



THE CHINESE UNIVERSITY OF HONG KONG  
*Department of Physics*  
SEMINAR

# AI4Astro: Exploring Star Formation and ISM through Artificial Intelligence

*by*

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*Date: January 31, 2024 (Wednesday)*

*Time: 9:00 - 10:00 a.m.*

*Join ZOOM Meeting: <https://cuhk.zoom.us/j/91366170917>*



ALL INTERESTED ARE WELCOME

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## Abstract

The field of astronomy is undergoing a transformation through machine learning, particularly deep learning, which facilitates the efficient processing of extensive datasets. It outperforms human capabilities in swiftly and accurately analyzing complex data, encompassing images and data cubes related to the interstellar medium and star formation. To illustrate, I will introduce CASI-3D (Convolutional Approach to Structure Identification-3D), a deep learning method renowned for its effectiveness in identifying stellar feedback signatures like stellar winds and outflows in molecular line spectra. Furthermore, I will delve into the extension of CASI-3D to infer the orientation of magnetic fields in sub-/trans-Alfvénic turbulent clouds based on molecular line emission. Additionally, Denoising Diffusion Probabilistic Models (DDPMs), drawing inspiration from diffusion thermodynamics, exhibit state-of-the-art performance across various domains. These models bring several advantages to the table for inferring physical quantities in astronomy, including stable training, robust performance, interpretability, and alignment with the inherent nature of scientific problems. I will showcase applications of DDPMs in inferring intrinsic physical quantities, such as volume density and the interstellar radiation field, from observational data. Moreover, I will discuss the utility of DDPMs for segmentation tasks, such as segmenting filaments from dust emission.