Abstract

In recent years, power laws have been conjectured to characterize the behavior of the upper tails of the degree distribution in many real phenomena and real-worlds networks. Historically, the first one to propose a model with a power law behavior was Yule [1] in the context of the creation of new genus and the evolution of species inside of these genus. Later, Simon [2] provides another version of the Yule model in discrete time and finds also a power law behavior. In the context of random graphs the first model created to obey the power law property was introduced by Barbási and Albert [3].

All these models look very related, even sometimes they are considered equivalent on the basis of heuristic approach. However, we believe that each of them has its peculiarity and a rigorous comparison should be performed.

In this talk we will give first a common description of the discrete models, specifically Simon and Barbási-Albert models, by using random graph processes with preferential attachment mechanisms, and also introduce a continuous time preferential attachment model, the Yule model. Then, we prove and explain why in some cases the asymptotic degree distribution of the Barbási-Albert model coincide with the asymptotic in-degree distribution of the Simon model. On the other side, we also prove that when the number of vertices in a Simon model (with parameter α) goes to infinite, it behaves as a Yule model with parameters $\lambda = (1 - \alpha)$ and $\beta = 1$.

References

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[4] B. Bollobás, O. Riordan, J. Spencer, G. Tusnády. (2001). The Degree Sequence of a Scale-Free Random Graph Process. *Random Structures and Algorithms.* **18**, 279–290.