Candi Zheng

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Education

- **Ph.D. Candidate in Mathematics**, Feb 2019 – Present, expected graduation date May 2024
  The Hong Kong University of Science and Technology
- **Ph.D. Student in Mechanical and Aerospace Engineering**, Feb 2017 – Present
  The Southern University of Science and Technology (Joint Program)
- **Ph.D. Student in Mechanical and Aerospace Engineering**, Sep 2017 – Feb 2019
  The Hong Kong University of Science and Technology (Joint Program)
- **Visiting Student**, Sep 2016 – Jan 2017
  The University of Edinburgh
- **B.S. in Physics**, Sep 2013 – Jun 2017
  The Southern University of Science and Technology

Research Interest

I'm interested in bridging artificial intelligence (AI) with non-equilibrium physics, especially focusing on generative modeling and kinetic theory, emphasizing both the insights from physics and mathematical solidity. My current research includes:

1. Physics in Generative Modeling: how physics knowledge helps diffusion model and image generation
2. Non-Equilibrium Physics: how data-driven approach helps models for kinetic theory, rarefied gas dynamics, shock waves, and light scattering

Publications

1. **Candi Zheng***, Yuan Lan. "Characteristic Guidance: Non-linear Correction for DDPM at Large Guidance Scale." arXiv:2312.07586 (2023), Accpeted by ICML 2024.
2. **Candi Zheng***, Yang Wang, and Shiyi Chen. "Phase Transition in Extended Thermodynamics Triggers Sub-shocks." arXiv:2304.10742 (2023).
3. **Candi Zheng***, Yang Wang , and Shiyi Chen. "Stabilizing the Maximal Entropy Moment Method for Rarefied Gas Dynamics at Single-Precision." arXiv:2303.02898 (2023).
4. **Candi Zheng***, Yang Wang, and Shiyi Chen. "Data-driven constitutive relation reveals scaling law for hydrodynamic transport coefficients." Physical Review E 107, no. 1 (2023): 015104.

5. Jin, Yuan-Jun, Rui Wang, Jin-Zhu Zhao, Yong-Ping Du, **Can-Di Zheng**, Li-Yong Gan, Jun-Feng Liu, Hu Xu*, and S. Y. Tong*. "The prediction of a family group of two-dimensional node-line semimetals." Nanoscale 9, no. 35 (2017): 13112-13118.

* for corresponding author

Projects

1. Characteristic Guidance Web UI is an extension of for the Stable Diffusion web UI (AUTOMATIC1111). It offers a theory-backed guidance sampling method with improved sample and control quality at high CFG scale.

2. Moment Gauge is a Python JAX library designed to facilitate the implementation of numerical solvers using the maximal entropy moment method. Built on the JAX framework, Moment Gauge aims to provide reusable code for researchers and developers working with rarefied gas dynamics and other applications of the maximal entropy moment method.

Awards and Scholarships

- **Risk Classification Top 10**, ATEC 2018 Developer AI Challenge, Primary round, 2018
- **Outstanding Graduation Project**, Southern University of Science and Technology, 2017
- **The University Physics Competition**, Silver, 2015
- **RoboMaster**, Central South China Division, Third Class, 2015
- **National Encouragement Scholarship**, Southern University of Science and Technology, 2014
- **Outstanding Freshman Scholarship**, Southern University of Science and Technology, 2014

Skills

- **Language:** English, Chinese, A little bit of Japanese
- **Math:** Ph.D. qualification in pure mathematics options (analysis and algebra).
- **Physics:** Specialized in statistical physics and kinetic theory.
- **Programming:** Proficient in Python for a diverse range of applications. Skilled at object oriented programming (OOP). Experience with JAVA, Fortran, CUDA C, and MPI for high-performance computing tasks.
- **Machine Learning:** Proficient in common machine learning frameworks and tools, including Pytorch, Jax, Scikit-learn.