Asymptotics in undirected random graph models parameterized by the strengths of vertices

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November 9, 2014

Abstract

To capture the heterozygous of vertex degrees of networks and understand their distributions, a class of random graph models parameterized by the strengths of vertices, are proposed. These models are equipped in the framework of mutually independent edges, where the number of parameters matches with the size of networks. The asymptotic properties of the maximum likelihood estimator have been derived in some special models such as the $\beta$-model, but general results are lacking. In these models, the likelihood equations are identical to the moment equations. In this paper, we establish a unified asymptotic result including the consistency and asymptotic normality of the moment estimator instead of the maximum likelihood estimator, when the number of parameters goes to infinity. We apply it to the generalized $\beta$-model, maximum entropy models and Poisson models.

KEY WORDS: Asymptotical Normality, Consistency, Moment Estimators, Increasing Number of Parameters, Undirected Random Graph Models

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