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Emotion Based Music Player with AI and ML

A. Melavane[1], B. Patil[2], R.Vidhate[3], P.Waghmode[4]

Computer Engineering Department, AISSMS Polytechnic Pune, India

ABSTRACT: Music plays a very important role in human's daily life. The work presents described the development of Emotion Based Music Player, which is a computer application meant for all type of users, specifically the music lovers. Everyone wants to listen music of their individual taste, mostly based on their mood. Users always face the task of manually browsing the music and to create a playlist based on their current mood. Moreover, there is no commonly used music player which able to play the songs based on user's emotion. The proposed model is able to extract user's facial expression and thus detect user's emotion. The proposed project is very efficient which generates a music playlist based on the current mood of users**.**

KEYWORDS: Machine learning, , logistics, optimization, reinforcement learning, clustering, predictive analytics, demand forecasting, fleet management,resource allocation

I. INTRODUCTION

Deep learning is a branch of machine learning which is completely based on artificial neural networks. Deep learning is an artificial intelligence function that imitates the workings of the human brain in processing data and creating patterns for use in decision making. Deep learning is a subset of machine learning in artificial intelligence (AI) that has networks capable of learning unsupervised from data that is unstructured or unlabelled. It has a greater number of hidden layers and known as deep neural learning or deep neural network.

II. LITERATURE SURVEY

Literature survey is the most important step in software development process. Before developing the tool, it is necessary to determine the time factor, economy and company strength. Once these things are satisfied, then next step is to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need lot of external support. This support can be obtained from senior programmers, from book or from websites. Before building the system, the above consideration is taken into account for developing the proposed system.
There are several applications that provides facilities and services for music playlist generation or play a particular song and in this process all manual work is involved. Now to provide there are various techniques and approaches have been proposed and developed to classify human emotional state of behaviour. The proposed approaches have only focused on only some of the basic emotions using complex techniques.

Emotion Recognition from Audio: Analyzing the listener's voice tone, speech patterns, or even music preferences to gauge their emotional state (e.g., happy, sad, stressed, etc.).
Facial Recognition: Using computer vision to analyze facial expressions via the device's camera.
Contextual Analysis: Using metadata such as time of day, location, or activity to infer the user's emotional state (e.g., listening to music while working vs. relaxing).
Physiological Signals: Collecting heart rate, skin conductivity, or other biosignals via wearables for more accurate emotional detection.

An **emotion-based music player using AI/ML** would focus on identifying and responding to the listener's emotional state in order to curate and play music that aligns with or enhances their mood.

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Despite its potential, several challenges remain:

- **Complexity of Emotions**: Emotions are multi-dimensional and can be difficult to capture. A user might experience mixed emotions (e.g., sadness and nostalgia, or excitement and anxiety) which are hard to quantify or categorize.
- **Context-Dependent Emotions**: The emotional state of a person can change depending on the context (e.g., time of day, social setting, personal events), making emotion detection challenging.

An **Emotion-Based Music Player using AI/ML** is a sophisticated system designed to dynamically adjust music recommendations based on the emotional state of the listener. The idea is to provide a personalized listening experience that responds to the user's mood, enhancing their emotional well- being or aligning with their current emotional state.
Objectives of the Survey This survey paper aims to:
Assess what emotional states users typically want music to influence (e.g., relaxation, motivation, mood lifting).

III. MACHINE LEARNING CONCEPTS

Machine Learning is the most popular technique of predicting or classifying information to help people in making necessary ecisions. Machine Learning algorithms are trained over instances or examples through which they learn from past experiences and analyse the historical data. Simply building models is not enough.
You must also optimize and tune the model appropriately so that it provides you with accurate results. Optimization techniques involve tuning the hyperparameters to reach an optimum result.
A. Types of Machine Learning Methods
An ML method involves a set of parameters that need to be estimated using input data. The output from an ML method can be:

- **Speech and Music Signal Processing**: Techniques like **Mel-frequency cepstral coefficients (MFCCs)** and **Chroma features** are often used to extract features from music or speech. These features capture characteristics of sound such as pitch, rhythm, and tone, which are helpful for emotion recognition.
- **Convolutional Neural Networks (CNNs)** and **Recurrent Neural Networks (RNNs)** are commonly employed to classify emotions in the audio. CNNs are good at capturing local patterns in spectrogram images (from audio signals), while RNNs (like LSTM or GRU) capture temporal dependencies in music sequences.ML methods can be categorized as follows:
- **Physiological Signal-Based Emotion Recognition**
- **Heart Rate Variability (HRV)**, **Electroencephalography (EEG)**, and **Galvanic Skin Response (GSR)** are used to collect data on physiological signals that reflect emotional states.
- **Deep Learning**: Models like **LSTM**, **CNNs**, or **SVMs** are applied to these signals to classify emotional states in real time.
- **Multi-Modal Emotion Recognition**
- **Fusion Models**: Combining multiple sources of data (e.g., audio, text, physiological signals) using techniques like **Multimodal Neural Networks** to improve the accuracy of emotion detection.

1. **Assess Preferences for Music Personalization**

- Explore how users would like the music player to adjust based on their emotional state and preferences.
- Understand user preferences for music personalization—whether they want the system to align with or counteract their mood.

2. **Assess Interest in Advance Features**

- Explore whether users are interested in more advanced features, such as integration with wearables, real-time mood tracking, or therapeutic music interventions.
- Determine the demand for additional features that could enhance the emotional music player experience (e.g., mood-based guided meditation, mood journaling, integration with mental health apps).

3. **Combining AIML with Emotion Detection and Music Recommendation**

Here's how you can integrate all these components:
User Input (Text/Voice): The user either types a message or speaks to the system.
Emotion Detection: The system detects the user's emotional state from their speech or text input.

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1. **Modeling and Learning**

- Detecting the user's emotions through speech, text, or other sensors.
- Using music recommendation algorithms to match those emotions to appropriate songs.
- Enhancing user interaction through AIML-based conversational AI to make the experience more personalized and dynamic.

2. **Evaluation**

- Investigate how users feel about using multiple data sources (voice, facial expression, text, physiological data) to detect their emotions.**Mean Squared Error (MSE)**.

Structured Chart

The structured chart consist of following shown in the

Figure 1: The Structured Chart

(A diagram here could include a flowchart with arrows showing the transition between stages)

Machine Learning Model

- **Support Vector Machines (SVM)**: A widely used method for classification tasks.
- **Random Forests**: Ensemble learning methods like random forests work well for music emotion recognition.

Machine learning concepts provide the foundation for solving critical challenges in logistics, offering a systematic approach to optimizing resources while improving operational efficiency. The subsequent sections delve into applications and datasets relevant to these ML methods.

Structured Chart

A structure chart (SC) in software engineering and organizational theory is a chart which shows the breakdown of a system to its lowest manageable levels. They are used in structured programming to arrange program modules into a tree. Each module is represented by a box, which contains the module's name.

IV.USE CASE DIAGRAM

In the Unified Modelling Language (UML), a use case diagram can summarize the details of your system's users (also known as actors) and their interactions with the system. To build one, you'll use a set of specialized symbols and connectors. An effective use case diagram can help your team discuss and represent:

Scenarios where you system interacts with people,organizations and external systems.

Activity Diagram

An activity diagram is a behavioral diagram i.e., it depicts the behavior of a system. An activity diagram portrays the control flow from a start point to a finish point showing the various decision paths that exist while the activity is being executed.

Improved Recommendations Over Time: The system can learn from user interactions (e.g., which songs were played or skipped) and fine-tune its recommendations to better match the user’s emotional and musical preferences over time.Servers and Repositories

Example:User: "I'm feeling happy."

System (AIML response):"That's great! You're in a good mood today! How about I play some upbeat pop or dance music to match your happiness?"

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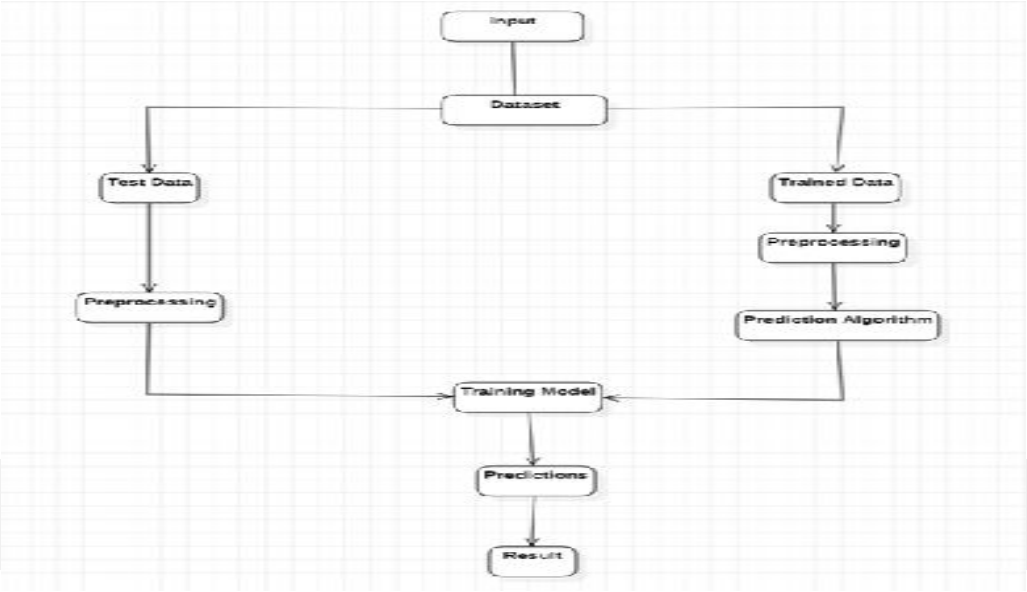
Figure1: Structure of chart



Mood Detection

In this module, the system will capture the image of the user from an already in-built camera. Also, while capturing the images the user needs to follow all the requirements such as the user should be close to the camera, etc.

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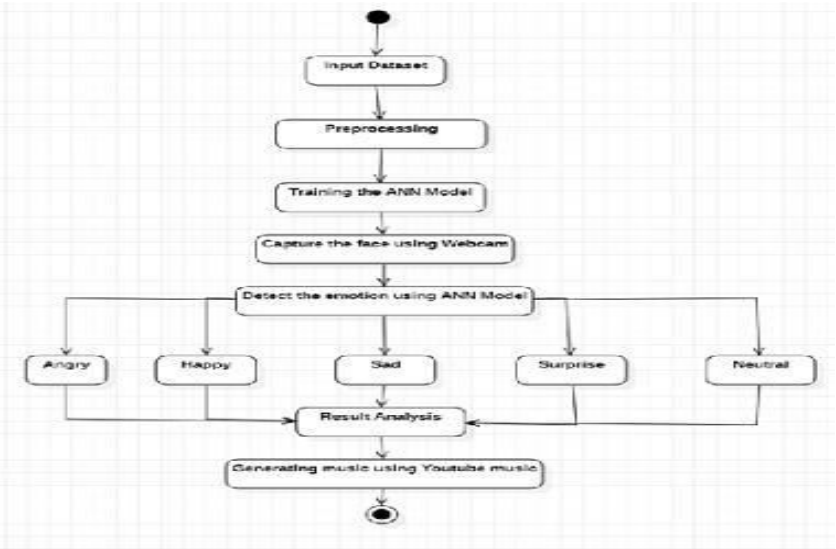
Figure 2: **Activity Diagram**



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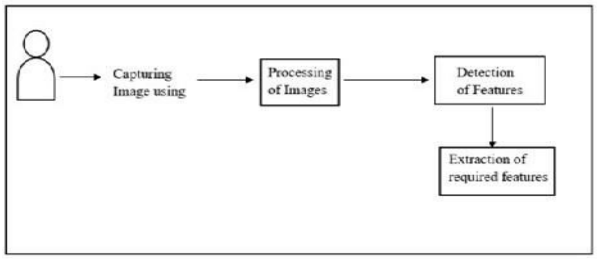
B. Activities and Applications

Emotion Detection

Input Analysis: The system analyzes the user's input to detect emotions (via **sentiment analysis** or **emotion recognition** tools).
For text input, it could use NLP (Natural Language Processing) models (like VADER, TextBlob, or transformer-based models) to analyze the tone.

Figure 3: Proposed System



After capturing the image of the user, the image is then sent for further processing where it is scaled along with this it's also tested using techniques proposed in the system i.e., OpenCV. OpenCV will be used in our project to detect the user mood. Mood can be of various types such as: happy, sad, fear, excited, joyous etc.
Such Moods and their related features are extracted using such techniques.

V. CONCLUSION

Music Player has changed in many different ways since it was first introduced. Now-a-days people like to get more out of different applications, so the designing of applications and the thought process behind it has changed. The users prefer more interactive & sophisticated yet simple to use applications. Even though human emotions are complex and subtle, it is possible for a machine learning model to be trained to accurately detect a set of emotions which can be differentiated from each other with certain facial expressions**.** The application solves the basic needs of music listeners without troubling them as existing web-applications do: it uses increase the interaction of the system with the user in many ways. It eases the work of the end – user by capturing the image using a camera, determining their emotion, and suggesting a customized play-list through a more advanced and interactive system. This Project has been developed to give us a great advancement in the field of human behaviour. Including other emotions, Playing songs automatically, optimizing **Mediapipe**, **CV2** and **Artificial Neural Networks (ANN)** Machine Learning Algorithms by including additional features, are used for Face Detection and emotion generation. The Emotion Based Music System will be of great advantage to users looking for music based on their mood and emotional behaviour. . It will be a complete system for music lovers and listener.

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