Contributions

We present a new framework for performing data mining on dynamic networks in an on-top fashion. Existing subgraph mining algorithms on static graphs can be easily integrated into our framework. The efficient search for dynamic patterns inside static frequent subgraphs is based on the idea of suffix trees.

Efficient Dynamic Frequent Subgraph Discovery

Transformation into a Dynamic Graph

The three graphs on the left represent a time series of graphs with edge insertions and edge deletions over time. The graph on the right is a dynamic graph that summarizes all information represented by the time series by the use of so called existence strings.

Results on Biological Yeast Data

Dynamic network construction by integration of PPI data and a time series of yeast gene expression levels. Enumeration of all static frequent subgraphs by the use of FANMOD [Wernicke, 2006].

The p-value of each static frequent subgraph is determined to assess the significance of the subgraph. Evolutionary conservation rate indicates the quality of the result.

Algorithm 1 Dynamic frequent subgraph discovery

**Input:** All embeddings of one static frequent subgraph S
for each embedding $S_i$ of S do
1) Order the edges of $S_i$ according to canonical labeling
2) Store their existence strings in this order as a matrix
3) Translate each column of the matrix $M(S_i)$ into one character
4) Concatenate these characters into one string
end for

**Output:** Dynamic patterns within embeddings of S

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