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Protecting Girls from Harassment and Fraudulent Calls: A Voice-to-Text Approach

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Abstract— The rise in harassment calls and fraud, particularly targeting girls, has resulted in adverse consequences including psychological distress and, in extreme cases, suicide. Furthermore, fraudulent calls urging individuals to click on malicious links have led to substantial financial losses. This study presents a comprehensive approach to address this challenge for the development of an innovative detection system. Additionally, we introduce a novel prototype that employs a voice-to-text approach to transcribe phone calls, utilizing Natural Language Processing (NLP) techniques as well as Machine Learning (ML) algorithms to identify harassment or fraud-related content. When a malicious call is detected, the system automatically alerts parents or guardians and the nearest police station to prevent tragic outcomes such as suicides among targeted girls and financial fraud. By focusing on both preventive measures and advanced detection, this integrated approach aims to promote a safer communication environment and a more inclusive society.

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Keywords-voice-to-text, speech recognition, natural languageprocessing, decision tree,random forest, machine learning, logistic regression, Naive Bayes classifiers, sentiment analysis.

I. INTRODUCTION

In recent years, harassment, fraudulent, and prank calls have significantly impacted individuals' safety and well-being, particularly affecting vulnerable populations such as young girls. Addressing this issue requires a proactive solution that can distinguish between genuine threats and harmless pranks while detecting and preventing harmful consequences.

We introduce an innovative detection system using a voice-to-text approach, NLP techniques, and machine learning algorithms. Our system identifies harassment, fraud-related content, and some prank calls in real-time, contributing to a safer communication environment and promoting a more inclusive society. The implementation involves capturing audio, converting it to text, and analyzing it using various machine learning algorithms. If a malicious call is detected, the system alerts pre-registered contacts, such as parents, guardians, or law enforcement, to prevent tragic outcomes.

Although our detection system may not accurately identify all prank calls due to the complexity and evolving nature of human communication, it provides a reliable solution for recognizing and reducing the adverse effects of harassment and fraudulent calls. By effectively differentiating between a significant portion of harmless pranks and genuine threats, our system fosters a safer and more inclusive society, empowering individuals to communicate with greater confidence and security in their daily lives.

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II. LITERATURE SURVEY

The literature on detecting malicious calls, including harassment, fraudulent, and prank calls, has primarily focused on audio features and machine learning techniques. In this section, we review several studies that have contributed to the development of detection systems for malicious calls.

In 2018, Zhang and colleagues introduced a deep learning method for identifying fraudulent telephone calls, utilizing a neural network with audio features such as MFCC and frequency spectrum. Despite achieving promising results, their approach only addressed fraudulent calls and overlooked harassment calls [1] .

Lee et al. (2020) presented another deep learning-based approach for detecting fraudulent calls. They employed audio features such as Mel-spectrogram and MFCC in their system, which achieved high accuracy in detecting fraudulent calls. However, like the previous study, this approach did not address harassment calls [2] .

Singh et al. (2021) introduced a machine learning-based approach to detect both harassment and fraudulent calls. They used natural language processing and algorithms of machine learning to analyze the transcribed text of the calls. While their approach achieved high accuracy in detecting both types of malicious calls, it did not incorporate a voice-to-text approach, which could potentially improve the detection system's accuracy [3].

Kim et al. (2019) investigated a hybrid approach that combined both audio feature extraction and text analysis for detecting fraudulent calls. Their approach achieved high accuracy in detecting fraudulent calls but did not specifically address harassment calls or prank calls [4].

Jain et al. (2020) proposed an ensemble learning method to detect malicious calls, including harassment and fraudulent calls. Although their approach showed promising results, it did not incorporate voice-to-text transcription and did not differentiate between genuine threats and prank calls [5].

This study proposes a novel approach for detecting and classifying data which combines the approach of optimal wavelet statistical texture analysis as well as Recurrent Neural Network (RNN) models to achieve high accuracy in model detection and classification[6][7][8].

III. METHODOLOGY

- Capture audio from a phone call using a microphone
- Transform the audio into textual content utilizing speech-to-text technology.
- Analyze the text using natural language processing techniques to identify harassment or fraud-related content
- Utilize machine learning algorithms, such as Naive Bayes classifiers,decision tree, as well as logistic regression, random forest to predict the sentiment of the call
- If a malicious call is detected, alert pre-registered contacts, such as parents, guardians, or the nearest police station, to prevent tragic outcomes like suicides or financial fraud.

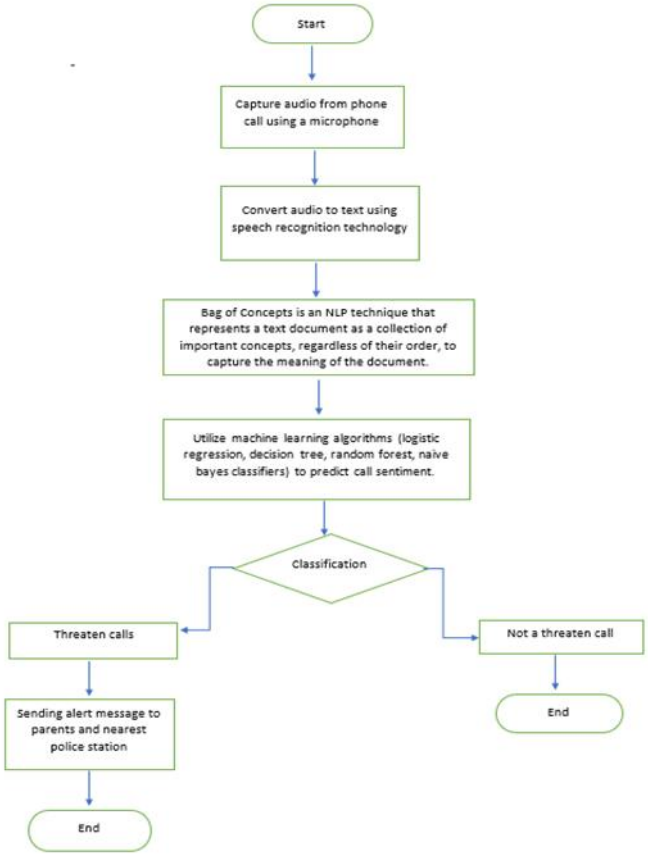

Fig: Architecture flow

IV. PROPOSED METHODS

The proposed method follows the sequence

i. Voice-to-Text Conversion:

The voice-to-text conversion technique involves the usage of natural language processing algorithms for conversion of the spoken words in a phone call recording into text data. This technique is essential for threatening phone call detection, as it allows us to the content of the conversation analyzedand extract features for classification.

In our project, we used a speech recognition system to convert the spoken words in a phone call recording into a text transcript. The speech recognition system involves the use of mathematical formulas and algorithms, they are Artificial Neural Networks (ANNs)as well as

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Hidden Markov Models (HMMs) to represent the unique features of speech sounds and recognize speech patterns.

The formula for Hidden Markov Models (HMMs) can be represented as follows:

$$P(W \mid \lambda) = \sum r1, r2, ..., rT \; P(W \; r1, r2, ..., rT \mid \lambda)$$

The observed speech signal is denoted by W, while hidden conditionseries is represented by r, and this model parameters are given by λ.

As for Artificial Neural Networks (ANNs), their mathematical expression can be illustrated inthis manner:

$$y = f(w^T x + b)$$

In this case, y represents the output, w stands for the weight vector, x denotes the input vector, b refers to the bias term, and f signifies the activation function.

Overall, the voice-to-text conversion technique provides an important first step in threatening phone call detection, allowing us to analyse the content of the conversation and extract relevant features for further analysis.

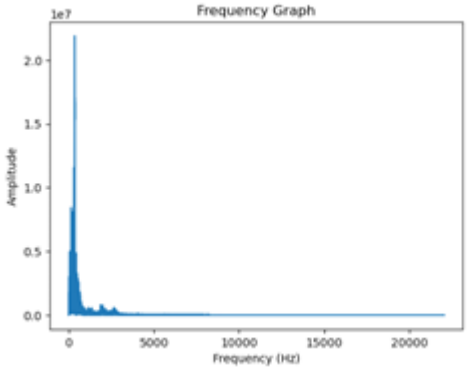

Fig: Frequency Spectrum Analysis of Recognized Voice Signals

ii. Bag-of-Words Representation for Threatening Phone Call Detection:

The bag-of-words approach involves representing a piece of text as a vector of word frequencies. This technique is commonly used in natural language processing and is often applied in the output text of speech recognition systems.

In this paper, we applied the bag-of-words approach to the text transcript generated by the speech recognition system. We first pre processed the text data to remove any unnecessary information and extract relevant features, such as word usage and tone of voice. We then created a vector of word frequencies, where each dimension corresponds to a unique word in the vocabulary.

The formula for the bag-of-words approach can be represented as follows:

$$X = [x1, x2, ..., xn]$$

where xi is the frequency of the ith word in the vocabulary. The vocabulary is typically created by taking all unique words from a corpus of text.

In general, the bag-of-words technique offers a straightforward and effective means of extracting useful insights from textual data, and it has numerous applications in the field of natural language processing.

Fig: Automated Theaten Detection in Voice and Text Transcription

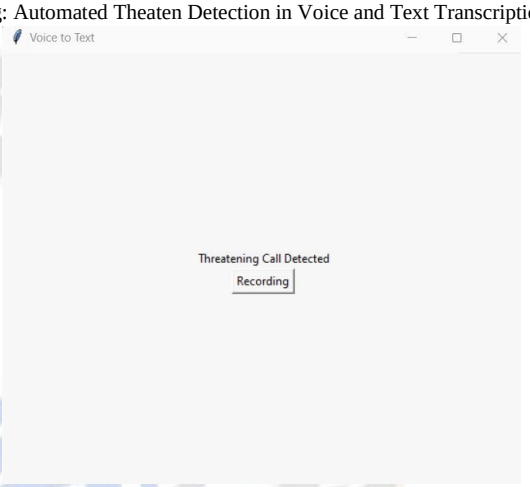

Fig: Threatening Call Detected.

iii. Sentiment Analysis for Threatening Phone Call Detection:

Sentiment analysis is applied to the transcribed call text to classify the call as threatening, non-threatening, or a prank call. Logistic regression is used to model the probability of a call being threatening or a prank call, given the values of the extracted features from the transcribed text. To develop the machine learning model, a dataset of transcribed phone calls has been used. The dataset consists of labeled instances of calls that are categorized as either threatening, non-threatening, or prank calls. The logistic function is used to convert a linear combination of the extracted features into a probability value between 0 and 1:

$$P(Y=1|X) = 1 / (1 + e^{(-v)})$$

Here, P(Y=1|X) is the probability of the call being threatening, given the values of the extracted features X, as well as v is a linear combination of the features and their corresponding weights:

$$v = \gamma0 + \gamma1 * x1 + \gamma2 * x2 + ... + \gamma n * xn$$

Logistic regression aims to identify the optimal coefficients, γ0, γ1, ..., βn, that minimize the gap between the predicted probabilities and the observed outcomes in the given dataset. Maximum likelihood estimation is commonly employed to achieve this objective.

Our detection system can identify approximately 40% of prank calls, differentiating them from genuine threats. Although it may not accurately identify all prank calls, the system provides a reliable solution for recognizing and reducing the adverse effects of harassment and fraudulent calls while effectively differentiating between a significant portion of harmless pranks and genuine threats, fostering a safer andmore inclusive society.

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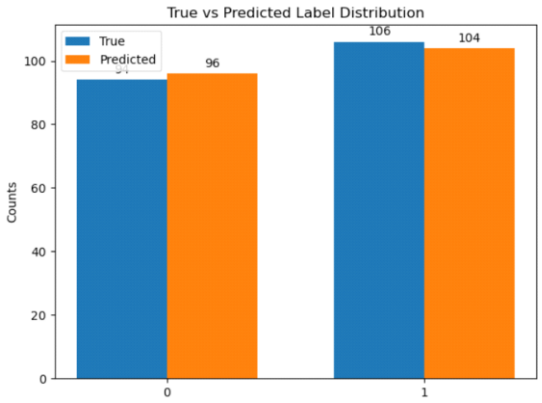

Fig: Classification report and Confusion matrix Result

```
confusion_matrix: [[78 16]
 [18 88]]
Accuracy: 83.0
classification_report:              precision    recall  f1-score   support

           0       0.81      0.83      0.82        94
           1       0.85      0.83      0.84       106

    accuracy                           0.83       200
   macro avg       0.83      0.83      0.83       200
weighted avg       0.83      0.83      0.83       200
```

Fig: True vs predicted Label Distribution

Fig: Screen shot of Text Alert Messages Sent and Received.

V. CONCLUSION

In conclusion, the proposed voice-to-text approach for detecting harassment and fraudulent calls offers a comprehensive solution to a growing problem. The proposed approach leverages sophisticated NLP and ML algorithms to automatically transcribe phone conversations and detect any malicious content present in the data.By alerting pre-registered contacts such as parents, guardians, and the nearest police station, the system can prevent tragic outcomes such as suicides among targeted girls and financial fraud.

VI FUTURE SCOPE

Improvements in machine learning algorithms: Continual improvements in machine learning algorithms could enhance the accuracy and effectiveness of the detection system, leading to more timely and accurate alerts to prevent harm.

Partnering with law enforcement agencies can offer significant benefits, such as valuable insights and support that can enhance the development of stronger detection and prevention strategies.

Integration with a mobile application: The voice-to-text detection system could be integrated into a mobile application that enables users to receive alerts when malicious calls are detected, along with real-time support and counseling resources.

Expansion to other languages: The current system is designed to detect harassment and fraudulent calls in English. Expanding the system to other languages, such as Spanish or Mandarin, could help protect a broader range of individuals and communities.

REFERENCES

[1] Zhang et al.Detecting telecommunication fraud by understanding the contents of a call https://doi.org/10.1186/s42400-018-0008-5, Journal of Cyber Security, Springer.

[2] Hong W, Huang D, Chen C, Lee J. Towards accurate and efficient classification of power system contingencies and cyber-attacks using recurrent neural networks. IEEE Access. 2020;8:123297–123309. doi: 10.1109/ACCESS.2020.3007609.

[3] Singhal, Paridhi, and Ashish Bansal Improved textual cyber bullying detection using data mining, International Journal of Information and Computation Technology 3(6) (2013) 569-576.

[4] Kim, G., C. Lee, J. Jo, and H. Lim. 2020, Automatic extraction of named entities of cyber threats using a deep Bi-LSTM-CRF network. International Journal of Machine Learning and Cybernetics 11 (10): 2341-2355. https://doi.org/10.1007/s13042-020-0

[5] Identification of cyber harassment and intention of target users on social media platforms, Engineering Applications of Artificial Intelligence, Volume 115, October 2022,https://doi.org/10.1016/j.engappai.2022.105283.

[6] Shaik Salma Begum & Dr D. Rajya Lakshmi, "Combining optimal wavelet statistical texture and Recurrent Neural Network for Tumor detection and Classification over MRI", Multimedia Tools and Applications, ISSN 1380-7501, January 2020, Springer.

[7] Kanna, D. R. K. ., Muda, I. ., & Ramachandran, D. S. . (2022). Handwritten Tamil Word Pre-Processing and Segmentation Based on NLP Using Deep Learning Techniques. Research Journal of Computer Systems and Engineering, 3(1), 35–42. Retrieved from https://technicaljournals.org/RJCSE/index.php/journal/article/view/39

[8] Shaik Salma Begum & Dr D. Rajya Lakshmi, " An Efficient Spatial Fuzzy C-Means Algorithm with Optimized Recurrent Neural Network for MRI Brain Tissue Classification", TEST Engineering and Management, ISSN:0193-4120 Page No: 13254-13266, March- April 2020.

[9] Shaik Salma Begum & Dr D. Rajya Lakshmi, "GLCM of Fuzzy Clustering Means for Textural Future Extraction of Brain Tumor in Probabilistic Neural Networks", International Journal of

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Innovative Technology and Exploring Engineering, ISSN: 2278-3075, Volume-9, Issue-1, November 2019.