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Emotify-Emotion Based Music Player

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Abstract: This research paper presents a novel approach to the problem of emotion-based music selection through the development of an emotion-based music player using Convolutional Neural Networks (CNNs) for facial expression recognition. Emotions play a significant role in music selection, and this project aims to bridge the gap between emotions and music by creating an app that can detect a user's facial expression through a webcam interface and suggest relevant songs based on the detected emotion. The project extensively studies emotions, exploring their psychological, physiological, neurological, and cognitive aspects. Through a literature review, previous research papers on emotion detection using CNNs are examined, highlighting the effectiveness of CNNs in classifying emotions from facial expressions. The methodology involves the development of an app that utilises OpenCV for face detection and a CNN model trained on the FER2013 dataset for emotion classification. The app maps the detected emotion to the respective music genre and provides relevant song suggestions to create a calming effect on the user's mind. The significance of this research lies in its contribution to understanding the role of emotions in music selection and providing a hands-free music streaming service that enhances the user experience. The findings of this project highlight the potential of CNNs in solving emotion-based problems and open doors for further research in affective computing and the intersection of emotions and music.

Keywords: Activity Detection, Face Recognition,Convolutional Neural Network

I Introduction

The project involves developing a Convolutional Neural Network to solve an image-based problem, specifically recognizing emotions through facial expressions. This method was chosen as there are many ways to approach image-based solutions, including body language and voice techniques. However, facial expressions have been proven to be a reliable method for detecting emotions, making it the methodology implemented in this project.

The goal of the project is to solve a problem that has gone largely unnoticed - the role of emotions in music selection. Music is a crucial part of everyday life, and individuals often choose what to listen to based on their emotions. As emotions and music have similar structures, this project aims to develop a simple implementation that can play music based on a user's emotional state, whether they are happy, sad, nervous, neutral, etc. This is a challenging problem that few researchers have been able to solve, making it an ambitious project that requires hard work and dedication.

In addition to developing the app, the project involves studying emotions in depth. This includes understanding what emotions are, how they are constructed, and how to detect them. This knowledge is crucial for developing effective algorithms for emotion detection, as it helps to guide what the algorithms should learn and why. However, emotions are complex and can vary widely between individuals and cultures, which makes it difficult to solve this problem. Therefore, the project will begin by studying a small group of people and gradually expanding to others over time.

Overall, the project is a challenging and important endeavour that seeks to shed light on the role of emotions in music selection. By using a Convolutional Neural Network and studying emotions in depth, the project aims to develop an effective solution that can benefit individuals in their daily lives.

Background description of the problem:

The research project focuses on the topics of emotions and their detection from photos, as well as the science behind Convolutional Neural Networks and their comparison with previous research results. The project aims to solve the problem of implementing an emotion-based music player using deep learning techniques, specifically Convolutional Neural Networks.

The discussion on emotions is extensive, covering various aspects such as the psychological, physiological, neurological, and cognitive states. Emotions are a complex state of feeling

that arises from physical and psychological changes, influencing thoughts and behaviours. They are associated with psychological phenomena such as mood, personality, and motivation. The theories of emotions include the physiological, neurological, and cognitive states, where each state has a different source of emotional response.

According to Charles Darwin, emotions develop over time as they are adaptive and essential for survival. Emotions play a vital role in providing motivation, increasing chances of success and survival, and helping us respond appropriately to situations. Understanding emotions is crucial for human and animal survival, and it enables us to respond correctly and feel safe without experiencing danger.

The project faced challenges due to the limited previous research available on the topic of music and emotions together. However, the research aims to cover all possible information in this field and provide a comprehensive solution using Convolutional Neural Networks. These networks are the best option for classifying images and extracting details, making them an ideal choice for solving the problem of emotion-based music players.

II. Literature Review

The research paper discusses three main papers in detail to gain more knowledge about emotion detection using Convolutional Neural Networks. The first paper is from the Department of Computer Engineering at Pune Institute of Computer Technology in India. The researchers aimed to build a more efficient and cost-effective app by classifying emotions into four major categories - Happy, Sad, Angry, and Neutral. They achieved over 50% accuracy using a Convolutional Neural Network (CNN) as it simulates the human brain and analyses visuals.

The researchers used the FER2013 dataset from Kaggle to compete in the Facial Expression Detection Challenge. This dataset consisted of grayscale images with dimensions of 48 x 48 pixels and was classified into seven emotions - Happy, Sad, Angry, Neutral, Disgust, Fear, and Surprise. Due to the large number of images in this dataset, they chose to analyse only the four main emotions. The dataset included 26,217 images, with 8,989 for Happy, 6,073 for Sad, 6,198 for Neutral, and 4,953 for Angry.

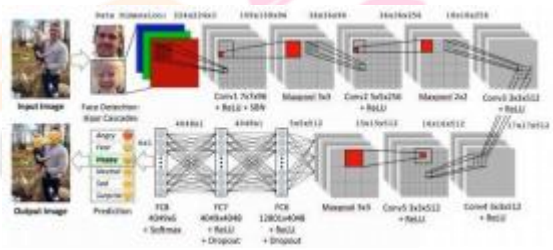
The researchers used a CNN to classify images and detect emotions from facial expressions. The CNN had several layers, with Layer 1 being the Input Layer, which played a crucial role in detecting the face from the image using OPENCV, a library of functions used to assist in the face detection process. Layer 2 was the Convolutional Layer, which extracted features from the image using small squares. This layer was the core of the CNN, and it saved the relationship between each pixel in the image by learning its features.

III. Methodology

The project aims to build an app that can detect the user's facial expression through a webcam interface and suggest relevant songs based on the detected emotion. To achieve this, a Convolutional Neural Network (CNN) model is used for face detection and emotion classification. The Django framework is used to integrate the backend with the website, which is hosted on a server.

The app starts by capturing the user's picture via the webcam. OpenCV, which is a well-known library for face detection, is used to classify the image into different emotions. The emotions are categorised into four major categories - Happy, Sad, Angry, and Neutral. The CNN model is trained and tested on a dataset called FER2013 from Kaggle, which consists of grayscale images of 48 x 48 pixels, classified into seven emotions.

Once the emotion is detected, the relevant song suggestions are displayed on the console. The app maps the detected emotion to the respective music genre and plays the relevant song. The music player is designed to capture human emotions and gradually calm the user's mind. The app captures the user's picture after every song or a decided interval of time since the user's mood may change over time.



Convolutional Neural Network Architecture

In summary, the app uses OpenCV for face detection, a CNN model for emotion classification, and the Django framework to integrate the backend with the website.The music player captures the user's emotions through the webcam interface and suggests relevant songs to create a calming effect on the user's mind.

IV. Need and Significance

It is possible to perform facial expression analysis using affordable commercial gear and HTML, CSS, JavaScript, and

React can be used to create interactive interfaces for open-source programmes like OpenFace.

A working website can incorporate the deep learning algorithm using the Django backend framework and The Spotify Api, which is described in its documentation, allows for the music streaming.

The goal of this project is to provide a hands-free music streaming service that eliminates the need for typing, searching, and selecting music to listen to.It generates strong recommendations on its own, assisting the user in having a satisfying musical experience.

This project is important because it enables those with impairments to listen to their favourite music without having to type in or search

V. Conclusion

In conclusion, this research project aimed to develop an emotion-based music player using Convolutional Neural Networks (CNNs) for facial expression recognition. The project successfully implemented a system that can detect a user's facial expression through a webcam interface and suggest relevant songs based on the detected emotion. By utilising the power of CNNs and studying emotions in depth, the project has made significant strides in bridging the gap between emotions and music selection.

The project started by studying emotions extensively, exploring their psychological, physiological, neurological, and cognitive aspects. Emotions were found to be complex states of feeling that have significant influence on thoughts and behaviours. Theories of emotions were investigated, highlighting the adaptive and essential nature of emotions for human and animal survival.

Through a literature review, the project examined previous research papers that focused on emotion detection using CNNs. The studies demonstrated the effectiveness of CNNs in classifying emotions from facial expressions, providing a foundation for this research project. The FER2013 dataset was utilised, consisting of grayscale images categorised into seven emotions. The CNN model, with its various layers, including face detection and feature extraction, proved to be a suitable approach for emotion classification.

The methodology of the project involved the development of an app that captures the user's facial expression through a webcam interface. OpenCV was employed for face detection, and a CNN model trained on the FER2013 dataset was used for emotion classification. Relevant song suggestions were then provided based on the detected emotion, mapping it to the respective music genre. The app aimed to create a calming effect on the user's mind by capturing their emotions and tailoring the music selection accordingly.

The significance of this research lies in its contribution to the understanding of the role of emotions in music selection. By combining deep learning techniques with the study of emotions, the project successfully developed an app that enhances the music listening experience. The hands-free music streaming service eliminates the need for manual input and searching, providing strong recommendations and a satisfying musical journey for users.

Future research directions could involve expanding the study to a larger and more diverse dataset to account for individual and cultural variations in facial expressions and emotions. Additionally, incorporating other modalities such as voice analysis and body language could further enhance the accuracy of emotion detection and music recommendation.

In conclusion, this research project has demonstrated the potential of Convolutional Neural Networks in solving the problem of emotion-based music selection. By understanding emotions, utilising deep learning techniques, and developing an intuitive app, the project contributes to the field of affective computing and opens doors for further exploration of the intersection between emotions and music.

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