THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON DATA SCIENCE AND APPLIED MATHEMATICS

Estimating the persistent homology of $\mathbb{R}^n$-valued functions using function-geometric multifiltrations

By

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Abstract

Given an unknown $\mathbb{R}^n$-valued function f on a metric space X, can we approximate the persistent homology of f from a finite sampling of X with known pairwise distances and function values? This question has been answered in the case $n = 1$, assuming f is Lipschitz continuous and X is a sufficiently regular geodesic metric space, and using filtered geometric complexes with fixed scale parameter for the approximation. In this talk we answer the question for arbitrary n, under similar assumptions and using function-geometric multifiltrations. Our analysis offers a different view on these multifiltrations by focusing on their approximation properties rather than on their stability properties. We also leverage the multiparameter setting to provide insight into the influence of the scale parameter, whose choice is central to this type of approach. From a practical standpoint, we demonstrate that our approximation is robust to noise in the input and has good statistical properties. This work bridges theory and applications, offering new insights into the topological analysis of $\mathbb{R}^n$-valued functions on metric spaces.

Bio: *Jingyi Li is a PhD student supervised by Steve Oudot at École Polytechnique and Inria Saclay, France. Before that, she obtained her bachelor's degree from the University of Chinese Academy of Sciences. Her research focuses on the mathematical foundation and computation of topological data analysis (TDA), with a particular emphasis on multi-parameter persistent homology.*

Date	**:**	**08 July 2025 (Tuesday)**
Time	**:**	**3:30p.m. – 4:30p.m. Hong Kong SAR**
Venue	**:**	**Room 4503 (near Lift 25 & 26)**

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