Chapter 12
Quantifying Information Propogation Rate and Geographical Location Extraction During Disasters Using Online Social Networks

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ABSTRACT

The pervasive popularity of social networking facilitates the propagation of trending information and the online exchange of diverse opinions among socially connected individuals. In order to identify events from the density ratio of real-time tweets, the authors suggest a new underlying quantification model, and morphological time-series analysis is performed using information entropy to ascertain the rate of news coverage of crisis situations. To further get insightful patterns in events, the event-link ratio is evaluated. In this study, the authors utilize data collected from Twitter to evaluate how far news of these events has spread. The study concludes by demonstrating the effectiveness of the proposed framework in a case study on the disasters events where it successfully captured critical information and provided insights into the dissemination of information during the disaster. The suggested approach detects events faster and with 94% accuracy than state-of-the-art methods. Comparing all location references, unambiguous location extraction has 96% accuracy.

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1. INTRODUCTION

During disaster events, the ability to quickly and accurately disseminate information is crucial in ensuring public safety and minimizing the impact of the disaster (Ma et al. (2022)). The use of online social networks, notably Twitter, as major sources of information during natural disasters is a relatively recent development. During catastrophes, social media data is abundant, making it difficult to retrieve vital information (Gao et al., 2021). Social media data contains massive amounts of event and opinion data. This data assists public safety during catastrophes (A. Zhang et al. 2020). Lee et al. (2015) used social networks to examine the real-time consequences of catastrophic occurrences. The platform's user-friendly services enable content creation in response to the large volume of information. Non-geotagged data sometimes contains additional information from automated bots, location fabrication, and human mistakes, whereas geotagged data is limited. Many studies want to understand how geo-tagged tweets diffuse differently on Twitter. Events fluctuate temporally and spatially. Imran et al. (2015) found that Twitter and Facebook can detect earthquakes, floods, and landslides. These platforms enable rapid recuperation. Hughes et al. (2009) say geographically situated social streaming data can identify catastrophes and analyzed reaction following large emergency situations. Disasters use social media mining. Its public sentiment analysis helps disaster relief models. Filtering is needed due to the volume of social data streams.

Disasters may be identified by activity surges and meaning by content changes. Disaster studies have examined social media usage. During Hurricane Sandy, Kryvasheyeu et al. (2016) discovered that Twitter was excellent in spreading information and connecting people to supplies. However, the incident created a lot of data, making it hard to extract relevant information quickly. Other research have used machine learning and NLP to extract disaster-related social media data. Imran et al. (2015) suggested a method for automatically recognizing interesting tweets during disasters. They classified disaster-related tweets using machine learning and natural language processing. Kumar et al. (2011) developed a technique to automatically recognize tweets concerning disaster-related road closures. It's hard to track information on catastrophe victims' true social connections, implicit behavioural profiles, and social roles. Liu et al. 2013 and Kim et al. 2013 found that core heterogeneity Social Networks and user behavioural patterns affect information propagation. "Temporal series" data measures user behaviour. This research examines retweeting by "popular" Twitter users (Li, Y., & Li, J. (2021). Information sharing may reduce damage and save lives during disasters. Twitter is used to share information during such incidents (Mishra et al. 2022). Twitter allows users to post real-time crisis bulletins, calls for support, and offers of aid. Twitter helps people find supplies and information during disasters.

Sun et al. (2020) and Rahman et al. (2021) developed a Twitter crowd behavior-based geo-social event identification method. Geographic uniformities derived from crowd behaviour patterns discovered aberrant geo-social events despite sparse geo-tags. Wang and Zhang (2021) used weather and seasonal trends to assess user interest distribution based on trip history. A probabilistic-based topic model identifies user commonalities on the subject. The research used geo-tagged Flickr photos from eleven Chinese cities. Zhang et al. (2021) developed a framework to reduce noise, investigate the diffusion process's fundamental structure, and examine geo-tagged tweets' geographical patterns and land-use categories. The researchers used two phrases, 'flu' and'movie Ted', to collect Twitter data from four US areas. This was done to assess and categorise various subjects and locales. Li and Zhai (2020) found various pivot characteristics in geo-tagged twitter streams' query windows using a cross-modal expert measure. This method was used for real-time local event detection without precision. Ding and Shen (2021) examined Twitter retweeting behaviours among geographically susceptible people. The disaster-induced cluster