Mining Rainfall Spatio-Temporal Patterns in Twitter: A Temporal Approach

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Abstract Social networks are a valuable source of information to support the detection and monitoring of targeted events, such as rainfall episodes. Since the emergence of Web 2.0, several studies have explored the relationship between social network messages and authoritative data in the context of disaster management. However, these studies fail to address the problem of the temporal validity of social network data. This problem is important for establishing the correlation between social network activity and the different phases of rainfall events in real-time, which thus can be useful for detecting and monitoring extreme rainfall events. In light of this, this paper adopts a temporal approach for analyzing the cross-correlation between rainfall gauge data and rainfall-related Twitter messages by means of temporal units and their lag-time. This approach was evaluated by conducting a case study in the city of São Paulo, Brazil, using a dataset of rainfall data provided by the Brazilian National Disaster Monitoring and Early Warning Center. The results provided evidence that the rainfall gauge time-series and the rainfall-related tweets are not synchronized, but they are linked to a lag-time that ranges from −10 to +10 min. Furthermore, our temporal approach is thus able to pave the way for detecting patterns of rainfall in real-time based on social network messages.

Keywords Social network, Twitter, Rainfall, Temporal analysis, Time-series correlation