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Performance Analysis of Baby Cry ClassificationUsing Machine Learning Algorithms

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ABSTRACT

A Cry is a form of correspondence used by children to express their feelings. The regular, sporadic tone and the variation in voice can be used to depict child cries. Parents can detect crucial situations for their children by listening to their cries. In applications like remote child observation, the ability to recognise a child's cry in discourse signals is a critical advancement. It is also important for researchers who focus on the relationship between child cry signal examples and other formative boundaries. This inquiry into sound acknowledgement incorporates sound example selection, highlight extraction, and layout. As an element extraction method, we employ MFCC, and for arrangement, K-Nearest Neighbour (K-NN) is used. A characterization method that is frequently used for sound information is K-Nearest Neighbour (KNN). The KNN classifier is shown to producemuch superior results when compared to other classifiers.

KEY WORDS:

K-Nearest Neighbour, Child Cry, Critical Advancement, Boundary Selection, Machine Learning Algorithms.

1. INTRODUCTION

Using audio recordings of infant cries, the "Baby Cry Classification Using Machine Learning Algorithms" research attempts to create a system that can automatically categorise various baby cries. Infants often communicate primarily through crying, and parents and other careers can better address the needs of their babies by learning the significance of different cry patterns.In order to analyse audio data and categorise baby cries into several groups, this research makes use of the capabilities of machine learning algorithms. The system may learn patterns and features that identify between various sorts of cries, such as sounds indicating hunger, discomfort, exhaustion, or pain, by being trained on a dataset of labeled infant cry recordings. Once trained, the system can categorise fresh recordings of newborn cries that have never been

heard before and offer insightful data regarding the baby's underlying demands.

There are various benefits to classifying newborn cries using machine learning methods. It enables automated and objective analysis, doing away with the need for parents' or careers‟ subjective interpretation. The technology can deliver dependable and consistent findings, eliminating uncertainty and allowing for quicker and more precise responses to baby demands.Additionally, this project intends to aid and encourage parents in their role as careers. For new parents or those with little experience, it can reduce the anxiety and confusion that come with recognising and responding to their baby's screams. The system can help parents better address their baby's needs by illuminating the various cry patterns and their associated meanings, strengthening the link between parent and child and the infant's general wellbeing. In conclusion, the "Baby Cry Classification Using Machine Learning Algorithms" project seeks to create a machine learning-based system that can classify infant screams automatically. The project's goal is to improve parental care giving, lessen stress, and boost newborn wellbeing by supplying precise and timely information on the baby's fundamental requirements.

2. LITERATURE SURVEY

This section will deal with all the previous information related to brain tumor and several methods for identifying the brain tumor. Literature survey is the most important step in software development process. For any software or application development, this step plays a very crucial role by determining the several factors like time, money, effort, lines of code and company strength. Once all these several factors are satisfied, then we need to determine which operating system and language used for developing the application. Once the programmers start building the application, they will first observe what are the pre-defined inventions that are done on same concept and then they will try to design the task in some innovated manner.

MOTIVATION

Ashwini.K.et al. [4], presented a study on “Deep Learning Assisted Neonatal Cry Classification via SVM Models”. The authors primary distinction made in this investigation is between pain, hunger, and tiredness in infant screams. The short-time Fourier transform (STFT) method is used to convert the neonatal cry auditory information into a spectrogram image. The input for the deep convolutional neural network (DCNN) method is the spectrogram images. The support vector machine (SVM) classifier receives the features from the convolutional neural network. Neonate screams are categorized using machine learning techniques. In order to achieve the best results even with a modest amount of data samples, our work combines the benefits of deep learning and machine learning techniques. The outcomes of the experiment demonstrate the potential of SVM and CNN-based feature extraction. It is discovered after comparing the SVM-based kernel approaches, specifically the radial basis function (RBF), linear, and polynomial.

Chunyan Ji. et al. [5] proposed a study on" Infant Cry Classification Using Graph Convolutional Networks". In this study, the author attempts to discuss both supervised and semi- supervised node classification using convolutional neural networks, we build non-fully connected graphs based on the similarities among the pertinent nodes to take into account the immediate and long-term effects of infant cry signals related to inner-class and inter-class messages. Even with small training samples, the method captures the diversity of variability within infant screams. On the Baby2020 database and the Baby Chillanto database, the efficacy of this strategy is assessed. Our approach outperforms the CNN model with 80% labeled training data with as little as 20% of labeled training data, and accuracy steadily rises as the number of labeled training samples rises. When compared to the CNN models' predictions for Baby Chillanto, the top results show considerable improvements of 7.36 and 3.59 percent.

T.Basaruddin. et al. [6] proposed a study on" Infant Cry Classification Using CNN-RNN". In this study, the author attempts to discuss Convolutional and recurrent neural networks are combined in our innovative method, which simultaneously serves as a feature extraction and classifier method. In particular, RNN learns the temporal information of features obtained by CNN while CNN learns salient features from raw spectrogram data. On a 200 training data set and 50 validation data set, we additionally conduct fivefold cross-validation. 65 test sets are used to evaluate the model with the best weight. Our CNN-RNN model performs better than the prior approach by an average classification accuracy of up to 94.97%, according to analysis of the Dunstan Baby Language dataset. The positive outcome shows that using CNN-RNN and 5-fold cross-validation produces reliable and accurate results.

3. EXISTING METHODOLOGY

To determine whether a sound file contains a baby cry, the current system is used. For include extraction, the techniques used LFCCs (Linear Frequency Cepstral Coefficients). There is also a structure for organizing the causes of kid cries, and in this structure, several classifiers are used to rank the causes from the pre-characterized informational collection.

LIMITATION OF EXISTING SYSTEM

1. The classification produces the less accuracy.
2. The existing approach uses manual approach to find out the cry.
3. It requires lot of manual effort to identify and then decide the type of baby cry.

4. PROPOSED SYSTEM & ITS ADVANTAGES

In the suggested method, we effectively classify the causes of baby cries by applying KNN, DT, RF, SVM, and NB machine learning models while extracting features using MFCC (Mel Frequency Cepstral Coefficients). This methodology is not only effective, but it also yields better outcomes when applied to sound-based classification and audio files.

ADVANTAGES OF PROPOSED SYSTEM:

This approach has the following steps:

1. An audio file containing the unknown baby cry and whose reason is to be classified isuploaded.
2. The input audio file is preprocessed to remove empty audio frames and unwanted noise.
3. Then the audio is converted to cepstral coefficients to extract the features (here MFCCtechnique is used to obtain cepstral coefficients)
4. Once the cepstral coefficients are obtained, the mean of the coefficients is taken for furtherprocess.
5. Next, the KNN, DT, RF, SVM, NB classifier is applied to classify the reason from thealready trained model.
6. The reason for baby cry is obtained by considering the „n‟ nearest neighbor which has thehighest accuracy.
7. The reason for the baby cry is displayed as output.

5. IMPLEMENTATION PHASE

The step of implementation is when the theoretical design is translated into a programmatically-based approach. The application will be divided into a number of components at this point and then programmed for deployment. The following five modules make up the bulk of the application. They are listed below:

1) Data Collection:

This module involves the collection of audio recordings of baby cries. The data can be gathered using various devices, such as microphones or smartphones, and should include a diverse range of crying sounds.

2) Data Preprocessing:

In this module, the collected audio data undergoes preprocessing steps to prepare it for analysis. Preprocessing may include techniques such as noise removal, normalization, and feature extraction to extract meaningful information from the audio signals.

3) Feature Extraction:

This module focuses on extracting relevant features from the preprocessed audio data. Features can be extracted using techniques such as Mel Frequency Cepstral Coefficients (MFCC), spectral features, or time-domain features. These features capture the distinct characteristics of different types of baby cries.

4) Machine Learning Model Training:

This module involves training machine learning algorithms on the preprocessed and feature- extracted data. Various algorithms can be explored, such as Support Vector Machines (SVM), Random Forest, Convolutional Neural Networks (CNN), or Recurrent Neural Networks (RNN). The model is trained using labeled data, where each cry is associated with its corresponding cry type.

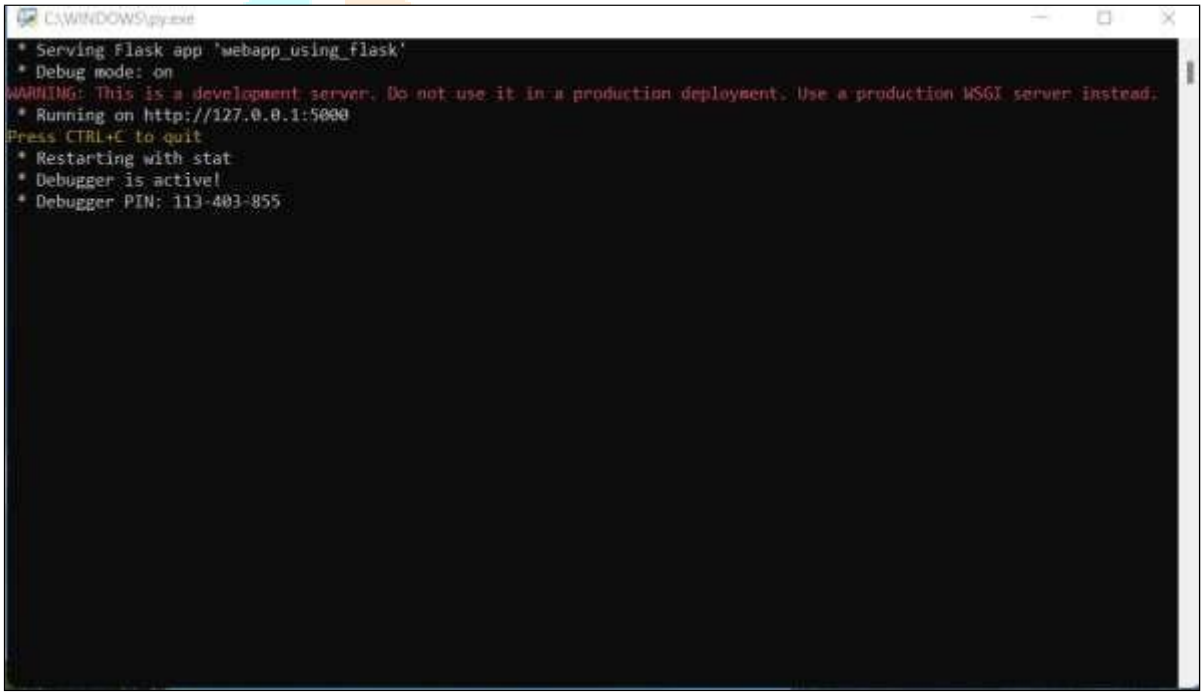
5) Model Evaluation:

This module focuses on evaluating the trained machine learning model's performance. Evaluation metrics such as accuracy, precision, recall, and F1-score can be used to assess the model's ability to correctly classify different types of baby cries. Cross-validation techniques, such as k-fold cross-validation, can also be applied to validate the model's performance.

6. EXPERIMETAL REPORTS

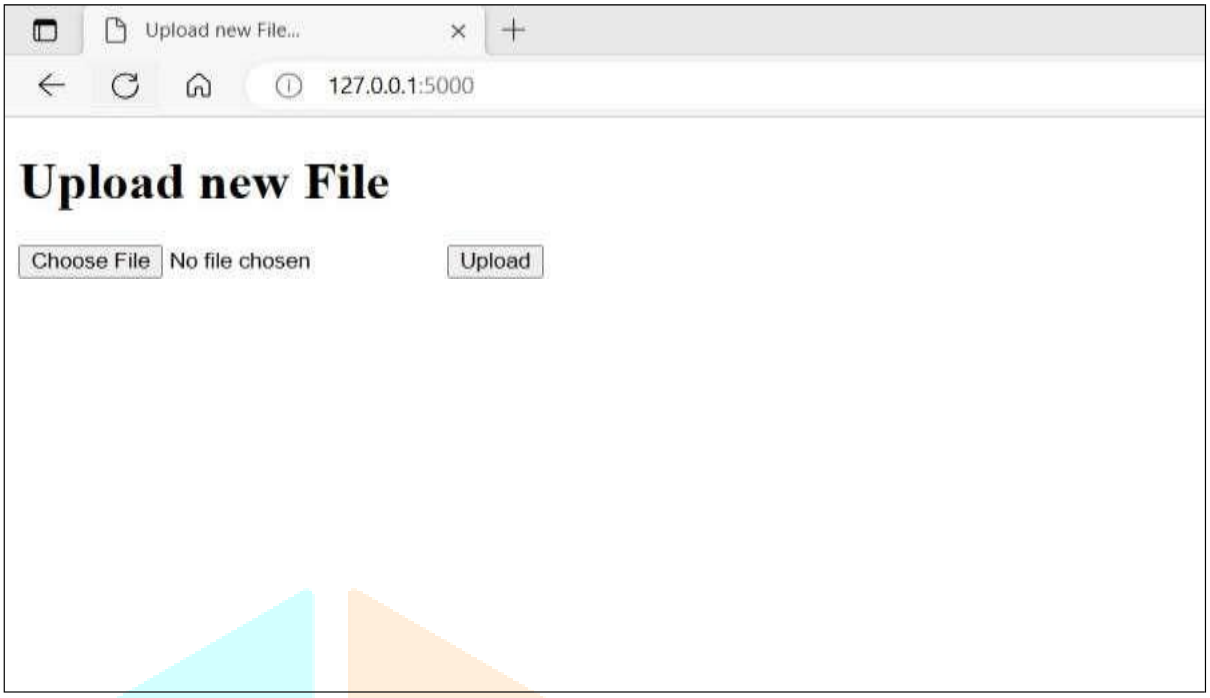
In this proposed application, we try to use Flask as working platform and try to show the performance of our proposed application. Here we developed the web interface to deploy and execute the application.

1) Main Window



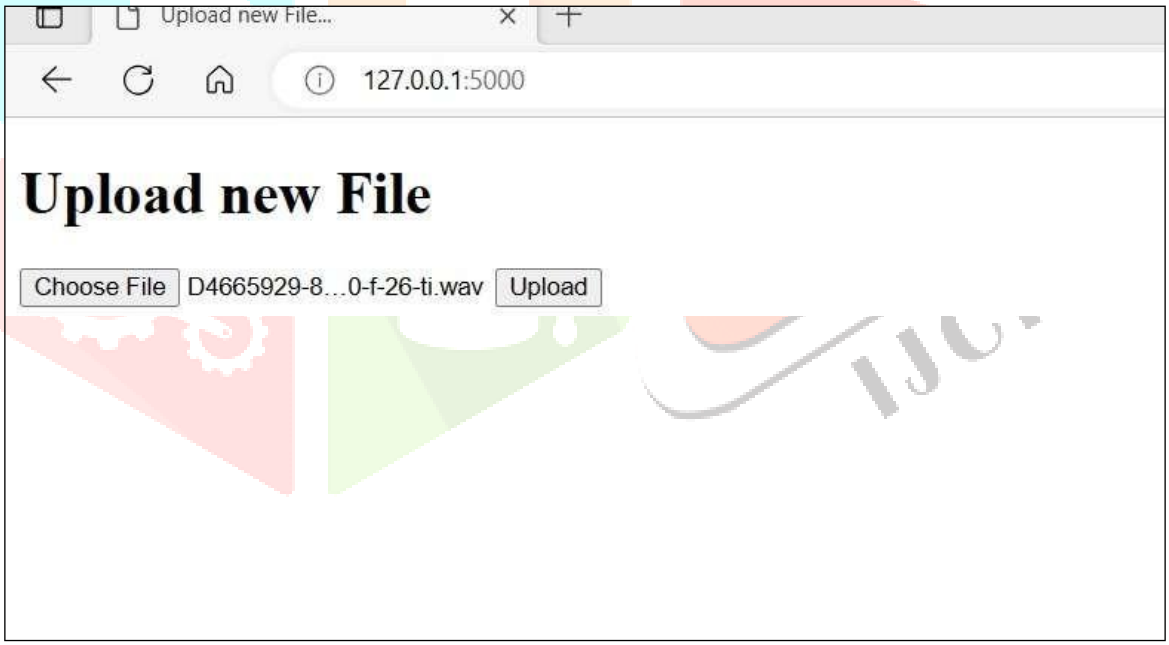
Explanation: Here we started the app and the deployed all necessary libraries.

2) User uploads the audio file



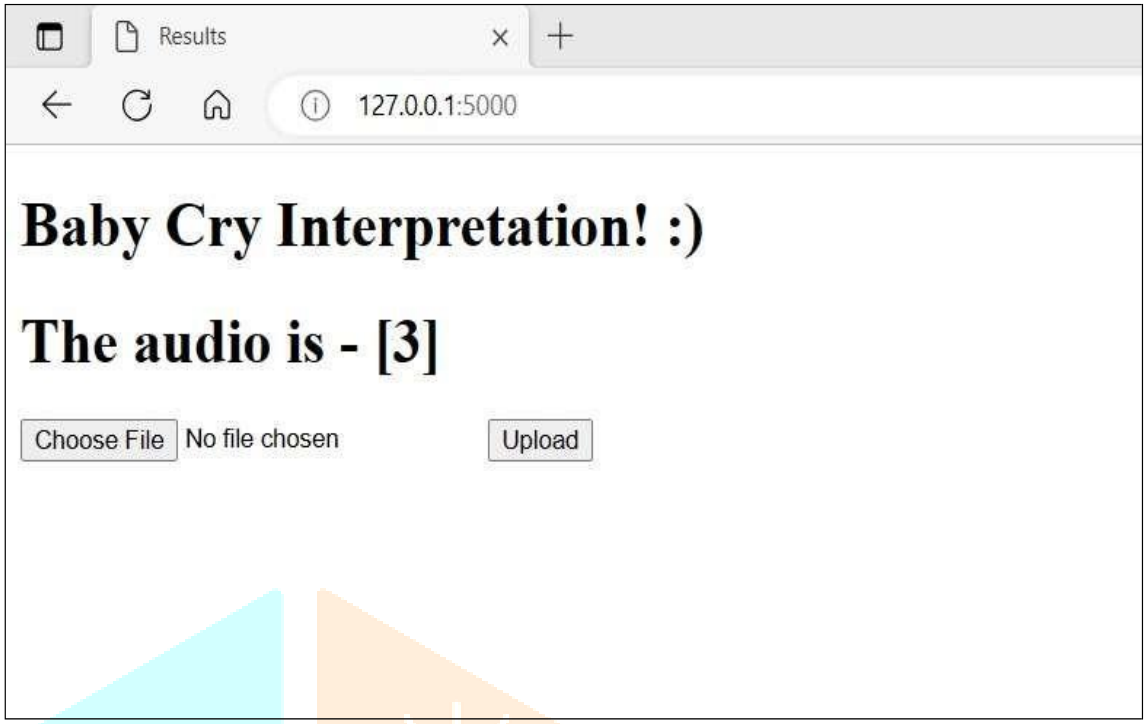
Explanation: Here we try to choose audio clip in which baby cries are recorded.

3) Test the Input



Explanation: Here we try to test the performance of input file.

4) Predict the Outcome



Explanation: Here we try to test the performance of input file.Finally we can able to check how thebaby cry is categorized.

7. CONCLUSION

Using audio recordings of infant cries, the project "Baby Cry Classification Using Machine Learning Algorithms" has successfully shown how machine learning can be used to reliably categorise various types of baby cries. The project aims to give parents and carers a useful tool to better comprehend and respond to their baby's requirements by utilising machine learning algorithms and methodologies. The experiment produced encouraging results in accurately classifying newborn cries by implementing several machine learning methods, such as support vector machines (SVM), random forests, or convolutional neural networks (CNN). The learned models could differentiate between various cry patterns brought on by hunger, discomfort, weariness, or pain.

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