

Exploring Social Dynamics in Online Bookmarking Systems

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1 Introduction

Web 2.0 technologies have spawned different types of information sharing systems, including online bookmarking systems. These information sharing systems have facilitated collaboration among their users with similar interests. They also provide a powerful means of sharing, organizing, and finding contents and contacts [1]. In this paper we focus on evaluating social interaction among users on *Del.icio.us*, which is one of the most popular and paradigmatic online bookmarking systems.

2 Degree Distribution

In *del.icio.us*, the collaborative tagging is globally visible among users. The process of tagging develops genuine social aspects, and the tagging system demonstrates social dynamics of user activity. We have designed website crawlers to collect the data and divided the dataset into several smaller datasets such as blog, finance, book, etc. Our analysis in this section was performed on the blog dataset which consists of 50,190 users. Fig. 1(a) shows the degree distribution of the user network, whose nodes are users and edges represent their social relationships. From this Figure, we can find that the network generally exhibits a power-law degree distribution: most of the nodes have small degree, and a few nodes have significantly higher degree. To test how well the degree distribution is modeled by the power-law, we used the least square method to fit the power-law behavior. We conclude that the distribution function $P(k)$ and degree k have the following approximate relation, $P(k) \sim k^{-2.4209}$.

3 User Activity Evolution

To analyze social dynamics, we use statistical approaches to identify the global characteristics of users in the tagging process. Fig. 1(b) displays the evolution of three variables: the average number of tags, URLs, and the average degree. We describe these variables as functions of age, measured by the final time we collected the data minus the time users first participated in the *Del.icio.us*. We can

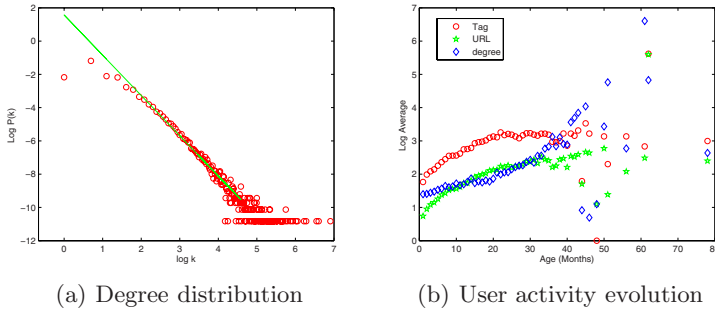


Fig. 1. Degree distribution and user activity evolution

characterize the evolution into two processes. In the first process, while users' age ranges from 1 to about 40 months, the average number of tags (*circle*) and the average number of URLs (*pentacle*) increase sublinearly with users' age. The average degree (*diamond*) increases similarly but superlinearly. However, in the second process when users' age is larger than 40 months, these relations disappear. This suggests that there exists a multi-scaling behavior in the tagging activity of users. When new users participate in the *Del.icio.us*, they will post some interesting web pages and use many tags to categorize and describe them. In the meanwhile, they will search some friends with common interests on *Del.icio.us*. As time goes by, some users exhibit stable interests in a consistent way while others not. This causes the numbers of their tags, URLs, and friends show different patterns.

4 Conclusions

This paper investigates the degree distribution of *Del.icio.us* user network and explores user activity evolution. We observe that the degree distribution exhibits the power-law property and the tagging activity shows an interesting multi-scaling behavior. Our current work is concerned with in-depth empirical analysis of these phenomena and related modeling work.

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References

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