应用数学讲座

Научный Семинар по Прикладной Математике
Research Seminar on Applied Mathematics

应用数学报告（77）

报告人 / Докладчик / Speaker: 姚志刚 副教授（National University of Singapore & CMSA at Harvard University ）

题目 / Название / Title: Principal flows, sub-manifolds and boundaries

时间 / Время / Time：26 Apr. 2023, 16:00-18:00

地点 / Место / Venue: 主楼336

摘要 / Аннотация / Abstract:

While classical statistics has dealt with observations which are real numbers or elements of a real vector space, nowadays many statistical problems of high interest in the sciences deal with the analysis of data which consist of more complex objects, taking values in spaces which are naturally not (Euclidean) vector spaces but which still feature some geometric structure. I will discuss the problem of finding principal components to the multivariate datasets, that lie on an embedded nonlinear Riemannian manifold within the higher-dimensional space. The aim is to extend the geometric interpretation of PCA, while being able to capture the non-geodesic form of variation in the data. I will introduce the concept of a principal sub-manifold, a manifold passing through the center of the data, and at any point on the manifold extending in the direction of highest variation in the space spanned by the eigenvectors of the local tangent space PCA. We show the principal sub-manifold yields the usual principal components in Euclidean space. We illustrate how to find, use and interpret the principal sub-manifold, by which a principal boundary can be further defined for data sets on manifolds.

姚志刚副教授简介：

Zhigang Yao is an Associate Professor in the Department of Statistics and Data Science at the National University of Singapore (NUS). He also holds a courtesy joint appointment with the Department of Mathematics at NUS. He is a Faculty Affiliate of

the Institute of Data Science (IDS) at NUS. He received his Ph.D. in Statistics from University of Pittsburgh in 2011. His thesis advisors are Bill Eddy at Carnegie Mellon and Leon Gleser at University of Pittsburgh. He has been an Assistant Professor at NUS from 2014-2020. Before joining NUS, he has been working with Victor Panaretos as a post-doc researcher at the Swiss Federal Institute of Technology (EPFL) from 2011-2014.

From 2022, he has been a Member of the Center of Mathematical Sciences and Applications (CMSA) at Harvard University. At Harvard, he collaborates with Shing-Tung Yau on manifold fitting and research the interface between statistics and geometry. He is also a Visiting Faculty in the Department of Statistics at Harvard. He is the organizer of the Harvard Conference on Geometry and Statistics, hosted by CMSA in 2023. He has published many articles in top statistical journals such as JASA, AOS, etc.