Ziqi Guo

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EDUCATION

Purdue University West Lafayette, IN, USA
Ph.D. in Mechanical Engineering; GPA: 4.00/4.00 *Sep. 2021 – Present*
Awards: Ross Fellowship
Courses: Machine Learning | Convex Optimization | Numerical Analysis | Quantum Transport | Solid state physics

Huazhong University of Science & Technology (HUST) Wuhan, China
B.E. in Energy & Power Engineering (Honours Degrees); GPA: 3.99/4.00, Rank: 1/221 *Sep. 2017 – Jun. 2021*
Awards: Outstanding Merit Student | National Scholarship recipient for three consecutive years
Courses: Object-oriented Programming | Finite Element Method | Heat Transfer | Fluid Mechanics | SQL

SKILLS

Programming: Python, MATLAB, Fortran, C++, Git, SQL, Linux

Libraries and Frameworks: Pytorch, Tensorflow, Sklearn, XgBoost, Numpy, Pandas, NLTK, BERT

Software: VASP, LAMMPS, COMSOL, ANSYS, AutoCAD, SolidWorks, Inventor

Hardware: Arduino, Raspberry pi, PLC

RESEARCH EXPERIENCE

Nanoscale Energy Transport and Conversion Laboratory Purdue University
Research Assistant, supervised by Prof. Xiulin Ruan and Prof. Guang Lin *Sep. 2021 – Present*

- **Machine learning prediction of phonon scattering and thermal conductivity**
  * Built a novel machine learning model for predicting phonon scattering rates and thermal conductivity, achieving $100\times$ faster prediction and less than 5% relative error for large-scale thermal transport informatics.

- **Memristor neural network for neuromorphic computing**
  * Analyzed the performance of a Memristor-based Deep Neural Network in image recognition tasks and demonstrated potential applications in neuromorphic computing.

- **Accelerated first principles prediction of thermal conductivity and radiative properties**
  * Developed a maximum likelihood estimation-based approach to efficiently and accurately estimate thermal conductivity and radiative properties, leading to a reduction of over 99% in computational costs compared to first principles calculations while maintaining relative errors below 10%.

- **Thin layer lightweight and ultrawhite hBN radiative cooling paint**
  * Conducted multiscale, multiphysics simulations to predict the solar reflectivity of hBN nanoporous radiative cooling paints, revealing the physical origin behind their exceptional radiative cooling performance.

- **Fast Optical Spectrum (FOS) calculations for nanoparticle media**
  * Designed and implemented user-friendly software that accurately predicts the optical response of nanoparticle media by integrating Mie theory, effective medium theory, and Monte Carlo simulations.

Thermal Science and Engineering Lab HUST
Research Assistant, supervised by Prof. Zhichun Liu *Jan. 2018 – May. 2021*

- **High-performance liquid-based electrocaloric cooling system**
  * Designed and simulated a novel liquid-based electrocaloric cooling system for electronic devices; demonstrated an extensive temperature span of 2.1K.

- **Flat plate loop heat pipe with dual evaporators**
  * Built a novel flat plate loop heat pipe featuring dual evaporators; enabled cooling of multiple heat sources and achieved steady operation across a wide range of heat loads (10W - 130W).

- **Heat pipe performance study based on surface modification**
  * Reduced the thermal resistance of heat pipes by 10% by implementing advanced super-hydrophilic and super-hydrophobic coating on the capillary core.

Maizie Zhou Lab   Vanderbilt University

Research Intern, supervised by Prof. Xin Zhou   *Apr. 2020 − May. 2021*

- **Text mining and analysis of Autism gene-phenotype associations** [**Open Source**]
  * Proposed an innovative text mining pipeline utilizing natural language processing techniques to identify autism-associated genes and phenotypes associations in literature; created a comprehensive and updatable database.

State Key Laboratory of Digital Equipment Manufacturing   HUST

Research Intern, supervised by Prof. Bo Tao   *Dec. 2018 − Apr. 2019*

- **Logistics sorting system based on RFID localization method**
  * Built an efficient automatic parcels sorting system based on RFID localization method and UR robot arms, resulting in a remarkable 70% increase in work efficiency compared to manual sorting.

Selected Honors and Awards

Best presentation award, ASME Heat Transfer Summer Conference	*2023*
Ross Fellowship, Purdue University	*2021*
Commencement Address Speaker, HUST	*2021*
National Scholarship, HUST	*2017, 2018, 2019*
Outstanding Merit Student, HUST (The highest award for undergraduates in HUST)	*2019*
National Second Prize, China Mathematical Modeling Contest	*2019*
National First Prize, Energy Saving and Emission Reduction Competition	*2019*
National Third Prize, The Chou Pei-Yuan Mechanics Competition	*2019*

Publications

8. Fei Qin, Yuxuan Zhang, Ziqi Guo, Taejoon Park, Chung Soo Kim, Jeongmin Park, Xingyu Fu, Kwangsoo No, Kejie Zhao, Han Wook Song, Xiulin Ruan, and Sunghwan Lee. CMOS-compatible high performance SiO2-based memristors for neuromorphic computing: Understanding the switching mechanisms through theoretical and electrochemical aspects. *Under Review.*

7. Ziqi Guo, Zherui Han, Dudong Feng, Guang Lin, and Xiulin Ruan. Accelerated First-principles Prediction of Thermal Conductivity and Radiative Properties through Maximum Likelihood Estimation of Phonon Scattering Rates. *Under Review.*

6. Ziqi Guo, Prabudhya Roy Chowdhury, Zherui Han, Yixuan Sun, Dudong Feng, Guang Lin, and Xiulin Ruan. Fast and Accurate Machine Learning Prediction of Phonon Scattering Rates and Lattice Thermal Conductivity. *npj Computational Materials, Jun. 2023.* [Paper]

5. Andrea Felicelli, Ioanna Katsamba, Fernando Barrios, Yun Zhang, Ziqi Guo, Joseph Peoples, George Chiu, and Xiulin Ruan, Thin layer lightweight and ultrawhite hexagonal boron nitride nanoporous paints for daytime radiative cooling, *Cell Reports Physical Science, Oct. 2022.* [Paper]

4. Song He, Zhengyuan Ma, Weizhong Deng, Zikang Zhang, Ziqi Guo, Wei Liu, Zhichun Liu. Experimental investigation on the start-up performance of a novel flat loop heat pipe with dual evaporators. *Energy Reports, Nov. 2022.* [Paper]

3. Sijie Li[1], Ziqi Guo[1], Jacob B Ioffe, Yunfei Hu, Yi Zhen, Xin Zhou. Autism_genepheno: Text mining of gene-phenotype associations reveals new phenotypic profiles of autism-associated genes. *Scientific Reports, Jul. 2021.* [Paper]

2. Sorting System Based on RFID Positioning Technology. 2019SR1151524. *Software Copyright filed Nov. 2019.*

1. Grab-type flexible sorting method based on RFID spatial positioning technology. CN 201910875139.3. *Patent filed Sep. 2019.*

([1] indicates equal contribution.)

Mentoring Experience and Professional Services

High school student research mentor. Won 2nd place in the International Science and Engineering Fair.	*2023*
Undergrad research mentor. Identified potential ultrawhite radiative cooling material with data mining.	*2023*
Judge of SURF'23 conference	*2023*