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Adapting the Stochastic Block Model to Edge-Weighted Networks

Christopher Aicher, Abigail Z. Jacobs, Aaron Clauset

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We generalize the stochastic block model to the important case in which edges are annotated with weights drawn from an exponential family distribution. This generalization introduces several technical difficulties for model estimation, which we solve using a Bayesian approach. We introduce a variational algorithm that efficiently approximates the model's posterior distribution for dense graphs. In specific numerical experiments on edge-weighted networks, this weighted stochastic block model outperforms the common approach of first applying a single threshold to all weights and then applying the classic stochastic block model, which can obscure latent block structure in networks. This model will enable the recovery of latent structure in a broader range of network data than was previously possible.

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