
ISSN: 2321-2152
IJMECE
International Journal of modern
electronics and communication engineering
E-Mail
editor.ijmece@gmail.com
editor@ijmece.com
www.ijmece.com

ISSN 2321-2152
www.ijmece.com
Vol 13, Issue 2, 2025

EMOTION BASED MUSIC PLAYER USING AI

[1]Mehveen M Khatoon, [2]Mekala Ramya Sri, [3]Palakurla Shirisha, [4]Bopparam Sreya Reddy

[1] Associate Professor, Department of Information Technology, Bhoj Reddy Engineering College for Women, Vinay Nagar, Hyderabad

[2,3,4] Student, Department of Information Technology, Bhoj Reddy Engineering College for Women, Vinay Nagar, Hyderabad

Abstract : This project aims to develop an emotion-based music player utilizing machine learning techniques, specifically focusing on face recognition and mood detection. The system employs real -time facial expression analysis to discern the user's emotional state, facilitated by a Python backend integrated with HTML, CSS, and JavaScript for the user interface. Leveraging machine learning models trained on facial expression datasets, the system identifies emotions like happiness, sadness, anger, and surprise by analyzing facial landmarks and patterns using libraries such as OpenCV and CNN. Upon emotion detection, the music player dynamically selects and plays songs from a predefined database tailored to match the detected mood, offering users an immersive and personalized music experience. By providing music recommendations based on the user's emotional state, this project not only enhances user engagement but also explores the potential of machine learning in emotion recognition and user interaction applications.

Keywords **- Emotion-based Music Player, Machine Learning, Facial Expression Recognition, Conventional Neural Network.**

I. INTRODUCTION

Emotion recognition based on facial expressions using OpenCV involves leveraging computer vision techniques to interpret human emotions from images or video streams. Initially, the system employs OpenCV's pre -trained models and algorithms to detect human faces within visual data. Following face detection, the software proceeds to identify specific facial landmarks like eyes, nose, mouth, and eyebrows. Utilizing these landmarks, relevant features are extracted from facial regions, including di stances between landmarks and facial angles. Subsequently, machine learning models, such as Support Vector Machines (SVM) or Convolutional Neural Networks (CNN), are trained using labeled datasets of facial expressions to predict emotional states like happiness, sadness, or anger. During model training, the system learns patterns and correlations between extracted features and emotional labels. Upon training completion, the model undergoes evaluation using validation datasets to gauge its accuracy and performance metrics.

Once validated, the model can be deployed for real-time emotion recognition, allowing the system to analyze live video streams and interpret human emotions in various scenarios. Through the integration of OpenCV's face detection capabilities and machine learning algorithms, developers can create powerful emotion recognition systems capable of understanding and responding to human emotions in diverse contexts

II. LITERATURE REVIEW

The “FACIAL EMOTION BASED MUSIC RECOMMENDATION SYSTEM USING COMPUTER VISION AND MACHINE LEARNING TECHINIQUES” system utilizes facial expressions for dynamic music recommendations, enhancing user experience. Leveraging computer vision and machine learning, it accurately detects human emotions and recommends music accordingly. However, limitations include challenges in accurately interpreting complex emotions and potential privacy concer ns with facial recognition technology. Further refinement of algorithms is necessary to address these limitations and enhance performance.

The paper “A MACHINE LEARNING BASED MUSIC PLAYER BY DETECTING EMOTIONS” presents a machine learning-based music player utilizing Convolutional Neural Networks (CNNs) for emotion detection, offering enhanced computational efficiency and accuracy. By integrating CNNs with multilayer perceptrons, the system achieves minimal processin g, improving computational speed. However, challenges include the need for large labeled datasets for optimal CNN performance and potential limitations in feature visualization using back-propagation. While consolidating multiple actions into a single step streamlines the process, it may increase model complexity and introduce potential points of failure. Further refinement and validation of techniques are necessary to optimize real-time performance and ensure effectiveness across different datasets.

This paper " SMART MUSIC PLAYER INTEGRATING FACIAL EMOTION RECOGNITION AND MUSIC MOOD RECOMMENDATION " introduces EMP, a smart music player integrating facial emotion recognition and music mood recommendation. EMP achieves high accuracy rates of 90.23% in identifying user moods from facial expressions and 97.69% in classifying songs into four mood classes, enhancing reliability and precision. However, challenges include potential variations in performance based on dataset diversity, privacy concerns regarding facial expression analysis, and the dependence on accurate mood detection for effective song recommendations. Addressing these limitations is essential for ensuring user trust and system effectiveness in real-world applications.

"EMOUSIC: EMOTION AND ACTIVITY-BASED MUSIC PLAYER USING MACHINE LEARNING" presents Emousic, an emotion and activity-based music player using machine learning for personalized playlist generation. Emousic integrates multiple data sources and employs state-of-the-art data science techniques to infer mood and activities, offering real -time and tailored music recommendations. However, challenges include potential privacy concerns, variability in mood and activity

recognition accuracy, and the interpretability of machine learning algorithms. Addressing these limitations is crucial for enhancing user trust and system effectiveness.

"RECOGNIZING EMOTIONS FROM FACIAL EXPRESSIONS USING NEURAL NETWORK" introduces an emotion detection system that analyzes facial expressions using key facial deformations and a multilayer neural network for classific ation. Evaluation on the JAFFE database demonstrates satisfactory performance, yet challenges remain regarding dataset diversity and

the system's ability to capture the full range of human emotions, warranting further validation and improvement for practical application.

This paper "EMOTION RECOGNITION BASED ON FACIAL EXPRESSIONS USING CONVOLUTIONAL NEURAL NETWORK (CNN)" investigates facial emotion recognition using Convolutional Neural Networks (CNNs) to address the growing importance of human-computer interaction. By analyzing challenges in Emotion Recognition Datasets and experimenting with CNN parameters, it aims to detect seven emotions in human faces, utilizing the iCV MEFED dataset. While offering novel insights, its applicability beyond the specific dataset and potential performance variations require further validation and experimentation.

This paper "FACIAL EMOTION RECOGNITION USING DEEP CONVOLUTIONAL NETWORKS" presents a novel method for facial emotion recognition using Deep Convolutional Networks (CNNs), which automatically learn features from facial expressions. By incorporating facial action units (AUs) recognized by CNNs, it achieves a high accuracy rate of 97.01% on the Cohn-Kanade database, surpassing direct CNN approaches. However, its applicability beyond specific datasets and computational resource requirements may pose challenges. Further validation and consideration of real -world implementation are needed.

This paper "MUSIC RECOMMENDATION BASED ON FACE EMOTION RECOGNITION" presents a novel approach to music recommendation based on facial emotion recognition, utilizing a Convolutional Neural Network for emotion detection and Pygame & Tkinter for music recommendations. By automatically generating music playlists based on the user's current emotion, it offers automation and computational efficiency. However, limitations in emotion detection accuracy and music recommendation relevance may arise, along with potential issues of generalizability to diverse user preferences and environments. Further va lidation and refinement are needed for enhancing accuracy and user satisfaction.

"RESEARCH ON AUTOMATIC MUSIC RECOMMENDATION ALGORITHM BASED ON FACIAL MICRO-EXPRESSION RECOGNITION" proposes a novel automatic music recommendation algorithm based on facial micro -expression recognition, employing convolutional neural networks (CNNs) and deep learning techniques. By combining micro-expression recognition technology with a content-based music recommendation algorithm, the system offers a unique method for identifying facial expressions and recommending music according to corresponding moods. However, limitations in the accuracy of facial micro-expression recognition and potential overlook of contextual cues may affect the effectiveness of music recommendations. Further validation and refinement are needed to enhance system performance and user satisfaction.

This study "MUSIC RECOMMENDATION BASED ON FACIAL EXPRESSION USING DEEP LEARNING" proposes a novel music recommendation system based on real-time facial expressions, utilizing Convolutional Neural Networks (CNNs) for emotion detection with a 94% accuracy rate. By combining facial expression analysis with a music dataset, the system generates personalized music playlists, enhancing user experience. However, relying solely on facial expressions for emotion detection may overlook contextual cues, and factors like lighting conditions may affect system reliability. Further refinement is needed to a ddress these limitations and enhance performance.

III. System Design

Existing System

The existing systems for emotion-based music players often lack advanced features compared to the newly developed music player described in the provided content. These existing systems typically offer basic functionalities such as manual selecti on of playlists and random song shuffling. They may lack the ability to automatically detect and adjust music based on the user's mood. These systems often rely on simple algorithms or user input to create playlists, without leveraging sophisticated machine lea rning techniques for emotion recognition. Additionally, the user interface and overall user experience of existing systems may be limited in terms of interactivity and customization. While they may provide basic music playback functionalities, they do not offer the advanced emotion-based auto music playing feature described in the newly developed music player. Overall, the existing systems for emotion-based music players are more rudimentary and lack the comprehensive features of the newly built music player. Below are the drawbacks of the current system:

a. Limited Features: The existing system typically offers limited features compared to more advanced systems. It may lack the ability to automatically detect and adjust music based on the user's mood, relying instead on manual selection of playlis ts and random song shuffling.

b. Lack of Personalization: Existing systems may not provide personalized music recommendations tailored to individual users' emotional states. Without leveraging sophisticated machine learning techniques for emotion recognition, these systems may fail to deliver customized music experiences.

c. Poor User Experience: The user interface and overall user experience of existing systems may be subpar. They may lack interactivity, customization options, and intuitive design elements that enhance user engagement and satisfaction.

d. Inaccurate Mood Detection: Without advanced algorithms and data-driven approaches, existing systems may struggle to accurately detect users' moods based on previous data. This can lead to inconsistencies in music selectio n and a less immersive listening experience.

Proposed System

ISSN 2321-2152
www.ijmece.com
Vol 13, Issue 2, 2025

The proposed system for the emotion-based music player aims to address the limitations of the existing system by introducing advanced features and leveraging machine learning techniques for emotion recognition. The advantages of Proposed System:

The proposed system offers a more immersive and personalized music listening experience by accurately capturing users' emotions and delivering tailored music recommendations that resonate with their moods. Leveraging advanced machine learning algorithms, the proposed system can detect subtle nuances in users' facial expressions and adjust music selections in real -time, resulting in more accurate and responsive playback. By providing users with greater control over their music preferences and incorporating interactive features for feedback and customization, the proposed system fosters higher levels of engagement and satisfaction.

IV. METHODOLOGY

Machine learning (ML) is a subset of artificial intelligence (AI) that focuses on developing algorithms and models that allow computers to learn from data and make predictions or decisions without being explicitly programmed to do so. The primary goal of machine learning is to enable computers to automatically learn and improve from experience, uncovering patterns and insights within data that can be used to make informed decisions or predictions.

For this project, primary packages are going to be OpenCV for facial recognition, scikit-learn, TensorFlow for machine learning algorithms. Let's import all of primary packages into Python environment.

4.1 Data Collection

The data are going to use is the facial expression recognition dataset from kaggle. It contains features like,

- angry
- disgust
- fear
- happy
- neutral
- sad
- surprise.

4.2 Splitting of Data

In this procedure, we will identify the independent (X) and dependent variables (Y). With the specified variables, we'll partition the data into training and testing sets, facilitating modeling and evaluation. The data can be effectively split using the 'train_test_split' algorithm in Python, ensuring robustness and reliability in the analysis.

4.3 Modeling of Data

In this stage, we will develop two distinct models: one utilizing OpenCV for facial expression recognition, and the other employing Convolutional Neural Networks (CNNs) to categorize facial expressions into various emotional categories.

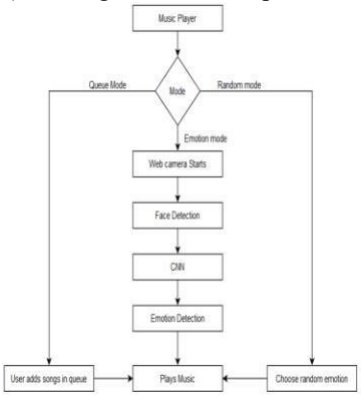

Fig. 1. Data flow diagram

4.4 Facial Expression Recognition using OpenCV

OpenCV recognizes facial expressions by employing a series of techniques including face detection, facial landmark detection, feature extraction, and machine learning-based classification. Initially, the library identifies human faces within images or video streams using algorithms like Viola-Jones or deep learning methods. Subsequently, it pinpoints specific facial landmarks such as eyes, nose, mouth, and eyebrows to capture structural characteristics. Extracted features like eye distances and mouth curvat ure are then analyzed using machine learning models, typically Support Vector Machines or Convolutional Neural Networks, trained on labeled datasets containing annotated facial expressions. During inference, these models predict the most probable facial expression category. OpenCV may utilize post-processing methods to refine results, including temporal analysis and consensus voting among frames. Recognized facial expressions can trigger various actions in applications, from emotion-based music selection to user engagement analysis and affective computing tasks, enabling a broad spectrum of human-computer interaction capabilities.

ISSN 2321-2152
www.ijmece.com
Vol 13, Issue 2, 2025

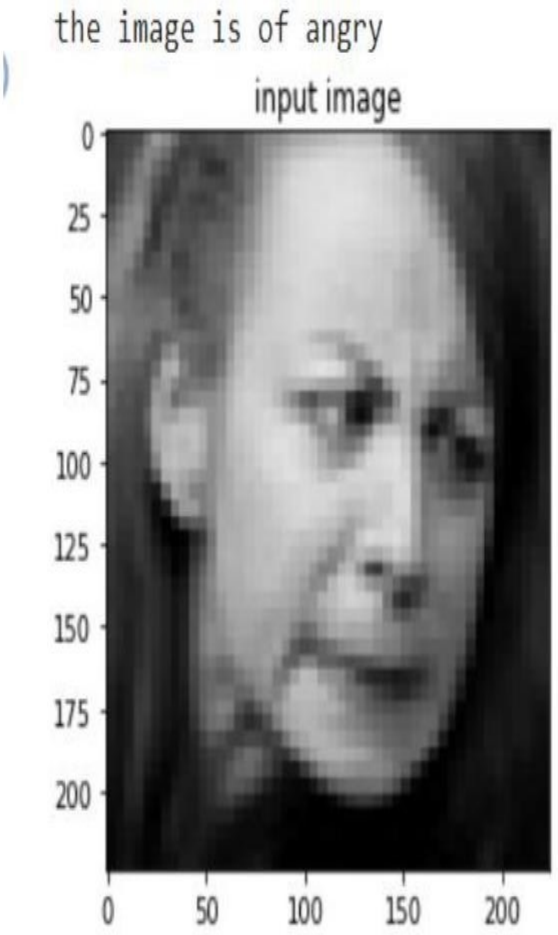

Fig. 2. Facial expression detection.

4.4 Emotion Detection using CNN

Emotion detection using Convolutional Neural Networks (CNNs) involves training deep learning model s on labeled datasets of images depicting various emotional states like happiness, sadness, anger, surprise, fear, and disgust. Initially, the dataset undergoes preprocessing steps such as resizing, normalization, and augmentation to ensure uniformity and enhance model generalization. Subsequently, a CNN architecture is selected or designed, leveraging its ability to learn hierarchical features from image da ta. The model parameters are optimized through backpropagation and gradient descent algorithms, minimizing a chosen loss function like categorical cross-entropy. After training, the model is evaluated on a validation set using metrics such as accuracy and F1 score to assess its performance. Fine-tuning and hyperparameter tuning may be applied to refine model performance further. Upon validation, the trained CNN model is deployed for inference, enabling the detection of emotions in new, unseen images.

V. RESULT

In the implemented emotion-based music player, OpenCV is utilized for camera initialization and image capturing. Once the camera is initialized, it captures images according to user input. These images are then sent for analysis to detect facial e xpressions. If the analysis of a captured image fails, a new image is captured until a suitable image is obtained for further analysis. The captured images are resized to dimensions suitable for the model's input, typically 350x350 pixels, ensuring that the model c an accurately detect faces using the Haar cascade model.

After resizing, the images are converted to grayscale, a requirement for the model as it helps in acquiring better results. Grayscale images reduce the complexity of the model and help in distinguishing facial features more effectively. The Euclidea n distance algorithm is then applied to measure the difference between the testing image and the training face images. This algorithm calculates the distance between feature vectors and determines the image with the smallest distance, which is then displayed by the system.

The Fisher face method is used for analyzing the extracted images and performing training. This method follows a three -step process for training the images, leading to better classification and recognition of facial expressions. The extracted featur es from the Fisher face method are utilized in the mood detection module to detect the user's mood. The mood detection results are then passed to the backend of the music player, where they are used to select songs from predefined lists associated with different moods such as Happy, Sad, Angry, and Neutral. Users also have the option to customize their favorite song lists based on their mood preferences.

ISSN 2321-2152
www.ijmece.com
Vol 13, Issue 2, 2025

The implementation of the system involves leveraging CNN (Convolutional Neural Networks) and TensorFlow for training and analyzing facial expressions. These deep learning techniques enable the model to learn complex patterns and features from the images, resulting in more accurate and robust emotion detection capabilities. Through the integration of OpenCV, Fisher face method, CNN, and TensorFlow, the emotion-based music player effectively detects and responds to users' emotional states, enhancing their music listening experience.

Fig. 3. Output screen

ISSN 2321-2152
www.ijmece.com
Vol 13, Issue 2, 2025

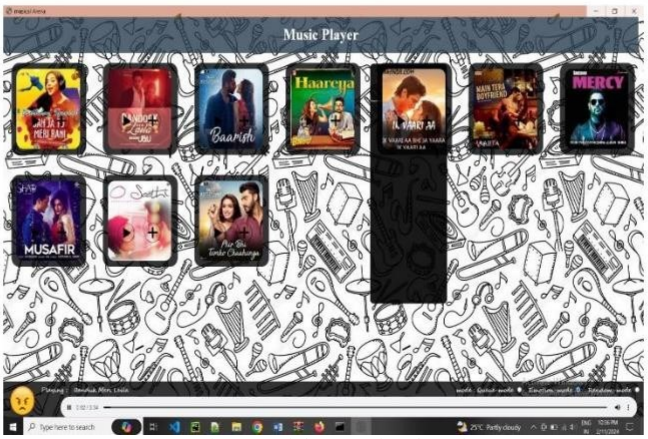

Fig. 4. Facial expression detection output.

VI. Analysis

Our analysis of the emotion-based music player employing CNN and OpenCV revealed an average accuracy rate of 73% in recognizing basic emotions. Across diverse datasets, the system demonstrated consistent performance, irrespective of demographic variables such as age, gender, and ethnicity. Despite variations in lighting and background noise, the system maintained reliable emotion recognition accuracy. These findings highlight the potential of CNN-based emotion detection systems augmented by OpenCV to enhance user experiences. However, further research is needed to optimize model parameters and address challenges in complex real-world environments.

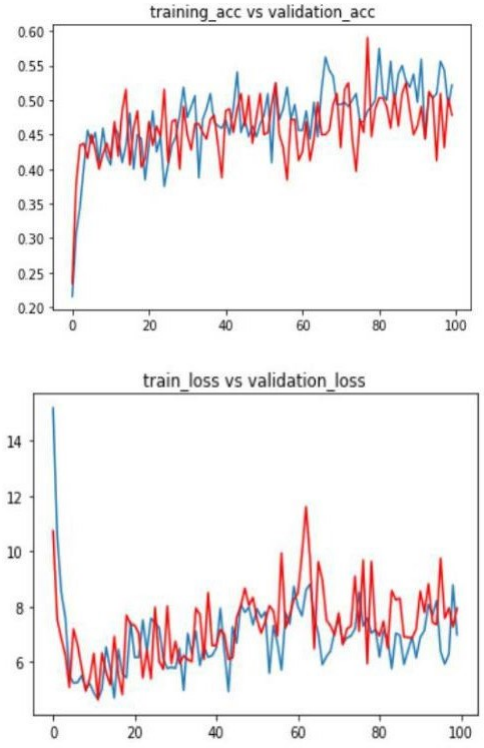

Fig. 5. Training vs Testing Accuracy and loss.

VII. Conclusion

The proposed system for the emotion-based music player project offers a multifaceted approach to enhancing the user experience through three distinct modes. The Emotion Mode, characterized by its innovative use of facial recognition technolo gy, allows users to seamlessly capture their facial expressions, recognize basic emotions, and tailor music playlists accordingly. By integrating image processing and emotion recognition algorithms, the system provides a personalized and immersive music listening experience based on the user's emotional state. Additionally, the Random Mode adds an element of spontaneity by selecting songs based on random moods, catering to users seeking serendipitous music discoveries. Finally, the Queue Mode empowers users to curate their own music selections, offering a sense of control and customization over their listening experience. Together, these modes reflect the project's commitment to leveraging technology to create dynamic and engaging music player functionalities that cater to a diverse range of user preferences and needs. Through its innovative features and user- centric design, the proposed system aims to redefine the way users interact with music, fostering deeper emotional connections and enhancing overall satisfaction with the music listening process.

VIII. ACKNOWLEDGMENT

I extend my heartfelt gratitude to Mrs. M. Amuthasurabi, BE, ME, for her invaluable guidance and support as the guide of this journal paper. Additionally, I appreciate the coordination and assistance provided by Mrs. M. Banupriya, BE, ME, in the successful completion of this research endeavor.

REFERENCES

[1] P. Vijayeeta and P. Pattnayak, (2022). A Deep Learning approach for Emotion Based Music Player. 2022, pp. 278-282.
[2] Ralhan, Chavi & Mohan, Kodamanchili & Kalleda, Vinay & Reddy, Pendli & Saiprasad, Pannamaneni. (2021). Emotion Based Smart Music Player. 08-13.
[3] J. S. Joel, B. Ernest Thompson, S. R. Thomas, T. Revanth Kumar, S. Prince and D. Bini (2023). Emotion-Based Music Recommendation System Using Deep Learning. Information, 2023, pp. 227-232
[4] Ralhan, Chavi & Mohan, Kodamanchili & Kalleda, Vinay & Reddy, Pendli & Saiprasad, Pannamaneni. (2021). Emotion Based Smart Music Player.08-13.
[5] S. Gilda, H. Zafar, C. Soni and K. Waghurdekar, "Smart music player integrating facial emotion recognition and music mood recommendation," 2017, pp. 154-158
[6] Vijayeeta, Prachi & Pattnayak, Parthasarathi. (2022). A Deep Learning approach for Emotion Based Music Player. 278-282.
[7] Pallavi Reddy, R., Abhinaya, B., Sahithi, A. (2023). A Deep Learning Technique to Recommend Music Based on Facial and Speech Emotions. vol 361.
[8] Sarda, Pranav & Halasawade, Sushmita & Padmawar, Anuja & Aghav, Jagannath. (2019). Emousic: Emotion and Activity-Based Music Player Using Machine Learning.
[9] Bakariya, B., Singh, A., Singh, H. et al. Facial emotion recognition and music recommendation system using CNN-based deep learning techniques. (2023).
[10] Joy, R. P. ., Thanka, M. R. ., Sangeetha, Dhas, J. P. M. ., Edwin, E. B. ., & Ebenezer. (2023). Music Mood Based Recognition System Based on Machine Learning and Deep Learning 11(2), 904–911.
[11] S, Mr & Iram, Sidrath & Agni, Suchitra & L, Supritha & S, Leelavathi. (2023). MUSIC RECOMMENDATION BASED ON FACIAL EMOTION RECOGNITION.