Social Reach: Adjusted latent space network model for preferential attachment

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Abstract

We propose a novel dynamic latent space network model that integrates the concept of social reach to explain preferential attachment, a key mechanism driving network growth. Social reach quantifies the influence of a node in the latent space, enabling a more realistic modeling of network dynamics. By incorporating both the latent positions of nodes and their social reach, the model captures complex network behaviors, including preferential attachment. We present a Bayesian inference algorithm to estimate model parameters and latent positions, validated through Monte Carlo simulations under various network scenarios. The proposed model is further applied to a real-world Facebook friendship network, demonstrating its effectiveness in explaining network growth and uncovering the latent characteristics of individual nodes. Additionally, it provides a framework that can be leveraged for applications such as node recommendation.