



The Hong Kong University of Science and Technology

Department of Mathematics

PhD THESIS EXAMINATION

**From Generative Artificial Intelligence to Statistical Physics and Back:
Tackling Non-Equilibrium Gas and Diffusion Process**

By

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ABSTRACT

Generative artificial intelligence (GAI) is the art of harnessing the power of data to model probability distributions. Probability distributions are foundational in various domains, including computer vision and statistical physics. Their accurate characterization is essential for generating high-quality images and predicting complex fluid dynamics. This thesis delves into the interplay between GAI and statistical physics through probability distributions. We explore how the physics of the diffusion process helps the denoising diffusion probabilistic model (DDPM) create better images and an application of AI in disease diagnosis. Moreover, we investigate the methods, limitations, and challenges of using generative models to model non-equilibrium gas flows.

Date : 21 May 2024, Tuesday

Time : 9:45 am

Venue : Room 4472 (Lifts 25/26)

Thesis Examination Committee:

- Chairman** : Prof. Xiangru ZHANG, CIVL/HKUST
- Thesis Supervisor** : Prof. Yang WANG, MATH/HKUST
- Thesis Supervisor** : Prof. Shiyi CHEN, SUSTech
- Member** : Prof. Jianfeng CAI, MATH/HKUST
- Member** : Prof. Can YANG, MATH/HKUST
- Member** : Prof. Baoling HUANG, MAE/HKUST
- External Examiner** : Prof. Chih Ming HO, Dept of Mechanical & Aerospace Engrg /
University of California, Los Angeles

(Open to all faculty and students)

The student's thesis is now being displayed on the reception counter in the General Administration Office (Room 3461).