

#### THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

### **Department of Mathematics**

# **SEMINAR ON STATISTICS**

## **Bayesian Inference via Geometry: Gradient Flows and Optimal Transport in Probability Spaces**

By

## **Prof. Yun YANG**

University of Maryland, College Park

#### <u>Abstract</u>

This talk presents two complementary perspectives on modern Bayesian computation through the lens of geometry in the space of probability measures. The first introduces a dynamic optimization approach for minimizing generic objectives using gradient flows with respect to the Kullback-Leibler (KL) divergence. We propose the Implicit KL Proximal Descent (IKLPD) algorithm, which discretizes the KL gradient flow to minimize convex functionals and guarantees global convergence. When applied to Bayesian inference with a KL divergence objective, the method achieves exponential convergence rates. The second approach offers a static framework based on optimal transport (OT), where a deterministic map is learned from a reference distribution to the posterior. This map-based method avoids issues with MCMC such as intractable normalizing constants and sampling inefficiency, while supporting mixed data types and enabling OT-based tools for exploratory analysis. Together, these perspectives highlight how geometric ideas can lead to scalable and principled methods for Bayesian inference.

> Date : 23 June 2025 (Monday) Time : 11:00a.m. - 12:00noon Venue : Room 4502 (Lift 25/26)