

Hybrid Swarm Based Method for Link Prediction in Social Networks

Abstract—Understanding the evolution of dynamic network structures is an emerging and very interesting topic, which is motivated by several real applications in many scientific fields. In this article, we discuss the link prediction problem, which is one of the key issues in the analysis of social evolving networks. We propose a new hybrid approach to predict the connections in social networks. The approach is inspired from the particle swarm algorithm and is combined with supervised machine learning strategy into a hybrid system. The paper includes an experimental study using real world data sets to compare the proposed methods against other approaches. The obtained results show good performance and prove the effectiveness of the proposed method.

Keywords—Social Networks, Link prediction, Particle Swarm Optimization, Supervised machine learning

I. INTRODUCTION

Social networks have become a popular communication way alongside traditional media. This success is due to the various services offered by such systems (micro-blogs, sharing content, friendship...). In the last years there has been a blast of social networks in the on-line world whereas users flock these networks and connect with other people. In research, social network analysis (SNA) has attracted the interest of several researchers in various fields such as biology, computer science, information science and sociology, Considerable works have focused on static the aspect of networks. In reality, social networks are constantly evolving over time, which requires a dynamic analysis [1]. Temporal social networks can serve to modeling the dynamics change over time: nodes may join or leave the network whereas interactions (links) can be increased or reduced. The majority of the network evolution studies have attempted to follow the global properties change (diameter, degree,...), which does not express local change. Predicting missing links or links which may appear in the future is one of the major approaches elaborated to understand the local dynamics of a network. It focus mainly on a forecasting problem: given an overview of a network at time t , we seek to make a predictive most recent links that may arise in the next time step, $t + 1$ (see figure 1).

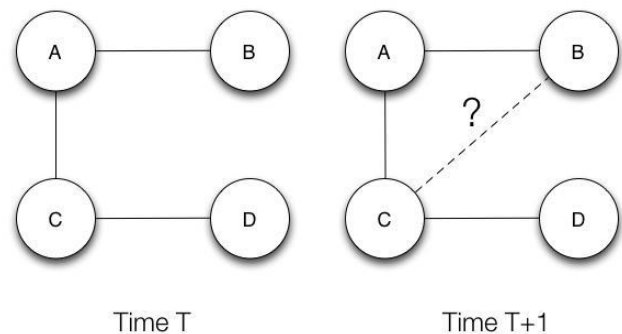


Figure 1. Link prediction problem

In the practical side, Link prediction is very important in a wide range of applications [2]. For example, it may be used to recommend friends for users in social online sites, or recommend potential collaborations in organizational studies. In a criminal investigation, it is useful to discover missing links in a criminal network [3] [4]. In marketing we can forecast some users' future attitudes and recommend potential products to customers (Amazon.com¹, SkyMall.com², MovieLens.org³...) [5]. In biology, it is possible to predict future protein interactions that can guide the experiments [6] [7]. This article presents a new hybrid link predictor. The approach is inspired from the particle swarm paradigm and is combined with a supervised learning to enhance performance. An experimental study has been performed using real world data sets to compare the proposed algorithm against other approaches.

The rest of the paper is structured as follows. In the next section, we present a literature review of related works. Section 3 describes the proposed method. Then we will demonstrate the performed experiments and achieved

¹recommends books, music and retail products to potential customers

²recommends retail products to potential customers

³recommend movies to potential viewers