Sun Minghui

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Summary

Third-year undergraduate in Applied Physics (Ranked 1/46, Top 2.17%) with research experience in physics-informed machine learning and tunable solid-state lasers. First author of one manuscript under review in *Journal of Power Sources*, and co-author on two additional manuscripts under review (*Infrared Physics & Technology, Journal of Computational Physics*).

Education

B.S., Changchun University of Science and Technology, School of Physics, Major in Applied Physics
- Ranked 1 / 46 (2.17%)

Research Experience

Modeling and Optimization of Tunable Solid-State Lasers Based on Seed Injection Locking, Project Leader

CUST
Jan. 2025 to Present

- Developed physics-based models for seed injection locking in tunable 2-μm solid-state lasers, enabling systematic analysis of seed–cavity mode coupling dynamics.

- Investigated nonlinear multi-wavelength tuning behavior and thermo-optical coupling via analytical modeling and numerical simulations, improving frequency stability and spectral purity.

- Optimized key system parameters and predicted minimum injection power to support experimental design and performance optimization.

Physics-Informed Neural Network Modeling for Sodium-Ion Battery Systems, Project Leader

CUST
Feb. 2024 to Feb. 2025
12 months

- Built a physics-informed neural network (PINN) framework for the sodium-ion battery single-particle model (SPM) by embedding electrochemical governing equations and boundary conditions.

- Proposed an attention-enhanced residual-coupled PINN (RCA-PINN) architecture to reduce voltage prediction errors and improve computational efficiency under high-rate conditions.

- Achieved >50% error reduction with ~0.01 s/step inference time, enabling real-time state estimation for battery management systems.

Operator-Consistent Physics-Informed Learning for Wafer Thermal Reconstruction in Lithography, Research Assistant

CUST
Jan. 2025 to Oct. 2025
9 months

- Developed an operator-consistent physics-informed learning framework to reconstruct wafer temperature fields under sparse and noisy measurements in lithography processes.

- Implemented physics-based constraints and operator learning modules to improve generalization and stability across varying boundary conditions and thermal diffusion regimes.

- Conducted numerical experiments and ablation studies to validate reconstruction accuracy and physical consistency.

Additional Experience And Awards

Granted Invention Patent ×1

Invention Patents under Review ×2 (including 1 as **First Inventor**)

Utility Model Patents under Review ×3 (including 1 as First Inventor)

Provincial Government Scholarship (Highest Provincial-Level Award), 2024–2025

President's Scholarship (Top 1%, University-wide Top Award), CUST — Spring 2024

Merit Student (Top 1%, University-wide Honor), CUST — 2023–2024

First-Class Scholarship (Top 2%) ×2 , CUST— Fall 2023 / Spring 2025

Second-Class Scholarship, Changchun University of Science and Technology — Fall 2024

National Undergraduate Innovation Training Program (Key Project), Project Leader, 2025

Provincial-Level Undergraduate Innovation Project, Core Member, 2024 (Project Initiation)

Provincial-Level Undergraduate Innovation Project, Core Member, 2025 (Project Completion

National :

China Undergraduate Engineering Practice and Innovation Competition: Second Prize, 2025

China Robot and Artificial Intelligence Competition: Third Prize, 2025

Global Campus Artificial Intelligence Algorithm Competition: Excellence Award, 2025

Provincial / Regional Level :

Jilin Provincial Undergraduate Engineering Practice and Innovation Competition: Grand Prize, 2025

National Undergraduate Optoelectronic Design Competition : Second Prize

"Saibo Cup" Intelligent Robot Creative Competition : Second Prize, 2025

China Robot and Artificial Intelligence Competition : Second Prize

Global Campus Artificial Intelligence Algorithm Competition: Second Prize, 2025

Publications (Under Review)

• **Minghui Sun**, et al. *Physics-Informed Neural Networks Unlock High-Fidelity Modeling of Sodium-Ion Battery Dynamics: A Single-Particle Model with Multiscale Optimization for Real-Time Battery Management System Applications. **Journal of Power Sources** — Under Review (First Author). Manuscript ID: POWER-D-25-07389.*

• Chunyang Wang, **Minghui Sun**, et al. *2 μm dual-wavelength Tm:YAG laser based on a $MoS_2/Ti_3C_2T_x$ saturable absorber.* Infrared Physics and Technology — Under Review *(Second Author). Manuscript ID: INFPHY-D-25-02328.*

• Ze Tao, Yuxi Jin, Ke Xu, **Minghui Sun**, et al. *Operator-Consistent Physics-Informed Learning for Wafer Thermal Reconstruction in Lithography*. Journal of Computational Physics — Under Review *(Fourth Author). Manuscript ID: JCOMP-D-25-02717.*

Technologies

Programming: Python (PyTorch), MATLAB

Modeling & Simulation: PINNs, numerical simulation, optimization

Tools: SolidWorks, KeyShot, LabVIEW, Overleaf (LaTeX)