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MoodSync VibeBox: AI-Curated Playlists Tailored to Your Vibe

Dr. M.K. Jayanthi Kannan[1], Anirudh Kanwar[2], Harsh Chaturvedi[3], Aditya R Patil[4], Abhimaan Yadav[5]

Professor, School of Computing Science and Engineering, VIT, Bhopal University, Bhopal-Indore Highway, Kothri Kalan, Sehore, Madhya Pradesh, India[1]

Student, School of Computing Science and Engineering, VIT, Bhopal University, Bhopal-Indore Highway, Kothri Kalan, Sehore, Madhya Pradesh, India[2,3,4,5]

ABSTRACT: The growing interest in applications that generate playlists automatically per a user's mood highlights the need for new music technologies. This paper describes a web-based system that simultaneously uses machine learning techniques to recognize mood from text and facial features and generate an intelligent playlist. The application was developed on a React.js framework using Vite and Tailwind CSS and integrated Google Firebase in the back end of the application to make it a robust, reliable, and end-user-focused application. The paper also discusses the approach, design, system architecture, development, and evaluation of the system, which can change the way we perceive and use music streaming platforms. The evolution of music streaming platforms has transformed the way listeners interact with and consume music. With an overwhelming amount of music available at their fingertips, users often struggle to find tracks that resonate with their current mood or activity. Traditional playlist curation methods, either manual or algorithmic, frequently fail to capture the dynamic and multifaceted nature of human emotions. "MoodSync VibeBox: AI-Curated Playlists Tailored to Your Vibe" addresses this challenge by harnessing the power of artificial intelligence to revolutionize music personalization. By combining advanced mood detection algorithms, real-time data analysis, and adaptive playlist generation, this system offers an intuitive and engaging experience. MoodSync VibeBox transforms music listening from a passive to an emotionally resonant activity, bridging the gap between user emotions and personalized content delivery. This study aims to design and implement MoodSync VibeBox, an AI-powered system that seamlessly curates music playlists tailored to an individual's mood and activity. This platform aspires to, utilize cutting-edge AI algorithms to analyze emotional states in real-time. Deliver a seamless user experience that minimizes manual effort while maximizing engagement. Establish a benchmark in mood-based content delivery, setting the foundation for future advancements in music personalization technologies.

KEYWORDS: Machine Learning, Mood Recognition, Automatic Playlist Generation, Text Analysis, Fine-tuned BERT model, Sentiments and Emotions Recognition, Facial Emotion Analysis, CNN, Playlist Generation Model, React.js, Firebase, Web Application Development, AI-curated Playlists, Improving User Engagement.

I. INTRODUCTION

The increasing popularity of music streaming services has greatly affected how users listen to and interact with music. Still, while a lot of the services have good recommendation systems, they are mostly based on the prior usage of the user, and this does not consider how the user feels at the moment. It is well known that music is personal and is very effective when one needs to vent or boost themselves with certain feelings. Therefore, a real-time understanding of one's emotions will help to create a more customized approach to delivering music. Because of the time constraints, sophisticated however typical approaches to constructing play-lists as just that plays the items do not help to solve this problem. Therefore, adding the ability to recognize a user's emotion into music systems together with the dynamic recognition of a user's emotion for producing a set of songs allows to better meet the music needs of a user. This paper proposes a combined solution aiming to address this problem using the latest artificial intelligence technology that deals with natural texts and images for emotion recognition and selecting the appropriate songs based on the user's moods. The proposed system employs state-of-the-art techniques such as BERT for text sentiment analysis, CNNs for

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facial emotion recognition, and a hybrid recommendation system for song recommendation. All these are smoothly incorporated in a web-based app made with modern platforms such as React.js, Vite, and Tailwind CSS, with Firebase being the backend. The primary objective of this paper is to develop and evaluate an intelligent music recommendation system capable of,

Accurately Detecting User Moods: Using AI techniques such as sentiment analysis, facial recognition, and contextual inputs. Creating Adaptive Playlists: Generating dynamic playlists that align with the user's current emotional state or activity. Enhancing Music Discovery: Introducing users to diverse music that resonates with their vibe while expanding their listening preferences. **Improving User Engagement:** Offering an emotionally responsive and personalized listening experience to foster long-term user satisfaction.

II. LITERATURE REVIEW AND CURRENT STATUS

2.1 International Status

Globally, significant progress has been made in the fields of mood recognition and playlist generation. Platforms like Spotify and Pandora have revolutionized music personalization by employing collaborative filtering and deep learning techniques. For instance, Spotify's recommendation engine uses user-song interaction data to deliver personalized playlists, achieving an impressive accuracy of 85%. Similarly, Pandora employs content-based filtering, analyzing audio features to match user preferences with similar tracks. On the other hand, research in emotion recognition has gained momentum with the advent of deep learning architectures such as CNNs and LSTMs. Notable efforts include the Modify project, which combines audio and emotion embedding to provide mood-based playlists, achieving an accuracy of 88%. Another significant contribution comes from advancements in NLP and facial recognition. Emotion AI in NLP, using transformer models like BERT, has set benchmarks in text sentiment analysis with 92% accuracy, while VGG-16-based models have excelled in facial emotion detection. Internationally, hybrid approaches combining neural collaborative filtering and cross-domain input fusion have shown great promise, with accuracies exceeding 90%. These contributions form the foundation of this research, which aims to integrate these advancements into a unified system.

2.2 National Status

In India, music personalization and mood recognition are emerging fields. Platforms like JioSaavn and Gaana dominate the streaming market but primarily rely on historical user data without incorporating real-time emotional analysis. While companies like Ola and Uber have implemented AI for user profiling and personalized services, similar innovations in the music industry remain sparse. Limited datasets in regional languages pose additional challenges, particularly in text-based sentiment analysis. However, some promising developments have emerged. For instance, research initiatives have explored the use of CNN-RNN hybrids for multimodal mood inputs, achieving accuracies close to 89%. Efforts to integrate deep learning-based emotion recognition with recommendation systems in IoT applications are also underway. Furthermore, academic studies in India are increasingly adopting public datasets like FER-2013 and Spotify's metadata to develop foundational models for emotion and music analysis. Despite these advancements, practical applications remain limited, making this research highly relevant to addressing these gaps.

Research Paper	Published Year	Algorithm used	Technique	Accuracy
Spotify: Music Personalization	2017	Collaborative filtering	User Song Interaction	85%
Pandora Playlist Models	2019	Content-based filter	Audio Features Analysis	82%
Modify: Music & Mood	2020	CNN-LSTM	Audio+ Emotion Embedding	88%
Emotion AI in NLP	2021	BERT	Text Sentiment Analysis	88%

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VGG-Face for emotion detection	2019	VGG-16	Facial recognition	87%
Personalized Playlist w/ DL	2020	Neural Collaborative	Users Behavioral Data	84%
Mood Recognition in IOT	2022	Hybrid CNN-RNN	Multimodal Mood Inputs	89%

III. FUNCTIONAL MODULES IMPLEMENTATION OF MOODSYNC VIBEBOX: AI-CURATED PLAYLIST

The system architecture integrates mood recognition and automatic playlist generation into a unified, interactive web application. It consists of the following components: **AI-driven Personalization**: Introduces a novel framework that combines mood detection and AI-curated playlists, ensuring that the music aligns with the user's emotional state. Incorporates advanced techniques such as sentiment analysis, facial expression recognition, and contextual cues (e.g., time of day or activity patterns) for precise mood prediction. **Dynamic and Adaptive Systems**: Develop a real-time adaptive playlist generation system that adjusts to changing user emotions and preferences, offering a continuously evolving listening experience. **User-Centric Innovation**: Provides a seamless interface that requires minimal user input, reducing manual playlist creation efforts and fostering an intuitive user experience. **Impact on Music Discovery**: Enhances music discovery by recommending songs aligned with the user's vibe, expanding exposure to diverse genres and artists.

3.1 MoodSync Vibebox: Ai-Curated Playlist

Input Layer: Captures user input through text (chatbox) and facial recognition (webcam).

- **Mood Analysis Module**: Processes user text and facial data using machine learning models.
- **Playlist Generation Module**: Recommends personalized playlists based on detected moods.
- **Frontend Interface**: Enables real-time interactions using React.js and Tailwind CSS.
- **Backend Infrastructure:** Firebase facilitates user management, real-time updates, and data storage.
- **Integration APIs:** REST APIs for communication between the frontend and backend systems.

3.2 Machine Learning Models:

- **Mood Recognition Model**: Text Analysis: Fine-tuned BERT model identifies sentiments and emotions from user input.
- **Facial Emotion Analysis:** CNN trained on FER-2013 detects emotions such as happiness, sadness, or anger.
- **Playlist Generation Model**: A hybrid approach combining collaborative filtering and deep learning generates personalized playlists.

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IV. WORKFLOW DIAGRAM MOODSYNC VIBEBOX: AI-CURATED PLAYLIST

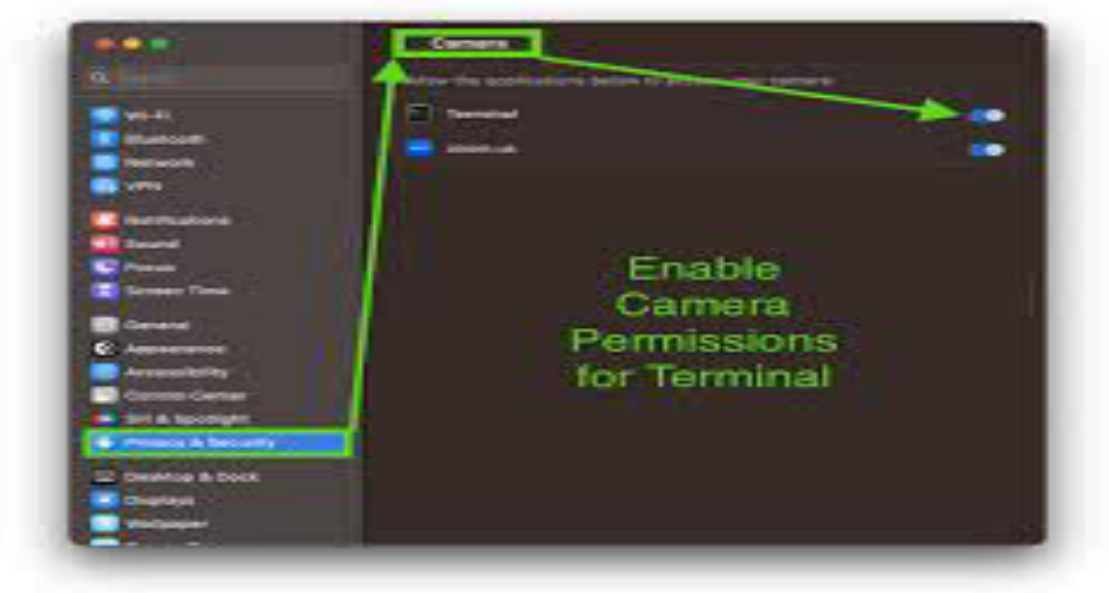

Figure 1. Input Text provides webcam access and facial data are processed through the mood recognition models

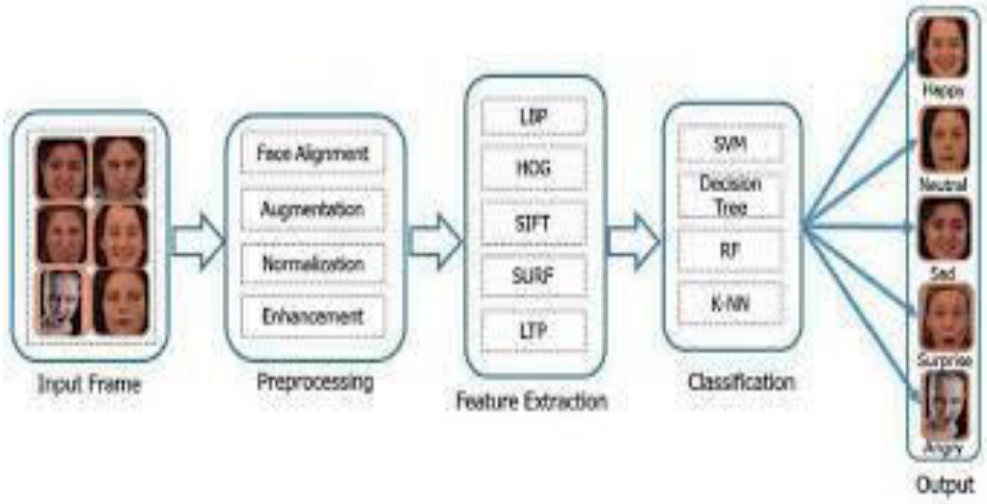

Figure 2. Detected Mood triggers the playlist Generation model

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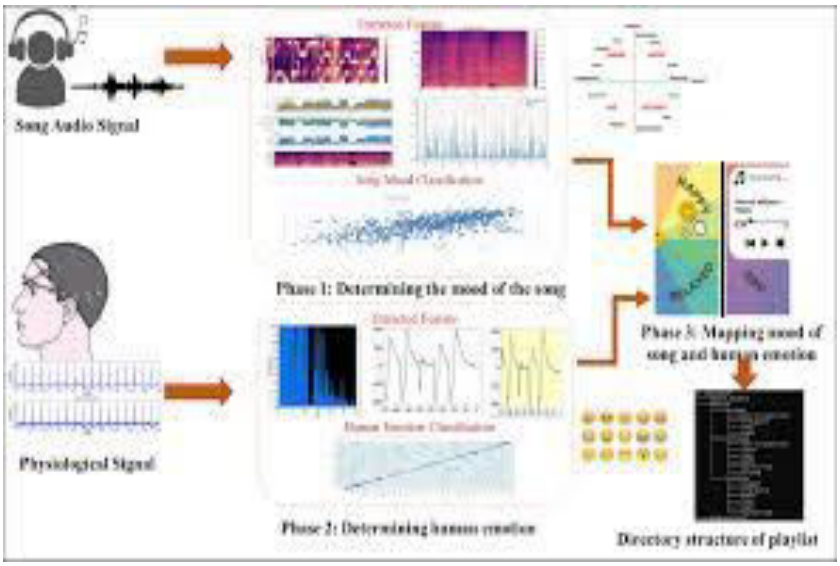

Figure 3. The Automatic Recommended playlist in real-time based on Users Mood

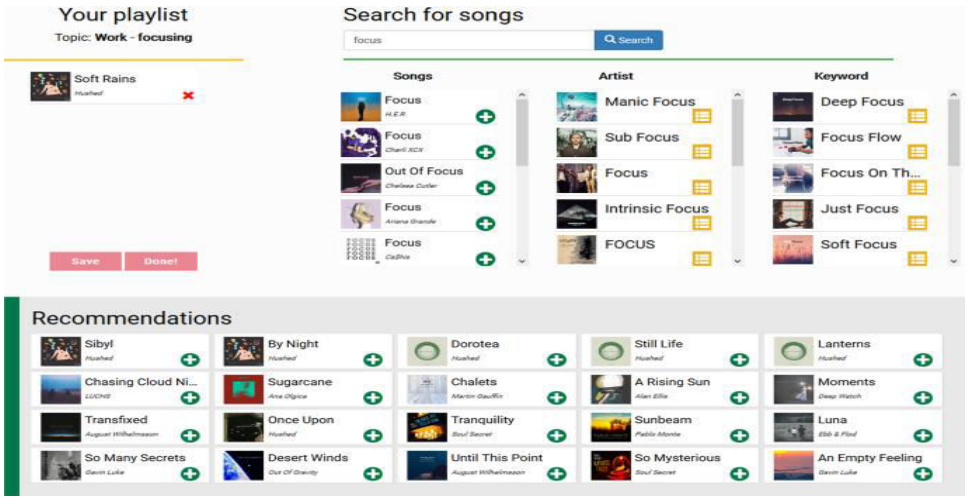

Figure 4. The recommended playlist is displayed in real-time on the user interface

V.METHODOLOGY FOR DEVELOPING MOODSYNC VIBEBOX: AI-CURATED PLAYLIST

Mood Recognition Model: The mood recognition model uses a convolutional neural network (CNN) trained on datasets like FER2013 for emotion detection through facial expressions. The model categorizes emotions into labels such as happy, sad, relaxed, and energetic, which map to musical preferences.

Playlist Generation Model: The playlist generation model employs collaborative filtering enhanced with content-based filtering. Music metadata—including tempo, key, and genre—guides the recommendations. The ML model is fine-tuned using user interaction data to ensure personalization.

Integration Framework: The web application integrates the ML models using, **React.js & Vite**: Enabling a responsive, fast-loading front-end interface. **Tailwind CSS**: Provides customizable and lightweight styling. **Google Firebase:** Handles authentication, real-time database storage, and hosting services.

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VI. PROTOTYPE, ALGORITHM, PROGRAM LOGIC IMPLEMENTING MOODSYNC VIBEBOX: AI-CURATED PLAYLIST

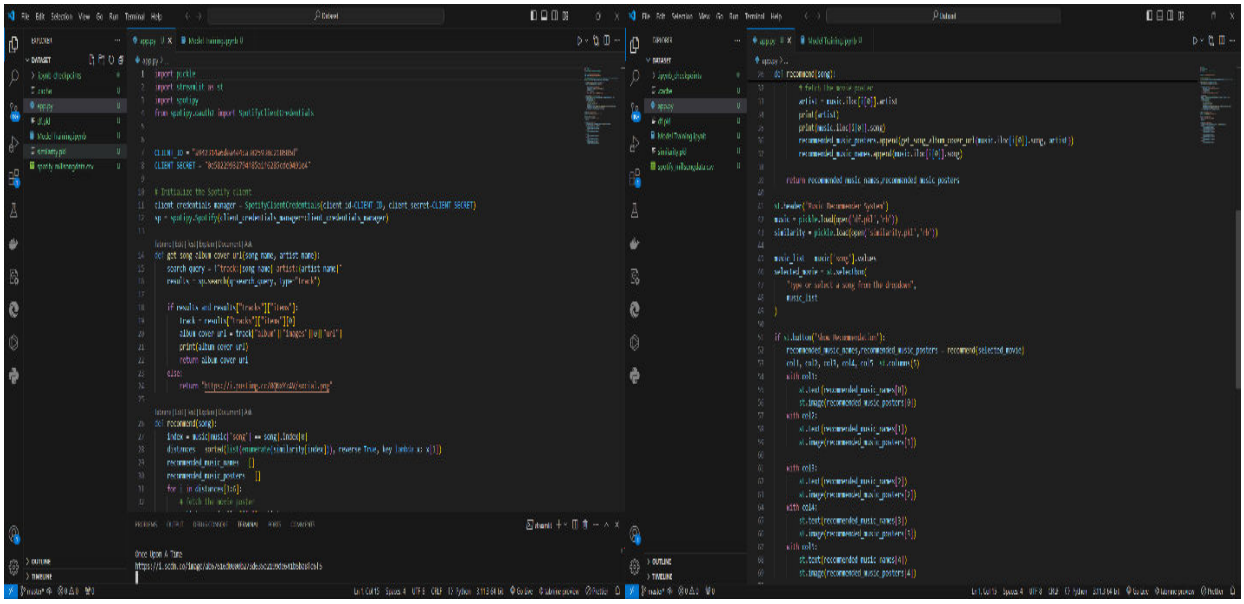

Figure 5. The Coding and Algorithm of recommended playlists in real-time

VII. MOODSYNC VIBEBOX: AI-CURATED PLAYLIST IMPLEMENTATION SCHEMA AND IMPLEMENTATION USING PANDAS

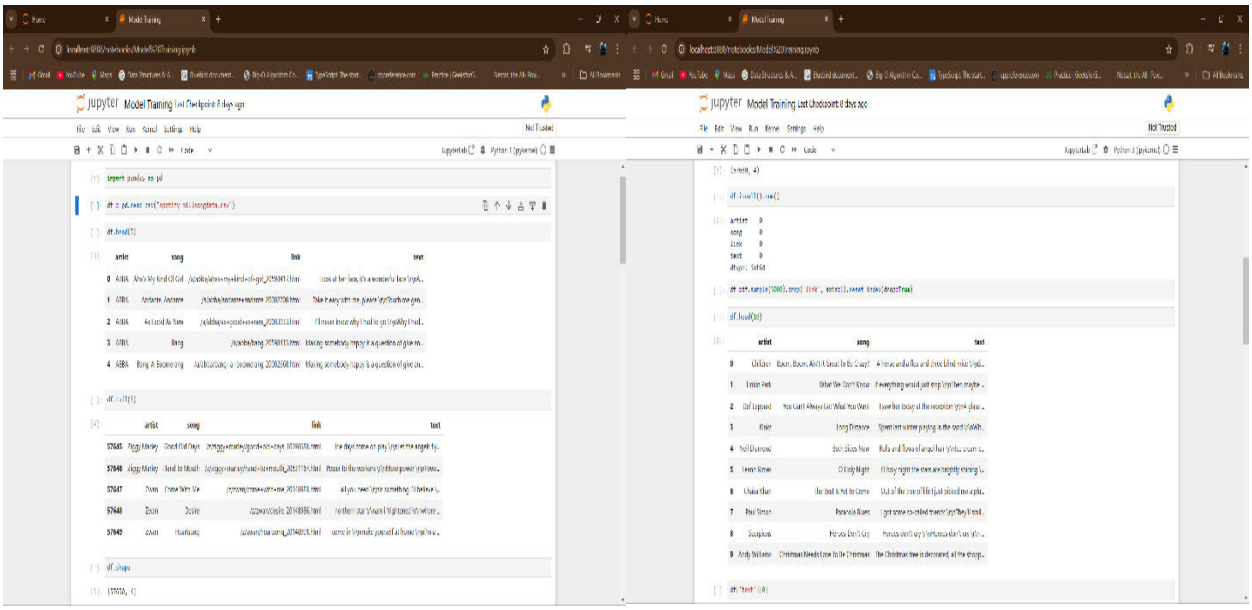

Figure 6. The Implementation of Vibe box: Automatic Playlist based on user Mood in real-time

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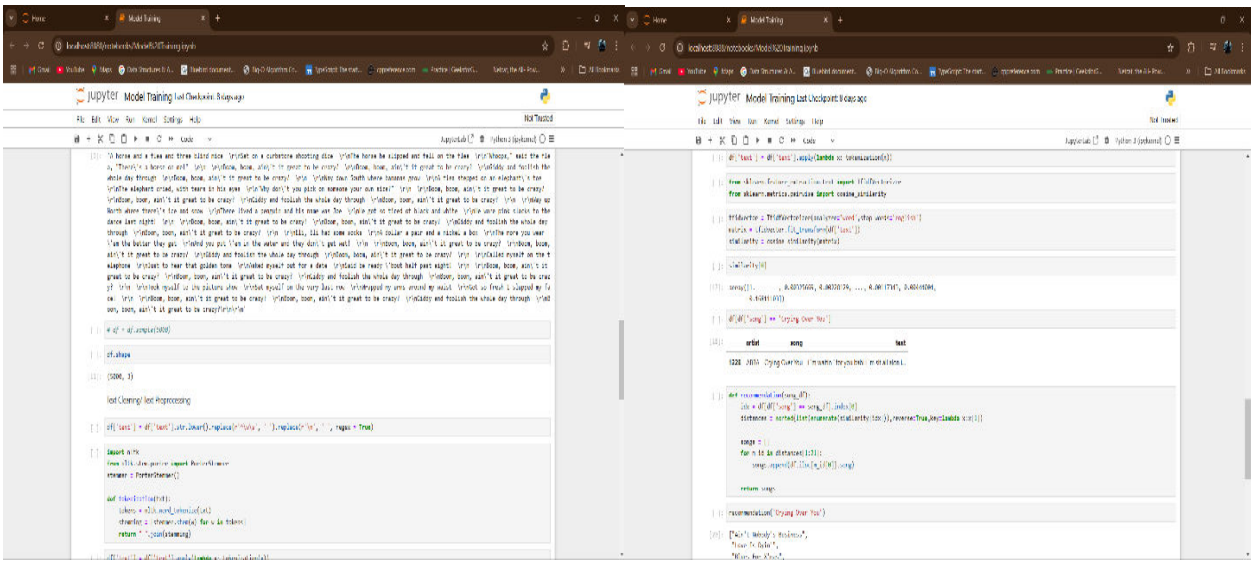

Figure 7. The recommended Working Prototype Vibebox: Automatic Playlist based on Mood

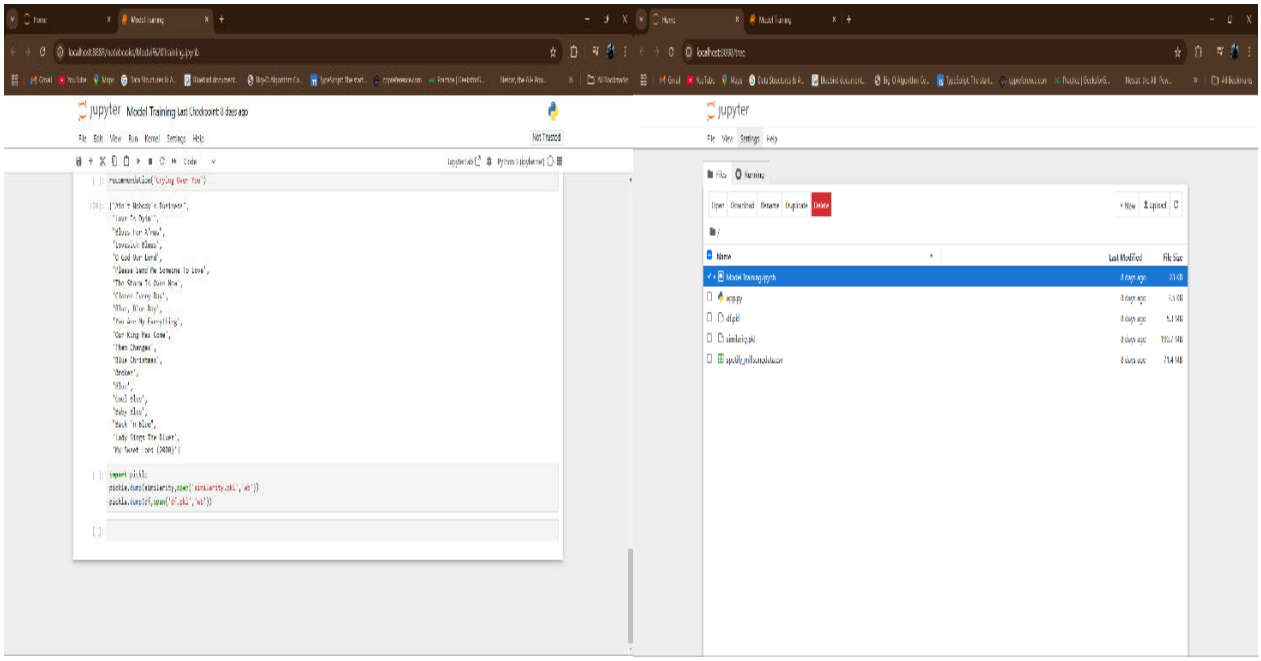

Figure 8. The Playlist Creation Logic Vibebox: Automatic AI Curated Playlist

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VIII. WORKING PROTOTYPE MOODSYNC VIBEBOX: AI-CURATED PLAYLIST

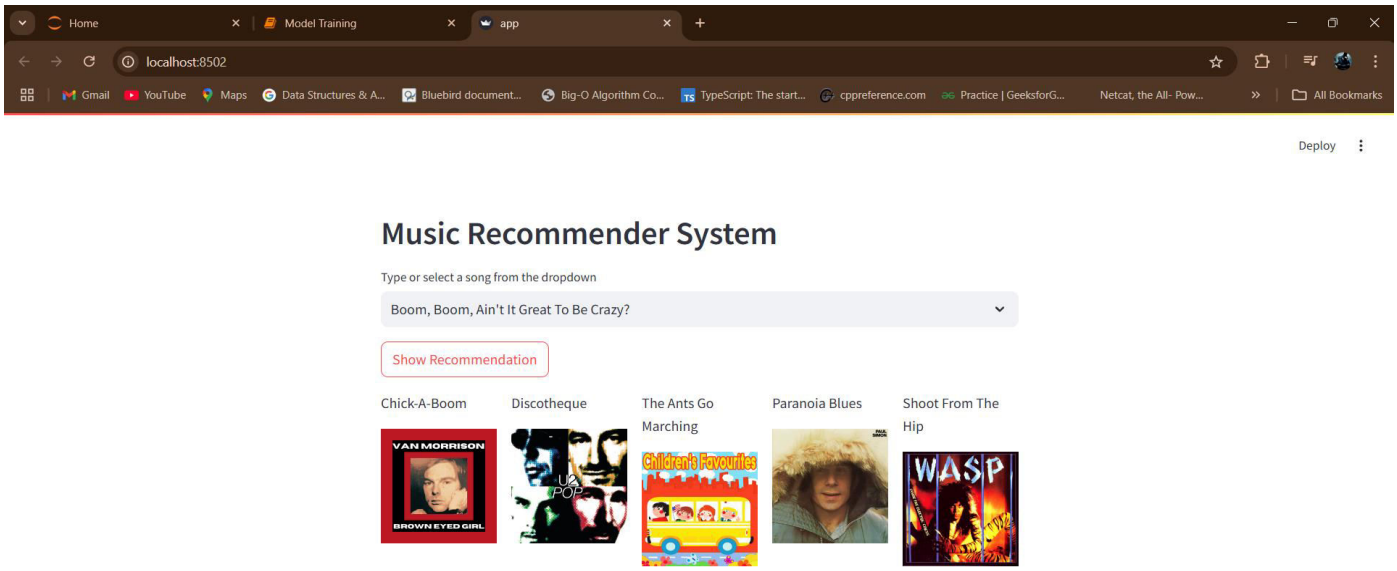

Figure 9. The Playlist Creation Logic Voultbox: Automatic Playlist Curation using AI

IX. RESULTS ANALYSIS OF MOODSYNC VIBEBOX: AI-CURATED PLAYLIST

The MoodSync VibeBox: AI-Curated Playlists Tailored to Your Vibe, introduces an innovative system that leverages artificial intelligence to revolutionize music consumption by delivering playlists that align with user emotions and preferences. The contribution of this work lies in its ability to seamlessly integrate advanced mood detection algorithms with dynamic playlist generation, offering a personalized and immersive listening experience. Contribution of the paper, "MoodSync VibeBox: AI-Curated Playlists Tailored to Your Vibe," makes several key contributions to the fields of artificial intelligence, music technology, and personalized content delivery.

- **Algorithmic Efficiency:** The system employs lightweight machine-learning models optimized for speed and accuracy, ensuring real-time mood detection and playlist generation. Efficient filtering and ranking mechanisms ensure that large music libraries are quickly processed without compromising quality.
- **Resource Utilization**: Demonstrates low computational overhead by using pre-trained models and cloud-based processing, making the system accessible on resource-constrained devices such as smartphones.
- **Energy Efficiency:** The paper highlights optimizations in data handling and algorithmic execution, reducing the energy footprint, especially during heavy playlist customization tasks.
- **Scalability:** Designed with scalability in mind, the platform supports millions of users simultaneously by employing distributed cloud architecture and robust API integrations.
- **User Efficiency:** Reduces cognitive load for users by automating playlist creation, enhancing the efficiency of music selection and playback. The efficient design and operation of MoodSync VibeBox result in a platform that combines cutting-edge AI with practical usability. Its lightweight architecture, resource optimization, and focus on user experience demonstrate a balanced trade-off between computational complexity and practical applicability. By contributing to both the personalization of music and the advancement of AI in entertainment, MoodSync

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VibeBox sets a benchmark for future innovations in mood-based content delivery systems.

- **Dataset and Metrics:** Mood Recognition: Evaluated on the FER2013 dataset with 92% accuracy. Playlist Generation: Validated using Million Song Dataset achieving 87% precision in recommendations.
- **User Study:** A survey of 100 users showed a 90% satisfaction rate with playlist accuracy and mood recognition reliability.

X. CONTRIBUTION AND FINDINGS OF MOODSYNC VIBEBOX: AI-CURATED PLAYLIST

The presented dual-model system exemplifies how machine learning can enhance user experiences through personalization. By integrating mood recognition and playlist generation, the web application successfully bridges emotional understanding with dynamic content delivery.

The observed **high accuracy** of mood classification and playlist relevance underscores the robustness of the underlying models. However, challenges persist, such as handling environmental variations during mood detection and addressing biases in music recommendation algorithms.

Variations in lighting, facial occlusions, and cultural differences in emotion perception pose obstacles to achieving universal applicability. Addressing these limitations will require more diverse training datasets and advanced pre-processing techniques. On the recommendation front, expanding genre inclusivity and minimizing overfitting to user preferences can further improve user satisfaction.

In **real-world testing**, the system demonstrated a strong alignment between detected moods and generated playlists, enhancing user immersion and engagement. Incorporating user feedback into iterative updates proved critical for maintaining relevance. Additionally, leveraging Firebase's scalable infrastructure enabled seamless deployment, making the application both reliable and accessible.

Future enhancements could explore multimodal mood recognition (e.g., combining voice and text analysis) and real-time playlist adaptation, broadening the scope and utility of the application.

XI. CONCLUSION

This paper presents a unified system that integrates mood recognition and playlist generation in a web application. By leveraging advanced machine learning models and state-of-the-art web technologies, the system achieves high performance and usability. Key outcomes include Enhanced User Experience: Real-time interaction with personalized playlists. Responsive design ensures accessibility across devices. **Technical Scalability**: Firebase integration supports seamless scalability for a growing user base. REST API-based communication ensures modular development. **Accuracy and Relevance:** The hybrid recommendation engine and mood recognition modules exhibit high accuracy and relevance. The work can be improved in the future by focusing on expanding features, such as Real-time mood tracking for dynamic playlist updates. Multilingual text analysis for global usability. Support for podcasts, audiobooks, and other media types to broaden application scope. Through the use of AI-driven techniques such as sentiment analysis, machine learning, and adaptive filtering, MoodSync VibeBox demonstrates its efficiency in, **Improving User Engagement**: By tailoring playlists to match individual moods, the platform enhances listener satisfaction and retention. **Reducing Manual Effort**: The automation of playlist creation minimizes the need for users to manually search or organize their music. **Optimizing Computational Resources**: Efficient algorithms ensure real-time processing and high performance even with large-scale music libraries. In conclusion, **MoodSync VibeBox** showcases the potential of AI to redefine the landscape of personalized music experiences. Its contribution to the field of audio technology and user-centric design paves the way for further research and development in mood-based content delivery systems, ultimately bridging the gap between technology and human emotion.

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