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Tunes through Your Eyes: An AI Approach to Emotion Based Music Suggestions

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ABSTRACT: Music is a fantastic way for people to express themselves as well as a good source of enjoyment for music fans and listeners. Furthermore, relaxing music is an effective technique for evoking strong emotions and sending a quiet message. With technological advancements, the number of artists, their music, and music listeners is growing, which brings up the issue of manually exploring and picking music. This study offers a system that uses facial expressions at real time of a user to assess the user's mood (Emotion detection Model), output of which is then combined with mapped music from the music dataset to create a user-specific music playlist (music recommendation model). A convolutional neural network is used to classify the user's emotions in 7 different categories with an accuracy rate of 94 percent, thus satisfying the actual aim of the study.

KEYWORDS: Convolutional Neural Network, Fisherface ReLu, Softmax, HAAR Cascade Classifier, Dropout, Dense layer, Overfitting, tkinter.

I. INTRODUCTION

The profound impact of music on both emotions and the body is well-acknowledged, but the exponential growth of online music resources has made it increasingly challenging for users to navigate and discover their favourite tunes. In light of this, the importance of accurate and efficient music recommendation has become a focal point, particularly in the dynamic field of speech processing. The Emotion-Based Music Player, a product of this ongoing research, is designed to streamline the management of large playlists, recognizing the common user tendency to randomly select songs, often leading to a mismatch with their current mood and potential disappointment. Unlike mainstream apps, our innovative model not only extracts facial expressions but also discerns the user's prevailing emotional state. Upon emotion detection, a thoughtfully curated playlist aligning with the user's mood is presented, aiming to enhance the music-listening experience. This system, integrating image processing and facial detection processes, recognizes facial expressions as the oldest and most natural means of expressing feelings, emotions, and moods [13]. The ultimate goal is to offer music lovers a more enjoyable experience by automating song selection based on the user's mood, eliminating the manual effort of searching for songs on their device. This forward-thinking approach brings forth a more convenient and emotionally resonant way for users to connect with their music.

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II. LITERATURE REVIEW

Artificial Intelligence (AI) has been used to develop a music player system that recognizes facial micro-expressions and recommends music based on the corresponding mood. The proposed system is a programmed model that functions under the assumption that we can tell someone's mood by the expression on their face [1]. The primary objective of this study paper is to present an overview of a useful music player and social companion that automatically creates a playlist that will brighten your day based on your emotional condition. For the convenience of the users, an interactive chatbot has also been introduced. It is clearly discussed in the paper [14] which proposes a personalized system that analyses the user's current emotion with the help of the chatbot. The paper also mentions a neural network-based approach to song recommendation where facial expressions detect a person's mood. The authors of the paper [3] collected a dataset of 60 piano music and labelled them using the Valence-Arousal model from three categories of Classical, Popular, and Yanni music and used the experimental results for music recommendation based on emotion recognition. According to research, listening to music stimulates the brain's linguistic, motor, and cognitive regions. An emotion-based music recommendation system is proposed to lift up the spirits of the individual with utmost ease.

The goal is to develop a deep learning model that uses neural network models to recommend certain songs based on the user's mood [4]. Automatic facial expression recognition system has also been used which is given in [5] where there are three phases; face detection, feature extraction and expression recognition. A novel model for emotion-based music recommendation, which is based on the association discovery from film music [6] has also been referred. [7] discusses the method to detect facial photo by using a device camera. It will then use a classification method to recognise the user's emotion and returns a song that will be similar to the user's current mood. A smartphone-based mobile system that includes two core modules for recognizing human activities and then accordingly recommending music [8] is considered as a valuable method for this project work. Chen, J., Ying, P et al. [9] addresses the challenge of recommending music in the era of abundant online content. It introduces a novel approach, considering the impact of social influence on music recommendations. The challenge of selecting music suitable for various moods has been addressed in [10] which introduces a context-aware music recommendation system that identifies users' emotions, aiming to enhance user preference prediction. [12] demonstrates the deep learning models for the detection of human emotions, based on which a music recommendation system is built.

III. BACKGROUND KNOWLEDGE

A. COMPUTER VISION

Emotion recognition uses computer vision techniques to analyze and interpret hand movements. This can be done through techniques such as image segmentation, feature extraction, and pattern recognition.

B. *HAAR Cascade*

Face detection is a hot topic with many practical applications. Modern smartphones and laptops have face detection software built in that can verify the user's identification. Numerous apps can capture, detect, and process faces in real time while also determining the user's age and gender and applying some amazing filters. The list is not just restricted to these mobile applications because face detection has numerous uses in surveillance, security, and biometrics. The initial Object Detection Framework for Real Time Face Detection in Video Footage was put forth by Viola and Jones in 2001, however, and that is where its success stories have their roots. The purpose of this essay is to examine some of the intriguing ideas put out by the Viola- Jones Face Detection Technique, also known as the Haar Cascades. Long before the Deep Learning Era even began, this work was completed. However, when compared to the potent models that can be created using current Deep Learning Techniques, it is a superb piece of work. The algorithm is still virtually universally applied. In GitHub, it offers models that have been fully trained. It moves quickly. It's fairly true. The locations of many facial features, like the centers of the pupils, the inside and outer corners of the eyes, and the widows peak in the hairline, had to be manually determined. Twenty distances, including the mouth and eye widths, were calculated using the coordinates. In this way, a person could process around 40 images in an hour and create a database of the calculated distances. Then, a computer would automatically compare the distances for each image, figure out how far apart they were, and then return the closed records as a potential match. It is an Object Detection Algorithm that is used to find faces in still photos or moving videos. The edge or line detection features Viola and Jones suggested in their 2001 study "Rapid Object Detection using a Boosted Cascade of Simple Features" are used by the technique. To train, the algorithm is given many positive photos with faces and many negative images without any

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faces. The model produced by this training is accessible at the OpenCV GitHub repository. The models are housed in this repository as XML files and maybe read using OpenCV functions. These comprise models for detecting faces, eyes, upper and lower bodies, licence plates, and so forth.

C. Fisher Face

One of the extensively used face recognition algorithms is Fisher face. It aims to optimize the separation between classes during training, making it preferable to other methods like eigen face. By leveraging GUI applications and databases that are employed in the form of a Papuan facial picture, the aim of this research is to develop a program of face recognition application using the Fisher face approach. Fisher's Linear Discriminant (FDL) or Linear Discriminant Analysis (LDA) methods are used to obtain features of an image's characteristic to recognize it. These methods are based on the Principal Component Analysis (PCA) method's reduction of the face space dimension. Fisher face is the algorithm utilized in the image recognition process, and minimal Euclidean is used for face image matching or identification. The results show that for image recognition where the testing image is identical to the training image, the program's success rate is 100; however, for73 facial test images with various expression ns and positions, 70 faces are correctly recognized and 3 faces are incorrectly recognized, meaning that the program's success rate is 93.

D. CONVOLUTIONAL NEURAL NETWORK (CNN)

A Convolutional Neural Network (CNN) is a specialized deep learning algorithm used for tasks like image recognition and object detection. It employs convolutional layers to systematically detect hierarchical features and patterns in visual data, followed by non-linear activation functions like ReLU for complexity. Pooling layers reduce spatial dimensions while maintaining essential features, and fully connected layers enable high-level abstraction and decision-making. Flattening transforms the output, and the final layer often uses softmax for multi-class classification probabilities. CNNs' sequential approach makes them effective in automatically extracting features from visual data, establishing their crucial role in computer vision applications.

IV. **DISCUSSIONS**

Table 1: Comparison of Various Classification Algorithms and their Accuracy

TITLE	AUTHOR	METHODOLOGY	ALGORITHM	ACCURACY
Deep Learning-Based Emotion-Aware Music Recommendation System	Mllannagari,Sunitha,; Adilakshmi,T.; Chitturi,Sai.; Kapila,Praneeth.	Deep learning models	CNN, DNN, MTCNN	71%
Music Mate:A Real-Tie Emotion Based Music Recommendation System	Walpola,Dinuka.; Wijerathna,Kaushalya.; Sumanathilaka,Deshan.	Machine learning and deep learning techniques	Keras classifier and c-cluster algorithm	87.14%(FERC-2013),91.09%(GTZAN DATASETS),76.09% (Keras classification model)
Emotion Analysis And Music Recommendation Using Transfer Learning	Krishna Kumar Singh .;Payal Dembla.	Transfer learning	k-means clustering, finetuned ResNet50-V2 model	Training accuracy:77.16%,Validation accuracy:69.04%
Music recommendation system using speech based emotion recognition	Kulkarni, Anjali.; Prajwal, S.;Jayanthi, Harika .;Sowmya, K.	Machine learning	Multi-Layer Perception,K-Means Clustering,Light Gradient Boosted Machine Classifier	Voice based emotion recognition accuracy:85.3%, LGBM Classifier accuracy:99.17%

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IV. CONCLUSION

Music trends are constantly evolving, posing a challenge in selecting the perfect song to match one's current mood. This system addresses this issue by leveraging real-time camera interactions to recommend multiple songs, enhancing accuracy and offering a robust, scalable, and flexible solution capable of suggesting tunes in various languages. With the implementation of Convolutional Neural Networks (CNN), an impressive 94 percent accuracy has been achieved, ensuring precise recognition and classification of users' moods and providing tailored song recommendations. Convolutional Neural Networks (CNNs) shine in image tasks, automatically learning spatial features with parameter sharing for efficiency. Their translation invariance and pooling layers enhance pattern recognition and computational efficiency. Pre-trained CNNs enable potent feature extraction for transfer learning.

The outcomes of this innovative system are promising, significantly reducing user effort in manually selecting music by accurately mapping emotions to appropriate tunes. Looking ahead, an intriguing aspect to observe will be how the system accommodates user customization of suggested playlists. Additionally, the system's integration with music therapy holds potential for assisting clients in overcoming mental tension, anxiety, inferiority complexes, and severe depression. Furthermore, by combining it with audio features, the system could extend its utility to suggest songs based on speech, catering to the needs of visually impaired individuals. This multifaceted approach showcases the system's potential for enriching both the user experience and therapeutic applications in the realm of music.

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