Chapter 36
Mining of Medical Trends Using Social Networks

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ABSTRACT

Recent work in machine learning and natural language processing has studied the content of health related information in tweets and demonstrated the potential for extracting useful public health information from their aggregation. Social intelligence derived from health content has become of significant importance for various applications, including post-marketing drug surveillance, competitive intelligence, medicine reviews and to assess health-related opinions and sentiments. Further, the quantity of medical information in the media such as tweets on Twitter, Facebook or medical blogs is growing at an exponential rate. Medical data such as health records, drug data, etc. has become major candidates for Big Data analysis and thus exploring this content has become a necessity for organizations. However, the volume, velocity, variety, and quality of online health information present challenges, necessitating enhanced facilitation mechanisms for medical social computing. The objective of this chapter is to discuss the possibility of mining medical trends using Social Networks.

INTRODUCTION

Social Network is a social structure comprising of individuals (or organizations) interconnected by one or more specific types of interdependencies such as kinship, exchange of financial data (e.g. SWIFT code), communication exchange, and other information or knowledge processing entities. It is based on an assumption of the importance of relationships among interacting units (Wasserman, S. and K. Faust, 1994). Social Network Analysis is the application of graph theory to comprehend, classify and quantify relationships in a social network. Social Network Analysis (SNA) relates to mapping, understanding, and analysing interactions across a set of people. Social network mining approaches tend to be founded on graph mining or network analysis techniques. Due to the evident recent big data surge due to increased

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consumer connectivity via medium of mobiles, tablets and other portable devices there is a growing need for social network analysis to understand more about the customers and their communities and enhance existing reports, modelling tools, and methodologies with social metrics(Taxidou,2013). In information diffusion in a social network, we study information diffusion in complex networks. Information can be anything from a quote, to rich text or media. Information diffusion study involves how information cascades in a network over a period of time. For organizations, such information diffusion analysis results in competitive intelligence, deeper customer insight and buying behaviour patterns. Information Diffusion analytics help in direct establishment of temporal information diffusion patterns in which social groups are more likely to recommend products, or form opinions, which can be further mined by decision support systems for business benefits resulting in increased sales/ returns for an organization.

Various applications for such analysis include optimization of supply chain for big e-tailers such as Amazon, Walmart etc., decision support system for HR and human capital retention, and market research survey analysis. In the UK, there has been renewed interest in the application of this theory in the field of health care. Research funded by the NIHR (National Institute for Health Research) Service Delivery and Organization Programme and more recently the development of NIHR Collaborations for Leadership in Applied Health Research and Care (CLAHRCs), has refocused attention on the role of social interactions and networks in the ability of health service organizations to identify and exploit knowledge from outside the National Health Service (NHS) (Chambers et al., 2002).

Information Diffusion Techniques in Social Networks

Before analysing the various techniques that have already been presented for information diffusion on social networks, we need to study the properties of the social networks. The following properties have been formally defined for the Social networks:-

1. **Diameter:** In a Social Network it a small diameter may be inferred as: (1) The longest shortest-path length, which is the true graph theoretic diameter but which is infinite in disconnected networks, (2) The longest shortest-path length between connected nodes, which is always finite but can't distinguish the complete graph from a graph with a solitary edge, (3) The average shortest-path length and (4) The average shortest-path length between connected nodes (David,2005).
2. **Navigability:** Social networks can be viewed as navigable small worlds because not only there exists small chains connecting most pairs of people but using only a fraction of the local and global information people in a network can connect to each other via small chins. For Navigability, we refer Kleinberg's social network model, which is based upon Greedy algorithm. Here each node is connected to its nearest neighbour. It can construct short paths between nodes in the graph. We can have short paths connecting most pairs of people by using only local information and some knowledge of global structure (Kleinberg, JM,2000).
3. **Clustering Coefficient:** It measures the probability that two people with common friends will themselves be friends. A more general way of seeing clustering coefficients is as a manifestation of the following phenomenon: for a pair (u, v) of people in a social network, the event that an edge between u and v exists is highly negatively correlated with the graph distance between u and v in the network with the possibly existent edge (u, v) deleted (Newman M. E. J, 2001).

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