Guodong Zhu

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PROFESSIONAL SUMMARY

Ph.D. candidate in electrical and computer engineering with expertise in multiphysics modeling, nanophotonics theory and experimentation, and metasurface inverse design. Proficient in C/C++, Python, PyTorch, and machine learning. Experienced in electronic design automation for digital ICs. Passionate about creating well-loved electronic products and addressing real-world engineering challenges.

EDUCATION

- **Vanderbilt University** — Nashville, TN
  Ph.D. in Nanophotonics — *Aug. 2021 – Aug. 2026 (expected)*

- **Zhejiang University** — Hangzhou, China
  Master in Optical Engineering — *Seq. 2015 – July 2018*

- **University of Electronic Science and Technology of China** — Chengdu, China
  Bachelor in Electric Engineering — *Seq. 2011 – July 2015*

EXPERIENCE

- **Cadence Design System** — Shanghai, China
  Lead Software Engineer — *Oct. 2018 - May 2021*
  - **Physical design optimization**: Maintained and enhanced optimization code related to multi-bit flip-flop in placement, routing, clock tree synthesis and design rule checking.
  - **Flip-flop merge/split**: In charge of the single/multi-bit flip-flop merge/split code for INNOVUS. Developed new flip-flop merging/splitting methods for better timing and power.

- **X-times** — Shanghai, China
  Software Engineer Intern — *May 2021 - Aug. 2021*
  - **Circuit analysis for VLSI designs** : Implemented passive reduced-order interconnect macromodeling algorithm with C++ to obtain the admittance matrix for large scale circuits and solve sparse matrix equations based on SuperLU and LAPACK. The results agree well with LTSpice.

RESEARCH

- **Thermal emission wavefront shaping** — Nashville, TN
  Research Assistant — *May. 2025 - present*
  - **Emission steering**: Steered the thermal emission angle by designing the phase gradient.
  - **Thermal lens**: Focused the high Q factor thermal emission by introducing the geometric phase.
  - **Thermal holograms**: Generated phase holograms by designing the phase of thermal emission.

- **AI-augmented tracking and label-free analysis of milk EVs** — Nashville, TN
  Research Assistant — *April 2025 - present*
  - **Label-free imaging**: Imaged the Extracellular vesicles (EVs) based on the interferometric scattering microscopy without any labeling.
  - **Unet segmentation**: Trained a Unet for segmenting the EVs from videos and tracked the EVs with Trackpy.
  - **Size estimation**: Estimated the size of EVs based on their Brownian motion.

- **Inverse design for thermal metasurface** — Nashville, TN
  Research Assistant — *Jan. 2024 - present*
  - **Generative model**: Generated high Q factor design for thermal metasurfaces by employing GAN models.
  - **Topology optimization**: Optimized the Q factor of thermal emission by utilizing topology optimization.

- **High Q factor metasurfaces design** — Nashville, TN
  Research Assistant — *Jan. 2022 - Jan. 2024*
  - **Surface lattice resonance**: Experimentally obtained high Q factor for metallic structures in Mid-infrared region.

- **Merging bound states in the continuum (BICs)** : Merged multiple BICs to improve the Q factor and robustness of metasurfaces.
  - ○ **RCWA**: Analyzed the angular response of high Q factor system under broadband incidence condition with rigorous coupled-wave analysis(RCWA).
  - ○ **TCMT**: Mathematically explained the high Q factor system by utilizing temporal coupled mode theory (TCMT).

- **Multiphysics simulator for large scale memories and RF circuits**   Hangzhou, China
  Research Assistant   *Aug. 2015 - July. 2018*
  - ○ **Finite element method (FEM)**: Developed a multiphysics simulator based FEM to simulated physical process in memories and RF circuits. Diffusion equation, Poisson equation, thermal conduction equation, and Maxwell equations were solved.
  - ○ **Supercomputing**: The simulator is based on C++ and capable to be configured on supercomputers to run very large scale fast simulations with thousands of CPU cores.

Publications

[1] **Guodong Zhu**, Ikjun Hong, Theodore Anyika, Maxwell T. Ugwu, J. Ryan Nolen, Mingze He, Joshua D. Caldwell, and Justus C. Ndukaife. Engineering thermal emission with enhanced emissivity and quality factor using bound states in the continuum and electromagnetically-induced absorption (**Cover featured article**). *Advanced Optical Material*, 2025.

[2] **Guodong Zhu**, Sen Yang, and Justus C. Ndukaife. Merging toroidal dipole bound states in the continuum without up-down symmetry in lieb lattice metasurfaces. *Nanophotonics*, 13(9):1561–1568, 2024.

[3] **Guodong Zhu**, Wenchao Chen, Dawei Wang, Hao Xie, Zhenguo Zhao, Pingqi Gao, Jose Schutt-Aine, and Wen-Yan Yin. Study on high-density integration resistive random access memory array from multiphysics perspective by parallel computing. *IEEE Transactions on Electron Devices*, 66(4):1747–1753, 2019.

[4] **Guodong Zhu**, Jie Tong, DaWei Wang, Jing Jin, Jun Hu, Z.G Zhao, G.R Li, and Wen-Yan Yin. Parallel simulation of electromagnetic and thermal characteristic in rf component. In *2017 IEEE Electrical Design of Advanced Packaging and Systems Symposium (EDAPS)*, pages 1–3, 2017.

[5] Sen Yang, Chuchuan Hong, **Guodong Zhu**, Theodore Anyika, Ikjun Hong, and Justus C. Ndukaife. Recent advancements in nanophotonics for optofluidics. *Advances in Physics: X*, 9(1):2416178, 2024.

[6] Hao Xie, Wenchao Chen, Shuo Zhang, **Guodong Zhu**, Afshan Khaliq, Jun Hu, and Wen-Yan Yin. Modeling and simulation of resistive random access memory with graphene electrode. *IEEE Transactions on Electron Devices*, 67(3):915–921, 2020.

[7] Da-Wei Wang, Wen-Sheng Zhao, Wenchao Chen, **Guodong Zhu**, Hao Xie, Pingqi Gao, and Wen-Yan Yin. Parallel simulation of fully coupled electrothermal processes in large-scale phase-change memory arrays. *IEEE Transactions on Electron Devices*, 66(12):5117–5125, 2019.

Awards

- **C.F. Chen best paper award**: Selected as one of two best papers annually in the Electrical and Computer Engineering Department, Vanderbilt University ($5,000, 2025).
- **SPIE best paper award**: Best poster presentation award at the 2023 SPIE Optics + Photonics Conference.

Skills

- **Theory**: Electromagnetics, Optics
- **Programming**: C/C++, Python, Git, Tcl, Shell
- **Machine learning**: PyTorch, deep learning, generative model
- **Simulation**: Tidy3D, Lumerical, COMSOL, CST
- **nano fabrication**: EBL, deposition, etching, SEM, microfluidic chip
- **Language**: English, Chinese

Hobbies

- **Sports**: Soccer, Table Tennis
- **Personal Interests**: Cooking, Reading