# NEIWalk: Community Discovery in Dynamic Content-Based Networks

## Abstract:

Recently, discovering dynamic communities has become an increasingly important task. Many algorithms have been proposed, most of which only use linkage structure. However, rich information is encoded in the content of social networks such as node content and edge content, which is essential to discover topically meaningful communities. Therefore, to detect both structurally and topically meaningful communities, linkage structure, node content and edge content should be integrated. The main challenge lies in how to integrate them dynamically in a seamless way. This paper proposes a novel transformation of content-based network into a Node-Edge Interaction (NEI) network where linkage structure, node content and edge content are embedded seamlessly. A differential activity based approach is proposed to incrementally maintain the NEI network as the content-based network evolves. To capture the semantic effect of different edge types, a transition probability matrix is devised for the NEI network. Based on this, heterogeneous random walk is applied to discover dynamic communities, leading to a new dynamic community detection method termed NEIWalk (NEI network based randomWalk). Theoretical analysis shows that the proposed NEIWalk method gets a bounded accuracy lossdue to the random walk sampling. Experimental results demonstrate the effectiveness and efficiency of NEIWalk.