

ACMS Statistics Seminar



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Tuesday, Sept. 15, 2026
154 Hurley Hall
3:30 PM – 4:30 PM

Test of Independence Using Generalized Distance Correlation

The test of independence between two random vectors is a fundamental statistical problem with a long history. Existing asymptotic theories for test statistics based on distance covariance apply only to either low-dimensional or high-dimensional settings. In this talk, I will introduce a unified distributional theory for the sample generalized distance covariance that applies to random vectors of arbitrary dimensions. In particular, we derive a non-asymptotic error bound for its Gaussian approximation. Under fairly mild moment conditions, the asymptotic null distribution of the sample generalized distance covariance is shown to be a linear combination of independent and identically distributed chi-squared random variables. We also demonstrate that high dimensionality is necessary for the null distribution to be asymptotically normal. To facilitate practical estimation of the asymptotic null distribution, we propose a Half-Permutation procedure and provide theoretical justification for its validity. The exact asymptotic distribution of the resampling distribution is derived under general marginal moment conditions, and the proposed procedure is shown to be asymptotically equivalent to the oracle procedure with known marginal distributions.

The Department of Applied and Computational
Mathematics and Statistics
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