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**3-HBP: A THREE-LEVEL HIDDEN BAYESIAN LINK PREDICTION MODEL IN SOCIAL NETWORKS**

**ABSTRACT:**

In social networks, link establishment among the users is affected by complex factors. In this paper, we try to investigate the internal and external factors that affect the formation of links and propose a three-level hidden Bayesian link prediction model by integrating the user behavior as well as user relationships to link prediction. First, based on the user multiple interest characteristics, a latent Dirichlet allocation (LDA) traditional text modeling method is applied into user behavior modeling. Taking the advantage of LDA topic model in dealing with the problem of polysemy and synonym, we can mine user latent interest distribution and analyze the effects of internal driving factors. Second, owing to the power-law characteristics of user behavior, LDA is improved by Gaussian weighting. In this way, the negative impact of the interest distribution to the high-frequency users can be reduced and the expression ability of interests can be enhanced. Furthermore, taking the impact of common neighbor dependencies in link establishment, the model can be extended with hidden naive Bayesian algorithm. By quantifying the dependencies between common neighbors, we can analyze the effects of external driving factors and combine internal driving factors to link prediction. Experimental results indicate that the model can not only mine user latent interest distribution but also can improve the performance of link prediction effectively.