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| TECHNICAL REPORT |

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| Electrical & Computer Engineering & Computer Science (ECECS) |

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| DiasterWatch |

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| Executive Summary The disaster response machine learning model is designed to help governments respond quickly and effectively to disasters by identifying the right category of messages from social media. The model uses advanced machine learning algorithms to analyze social media messages in real-time and classify them into different categories, such as requests for help, reports of damage, or offers of assistance. This allows governments to prioritize and address the most pressing needs in the aftermath of a disaster.  The model has been trained on a large dataset of social media messages from previous disasters and has been shown to be highly accurate at identifying the correct category of messages. This allows governments to respond to the most urgent needs of the public quickly and efficiently during a crisis.  In addition, the model can be easily integrated into existing disaster response systems and can be customized to meet the specific needs of different governments and organizations. This makes it a valuable tool for improving disaster response efforts and saving lives in the event of a crisis. | | |
| person at a table writing in a notebook with people around | | |
| **Team Members:**  **Likhita Chandana Adabala**  **Kula Varshini Devarasetty**  **Kundana Sai Muthyala**  **Rakesh Raj Sonkamble** | **Questions?**  Contact :  Ladab11@unh.newhaven.edu |  |

Submitted on 12/11/2022

GitHub Link for all the project Files: <https://github.com/Likhitachandana/Diasaster_Response_Project>

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| Technical Report |

**DiasterWatch**

## Highlights of Project

The disaster response machine learning model is a powerful tool that helps governments respond quickly and effectively to disasters by identifying the right category of messages from social media. Using advanced machine learning algorithms, the model can analyze social media messages in real-time and classify them into different categories, such as requests for help, reports of damage, or offers of assistance. This allows governments to prioritize and address the most pressing needs in the aftermath of a disaster.

The model has been trained on a large dataset of social media messages from previous disasters, which has allowed it to learn the patterns and characteristics of different types of messages. This training enables the model to accurately identify the correct category of messages with high accuracy, even in noisy and chaotic environments.

One of the key benefits of the disaster response machine learning model is its ability to improve communication between governments and the public during times of crisis. By providing governments with real-time information about the needs and concerns of the public, the model helps to facilitate more effective and coordinated disaster response efforts.

Additionally, the model is designed to be easily integrated into existing disaster response systems and can be customized to meet the specific needs of different governments and organizations. This makes it a valuable tool for improving disaster response efforts and saving lives in the event of a crisis.

Overall, the disaster response machine learning model is a powerful and effective tool for improving disaster response efforts. By providing governments with real-time information about the needs and concerns of the public, the model helps to facilitate more coordinated and effective disaster response efforts, which can ultimately save lives in the event of a crisis.

## Abstract

The DisasterWatch is a powerful tool that helps governments respond quickly and effectively to disasters by identifying the right category of messages from social media. Using advanced machine learning algorithms, the model can analyze social media messages in real-time and classify them into different categories, such as requests for help, reports of damage, or offers of assistance. This allows governments to prioritize and address the most pressing needs in the aftermath of a disaster. The model has been trained on a large dataset of social media messages from previous disasters and has been shown to be highly accurate at identifying the correct category of messages. This makes it a valuable tool for improving disaster response efforts and saving lives in the event of a crisis.

Introduction

## Disasters can strike at any time, and when they do, it is critical for governments to respond quickly and effectively to save lives and minimize damage. One of the challenges of disaster response is the large amount of information that must be processed in a short period of time, including messages from the public requesting help, offering assistance, or reporting damage.

## To address this challenge, we have developed a disaster response machine learning model that uses advanced algorithms to analyze social media messages and classify them into different categories. By providing governments with real-time information about the needs and concerns of the public, the model helps to facilitate more coordinated and effective disaster response efforts.

## In this report, we will describe the technical details of the disaster response machine learning model, including the algorithms and techniques used, the datasets used for training and testing, and the results of our experiments. We will also discuss the potential applications and benefits of the model, as well as future directions for research and development.

## Methodology

The disaster response machine learning model is based on advanced machine learning algorithms, which are used to analyze and classify social media messages. The model was trained on a large dataset of social media messages from previous disasters, which included a variety of different message categories, such as requests for help, reports of damage, or offers of assistance.

The training dataset was preprocessed and cleaned to remove any irrelevant or duplicated information, and the messages were then vectorized using NLP techniques, such as tokenization and stemming. The resulting vectors were then used as input to a machine learning model, which was trained using a supervised learning approach. The model was evaluated using a variety of metrics, such as accuracy, precision, and recall, to determine its performance on the test dataset.

we also developed an Extract, Transform, and Load (ETL) pipeline to prepare the dataset for the machine learning pipeline. The ETL pipeline extracts the messages and their categories from the CSV files, cleans and merges the data into a single data frame, and then saves the data frame inside an SQLite database. This allows the machine learning model to access the data quickly and efficiently for training and prediction.

The Machine Learning (ML) pipeline is an essential part of the disaster response machine learning model, as it is responsible for creating the machine learning model that is used to classify social media messages. The ML pipeline works as follows:

1. The first step is to load the dataset from the SQLite database. This dataset contains the messages and their corresponding categories, which were extracted and cleaned by the ETL pipeline.
2. Once the dataset is loaded, the next step is to create the machine learning pipeline. This pipeline includes a series of steps that are used to preprocess the messages, such as tokenization and stemming, and then train the machine learning model on the training dataset. In this case, we used a support vector machine (SVM) model, which is a powerful and effective algorithm for classification tasks.
3. After the SVM model has been trained, it is then evaluated on the testing dataset to determine its performance. A variety of metrics, such as accuracy, precision, and recall, are used to evaluate the model and assess its effectiveness.
4. Finally, the trained and evaluated model is saved as a pickle file, which can be used for real-time prediction on new messages. This allows the disaster response system to classify incoming messages and provide the appropriate response quickly and efficiently.

Overall, the ML pipeline plays a crucial role in the disaster response machine learning model, as it is responsible for creating the machine learning model that is used to classify social media messages. By combining efficient data preprocessing and powerful machine learning algorithms, the ML pipeline can develop a highly accurate and effective model that can be used to improve disaster response efforts.

The entire project is deployed using Flask Application. Below are few of the screenshots of the application.

Graphical user interface, application

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## Results Section

## The disaster response machine learning model was evaluated on a test dataset to determine its performance and accuracy. The model was trained using a support vector machine (SVM) algorithm, and was evaluated using a variety of metrics, including accuracy, precision, and recall.

## The results of the evaluation showed that the model was highly accurate at classifying messages into the correct categories. The overall accuracy of the model was 95%, which indicates that the model was able to correctly classify most of the messages in the test dataset. In addition, the model showed high levels of precision and recall for each of the message categories, indicating that it was able to correctly identify the relevant messages with high accuracy.

## A picture containing text Description automatically generated

## These results demonstrate the effectiveness of the disaster response machine learning model at accurately classifying social media messages into the correct categories. This allows governments to respond to the most pressing needs of the public quickly and efficiently during a disaster and helps to improve communication and coordination between governments and the public.

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## In conclusion, the disaster response machine learning model shows strong performance and accuracy and has the potential to greatly improve disaster response efforts. By providing governments with real-time information about the needs and concerns of the public, the model can help to facilitate more coordinated and effective disaster response efforts, which can ultimately save lives in the event of a disaster.

## Discussion

One potential application of the disaster response machine learning model is in the early detection of emerging disasters, such as earthquakes or hurricanes. By analyzing real-time social media data, the model could be used to identify potential disasters before they occur, and alert authorities to take appropriate action. This could help to reduce the impact of disasters, and potentially save lives.

Another potential benefit of the model is its ability to improve communication between governments and the public during times of crisis. By providing governments with real-time information about the needs and concerns of the public, the model helps to facilitate more coordinated and effective disaster response efforts. This can ultimately save lives in the event of a disaster, as it allows governments to prioritize and address the most urgent needs of the public.

In terms of future research and development, there are several potential directions that could be pursued. For example, the model could be further refined and improved by using larger and more diverse datasets for training, or by incorporating more advanced machine learning algorithms. Additionally, the model could be extended to analyze other types of data, such as satellite images or sensor data, to provide a more complete picture of the disaster situation.

Overall, the DisasterWatch has the potential to greatly improve disaster response efforts and could help save lives in the event of a crisis. By providing governments with real-time information about the needs and concerns of the public, the model can help to facilitate more coordinated and effective disaster response efforts and has the potential to be used in a wide variety of disaster scenarios.

## Conclusion

In this report, we have described the technical details of the disaster response machine learning model and have presented the results of our experiments. The results show that the model is highly accurate and effective at classifying social media messages into the correct categories, which allows governments to respond to the most pressing needs of the public quickly and efficiently during a disaster.

This model has several potential applications and benefits. It could be used in the early detection of emerging disasters and could improve communication between governments and the public during times of crisis. Additionally, the model is designed to be easily integrated into existing disaster response systems and can be customized to meet the specific needs of different governments and organizations.

In conclusion, DisasterWatch is a powerful and effective tool for improving disaster response efforts. By providing governments with real-time information about the needs and concerns of the public, the model can help to facilitate more coordinated and effective disaster response efforts, which can ultimately save lives in the event of a crisis.