Null Models For Social Networks

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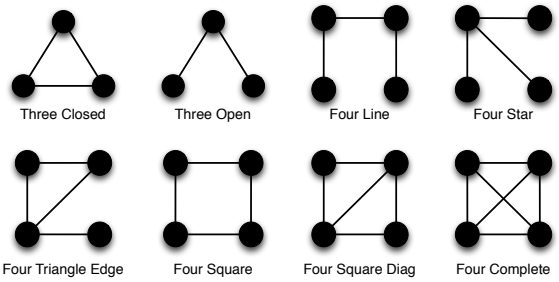

Figure 1: Graphical representation of the 3-motif and 4-motif.

ABSTRACT

Categories and Subject Descriptors

J.4 [**Social and Behavioral Sciences**]: Miscellaneous; H.3.3 [**Information Search and Retrieval**]: Text Mining

General Terms

Algorithms, Experimentation

Keywords

Social network

1. INTRODUCTION

2. PROBLEM DEFINITION

In this section, we first give some basic concepts that we use throughout in the paper. Then, we present formulate the problem of motif-driven graph generation problem.

Graph is a representation of a set of objects and correlations or connections between them. The objects in graph called nodes and the relations called edges. Let $G = (V, E)$ be a graph, where V is a set of $|V| = N$ nodes and $E \subseteq V \times V$ is a set of correlations or connections between nodes. A graph without a self-loop or multi-edge is called simple graph. Without loss of generality, we assume the graph is simple, connected and undirected.

Subgraph is a graph $G' = (V', E')$ whose nodes V' and edges E' form subsets of the graph nodes $V(V' \in V)$ and edges $E(E' \in E)$of a given graph $G = (V, E)$. In graph G', if $V' \in V, E' \in E$ and $\{e = (v_a, v_b) : v_a, v_b \in V, e \in E, e \notin E'\}$ then G' is a **vertex-induced subgraph(induced subgraph)**.

Motif is defined as a small, connected, non-isomorphic, induced subgraph of graph. In this paper, we only use 8 motifs within k nodes, where $k \in \{3, 4\}$. We use k-motif as a motif with k nodes. Here, we have ThreeClosed, ThreeOpen of *3*-motif, and FourLine, FourSquare, FourStar, FourTriangleEdge, FourSquare-Diag and FourComplete of *4*-motif which show in Figure 1

Problem **Motif-driven graph generation. Input:** The input of our problem consists of two components, i.e., the basic attributes $|V|$ and $|E|$ of the network G and the motif distribution D of graph G, where D only contains the motifs we mentioned in Figure 1.

Output: Our goal is to generate a graph G' which has the same basic attributes as G and approximate motif distribution as D.

The problem formulation is different from the traditional graph generation problem [2, 5, 1, 4, 3], as in this paper we focus on generating graph based on the motif distribution. Since in social science domain, the distribution of motif is highly used for analyzing large graphs and it's a like basic property.

3. DATA AND OBSERVATIONS

4. OUR APPROACH

5. EXPERIMENTS

6. RELATED WORK

7. CONCLUSION

8. REFERENCES

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