

國立中央大學數學系

專題演講

主 講 人：胡全榮博士 (國立臺灣師範大學數學系)

演講題目：Sheaves and Multi-parameter Persistent Homology
Arising from Mathematical Morphology

演講茶會：2022年3月17日(星期四) 3:30 p.m. ~ 4:00 p.m.

茶會地點：中央大學鴻經館M306

演講時間：2022年3月17日(星期四) 4:00 p.m. ~ 5:00 p.m.

演講地點：中央大學鴻經館M107

Abstract：

Topological Data Analysis (TDA) is a fast-growing research topic in applied mathematics that uses algebraic topology techniques to capture features from data. Many applied topologists have discovered its importance in many areas, such as medical image processing, molecular biology, machine learning, and pattern recognition. Persistent homology (PH) is one of the essential tools in TDA that measures the robustness and significance of homological objects (e.g., connected components, loops, or higher dimensional voids) in spaces' deformation. In the last decade, a generalization of PH called the multi-parameter persistent homology (or multi-parameter persistence) had become one of the most exciting research topics in TDA. So far, finding methods to extract features in multi-parameter persistence is still an open and concentrating topic in TDA. Also, examples of multi-parameter filtration are still rare and limited. In this talk, I will briefly introduce TDA development and propose a framework for constructing multi-parameter filtrations from digital images through mathematical morphology. Multi-parameter persistence derived from mathematical morphology is more efficient for computing. It contains intuitive geometric attributes of objects, such as the sizes or robustness of local objects in digital images. We involve these features to remove the salt and pepper noise in digital images as an application. Finally, I will discuss possible future approaches, such as using sheaf theory to extract features from this generalized algebraic model.

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