Chapter 40
Sentiment Based Information Diffusion in Online Social Networks

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ABSTRACT

This article describes how social media has emerged as a main vehicle of information diffusion among people. They often share their experience, feelings and knowledge through these channels. Some pieces of information quickly reach a large number of people, while others not. The authors analyzed this variation by collecting tweets on 2016 U.S. presidential election. This article gives a comprehensive understanding of how sentiment encoded in the textual contents can affects the information diffusion, along with the effect of content features, i.e., URLs, hashtags, and contextual features, i.e., number of followers, followees, tweets generated by the user so far, account age, tweet age. In order to explore the relationship between sentiment content and information diffusion, the authors first checked the features' significance as an indicator of diffusibility by using random forests. Finally, support vectors and k-Neighbors regression models are used to capture the complete dynamics of information diffusion. Experiments and results clearly reveal that sentiment prominently helps in making a better prediction of information diffusion.

INTRODUCTION

Online social networks (OSNs) are witnessing an unprecedented growth in the user base. The content being generated at these social networks is either experience, observation or views of the people. These contents have the power of changing the mind of people toward anything like societies, political parties, and products of business companies. So, understanding the information diffusion is of prime importance, because it can serve people in number of ways – in holding the reputation of their brand, in maintaining a good face of their societies or political parties. Information diffusion is a process by which a piece of information spreads and reach individuals through interactions. It involves sender(s), content, medium and receiver(s). So, to understand information diffusion process, there is a requirement of analyzing the effects of senders, content, and topology of the medium.

Information can be diffused by traditional media (i.e., television, radio, newspapers) or social media (i.e., Twitter, Facebook). To acquire the services of traditional media one has to pay the charges whereas services of the social media is almost free of cost. In Social media, people have to invest time in framing the content which can touch the emotions or affect the sentiment (mental attitude produced by the feelings) of the targeted population.

Due to the advent of Internet, getting the services of social media becomes very easy, in terms of time and cost both. Over social media, only a small fraction of people is active, generate novel or fresh news, all others remain passive and continue with a social media to consume the available information. Scarcity of the attention is emerged as a new issue in the field of OSNs (Lanham, 2006). People can effectively maintain relations with only a limited number of friends, colleagues, or business partners. They can consume a finite amount of information from the mountainous amount produced on daily basis. Due to this reason, people (i.e., managers, politicians) need to invest substantial time in framing effective messages. A message can only be called effective if it serves the purpose of reaching the targeted population in quicker and wider way.

Twitter is an online social networking and news service where people interact with messages. These messages are called tweets and restricted to 140 characters. It has 883 million registered users (twopcharts.com), out of these only 319 million users are active (wikipedia.org). These users generate mountainous data in the form of tweets. Tweets are posted by the registered users and unregistered users can only read them. It is a largest source of breaking news. On the day of the 2016 presidential elections of United States, users sent 40 million election-related tweets and proved Twitter as a largest source of the breaking news (Isaac, 2016). Tweet of a person is accessible by all others, unless the access is restricted by some settings. Twitter provides a mechanism of "following". If a user wants to get automatic notifications about the new tweets created by others, (s)he has to follow them. Following others is a sort of subscription to their tweets. People followed by a person are his/her friends (or followees) and those who are following that person are called his followers. Due to the size bound, additional information is added by using some special characters like # (hashtags), @. Hashtags are used to link tweets to a particular theme (i.e., #Ramadan, it linked the tweet to a month in which Muslims perform fasting) and mentions (@realDonaldTrump) are used to add users. People who get mentioned in a tweet also receive a notification along with the followers of the tweet's author. This platform also serves the users with private messaging and broadcasting.

In Figure 1, nodes are Twitter users and edges represent a follower to followee relationship. Users u_2 and u_3 are exposed to the information tweeted by u_1. But making the information (tweets) available beyond the followers of a tweet's original author depends upon the perspective of the people getting the

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