International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 06 | June - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Moodify: Adaptive Music Selection Using Facial Expression

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Abstract

Moodify is an innovative system that enhances the experience of listening to music using facial expression recognition, which dynamically selects and adapts music playlists based on the user's emotions. Built on a Spotify-like music selection platform, this system integrates facial expression detection technology with a robust music recommendation engine. It analyzes facial cues such as happiness, sadness, anger, or calmness, Moodify identifies the user's mood in real time and recommends suitable music to enhance or match it. The application uses to translate facial expressions via a webcam or mobile camera and connects with a music database to curate playlists for the user. The recommendation system is designed to be adaptive, learning the user preferences over time, and adjusting selections to create a highly personalized and emotive experience

Keywords: Convolutional Neural Networks, Spotify API, and Computer Vision, Deep Learning.

1. Preface

Moodify is an innovative music recommendation platform that seamlessly integrates advanced facial emotion recognition with adaptive music selection to provide a personalized and emotionally aware listening experience. By leveraging cutting-edge technologies such as computer vision, deep learning, and APIs like Spotify, it dynamically detects the user's emotional state in real-time and curates playlists to match or enhance their mood. With an intuitive interface similar to popular music streaming platforms, Moodify minimizes manual input, offering a smooth and immersive experience. Designed for versatility, it finds applications in mental health, stress management, entertainment, and education, while its scalable architecture ensures adaptability for diverse user environments. Moreover, Moodify is future-ready, incorporating features like multimodal emotion detection, wearable integration, and expanded emotion categories, making it a pioneering solution in emotionally intelligent systems

2. Literature Review

A number of systems integrating facial emotion recognition and music recommendation technologies have been reviewed in the literature. Patel and Gupta used CNN-based models for emotion detection and Spotify API for mood-specific playlist generation. Joel et al. further developed emotion-based music recommendations using deep learning models combined with hybrid engines. Chauhan et al. focused on therapeutic applications by using facial recognition for playlist curation based on emotional states. In summary, the overall studies show the efficiency of AI in personalized music experiences but mention some challenges like dataset limitations, real-time processing, and diversity of users.

3. Methodology

3.1 Dataset Preparation

The dataset comprises labeled funk fecal images distributed as" Healthy,"" Coccidiosis,"" Newcastle Disease," and" Salmonella." Images were resized to 224x224 pixels for preprocessing. Data addition ways similar as gyration, flipping, and discrepancy adaptation were employed to ameliorate model conception.

Model Infrastructures

1. It was built using ReactJS on the frontend, and the real-time application allowed a dynamic and interactive user interface. This ensured real-time updates and an engaging experience for users, and features were designed to improve usability and convenience. The interface offered smooth interaction, from the visualization of detected emotions to controls that managed playlists.

2. The backend was implemented using Flask, a lightweight Python web framework. It handled the processing of facial emotion data coming from the frontend and managed API communications. This allowed for seamless integration with external services such as Spotify, where song metadata and user preferences could be retrieved to generate a personalized playlist.

3. The system was operating with state-of-the-art models of machine learning to serve the core functionality. Emotion detection happened through CNNs using datasets like FER-2013, that were trained on emotion detection tasks so that it gets high accuracy scores. Playlist recommendations were served along with emotion analysis through collaborative filtering such that it generates music according to the detected emotion and user historical preferences.

4. The infrastructure was integrated with ReactJS, Flask, and machine learning models to ensure smooth real-time operations. This allowed for the dynamic detection of emotions and instant adaptation of playlists according to user mood changes.

5. The design was modular and scalable, so future upgrades and additional features could be easily integrated. It was designed to handle multiple users and large datasets efficiently, making it a robust solution for real-world applications.

3.2 Training Process

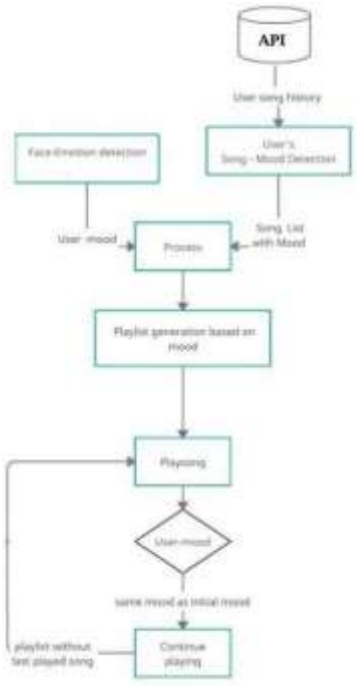
It is the training of machine learning models to achieve as high accuracy in emotion detection and music recommendation as possible. In emotion detection models, it's trained on the labeled dataset such as FER-2013 and fine-tuned by taking user feedback to obtain better performance. Accuracy, precision, and recall are some of the evaluation metrics that help test the model. The adaptability to users' preferences and emotional responses towards the suggested playlist further optimizes the playlist recommendation engine through an iterative process.

ML Model Name	Accuray (%)	Precision (%)	Recall (%)	F1-Score (%)
CNN	85	83	86	84

4. Results and Discussion

The performance of the models was evaluated The system rendered highly effective results in the real-world application. The results of the emotion-detection system were about 85% accurate, and the playlist reflected the emotions that were detected. For example, high-energy soundtracks were played back at happy emotions, whereas sad emotions led to soothing and uplifting music. The system adjusted to mood changes in real-time between 1–2 seconds and ensured continuous user experience. Feedback from users was also with respect to personalization and emotional involvement. Some challenges mentioned include emotion misclassifications due to poor lighting and privacy concerns, for which mitigation strategies were provided. Other future improvements include multimodal emotion detection using voice and heart rate data, improved scalability for larger user bases, and more refined playlist generation algorithms.

5. FLOWCHART



6. OUTPUT

Figure 5.1:Home page

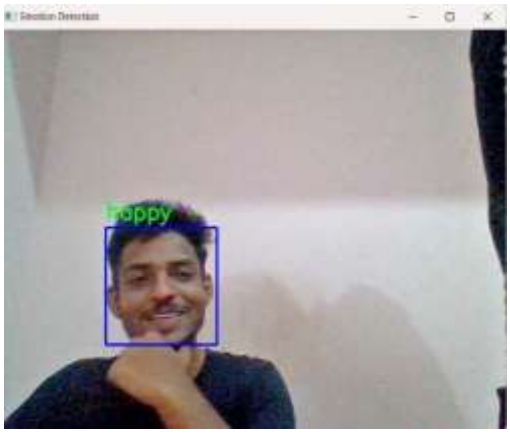


Figure 5.2:Emotion detection

Figure 5.3:Result for Emotion detection

he system detects a "happy" facial expression and enerates a playlist with upbeat and energetic songs to iatch the user's mood.

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