

## Shizheng WEN

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### EDUCATION

College of Energy and Power Engineering, **Nanjing University of Aeronautics and Astronautics (NUAA)**, Nanjing, China.

Bachelor in Aircraft Power Engineering; **Overall GPA: 92/100 (Top 2%)**;

Aug 2016 - Jul 2020

- **Core Courses: Engineering:** Engineering Thermodynamics (95), Heat Transfer (93), Fluid Mechanics Engineering (93), Materials Mechanics (90), Engineering Elasticity (90), Theoretical Mechanics (90), Mechanical Vibration foundation (92)
- **Math & Physics:** Advanced Mathematics (100), Programming of C++ Language (100), Linear Algebra (99), Probability Theory and Mathematical Statistics (91), Complex Function (93), University Physics (97), Basic Chemistry Engineering (98)

**Duke University**, NC, USA

Jul 2019 - Sep 2019

- Duke Undergraduate Visiting Researcher, advised by Professor **Earl H. Dowell (AIAA Honorary Fellow)**

### RESEARCH EXPERIENCE

[personal research page](#)

**Research Assistant (RA) in the Institute of Comprehensive Energy Research, NUAA, China**

**Advisor: Associate Dean Xianglei Liu**

2017.9- **Near-field Radiation-based Thermal Rectifiers**

2018.9

- Proposed a thermal rectifier based on near-field radiation between nanoparticles made of intrinsic silicon and a dissimilar material, and a record-high rectification ratio of more than 104 is theoretically demonstrated.
- Simulated the near-field thermal radiation between nanoparticles with irregular shapes by using the thermal discrete dipole approximation (TDDA), and investigated effects of gap distances, temperatures and configurations of nanoparticles on the performance of thermal rectifiers and explained the mechanism.
- Explored rectification ratios of ten different material pairs and proposed a criterion for other researchers to choose materials for thermal rectifiers with high performance.

2020.1-

**Machine Learning Strategy to Manipulate Near-Field Radiative Heat Transfer (NFRHT)**

2020.6

- Proposed a more efficient way to design the optimal geometric and physical parameter for micro- and nanothermal system by combining Artificial Neural Network (ANN) with Genetic Algorithm (GA).
- Build a surrogated model of calculating NFRHT between periodic multilayered metamaterials by using ANN and compared the efficiency and accuracy between surrogated model and Effective Medium Theory (EMT).
- Build a surrogated model of calculating rectification ration between two nanoparticles and found the optimal configuration by applying GA to the surrogated model.

**Research Assistant (RA) in the Institute of Nano Science, NUAA, China**

**Advisor: Chair Professor Wanlin Guo, Professor Min Yi, Professor Hu Qiu**

2021.5-

**Ultra-low Energy Loss in Biomolecular Motor**

Present

- Built the model of distal rod and LP ring with inner membrane for bacterial flagellar motor (2 million atoms).
- Ran 10-ns equilibrium all-atom molecular dynamics simulation for the whole system.
- Clarified the interactions between the rod and LP ring

**Visiting Student Researcher in the Aeroelasticity Group, Duke, USA**

**Advisor: William Holland Hall Professor Earl H. Dowell, Dr. Michael W. Lee**

2019.7-

**Machine Learning for Aeroelastic applications**

2019.9

- Trained a convolutional neural network (CNN) that was able to recognize several qualitatively different subsonic buffet flows over a high-incidence airfoil.

- Explored the sensitivity to hyperparameters including network architecture and convolutional kernel size.
  - Trained a long-short term memory CNN and demonstrated that with the inclusion of temporal information.
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## PUBLICATIONS

1. A Machine Learning Strategy for modeling and inverse design of Near-Field Radiative Heat Transfer  
Authors: **Shizheng Wen**, Chunzhuo Dang, Xianglei liu  
Status: in Preparation  
Comment: Machine Learning for nanoscale heat transfer
  2. [Application of Convolutional Neural Network in Feature Identification for Complex Fluid Flows](#)  
Authors: **Shizheng Wen**, Michael W. Lee, Kai M. Kruger Bastos, Earl H. Dowell  
Status: under revision  
Comment: Machine Learning for fluid mechanics
  3. [Ultrahigh thermal rectification based on near-field thermal radiation between dissimilar nanoparticles](#)  
Authors: **Shizheng Wen**, Xianglei liu, Sheng Cheng, Zhoubing Wang, Shenghao Zhang, Chunzhuo Dang  
Status: Published by *J. Quant. Spectrosc. Radiat. Transfer* **234**, 1-9 (2019) [citations:13]  
Comment: Nanoscale heat transfer. I proposed a new thermal rectifier which can reach a record-high rectification ration.
  4. [High-performance three-body near-field thermophotovoltaic energy conversion](#)  
Authors: Chunzuo Dang , Xianglei Liu, Haifeng Xia, **Shizheng Wen**, Qiao Xu  
Status: published by *J. Quant. Spectrosc. Radiat. Transfer* **259**, 107411 (2021) [citations:1]  
Comment: Nanoscale heat transfer. We proposed a three-body near-field thermophotovoltaic system.
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## HONORS & AWARDS

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| 2020.7    | ➤ Best Undergraduate Thesis award (top 1%)   |
| 2020.6    | ➤ University Achievements Award (nominee), NUAA (the highest honor for graduates)        |
| 2019.11   | ➤ Chancellor's Honorary Scholarships, NUAA (the highest honor for undergraduate student) |
| 2019.9    | ➤ National Scholarship, Ministry of Education of P.R. China (top 1%)                     |
| 2018.11   | ➤ Boeing Scholarship, Boeing Aerospace company (16 among the whole university)           |
| 2017-2019 | ➤ Nanjing University of Aeronautics and Astronautics Scholarship - First Prize (top 3%)  |
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## SKILLS & OTHERS

- **Programming:** Expertise in Python, Matlab, C++, R language, SPSS, LINGO and various machine learning algorithms (tensorflow)
- **Molecular Dynamics Simulations:** VMD, NAMD, tcl/tk language
- **Modeling:** ANSYS (finite element analysis), Multisim, ProE and AutoCAD
- **Hobbies:** Violin, Guitar, Tennis, Soccer, Billiards, Swimming, Music, Rubik's Cube