Social Media Scanning for Crisis Management

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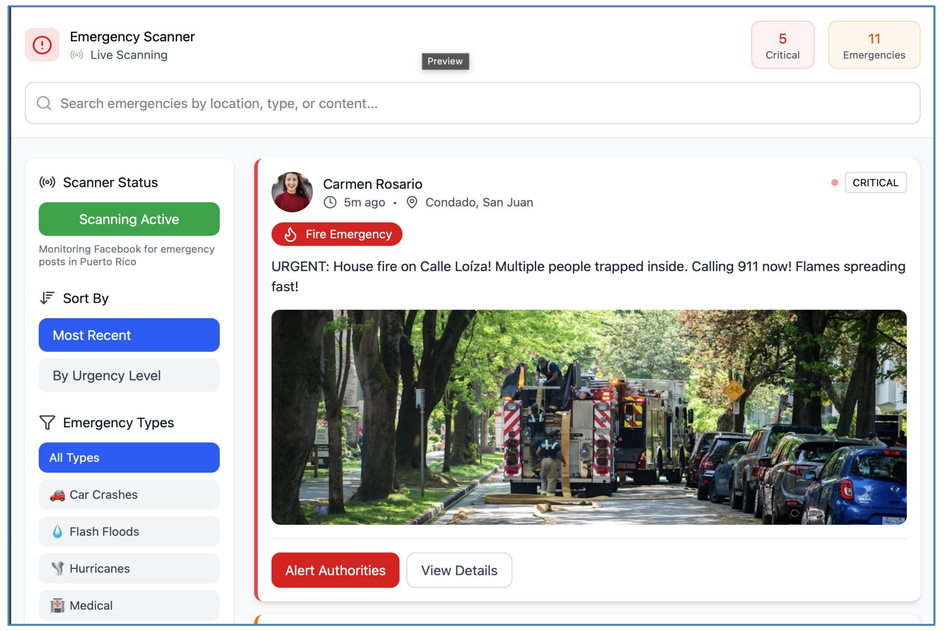
Abstract

Hurricane Maria exposed critical gaps in Puerto Rico's emergency response infrastructure. This research presents the Social Media Emergency Scanner, a system using NLP and deep learning to automatically detect and classify emergency-related posts from social media. Using the X (Twitter) v2 API, 4,250 bilingual (Spanish/English) posts were collected across multiple disaster years. Over 52% of posts contained actionable emergency information, with post utility improving significantly over time. Dominant emergency types included earthquakes and traffic accidents. A TF-IDF/Logistic Regression classifier was deployed, with BERT-Att-BiLSTM identified as the optimal future model. This tool aims to streamline disaster response coordination in Puerto Rico.

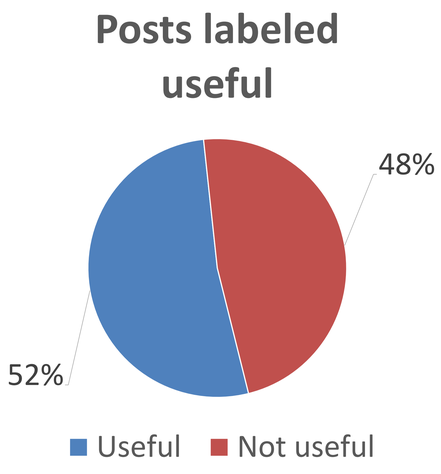
Methodology

Data was collected from X (Twitter) using the v2 API with bilingual emergency keywords in Spanish and English (e.g., #HuracanMaria, terremoto, flood) across six years (2017–2026). Retrieved posts underwent text preprocessing followed by rule-based weak labeling and manual annotation to establish utility. Features were extracted using TF-IDF and classified via Logistic Regression. The system architecture is divided into three modules: data collection, NLP classification, and web visualization.

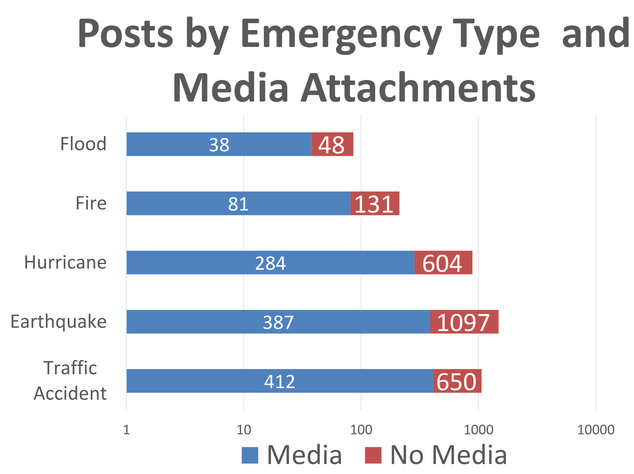
Data



User Interface Prototype of the social media scanner



4,250 posts from X were verified individually to determine which were useful and which were not useful, of which 52% were deemed useful.



Keywords for the API endpoints were selected to reflect events of crisis such as floods, fires, hurricanes, etc. and 28% contained media pertinent to crisis management.

Analysis

Of 4,250 posts collected, 2,145 (52.2%) were labeled as actionable for emergency response. Post utility rose from 44.8% in 2017 to 77.0% in 2023, reflecting growing community awareness. Earthquakes (1,484 posts) and traffic accidents (1,062 posts) were the dominant emergency types. Only 3.3% of posts were false positives: metaphorical or non-emergency uses of keywords. Media attachment rates were highest for floods (44.2%) and fires (38.7%), providing richer situational context.

Conclusions and Future Work

The Social Media Emergency Scanner demonstrates that social media is a viable, real-time source for emergency detection in Puerto Rico. With over 52% of posts yielding actionable data and utility rates improving year over year, the system shows strong potential. Future work will integrate BERT-Att-BiLSTM models, image verification, and geo-inference to enhance accuracy and expand platform coverage beyond X.

Acknowledgement

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References

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