THE UNIVERSITY OF CHICAGO | **DEPARTMENT OF STATISTICS**

MASTER'S THESIS PRESENTATION

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Semiparametric Estimation of Time-Varying Ising Models in High Dimensions

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ABSTRACT

Time-varying Markov random fields model dependence structures that change over time among nodal variables. Sample-efficient methods with respect to established information-theoretic lower bounds have been proposed to learn high-dimensional Ising models with binary spin alphabets and pairwise interactions in a static setting. In this paper, we consider a time-varying Ising model and propose a semiparametric estimator, the Regularized Interaction Screening and Kernel Smoothing (RISKS) estimator, to learn the graph structure underlying a time series of nodal observations in the high-dimensional regime. Our estimator extends the interaction screening method in the literature to a dynamic setting via a kernel smoother. With appropriate regularization and convexity conditions, RISKS reconstructs graph parameters and structure with sample complexity logarithmic in graph size, exponential in structural parameters (maximum interaction and node degree), and inverse to kernel bandwidth.