THE UNIVERSITY OF GEORGIA
DEPARTMENT OF STATISTICS

Colloquium Series

Chul Moon

Doctoral Defense

May 30, 2018

10:00 am in Room 327, Brooks Hall

Statistical Inference and Learning for Topological Data Analysis

Topological data analysis (TDA) is a rapidly developing collection of methods for studying the shape of data. Persistent homology is a prominent branch of TDA which analyzes the dynamics of topological features of a data set. We introduce statistical inference and learning methods for persistent homology of three types of data: point clouds, fingerprints, and rock images. First, we illustrate a topological inference plot for point cloud data, called the persistence terrace. The suggested plot allows robust and scale-free inference on the size and point density of topological features. Second, we suggest a new interface between persistent homology and machine learning algorithms and apply it to the problem of sorting fingerprints into pre-determined groups. We achieve near state-of-the-art classification accuracy rates by applying TDA to minutiae points and ink-roll images. Last, we present a statistical model for analysis of porous materials using persistent homology. Our model enables us to predict the geophysical properties of rocks based on their geometry and connectivity.

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