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Enabling Next Generation Logistics and Planning for Smarter Societies

Sugimiyanto Suma[1], Rashid Mehmood[2*], Nasser Albugami[3], Iyad Katib[1], Aiiad Albeshri[1]

[1]*Department of Computer Science, FCIT, King Abdulaziz University, Jeddah, 21589, Saudi Arabia*
[2]*High Performance Computing Center, King Abdulaziz University, Jeddah, 21589, Saudi Arabia*
[3]*Department of Information Technology, FCIT, King Abdulaziz University, Jeddah, 21589, Saudi Arabia*

Abstract

Social media has revolutionized our societies. It has made fundamental impact on the way we work and live. More importantly, social media is gradually becoming a key pulse of smart societies by sensing the information about the people and their spatio-temporal experiences around the living spaces. Big data and computational intelligence technologies are helping us to manage and analyze large amounts of data generated by the social media, such as twitter, and make informed decisions about us and the living spaces. This paper reports our preliminary work on the use of social media for the detection of spatio-temporal events related to logistics and planning. Specifically, we use big data and AI platforms including Hadoop, Spark, and Tableau, to study twitter data about London. Moreover, we use the Google Maps Geocoding API to locate the tweeters and make additional analysis. We find and locate congestion around the London city. We also discover that, during a certain period, top third tweeted words were about job and hiring, leading us to locate the source of the tweets which happened to be originating from around the Canary Wharf area, UK's major financial center. The results presented in the paper have been obtained using 500,000 tweets.

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Keywords: Smart Cities, Smart Societies, Big Data, High Performance Computing, Social network Analysis, Logistics, Planning, Transportation

1. Introduction

Social media has revolutionized our societies. It has made fundamental impact on the way we work and live. More importantly, social media is gradually becoming a key pulse of smart societies by sensing the information

* Corresponding author. Tel.: +966-537-069-318.
E-mail address: rmehmood@kau.edu.sa

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about the people and their spatio-temporal experiences around the living spaces. Twitter is one of the most-widely used social media at these days. People tend to post about their life, feel and experience to twitter. This thing leads to huge number data generation every day. There are around 500 million tweets per day[1]. It is a huge amount of data, and this is a big chance to explore the data and getting something benefit from it. By emerging big data term and technology, we can utilize this data to be explored and analyzed further to get insight and result in decision.

Every day data is being generated very fast, with vast amount, and in various type. There are lots of resources produce this data such as internet of things (IoT) from various installed sensor, microblogging, social media posting, transactional data, digital video and picture, and many more. This is called big data, and it is stored in cluster machine with distributed system. Big data also means big challenge, big effort, and big result. Stakeholders agree with the 3Vs (Volume, Variety, Velocity) to define the characteristics of big data, although there are some new Vs proposed by some researchers at these days. We use term big data analytic to get a deeper and wider insight for a good decision from our data. Since, big data is a lake of data which contains any type of data. Preparing this data to be easily processed further is challenging and consuming time, however we can get insight more accurate and faster. Big data and computational intelligence technologies are helping us to manage and analyze large amounts of data generated by the social media, such as twitter, and make informed decisions about us and the living spaces.

This paper reports our preliminary work on the use of social media for the detection of spatio-temporal events related to logistics and planning. Specifically, we use big data and AI platforms including Hadoop, Spark, and Tableau, to study twitter data about London. Moreover, we use the Google Maps Geocoding API to locate the tweeters and make additional analysis. We found and located congestion around the London city. We also discovered that, during a certain period, top third tweeted words were about job and hiring, leading us to locate the source of the tweets which happened to be originating from around the Canary Wharf area, UK's major financial center. The results presented in the paper have been obtained using 500,000 tweets.

This paper is organized as follows. Section 2 gives a literature review of any previous work related to this topic. Section 3 describes the methodology and design used in this paper. Section 4 discusses the results and analysis of our research. Finally, we conclude in Section 5 with directions for future work.

2. Literature Review

Big data and social network analysis have been used in the past for smart cities research. Herrera-Quintero *et al.* have proposed the design and implementation of an intelligent transportation system (ITS) prototype which combined big data and internet of things (IoT) to produce ITS cloud service for supporting transportation planning for Bus Rapid Transit (BRT) Systems[2]. Mousheimish *et al.* have proposed a framework that connects critical business operations with contextual events[3]. This framework aims to predict possible infraction to their occurrences. Kolchyna *et al.* proposed a framework to detect twitter events to predict spikes in sales and evaluated it using a dataset comprising 150 million tweet records and 75 brands of sales data[4]. Qu *et al.* investigated a dynamic Production Logistics Synchronization (PLS) mechanism of a manufacturer which adopts public PL service[5]. They reported that cloud manufacturing integrated with IoT infrastructure enables smart mechanisms for PLS control. Khan *et al.* developed and implemented a prototype cloud-based analytics service for big data management and analysis in smart cities[6]. Other relevant works on mobility in smart cities include smart emergency management systems[7,8], virtual reality based traffic event simulations[9], autonomic mobility systems[10,11], urban logistics[12–15], and location based services[16]. A review of *s*mart logistics is provided by Schuh *et al.* highlighting its benefits for efficient transportation[17]. Lingli et al. have reviewed existing logistics platforms and given recommendations for smart city and transportation logistics platforms[18]. Alam et al. has presented a comparison of eight artificial intelligence algorithms that is useful for selecting the right algorithm for social network data analysis purposes[19].

The contribution of this work is novel due to its uniquely different focus on the spatio-temporal analysis of the events relevant to road traffic using big data technologies. Some similar works exist[20–22], however, these works do not use big data technologies and their analyses are different. Moreover, our work is also looking into integrating high performance computing (HPC) with big data technologies.