Title of the chosen chapter:
A Dynamic Stochastic Block Model for Multi-Layer Networks

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Abstract of the chosen chapter:

We propose a flexible stochastic block model for multi-layer networks, where layer-specific hidden Markov-chain processes drive the changes in the formation of communities. The changes in block membership of a node in a given layer may be influenced by its own past membership in other layers. This allows for clustering overlap, clustering decoupling, or more complex relationships between layers including settings of unidirectional, or bidirectional, block causality. We cope with the overparameterization issue of a saturated specification by assuming a Multi-Laplacian prior distribution within a Bayesian framework. Data augmentation and Gibbs sampling are used to make the inference problem more tractable. Through simulations, we show that the standard linear models are not able to detect the block-causality under the great majority of scenarios. As an application to trade networks, we show that our model provides a unified framework including community detection and Gravity equation. The model is used to study the causality between trade agreements and trade looking at the global topological properties of the networks as opposed to the main existent approaches which focus on local bilateral relationships. We are able to provide new evidence of unidirectional causality from the free trade agreements network to the non--observable trade barriers network structure for 159 countries in the period 1995--2017 for a low number of communities and a bidirectional causality for a larger number of communities.