Statistics Seminar

Department of Mathematical Sciences

DATE:	Thursday, March 3, 2022
TIME:	1:15pm – 2:15pm
LOCATION:	Zoom meeting
SPEAKER:	Geran Zhao, Binghamton University
TITLE:	Asymptotic distribution of high-dimensional distance correlation inference

Abstract

Distance correlation has become an increasingly popular tool for detecting the nonlinear dependence between a pair of potentially high-dimensional random vectors. Most existing works have explored its asymptotic distributions under the null hypothesis of independence between the two random vectors when only the sample size or the dimensionality diverges. Yet its asymptotic null distribution for the more realistic setting when both sample size and dimensionality diverge in the full range remains largely underdeveloped. In this paper, we fill such a gap and develop central limit theorems and associated rates of convergence for a rescaled test statistic based on the bias-corrected distance correlation in high dimensions under some mild regularity conditions and the null hypothesis. Our new theoretical results reveal an interesting phenomenon of blessing of dimensionality for high-dimensional distance correlation inference in the sense that the accuracy of normal approximation can increase with dimensionality. Moreover, we provide a general theory on the power analysis under the alternative hypothesis of depen- dence, and further justify the capability of the rescaled distance correlation in capturing the pure nonlinear dependency under moderately high dimensionality for a certain type of alternative hypothesis. The theoretical results and finite-sample performance of the rescaled statistic are illustrated with several simulation examples and a blockchain application.