

Indiana University-Purdue University Indianapolis

Department of Mathematical Sciences

STATISTICS SEMINAR

12:15pm—1:15pm, Tuesday, February 20, 2024

Zoom Meeting: Meeting ID: 845 0989 4694

Speaker: Haolei Weng

*Department of Statistics & Probability ,
Michigan State University*

Title: Robust unsupervised Multi-task and Transfer Learning
on Gaussian Mixture Models

Abstract:

Unsupervised learning has been widely used in many real-world applications. One of the simplest and most important unsupervised learning models is the Gaussian mixture model (GMM). In this work, we study the multi-task learning problem on GMMs, which aims to leverage potentially similar GMM parameter structures among tasks to obtain improved learning performance compared to single-task learning. We propose a multi-task GMM learning procedure based on the EM algorithm that not only can effectively utilize unknown similarity between related tasks but is also robust against a fraction of outlier tasks from arbitrary sources. The proposed procedure is shown to achieve minimax optimal rate of convergence for both parameter estimation error and the excess mis-clustering error, in a wide range of regimes. Moreover, we generalize our approach to tackle the problem of transfer learning for GMMs, where similar theoretical results are derived. Finally, we demonstrate the effectiveness of our methods through simulations and real data examples. To the best of our knowledge, this is the first work studying multi-task and transfer learning on GMMs with theoretical guarantees.

Bio:

Dr. Haolei Weng is currently an Assistant Professor at the Department of Statistics and Probability, Michigan State University. Prior to MSU, he completed his Ph.D. in statistics from Columbia University in 2017 and was a postdoctoral researcher at Princeton University in 2018. Before going to Columbia, he received a B.S. in statistics from University of Science and Technology of China. His research interests are broadly in the area of high-dimensional statistics and statistical machine learning.