


# Chapter 10

## Predicting Catastrophic Events Using Machine Learning Models for Natural Language Processing

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### ABSTRACT

*In recent years, there has been widespread improvement in communication technologies. Social media applications like Twitter have made it much easier for people to send and receive information. A direct application of this can be seen in the cases of disaster prediction and crisis. With people being able to share their observations, they can help spread the message of caution. However, the identification of warnings and analyzing the seriousness of text is not an easy task. Natural language processing (NLP) is one way that can be used to analyze various tweets for the same. Over the years, various NLP models have been developed that are capable of providing high accuracy when it comes to data prediction. In the chapter, the authors will analyze various NLP models like logistic regression, naive bayes, XGBoost, LSTM, and word embedding technologies like GloVe and transformer encoder like BERT for the purpose of predicting disaster warnings from the scrapped tweets. The authors focus on finding the best disaster prediction model that can help in warning people and the government.*

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## **INTRODUCTION**

Disasters and crises have always been dynamic and chaotic by nature (Guha-Sapir et al., 2016). Natural disasters disrupt people's lives in an instant, causing mental, physical, and societal damage. Communication is important in all aspects of disaster management in such a circumstance (Mukkamala et al., 2016). Earlier people used to use traditional media channels in order to communicate disaster warnings. The traditional media included devices such as television, newspaper, and radio channels. However, this method of communication was slow and difficult.

With the development of new technologies, the communication ability of people has also improved and developed tremendously. One of the major contributors to this change is the ever-evolving smartphone and internet technologies. The second reason is the plethora of software and applications available on these devices. Unlike before, now people are just "a few clicks" and one "app" away from being able to send or receive information.

One of the biggest influencers of all has been the social media applications and platforms like FaceBook, Instagram, and Twitter. All these platforms have played a vital role in the prediction, the announcement of disasters. Not only this, but these platforms have also served as a way for people to communicate and share their grief as well as send and receive help. Today, social media is recognized as one of the most popularly used media platforms for disaster management. (Gray et al., 2016, Ranjan Avasthi, 2017).

Social media gives people the freedom to become producers along with being consumers of information. The present paper focuses on Twitter which is one of the most widely used social media networks for disaster prediction and management research. Since the launch of Twitter in 2005, it has become one of the largest microblogging services. (Dhiraj Murthy, 2018).

With new hashtags and keywords trending on Twitter every day, the latest trend is spreading the news updates from around the world. This is something that has proved to be beneficial in the prediction of natural disasters and emergency situations (Ulvi, O et al, 2019) like floods (Vieweg S. et al., 2010, Vieweg S. et al., 2010, Starbird K et l., 2010), earthquakes (Earle, P et al., 2010, Kireyev, K, et al., 2009, Muralidharan S et al), wildfires, and hurricanes (Hughes AL, Palen L, 2009, Hughes AL et al., 2008), etc. The platform has shown great potential in increasing the survival rate during emergency situations caused due to disasters like tornadoes and wildfires. In one such paper (Lindsay B, 2011), authors emphasized the use of Twitter as a multidirectional communication network that can not only aid officials in compiling lists of the disaster-affected people but also help them in contacting the grieved family members. Tweeting has hence provided people a way to announce emergency situations in real-time. People use this channel to express and describe

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