

Analyzing Local and Global Characterizations in Patent Citations

Using a Stochastic Model

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Abstract

In our stochastic generative model for patent citation networks, we explicitly address time by representing the number of nodes per time, the distribution of time differences among edges, and the distribution of references as functions. Using these, we generate nodes and edges over time by a generative mechanism of preferential attachment (PA) and triad formation (TF). To capture a structure of patent citations, we extend the switching probability parameter between PA and TF from a constant to a random variable. This model demonstrates a fit for both academic papers and patent documents. Model fit is evaluated based on characteristics of the simulated networks, mainly focusing on important local features such as in-degree distribution, out-degree distribution, and node triangle participation. These features, directly addressed by the model, are closely related to real-world phenomena and are easily interpretable. There is potential for improvement in global features such as scree-plots. Our goal is to build a better model. This presentation summarizes the properties obtained by analyzing the local and global features. We used graph motifs, hop-plot, and betweenness centrality in addition to the former characteristics. This is a joint work with Professor Junji Nakano (Chuo University, Japan).