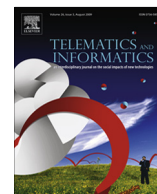




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## Interdisciplinary study on popularity prediction of social classified hot online events in China

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## ABSTRACT

We offer an interdisciplinary study of computer science and social science, analyzing behavior surrounding three types of online events: political events, social events, and non-public events. Based on the intrinsic characteristics of the three event types, this paper creates an effective method to predict such events. We continuously followed and recorded data every 10 min for 10 months from September 14, 2012 to July 11, 2013, and collected over 14 million “hot” posts from Sina Weibo, the largest microblogging provider in China. After removing spammers and noises, we developed a database of 4180 hot online events and 7,761,395 threads. We found that people’s online behavior regarding event types varies in terms of follow-up statistics and the predictability of events. The Chinese are, typically, quite concerned with social affairs that relate most closely to their personal interests and preferences. People tend to cluster around political events more often than social events and non-public events. This is demonstrated by an algorithm embedded with a clustering growth pattern of events, which predicts the popularity of online political events above others. The statistical findings are justified by Habermas’ public sphere theory and the theory of vertical/horizontal collectivism/individualism. This research provides an interesting piece of computational social science work to assist in the analysis of incentives concerning China’s collective events.

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### 1. Introduction

Nowadays, China is home to the world’s largest number of “netizens,” or people who are active in online communities. The 31st Statistical Report on Internet Development in China, issued by the China Internet Network Information Center, reported that the total netizen population in China was 688 million in December 2015, with an Internet penetration rate of 50.3% of the total population. The popularity of Internet enhances Chinese’s participation in public affairs. Understanding people’s attitude and behavior model toward political affairs and social affairs online is becoming another way for us to understand Chinese society. The Internet plays a special role in China: it is an important channel for Chinese to participate in social affairs. The Internet has also expanded the freedom of information in China. Research into online hot events diffusion will help us understand Chinese preferences and concerns regarding public participation.

Online events reflect real-world situations of China economically and politically to some extent. In recent years, more and more collective events have taken place in China, which may compose potential threat to the social stability. As the world’s

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second largest economy, questions have been raised for many years concerning China's social and political stability. On the one hand, China's economic reform over the past three decades is considered an obvious success. China's economic system has been transformed from a command economy to an expanding market economy (Lewis and Litai, 2003). Furthermore, its fast economic growth has ensured extensive support and social prosperity. On the other hand, rapid economic growth has resulted in social disruption, pervasive corruption, and social inequality (Cui et al., 2014; Ho, 2014). The complex change in China's social strata brought about by economic reform has intensified unrest and insecurity (Knight, 2013). In contrast, China's political system has remained unchanged in recent years, but mounting political and social problems have introduced volatility into society (Shirk, 2007). Large-scale online collective behaviors occur frequently in China (Sullivan, 2014; Yang, 2013). Research on the patterns of online collective behaviors with massive data opens more accessible way to observe Chinese interests and concerns regarding public affairs than conventional (usually offline) social questionnaire methodologies with sparse data.

In this paper, we conduct an interdisciplinary study of computer science and social science by investigating the following questions: 1) Are the behavior modes of netizens engaged in online hot political events or social events characterized by any special features? 2) Can we better predict the popularity of various online collective events based on netizens' behaviors?

We offer an interdisciplinary research framework including Internet data collection, algorithmic popularity prediction of online hot events, and the related explanations about experimental findings from the viewpoints of public sphere (Habermas, 1991), individualism/collectivism and some offline empirical researches. Our empirical study of China's online hot events is based on more than 14 million posts collected from Sina Weibo between September 14, 2012 and July 11, 2013. Controversial opinions regarding China's current regime have inspired us to classify the hot events into three categories: political public events, social public events and non-public events, as based on a bag-of-words model used in social science (Dumais, 2004). Such classifications can help us observe the root reason for China's hot events and better understand people's collective behaviors and intentions.

To compare and predict the popularity of the three types of events, we used three algorithms: a linear algorithm, correlation-based algorithm and a modified state transition-based algorithm. For online political events, the modified state transition-based algorithm visibly improves the prediction accuracy compared with the other two algorithms. We found that the growth pattern for political events is more regular and predicable than the other two types of online events and people are more likely to cluster and converge on online political events.

The prediction results provide an interesting piece of computational social science work to assist in the analysis of incentives concerning China's collective events. We discuss their far-reaching implications for Chinese politics and predict for China's social stability justified by public sphere (Habermas, 1991), horizontal/vertical individualism/collectivism, and some offline empirical studies and observation.

## 2. Literature review

About the impact of social media on public sphere, there is a lot of debate. Generally social media offers increasing opportunities for political communication and enable democratic capacities for political discussion within the virtual public sphere (Loader and Mercea, 2011). Habermas initially defined public sphere as "a domain of social life in which such a thing as public opinion can be formed." Access to this domain is "open in principle to all citizens" who may "assemble and unite freely, and express and publicize their opinions freely." He later recognized the internal dynamics of the public sphere, the possibility of multiple public spheres, as well as the conflicts and interactions among them (Habermas, 1991). Huang argues that Habermas binary opposition between state and society is inappropriate in China (Huang, 1993). He stated there is a third space in between state and society, in which both participate. The mass media constitute a source of power (Jarren and Donges, 2002). The dynamics of mass communication are driven by the power of the media to select, and shape the presentation of, messages and by the strategic use of political and social power to influence the agendas as well as the triggering and framing of public issues (Habermas, 2006). The rapid diffusion of new media has transformed the supply of information. There is a much wider range of media choices on offer, providing much greater variability in the content of available information. This means that something approaching information "stratamentation" (stratification and fragmentation at the same time) is going on. More people are drifting away from the mainstream media (Bennett and Iyengar, 2008). But on the new media area, unlike that in the US, Chinese government has large size and sophisticated censorship (King et al., 2012). Chinese Internet users have turned to the Internet for public expression and political activism even as the government is stepping up control (Barne and Davies, 2005). This offers Internet research in China an important role in public sphere and political communication.

As one aspect of political philosophy, the theory of individualism and collectivism influences people's attitude on public affairs and their behavior in public sphere. Hofstede first measured individualism and collectivism across cultures, the original two-dimensional conceptualization has been a successful predictor of behavioral patterns (Triandis and Gelfand, 1998). Triandis highlighted that it is important to make the distinction between vertical and horizontal individualism and collectivism (Triandis, 1995). Thus making four types of dimensions, horizontal collectivism, vertical collectivism, horizontal individualism and vertical individualism. Horizontal collectivists merge with in-groups, but they do not feel subordinate to their in-groups. Vertical collectivists submit to the norms of their in-groups and are even willing to sacrifice their personal identities for their in-groups. Horizontal individualists are characterized by seeking individuality rather than distinctiveness.

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