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AI-DRIVEN SCREAM DETECTION FOR CRIME CONTROL

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Abstract - *The increasing crime rates and delayed responses to emergencies highlight the need for advanced automated systems capable of detecting distress signals in real-time. This project addresses the issue by developing a sound-based detection system that utilizes machine learning and deep learning to recognize human screams in public spaces, especially during emergencies. By leveraging audio classification techniques, such as Support Vector Machines (SVM) and Multilayer Perceptrons (MLP), the system can distinguish screams from other sounds, minimizing false positives and ensuring high accuracy in real-world conditions. The proposed system operates continuously in the background on devices equipped with microphones. When a scream is detected, the application evaluates the level of risk. If the sound meets the criteria for a high-risk situation, the system sends an automated alert message, including GPS location, to the nearest authorities via SMS, enabling quick response. This project's objective is to improve public safety by reducing the time required for authorities to respond to potentially life- threatening situations, ultimately contributing to a safer society.*
The following report outlines the objectives, methodology, system architecture, and implementation of the scream detection system, with an emphasis on accuracy, real-time performance, and user privacy. This application has the potential to transform public safety measures and pave the way for broader AI-based security solutions in urban environments.

Key Words: *Scream detection, Machine learning, Deep learning, Audio classification, Public safety, Support Vector Machines, Multilayer Perceptrons, Real-time alert system.*

1.INTRODUCTION

The growing prevalence of urban crime and delayed emergency response times necessitate intelligent systems that can recognize and respond to distress situations in real-time. Human screams often serve as universal signals of danger or distress, making them ideal candidates for automated detection systems. This paper presents a novel approach to leveraging artificial intelligence (AI) techniques for detecting screams in real-time, aiming to enhance public safety and reduce response times for critical incidents.

1) Objectives

1. *Develop a robust AI-driven sound classification system capable of recognizing human screams.*
2. *Minimize false positives by distinguishing screams from other ambient noises.*
3. *Implement real-time alert generation with GPS location for emergency response teams.*
4. *Ensure user privacy and ethical handling of audio data.*

2) System Architecture

2.1. Audio Collection and Preprocessing

The system collects audio data using device microphones, which undergo preprocessing steps such as noise reduction and feature extraction. Key audio features, including Mel-Frequency Cepstral Coefficients (MFCC), are extracted to serve as input for machine learning models.

2.2 Classification Models

1. ***Support Vector Machines (SVM):*** *Used for binary classification of scream and non-scream audio.*
2. ***Multilayer Perceptrons (MLP):*** *Enhances feature recognition through deep learning.*

2.3 Alert System

When a scream is detected, the system evaluates its risk level. High-risk sounds trigger automated alerts containing GPS coordinates, which are sent to the nearest authorities.

3) Methodology

1. **Data Collection:** Audio datasets containing a variety of screams and non-scream sounds are collected from publicly available repositories and real-world recordings.
2. **Data Augmentation:** Techniques such as pitch shifting and noise addition are applied to enhance model generalization.
3. **Model Training:** SVM and MLP models are trained on labeled datasets to classify audio inputs accurately.
4. **System Integration:** The trained models are integrated into a real-time monitoring system operating on edge devices.
5. **Performance Evaluation:** Metrics such as accuracy, precision, recall, and F1-score are used to assess model performance.

- **Real-World Challenges in Scream Detection:** Explain noise interference, diverse audio patterns, and real-time constraints faced during the implementation.
- **Impact Analysis:** Elaborate on how the system reduces emergency response times and its potential applications in smart cities.

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4. CONCLUSIONS

This project demonstrates the feasibility of using AI for real-time scream detection to enhance public safety. Future work includes expanding the system to recognize other distress signals and improving robustness in noisy environments.

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