

COLLOQUIUM

Department of Statistics and Probability
Michigan State University

Sungkyu Jung

University of North Carolina at Chapel Hill

Statistical Analysis of Data on Curved Manifolds

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A405 Wells Hall

10:20 a.m. - 11:10 a.m.

Refreshments: 10:00 a.m.

Abstract

A number of interesting data lie naturally on curved manifolds, where conventional statistics are sometimes not directly applicable. This type of data arises in, for example, shape and image analysis. In this talk, I will discuss some challenges in statistical analysis on these non-Euclidean feature spaces, and introduce some data analytic methods that generalize principal component analysis (PCA). We focus on high dimensional spheres that are highly important in many applications, and introduce a general framework for a novel non-geodesic (non-linear) decomposition. This decomposition finds a sequence of sub-manifolds with decreasing dimensions, which can be interpreted as an analogue of PCA. The method is adapted and extended to more complex manifolds: shape spaces and direct product manifold (Cartesian product of simpler manifolds). The method provides a coordinate system to visualize the data structure, and an intuitive summary of principal modes of variation, as exemplified by several interesting real data sets.

In addition, I will continue to discuss some asymptotic results on Euclidean PCA, to illustrate conditions under which PCA is informative in high dimension, low sample size situations.

To request an interpreter or other accommodations for people with disabilities, please call the Department of Statistics and Probability at 517-355-9589.