
A Generalized Framework for Learning Graphical Models from Traveling Waves

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Abstract: Traveling waves in the brain have arisen in recent years as an increasing interesting phenomenon that reflect computational processes in the brain. Current literature has implicated these waves as important in sleep, working memory, or even as the underlying characterization of brain state. While this new area of research offers the potential for even richer understanding of the brain, the tools available to statistically analyze wave data are sparse. In this work, we develop a new approach to learn the true underlying graph structure of phase patterns in wave data. Our approach takes inspiration from Ising models of magnetization in statistical physics, and also interaction screening in statistical learning. We showcase probabilistic guarantees on our algorithm's ability to learn the true structure and parameters of the data, its performance in simulated data, and potential use cases in neuroscience.

Reading List:

Interaction Screening: Efficient and Sample-Optimal Learning of Ising Models

<https://arxiv.org/abs/1605.07252>

Cortical traveling waves: mechanisms and computational principles

<https://www.nature.com/articles/nrn.2018.20>