

Customizing Music Playlists based on user Emotional States: A Survey

Kaviya B¹, Girthigaa R², Anitha S³, Mamtha Varshini A S⁴ and Saravanan C⁵

¹⁻⁴Students, Velalar College of Engineering and Technology / Department of IT, Erode, India
Email: kaviyav1712003@gmail.com, girthigaaragupathy@gmail.com, anitaarunakash@gmail.com, mamthavarshini006@gmail.com

⁵Assistant Professor, Velalar College of Engineering and Technology / Department of IT, Erode, India
Email: saravananvanjii@gmail.com

Abstract— In the rapidly evolving realm of personalized digital interactions, the convergence of emotion detection via facial expression analysis and music recommendation systems offers a unique avenue to enrich user satisfaction and involvement. This survey paper delves into the emerging domain of tailoring music playlists based on facial expressions, which blends advancements in music information retrieval, emotional computing, and computer vision. Through a systematic review of existing literature, we identify the primary methodologies, technologies, and algorithms utilized for real-time facial expression recognition and their fusion with music recommendation engines to customize musical experiences according to listeners' emotional states. We examine the theoretical foundations of the correlation between emotion and music, the difficulties in accurately mapping intricate facial expressions to specific emotional states, and the subsequent selection of music tracks that resonate with or aim to influence these emotions. By offering a comprehensive overview of current progress, identifying research gaps, and outline directions for future work in creating empathetic and responsive music playlist customization platforms.

Index Terms— Facial Expression, Emotion Detection, Music Recommendation, Computer Vision.

I. INTRODUCTION

Music holds a good sized role in people's lives serving as a supply of comfort and a right away connection to emotions biologically and psychologically feelings are non-public subjective states that encompass thoughts emotions behaviors and moves facial expressions provide an effective way to locate emotions in computer vision a place in which comprehension of feelings is vital for some of studies goals indignant disgusted afraid glad sad amazed and neutral are the seven human emotions which can be universally recounted across cultural limitations. Emotion detection based on facial expressions addresses challenges and is a current focus in various fields. For music lovers, finding songs that match their mood can be a challenging task, even with advanced multimedia features. While features like fast forward, reverse, and genre classification exist, users often face the manual effort of browsing playlists to select songs based on their current mood and behavior. The need for a system that reduces human effort in playing songs based on mood is evident. Recent studies highlight the impact of music on the

human brain, influencing arousal, mood, and self-awareness. Music preferences are closely tied to personality traits and moods, with elements like meter, timbre, rhythm, and pitch affecting emotions and mood. Emotion detection has become a crucial technique in various applications, including smart card systems, surveillance, image database analysis, criminal investigations, video indexing, civilian applications, security, and adaptive human computer interfaces in multimedia environments.

Convolutional Neural Networks (CNN) are vital inside the place of facial features-based totally absolutely song recommendation systems this look at investigates the combination of computer imaginative and prescient and track advice emphasizing the todays trends in CNN architectures for emotion detection from facial indicators the assessment covers quite various device studying strategies that convert identified emotional states into tailored musical tips in this experience CNN integration is a large step closer to developing emotionally shrewd systems that could exchange how people engage with and find tune the study offers a succinct introduction of this developing interdisciplinary method thru comparing and describing diverse techniques for tune recommendation based mostly on facial expressions.

II. LITERATURE SURVEY

According to *Preema J.S, Rajashree, Sahana M, Savitri H*, [1] The song player device described within the paper chooses songs on its own, primarily based at the person's mood at the time. temper-based totally playlists are created via the utility via the use of audio capabilities to leverage a scanning and categorization process on audio files. The usage of the Viola-Jones set of rules which is normally used for face identity and facial expression extraction it's miles viable to decide the person's temper. The extracted facial expression capabilities are then subjected to a aid Vector device (SVM) for type into foremost universal emotions: anger, pleasure, surprise, unhappiness, and disgust. This integration of facial features analysis with SVM category allows the song player to dynamically tailor playlists, providing customers a customized and emotionally resonant music experience aligned with their cutting-edge emotional country.

According to *Ahmed Hamdy, AlDeeb*, [2] In this research, we combine the RReliefF feature selection set of rules with Convolutional Neural network (CNN) to create a user-pleasant interface for emotion-based totally tune selection. this system has a sturdy backend and an clean-to-use UI, and it works with each laptop and cellular (Android and iOS) platforms. the primary stage inside the technique is face detection the usage of OpenCV, that's vital for real-time emotion detection from digicam feeds. CNN, a deep studying algorithm for its efficiency in picture related tasks, is then implemented to the selected snap shots. trained on an in-depth dataset comprising almost 28,000 pictures representing feelings like glad, sad, indignant, and every day, the CNN achieves a high accuracy fee of 85% for schooling and 83% for trying out, showcasing its proficiency in emotion category. furthermore, the RReliefF characteristic selection set of rules is carried out to discover pertinent capabilities for emotion detection, enhancing ordinary device performance. The app seamlessly integrates those superior algorithms, turning in real-time emotion detection from live digicam feeds and recommending track primarily based at the recognized emotional nation. The amalgamation of OpenCV, CNN, and RReliefF signifies a complete and efficacious trouble solving method. The studies technique is guided by using a overview of associated paintings, incorporating insights from earlier research that tackled similar challenges the use of numerous strategies, such as PCA and Euclidean Distance or two-level guide Vector device. The ensuing app adeptly suggests music tailor-made to the person's emotional nation, imparting a amazing and consumer-friendly device for emotion-based totally song choice. This task contributes to the field by harnessing technologies and methodologies, exemplifying the sensible applications of deep getting to know in improving consumer reviews.

According to *Giridhar Sunil and Abraham Kuriakose*, [3] So as to show how song may be a beneficial tool for assessing a person's emotional condition and frequently express feelings that phrases on my own may also discover difficult to explicit, this takes a look at examines the deep relationship between track and emotions. while traditional track advice structures depend upon collaborative or content-primarily based filtering, this study proposes a modern method. It introduces an emotion detection system using k-means Clustering to classify songs into exclusive emotions primarily based on audio functions. additionally, a Convolutional Neural community (CNN) second version is evolved to hit upon the user's emotional state via facial expressions. The method includes custom playlist introduction, CNN version improvement, and music advice based at the labelled playlist and consumer's emotional nation. The system demonstrates promising consequences, accomplishing an accuracy of 94.6% in training statistics and 67.4% in checking out statistics for emotion detection. The interactive interface created complements the consumer revel in through recommending songs tailored to their emotional nation, showcasing the capacity for further enhancements inside the song application enterprise. The paper underscores

the machine's effectiveness in shooting consumer temper and customizing playlists for this reason, while also highlighting the need for sturdy testing under various lighting situations and the system's capability to evolve with updated person photographs. The general contribution lies inside the development of a recommender system that seamlessly integrates emotion detection from facial expressions into the track recommendation process, providing a innovative innovation for customers searching for songs aligned with their contemporary thoughts-country.

According to *D Raja, Puvvala Naga Bhavani, Siddi Kavya and Tallapogu Viswas*, [4] Analyzing the viability of figuring out human feelings from facial expressions recorded via a live feed from the machine's digital camera, this research explores the nexus among pc imaginative and prescient and system getting to know. The research, which acknowledges the strong correlation between emotions and tune, shows promise for effectively figuring out a fixed of emotions that may be distinguished through particular facial expressions via the use of device gaining knowledge of algorithms. no matter the inherent complexity and subtlety of human emotions, the developed version achieves an outstanding accuracy of about 75%, efficaciously discerning seven wonderful moods: anger, disgust, fear, happy, unhappy, marvel, and neutral. The realistic utility of this model is demonstrated via an Android application, which now not simplest accurately detects the user's mood but also shows tune tailor-made to the detected emotional state. The collaborative integration of computer imaginative and prescient, machine gaining knowledge of, and tune advice affords a promising avenue for enhancing person experience and mental properly-being by way of aligning tune alternatives with the individual's contemporary mood.

According to *Divyansh Shukla, Surya Pratap Singh, Sneha Saurabh, Ajay Kumar*, [5] The usage of facial features analysis and device studying, this research affords a creative music advice gadget that provides individualized recommendations based at the person's emotional state. The method is analyzing the user's facial expressions with machine mastering algorithms to decide their emotional kingdom and then suggesting song that fits that mood. The device contains a deep studying-based totally model for detecting and classifying facial expressions, coupled with a collaborative filtering set of rules to generate personalized song recommendations. assessment of the proposed machine applied a dataset comprising facial features fix and tune desire scores from participants. The effects reveal the gadget's capability to as it should be are expecting customers' emotional states, accomplishing an excellent common F1 score of 0.85. The consumer looks at similarly validates the effectiveness of the system, indicating that the personalized tune pointers had been properly-received via members. Via demonstrating the effectiveness of the usage of device getting to know and facial expression analysis to provide individualized recommendations, this research makes a big contribution to the sector of music recommendation systems. The importance of providing more accurate and custom designed guidelines is emphasized, alongside the device's capacity to growth consumer pleasure and engagement. In summary, the recommended track recommendation gadget which combines system studying and facial features evaluation sticks out as a creative manner to customize tune suggestions relying on users' emotional states. furthermore, destiny improvements should involve integrating extra capabilities which includes person comments and contextual records to further refine the accuracy and relevance of the suggestions. The authors discuss the broader implications of their work, emphasizing the practical applications of SER in various domains, such as call-center analysis, spoken dialog systems, and education. Future directions include exploring the proposed method's effectiveness in different emotional speech corpora and real-world scenarios, showcasing the potential for widespread applicability.

III. PROPOSED SYSTEM

The proposed system leverages a convolutional neural network (CNN) architecture, specifically the VGG16 model, to analyze and interpret user facial expressions for music recommendation, aligning playlists with the user's current emotional state. It facilitates interaction between the user and the music player by automatically generating a music playlist that reflects the user's detected emotions. Utilizing an inbuilt camera, the system captures facial expressions, which are then processed through the CNN to accurately identify the user's emotional state. Based on this emotional insight, the system recommends a playlist of songs aimed at positively enhancing the user's mood. The design focuses on reducing computation time and overall costs while simultaneously improving the accuracy of emotion detection and music recommendation, generating a seamless and responsive user experience.

IV. METHODOLOGY

A. Data Collection

The collection of an extensive variety of images of emotions on the face is the main goal of this module. The objective is to create an extensive database with a range of facial expressions that correspond to various moods. These images might have been taken with participants' permission or taken from publically accessible datasets.

The resilience and correctness of a facial expression detection technique depend heavily on the diversity of the dataset, which includes a range of ages, races, and lighting situations.



Fig 1. Samples of Dataset Image

B. Face Detection

This module uses a webcam to take live, real-time pictures of users' faces. This entails precisely identifying and tracking the features of the face using computer vision methods and computations, such as deep learning models or Haar cascades. Accurately identifying the user's face in a variety of settings, including altered lighting and backgrounds, is the aim. In order to suggest music that complements a user's mood, detection in real time is essential for assessing the user's emotional state at the moment.

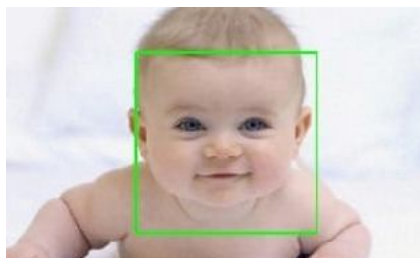


Fig 2. Face Detection

C. Emotion Detection

An extensive collection of face photos labeled with corresponding emotional states is necessary to train a CNN model for emotion detection. Convolutional layers, pooling layers, and fully connected layers which are used for feature extraction and emotion classification compose the typical CNN architecture. Through this approach, the model is able to classify the recognized face features into many emotional categories, such as happiness, sadness, annoyance, fear, surprise, aversion, or neutrality. It is possible to continuously improve the model's accuracy by feeding it larger, more diverse, and inclusive datasets. This will help the model identify and categorize a greater spectrum of emotional expressions with greater accuracy.



Fig 3. Emotion Detection

D. Song Database

Maintains an extensive database of music tracks, encompassing details like musical style, performer, beat, atmosphere, words, and feedback from listeners. Implements optimized database designs for rapid search and examination of musical data. Keeps the collection up-to-date by adding recent music and refreshing the metadata of existing tracks.

E. Music Playlist Recommendation

Collects data on users' listening preferences, direct feedback on tracks, and how they search for music to grasp their taste profiles. Leverages the results from an emotion recognition feature to choose tracks matching the user's present mood. Takes into account factors such as the time, the user's activity, and the social environment to refine the personalization of music suggestions. Creates playlists that mix well-known tracks with new discoveries, providing users with a blend of comfort and discovery in their listening experience.



Fig 4. Recommendation of Music Playlist

V. CONCLUSION

A review of the emerging field of facial expression-based music recommendation highlights a novel junction between customized music selection and emotional identification, with the potential to completely transform user experience. This paper explores the challenges of emotion and music analysis through an examination of the latest methods, techniques, and the intrinsic connection between the two. These challenges include accurately interpreting complex emotional cues in human facial expressions and mapping these emotions to musical selections that evoke a response or affect the listener's mood. Notwithstanding these obstacles, the reviewed literature points to a clear direction for future work, highlighting the need for improvements in the precision of identifying emotions, moral concerns, and the creation of sophisticated recommendation systems. Overall, the project represents a significant stride in the development of adaptive and emotionally intelligent music recommendation systems, catering to users' real-time emotional states for an enriched music discovery experience.

ACKNOWLEDGEMENT

The authors wish to thank Department of Information Technology, Velalar College of Engineering and Technology, Thindal for affording us the opportunity and encouragement.

REFERENCES

- [1] Preema J.S, Rajashree, Sahana M, Savitri H, Review on facial expression-based music player, International Journal of Engineering Research & Technology (IJERT), ISSN-2349-5162, Volume 10, Issue 7, 2023.
- [2] Ahmed Hamdy AlDeeb, Emotion- Based Music Player Emotion Detection from Live Camera, ResearchGate, June-2019.
- [3] Giridhar Sunil and Abraham Kuriakose, Emotion Detection with CNN Model and Song Recommendations using Machine Learning Techniques, International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), ISSN-2581-9429, Volume 3, Issue 3, June-2023.
- [4] D Roja, Puvvala Naga Bhavani, Siddi Kavya and Tallapogu Viswas, Music Recommendation System for Detection of Emotion, Mukta Shabd Journal, ISSN-2347-3150, Volume 11, Issue 6, June-2022.
- [5] Divyansh Shukla, Surya Pratap Singh, Sneha Saurabh, Ajay Kumar, Music Recommendation using Facial Expression May-2023, <https://doi.org/10.13140/RG.2.2.11618.91847>.