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A preferential attachment model with Poisson growth for scale-free networks

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Abstract We propose a scale-free network model with a tunable power-law exponent. The Poisson growth model, as we call it, is an offshoot of the celebrated model of Barabási and Albert where a network is generated iteratively from a small seed network; at each step a node is added together with a number of incident edges preferentially attached to nodes already in the network. A key feature of our model is that the number of edges added at each step is a random variable with Poisson distribution, and, unlike the Barabási–Albert model where this quantity is fixed, it can generate any network. Our model is motivated by an application in Bayesian inference implemented as Markov chain Monte Carlo to estimate a network; for this purpose, we also give a formula for the probability of a network under our model.

Keywords Bayesian inference · Complex networks · Network models · Power-law · Scale-free