

# Consistent community detection in multi-layer network data

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## Abstract

We consider multi-layer network data where the relationships between pairs of elements are reflected in multiple modalities and may be described by multivariate or even high-dimensional vectors. Under the multi-layer stochastic block model framework, we derive consistency results for a least squares estimation of memberships. Our theorems show that, as compared to single-layer community detection, a multi-layer network provides much richer information that allows for consistent community detection from a sparser network, with required edge density reduced by a factor of the square root of the number of layers. In this talk, we will present the theoretical analysis, including the development of a new spectral bound for tensor network data, as well as simulations and a data example.

## Keywords

Community detection; Consistency; Sparse network; Tensor concentration bound.