

## Statistics and Data Science Seminar

### *Weighted shape-constrained estimation with applications to Markov chain autocovariance function estimation*

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**Abstract:** In this talk, I will introduce a novel weighted  $l_2$  projection method for estimating covariance functions, with an emphasis on estimation of autocovariance sequences from reversible Markov chains. Shape-constrained estimation of a function with discrete support has been investigated and successfully applied to various application problems. Notably, Berg and Song (2023) connected this idea with uncertainty quantification in Markov chain Monte Carlo (MCMC) samples and proposed a shape-constrained estimator for autocovariance sequences. While the least-squares objective is commonly used in shape-constrained regression, it can be suboptimal due to correlation and unequal variances in the input function. To address this, we introduce a weighted least-squares method that defines a weighted norm on transformed data. Our approach involves transforming input data into the frequency domain and weighting the input sequence based on their asymptotic variances, exploiting the asymptotic independence of periodogram ordinates. I will discuss the computational aspects, theoretical properties, and the improved performance of this method compared to its non-weighted counterpart.

Wednesday, October 9 at 4:00 PM in 636 SEO