Stanford University
Department of Statistics

Departmental Seminar

4:30pm, Tuesday, January 14, 2020
Sloan Mathematics Center Room 380C

Refreshments served at 4pm in Sequoia Lounge.

Speaker: Hengrui Luo
Department of Statistics,
The Ohio State University

Title: Lower Dimensional Topological Information: Theory and Applications

Abstract:

Topological data analysis (TDA) allows us to explore the topological features of a dataset. Among topological features, lower dimensional ones are of growing interest in mathematics and statistics due to their potential to aid the discovery of low-dimensional structure in the dataset. However, lower dimensional features are usually challenging to detect from a probabilistic perspective. In the first half of this talk, I focus on one specific type of lower dimensional feature, the lower dimensional zero density regions lying within the support of a density function. I construct a sequence of families of covering balls with shrinking radii to detect this type of topological feature and give sufficient conditions for successful detection. In the second half of this talk, I illustrate how lower dimensional topological information, occurring in the form of boundaries of objects, can be useful in an image segmentation problem. I compare and combine topological and statistical shape analysis segmentation methods to utilize topological information. I conclude my talk with a discussion of how topological information can interact with statistical modeling.