

# ACMS Applied Math Seminar

Wenjing Liao

Georgia Institute of Technology

Thursday, April 25, 2019

154 Hurley Hall

3:30 – 4:30 PM



## Learning High-Dimensional Data With Low-Dimensional Structures

High-dimensional data arise in many fields of contemporary science and introduce new challenges in statistical learning and data recovery. Many datasets in image analysis and signal processing are in a high-dimensional space but exhibit a low-dimensional structure, due to rich local regularities, global symmetries, repetitive patterns, or redundant sampling. We are interested in building efficient representations of these data for the purpose of compression and inference, and giving performance guarantees depending on the intrinsic dimension of data. We model a dataset in  $\mathbb{R}^D$  by point clouds sampled from a probability measure concentrated on or near an unknown  $d$ -dimensional manifold with  $d$  much smaller than  $D$ . We consider two sets of problems:

low-dimensional geometric approximations to the manifold and regression of a function on the manifold. In the first case, we construct multiscale low-dimensional empirical approximations to the manifold and give finite-sample performance guarantees. In the second case, we exploit these empirical geometric approximations of the manifold and construct multiscale approximations to the function. In both cases our approximations can adapt to the regularity of the manifold or the function even when this varies at different scales or locations.

The Department of Applied and Computational  
Mathematics and Statistics

Please visit [acms.nd.edu](http://acms.nd.edu) to view the full list of speakers.