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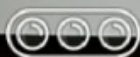
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ErLinkTopic: A GENERATIVE PROBABILISTIC FRAMEWORK FOR ANALYZING REGIONAL COMMUNITIES IN SOCIAL NETWORKS

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Abstract: Understanding how communities evolve over time have become a hot topic in the field of social network analysis due to the wide range of its applications. In this context, several approaches have been introduced to capture changes in the community members. Our claim is that a community is characterized by not only the identity of users but complex features such as the topics of interest, and the regional and geographic characteristics. Studying changes in such features of communities also provides informative findings for related applications. This leads to the main goal of the study in this paper, which is to capture the evolution of complex features describing communities. Particularly, we introduce a probabilistic framework called *ErLinkTopic* model. The model is able to extract regional *LinkTopic* [1] communities and to capture gradual changes in three features describing each community, i.e., community members, the prominence of topics describing communities, and terms describing such topics. It further supports the study of regional and geographic characteristics of communities as well as changes in such features. Experimental evaluations have been conducted using *Twitter* data to evaluate the model in terms of its effectiveness and efficiency in extracting communities and capturing changes in the features describing each community.

1 Introduction

Several models and algorithms have been developed for extracting communities in social networks. Typical approaches rely on the link structure of users, which is presented as a graph. This leads to the application of different graph clustering algorithms to detect such link-based communities, e.g., [2]-[4]. Recent studies, however, pay more attention to finding topical communities. By this, topical analysis is applied to the messages of users to derive topics indicating their interests. The extracted topics are used as another feature, besides the link structures to identify relationships between users. The key idea is that by leveraging more common features of users one can discover more meaningful communities. That is, users in a community exhibit both structural and hidden semantic links to each others. The main approach to extracting communities based on this idea is to develop a probabilistic model simulating a process of generating the observed features of users from hidden

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