresonator-based logic gate for high-speed optical computing in integrated photonics", IEEE Journal of Selected Topics in Quantum Electronics, 2019, 26(2): 1-8.
6. Zhoufeng Ying, **Chenghao Feng**, Zheng Zhao, et al. "Integrated multi-operand electro-optic logic gates for optical computing", Applied Physics Letters, 2019, 115(17): 171104.
7. **Chenghao Feng**, Richard Soref, Ray T. Chen, et al. Efficient and accurate synthesis of complex Bragg grating waveguide in dispersive silicon structures[J]. JOSA B, 2018, 35(8): 1921-1927.

Major Conference papers

1. Jiaqi Gu, Hanqing Zhu, **Chenghao Feng**, et al. " L2ight: Enabling On-Chip Learning for Optical Neural Networks via Efficient in-situ Subspace Optimization", Conference on Neural Information Processing Systems (NeurIPS), Dec. 7-10, 2021.(accepted)
2. Jiaqi Gu, Hanqing Zhu, **Chenghao Feng**, et al. " Towards Memory-Efficient Neural Networks via Multi-Level in situ Generation", in International Conference on Computer Vision (ICCV), Oct. 10-17, 2021. (accepted)
3. **Chenghao Feng**, Jiaqi Gu, Hanqing Zhu, et al. "Experimental Demonstration of a WDM-based Integrated Optical Decoder for Compact Optical Computing," in Conference on Lasers and Electro-Optics, Optical Society of America, 2021, SW3C.3.
4. Jiaqi Gu, **Chenghao Feng**, Zheng Zhao, et al. " Efficient On-Chip Learning for Optical Neural Networks Through Power-Aware Sparse Zeroth-Order Optimization", in Association for the Advancement of Artificial Intelligence (AAAI), Virtual Conference, Feb. 02-09, 2021.
5. **Chenghao Feng**, Jiaqi Gu, Zhoufeng Ying, et al. "Scalable fast-Fourier-transform-based (FFT-based) integrated optical neural network for compact and energy-efficient deep learning", Proc. SPIE 11690, Smart Photonic and Optoelectronic Integrated Circuits XXIII, 116900I (March 2021)
6. **Chenghao Feng**, Zhoufeng Ying, Zheng Zhao,et al. "Wavelength-division-multiplexing-based electronic-photonic integrated circuits for high-performance data processing and transportation", Proc. SPIE 11690, Smart Photonic and Optoelectronic Integrated Circuits XXIII, 116900R (March 2021)
7. **Chenghao Feng**, Zheng Zhao, Zhoufeng Ying, et al. "Compact design of on-chip elman optical recurrent neural network",CLEO: Applications and Technology. Optical Society of America, 2020: JTh2B. 8.
8. **Chenghao Feng**, Zhoufeng Ying, Zheng Zhao, et al. "Integrated WDM-based optical comparator for high-speed computing", 2020 Conference on Lasers and Electro-Optics (CLEO). IEEE, 2020: 1-2.

9. **Chenghao Feng**, Zhoufeng Ying, Zheng Zhao, et al. "Wavelength-division-multiplexing-based electronic-photonic network for high-speed computing", Proc. SPIE 11284, Smart Photonic and Optoelectronic Integrated Circuits XXII, 112840H (9 March 2020)
10. **Chenghao Feng**, Zhoufeng Ying, Zheng Zhao, et al. "Power and accuracy co-optimization of an optical full adder via optimization algorithms",2019 IEEE Photonics Conference (IPC). IEEE, 2019: 1-2.

Related Courses EE 383V-1 Nanophotonics; EE 383P-8 Optical Communications; EE 396K-21 Nanoscale Device Physics/Technology; EE 382M-7 VLSI I; EE 382N-14 High-speed computing arithmetic I; EE 380L-10 Data mining; EE 383V Modern Optics; EE 382N-1 Computer Architecture; ME 397 Intelligent nano-world; EE 381V Unconventional computation.

Skills
- **Programming Languages**: Python (PyTorch), C, Matlab, Verilog
- **Simulation Tools**: Lumerical Solutions, Synopsys Optism
- **EDA Tools**: Synopsys Optodesigner, Klayout, Cadense Virtuoso, Synopsys Design Compiler
- **Experiment**: High-speed testing, large-scale-photonic-circuit control, basic skills of fabrication such as E-beam lithography and plasma-etching.