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Music Recommendation System Using Emotion Recognition

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Abstract: ***The immense application value and market potential of face recognition technologies have garnered a lot of attention. It is used in a number of industries, including security systems, digital video processing, and many other recent technical developments. Music is also acknowledged to have a stronger connection to an individual's emotions. It has a special capacity to improve one's mood. This research primarily focuses on developing an effective music recommendation system that employs facial recognition to ascertain the user's emotional state. The implemented approach would prove to be more effective than the current systems. Additionally, this would allow for the labor and time that were used to do the same manually.***

Multiple machine learning techniques are employed by the system to increase efficiency. This uses the CNN algorithm, which is well known for its ability to analyse and recognize images. The system uses CNN and image processing to identify the input image, as well as libraries like TensorFlow lite. This is made possible by feeding the model an enormous amount of data for training to increase accuracy and improve results. The approach seeks to increase the emotional impact in entertainment and engagement of musical entertainment. This also potentially increases customization in music entertainment as per the user's mood.

Keywords- CNN, TensorFlow, Facial Expression, Emotion, Mood, Music Recommendation.

INTRODUCTION

Music influences our decision-making as well as our mental health; as humans, our mood fluctuates depending on the type of song we listen to. For instance, when we are listening to a cheerful song, our mood tends to be nice, however when we are listening to a sad song, our mood might not be all that great. In addition to this, music is a significant kind of entertainment. Almost everyone used to listen to music for entertainment purposes. Additionally, we are provided with tons of music applications where we can go and select songs based on our mood before listening to them. The issue with this strategy is that we must manually choose the song that we wish to listen to. So, it would be easy if we have a system that automatically plays a song based on the emotion detected on our face without the user manually selecting a song to listen to.

The human body reacts differently depending on how it is feeling, and various types of songs have various effects on the human body. The use of music can be suggested in a variety of contexts, including music therapy, sports, studying, relaxing, and supporting mental and physical activity. The application receives an image as input and predicts an emotion according to the facial expressions present in the image. In accordance with that emotion, a song from the collection of songs is selected that matches that particular emotion. For

each various emotion, a collection of music is available which is the actual output once the user gives the relevant input mood. This experience of personalization can please any user and specifically the younger generation that account for the majority of the user base in this segment.

The younger generation prefers technologies that help them engage, personalize and explore. The addition of new technologies to existing traditional activities has been a key area of attraction for a wide variety of users all around the world. Automated emotion detection in multimedia attributes like music or movies is expanding quickly thanks to advances in technology for digital signal processing and other efficient feature extraction algorithms, and this system can play a significant role in many potential applications like human-computer interaction systems and music entertainment. We present a recommender system for emotion recognition that uses facial expressions to identify user emotions and provide a list of suitable tunes.

Innovations are always readily accepted as technology advances and the use of social media and music platforms grows. A model that provides entertainment depending on user input in the form of facial emotions will make it far more interesting for users. The music industry has grown significantly, making this a viable paradigm. The users have already been used to providing facial inputs, image inputs; this has been possible with the emergence of various social media applications that allow users to click images and make the technology more engaging.

LITERATURE SURVEY

The potential ability of individuals to supply inputs to any system in numerous ways have piqued the interest of a number of learners, scientists, engineers, and others from all around the world.

The term "mind" has long piqued the interest of scientists who want to grasp it in its entirety. The most natural method to express emotions is through facial expressions. We humans frequently employ nonverbal clues such as hand gestures, facial expressions, and tone of voice to indicate feelings in interpersonal relationships. Nikhil Zaware et al [1] stated that creating and managing big playlists, as well as selecting songs from these playlists, takes a lot of time and effort. According to the study, there is a technique to automatically detect the user's mood and build a playlist of songs that are appropriate for the present mood. The image is recorded using a webcam and then processed via various stages to determine the user's mood or expression. The application is thus designed in such a way that it can manage the content viewed by the user, analyse image attributes, and detect the user's mood. The application also has the ability to sort music based on mp3 file attributes, allowing them to be added to appropriate playlists based on mood. To classify human emotional states of behaviour, various strategies and approaches have been proposed and developed. The proposed methodologies have only addressed a subset of the basic emotions. For the purposes of feature recognition, facial characteristics are divided into two categories: appearance-based feature extraction and geometric-based feature extraction. Only the shape or key conspicuous points of several important facial features, such as the lips and eyes, were examined by the geometric-based feature extraction technique. Renuka R. Londhe [2] proposed a precise and efficient statistical-based approach for analysing retrieved face expression features. The analysis of changes in curvatures on the face and intensities of corresponding pixels of photographs was the main focus of the paper. Support Vector Machine (SVM) was utilized to classify the retrieved features into six primary universal emotions: anger, disgust, fear, happiness, sadness, and surprise. Anukriti Dureha [3] proposed manual playlist segregation and song annotation based on a user's current emotional state as a laborious and time-consuming task. To automate this process, numerous algorithms have been developed. However, existing algorithms are slow, contribute to the overall cost of the system by requiring additional technology, and have lower precision. The algorithm automates the process of constructing an audio playlist based on a user's facial expressions, saving time and effort expended in executing the procedure manually. The proposed algorithm in the research intends to reduce the overall computing time and cost of the planned system. The study by Henal Shah et al [4] describes our proposed intelligent music player that uses sentimental or emotion analysis. Emotions are an essential component of human existence. The paper focuses on the strategies available for recognising human emotions in order to construct emotion-based music players, as well as the approaches utilised by existing music players to identify emotions. According to Saurabh

Malgaonkar's [5] research, algorithms automate music composition. Making a machine generate decent music composition is a rare achievement in one of the most revered forms of art. Music is composed in the system utilising a wholly automated computational technique. It will require some prior knowledge of music, such as chord and scale patterns. It will select the correct/valid notes and play them. For the sake of feature recognition, Zheng et al [6] categorised facial features into two main categories: appearance-based features and geometric features. The geometric characteristics were inspired by the shape or prominent points of various major face features, such as the mouth and eyes. K.McKay and colleagues created the xpod-a human activity and emotion aware music player[7]. Sensors used in the system to collect information about a user's emotions and actions in order to recommend music. The system used a client/server design. Michael lyons [8] et al. suggested a method for coding facial expressions using a multi-orientation and multi-resolution set of Gabor filters that were organised topographically and roughly aligned with the face. A. S. Bhat suggested in [9] an automatic method for identifying mood and tone in music by analysing spectral and harmonic aspects of music notes and human emotions. Using Thayer's methodology, it categorised songs based on their mood. Before classification, it recognises aspects of songs such as rhythm spectra and roughness. Anukritine [10] developed an algorithm that gives an inventory of songs from the user's playlist based on the user's emotion. The algorithm developed was focused on having reduced calculation time and thus lowering the cost associated with employing diverse hardware. The fundamental idea was to categorise emotions into five categories: joy, sadness, anger, surprise, and fear, which created a very good and efficient approach for music recommendation.

Benefits:

1. Ease of use.
2. Multiple moods detected.
3. Lower computational time.

Limitations:

1. Manual selection of songs.
2. Randomly selected playlists.
3. Less accurate.
4. Limited moods.

PROPOSED SYSTEM

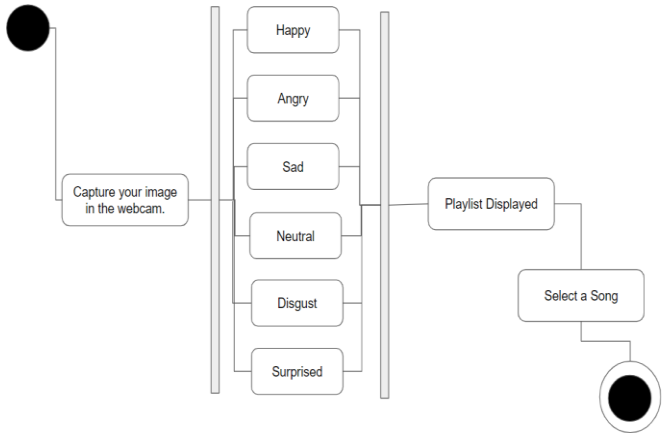
To propose and create a system capable of monitoring people's emotions, discriminating between them, and categorising them correctly. Then, using the information gathered, make song recommendations to them. The application is primarily concerned with implementing real-time mood detection. It's a new product prototype with two primary modules: facial expression recognition/mood detection and music recommendation. We benefit from the proposed system by presenting interaction between the user and the music player. The system's goal is to adequately capture the face using the camera. Images are captured and sent into a Convolutional Neural Network, which predicts emotion. The emotion produced from the taken image is then used to generate a song playlist.

SCOPE

This technology can detect and track a user's mental state in real time. This approach can be used to assist those conducting emotion-related research in improving the processing and comprehension of emotional data. Clever marketing is possible by utilising emotional understanding of a person or a person recognised by this system. This technology has the potential to make music platforms even more engaging. This also has traces of social media platforms when it comes to clicking the snapshot to provide the input.

METHODOLOGY

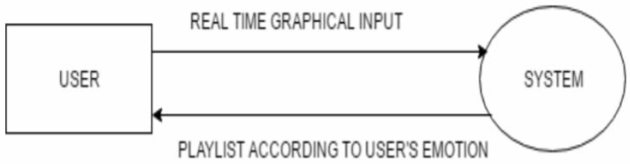
The mood-based music recommendation system is a programme that employs real-time mood detection to make music recommendations. It's a new product prototype with two primary modules: facial expression recognition/mood detection and music recommendation. We benefit from the proposed system by presenting interaction between the user and the music player. The system's goal is to adequately capture the face using the camera. Images are captured and sent into a Convolutional Neural Network, which predicts emotions. The emotion produced from the collected image is then used to create a playlist of music. The major goal of our suggested system is to automatically provide a music playlist to modify the user's mood, which can be joyful, sad, natural, or shocked.



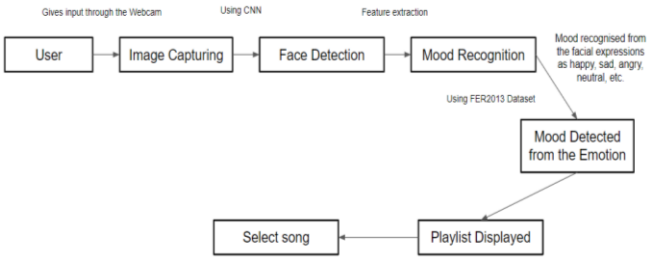
Activity diagram

IMPLEMENTATION:

The model is entirely driven by machine learning methods and frameworks such as CNN and Tensorflow. The model's flow is designed so that people may simply comprehend and navigate it



Flow of the Model (1)

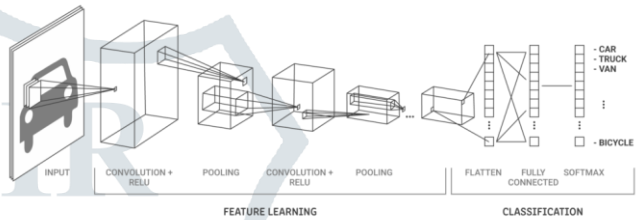


Flow of the Model (2)

The TensorFlow Lite framework, which is known for its superior calculation capabilities, is used. It performs substantially better in image processing tasks and produces superior results. The user logs into the application and captures an image to provide and input to the model.

The collected image is then processed using the best image processing technique available- CNN. CNN is a strong image processing technique. These algorithms are currently the best we have for automated image processing. The image's characteristics are retrieved and processed using several CNN layers. CNN is a strong image processing technique.

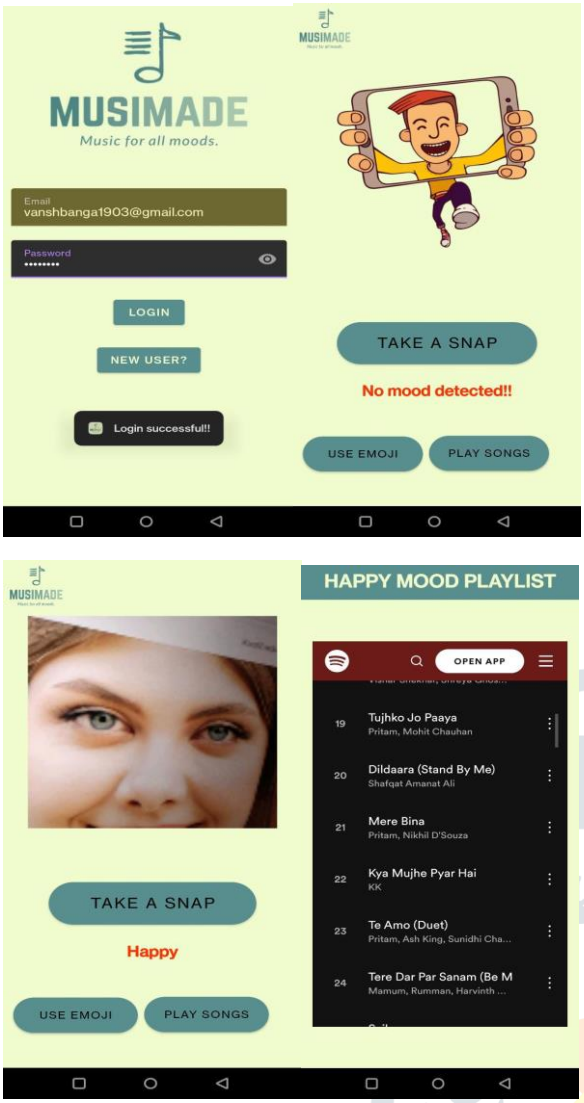
To extract features, the image is processed via multiple layers of CNN. Convolutional Layer: Each input neuron in a conventional neural network is connected to the next hidden layer. Only a small portion of the neurons in the input layer connect to the neurons in the hidden layer in CNN. Pooling Layer: The pooling layer is used to minimise the feature map's dimensionality. Inside the CNN's hidden layer, there will be several activation and pooling layers. Fully-Connected Layer: Fully Connected tiers are the network's final few tiers. The output of the final Pooling or Convolutional Layer is flattened and sent into the fully connected layer as the input of the fully connected layer.



A general CNN Architecture

This aids in facial recognition and, as a result, in identifying the user's mood. We used the FFHQ (Flickr-Faces-HQ) dataset to do facial recognition in this model. The Flickr-Faces-HQ (FFHQ) dataset contains 70,000 high-quality PNG photos at 10241024 resolution, with significant variance in age, race, and image background. It also covers a wide range of accessories such as eyeglasses, sunglasses, hats, and so on.

The dataset is best suited for age, gender, and mood recognition. The user's mood is determined once the image has been evaluated and the emotion has been identified. The playlist is then produced based on the user's mood. The interface is designed so that the user can quickly supply the input mood using facial expressions and the appropriate emoji, and then the option to play the songs is supplied.



User-friendly Interface

CONCLUSION

This research presents a method for recognising different types of face expressions. Face detection and emotion extraction from facial photos are valuable in a variety of applications, including video surveillance, digital cameras, security, and human-computer interaction. The goal of this research was to create a facial expression system that used computer vision to improve advanced feature extraction and classification in face expression recognition. This project includes 7 different types of facial expressions from various person photos from various datasets. This works great with the music platform as well. Having user-friendly ideas makes any platform more appealing. Combining these approaches can result in a more engaging platform.

FUTURE SCOPE

Given the evolution of the music industry and social media platforms, the approach has a lot of promise. It has the potential, like the industry revolution, to free individuals from manually selecting songs. The difficulties in creating appropriate playlists can also be overcome. Users have never witnessed such an aspect of music personalization. This technique can also be used to improve the engagement of social media sites. The application also incorporates an emotional component that helps to establish a connection with the user. Green IT elements can also make the application more environmentally friendly. Green IT is an emerging concept that should be implemented widely to have an ecological impact.

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