

## Statistics and Data Science Seminar

### *Counting Process Based Dimension Reduction Methods for Censored Outcomes*

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**Abstract:** We propose a class of dimension reduction methods for right censored survival data using a counting process representation of the failure process. Semiparametric estimating equations are constructed to estimate the dimension reduction subspace for the failure time model. The proposed method addresses two fundamental limitations of existing approaches. First, using the counting process formulation, it does not require any estimation of the censoring distribution to compensate the bias in estimating the dimension reduction subspace. Second, the nonparametric part in the estimating equations is adaptive to the structural dimension, hence the approach circumvents the curse of dimensionality. Asymptotic normality is established for the obtained estimators. We further propose a computationally efficient approach that requires only a singular value decomposition to estimate the dimension reduction subspace. Numerical studies suggest that the proposed methods exhibit significantly improved performance for estimating the true dimension reduction subspace. We further conducted a real data analysis on a skin cutaneous melanoma dataset from The Cancer Genome Atlas. The findings have important biological implications. The proposed methods are implemented in the R package "orthoDr", which efficiently solves the semiparametric estimating equations within the Stiefel manifold of the parameter space.

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