Friday 3:50pm to 5:30pm
Dynamic Network Analysis

Title: Social Networks Analysis of Text Mining and Bibliometrics for IT Assessment

Authors: Gilad Ravid, Elan Sasson and Nava Pliskin

Abstract:
In today's hyper-competitive business environment, in which Information technology (IT) innovations occur at increasing speeds with shorter life cycles, companies engage in technology assessment (TA) prior to IT investments. Assessment of a specific technology, however, presents a tough challenge for decision makers due to the inability of humans to manually process the abundance of data available on the Internet. This research responds to the TA challenge by modeling a TA framework for making sense of Internet data such as websites, blogs and forums about a certain technology and, based on this model, developing a decision support tool entitled Technology Assessment Software Kit (TASK). The data at the basis of this research is a diverse corpus of unstructured date-tagged textual data from the web about a certain technology. Methodologically, the research draws on a unique synergy of two well-established research fields: a) Information extraction (IE), also known as entity extraction, is applied to the data corpus using a text mining (TM)technique based on natural language processing (NLP) to yield named entities and create a concept network in order to uncover hidden patterns via co-word analysis and concepts relatedness algorithms; and b) Bibliometrics, a method often used for technology assessment, is applied to the extracted concepts to further fine tune the relatedness proximity through a series of bibliometric search queries, amplifying silent information and reducing noisy information. On the basis of the Vector Space Model (VSM) and the Cosine Similarity Measure (CSM), this research also introduces temporal proximity to the concept network via quantitative temporal operators to distinguish between emerging concepts and established concepts based on the time dimension. The combination of relatedness proximity and temporal proximity yields a more accurate and augmented concept map and professional social networks.

Title: Semi-parametric vertex set prediction for dynamic networks using latent tree models

Authors: Ragupathyraj Valluvan, Zack Almquist, Carter Butts and Animashree Anandkumar

Abstract:
Dynamic networks may be viewed as arising from a process of change in the vertex set and/or edge set of a network, with joint edge/vertex evolution being common in observational settings. In this latter case, recent work has shown that the accuracy of vertex set prediction substantially affects the ability of dynamic network models to correctly predict features of the edge structure (Almquist and Butts, 2011). Past research has applied dynamic logistic regression to scalably model joint edge/vertex dynamics; this approach, however, is unable to capture potentially important sources of dependence within the vertex set (e.g., subgroups who tend to be jointly present or absent due to endogenous social relations). Recent developments in latent tree models suggest their use as a mechanism for modeling dependence in vertex co-presence; these models can easily represent types of dependence expected in typical settings (e.g., subgroup structure, selective pairing), and can be efficiently inferred even for very large graphs. Here, we introduce a semi-parametric approach to the problem of vertex set prediction in dynamic networks, combining a parametric model for covariate effects with anon-parametric latent tree structure. We illustrate this approach on a classic data set involving interactions among windsurfers on a California beach (Freeman et al., 1988).