

A SURVEY ON EMOTION BASED MUSIC RECOMMENDED SYSTEM USING MACHINE LEARNING

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ABSTRACT

This design aims to produce a recommendation system that utilizes facial expressions as a base for suggesting reality like songs to druggies. Facial expression recognition technology will be employed to describe and classify druggies' feelings, mapping them to standard emotional countries. The term "recommender system" refers to a system that may be used to suggest products to a stoner grounded on information or criteria similar as previous stoner commentary or other stoner patterns. This design is aimed at not using the stoner past feedbacks or other pattern, it'll rather use the stoner's facial expression to recommend druggies like songs. thus, it's important to develop a recommendation system that uses lower stoner data while still performing well since a stoner's requirements couldn't be tied to his or her history but rather to the present, which is denoted by the stoner's expressions. The success of this recommendation system will depend on its capability to acclimatize to individual and artistic variations in facial expressions while furnishing real-time, sequestration-conscious, and ethical recommendations. The algorithm used in this systems are CNN (Convolution neural network), KNN (K- nearest neighbourhood algorithm). Content grounded filtering and cooperative filtering are used in recommendation system.

Keyword : Deep Learning, K-nearest neighbourhood algorithm, Machine Learning, Music Recommendation.

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INTRODUCTION

Facial recognition software is a tool that uses algorithms from technologies such as biometric to find information from faces and emotions. To put it bluntly, technology creates happiness, sadness, anger, disgust, etc. It is an emotional test that can detect many human expressions such as. Facial expressions and other gestures indicate nonverbal

communication and play an important role in interpersonal relationships. Therefore, since facial recognition extracts and analyzes information from images or videos, it can give negative responses without negative emotions such as this information. Psychologist Mehrabian's research shows that only 7% of real information is conveyed through speech, and 38% is transmitted through voice, speed, noise, etc. It shows that it is conveyed through speech aids such as. The proportion of information sent via face is around 55%. Broadly speaking, recommendations are systems designed to show users relevant products

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(a product is a video to watch, a text to read, a product to buy, or something else business-related). The proposed system does not need any of the above information and works without a constant and endless user. In this framework, we use an inexpensive "webcam" to capture users' eyes and faces as they browse the Internet. This article will show recommendations for using music using the visual display, because the current generation is more interested in multimedia entertainment, which is the most important of the system in the past. Organizations such as music/song have a genre associated with them that helps introduce them to the various expressions created by the human face. So the algorithm will include steps like facial recognition, then facial recognition, getting feedback from the user on whether the system wants it to play video or audio, music/song, then the system will return a link with a text link with instructions or it can do that. To return the same Hyperlinks to lists and web pages, users can use technology tools such as BeautifulSoup and Selenium WebDriver to get more information. With the advancement of signal processing and other efficient and improved inference algorithms, automatic mind detection can be found in various materials such as music or video. The film was developed quickly. and video recommendations play an important role in many applications. Artificial intelligence is a broad, important and important topic that has attracted the attention of many researchers and projects in recent years. This unique site quickly took over the world. It is being integrated into daily life through chatbots, digital assistants such as Siri, and many other technologies. One of the most important skills of intelligence is facial recognition technology. A simple example of its use is to group Google photos of specific people. There are many existing systems for facial recognition. On the other hand, there are machines for beautiful landscapes. The general concept explained in this article is a system to recommend music by recognizing the user's facial expressions. In the future, emotional intelligence will have many applications in fields such as robotics, allowing emotions to be used effectively without the involvement of other people. Online product recommendations have become a huge demand in today's business world. Apps like Amazon, Flipkart,

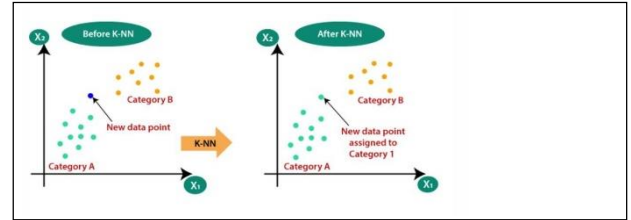
Snapdeal etc. It ranges from online retailers like YouTube to video sharing websites like YouTube to social networking sites like Facebook, Google+, and more. Recommending the right product to the customer on time will affect the customer's behavior. user. A lot of work has been done recently to improve recommendation algorithms. Algorithms such as Yoda, social recommendation algorithm SoRec, movie recommendation algorithm using similar format, collaborative filtering recommendation algorithm based on customer and purchasing groups, personal recommendation algorithm [5], and adaptive recommendation algorithm using trust network [6] are some examples. Although the performance of these algorithms has increased greatly, the basic implementation process remains the same. The system has a consensus module with a hybrid approach that combines three different systems: a content-based system, a collaborative filtering system and a fuzzy expert system. This new approach is to provide personalized recommendations by analyzing users' preferences, including what they like most and least. A combination of collaborative filtering and content-based techniques is used to generate recommendations. Used entirely as a web application, the module offers users a simple and effective way to find content that suits their tastes. An important aspect of this recommendation is that it provides significant benefits to movies, making them visible in the list of recommended movies [9]. Similar to Li's approach, Anchen et al. The method of using implicit correlation (IRec) is also accepted. In this case, IRec is divided into two main parts: the neighbor's house and the approved structure. In the first step, an implicit community set is created for each user and project. Latent neighbors of users and objects are defined by mapping each location to a fixed latent space. This approach enables recommendation systems to leverage user-to-user and product-to-product relationships, improving the quality and accuracy of their recommendations.

MACHINE LEARNING TECHNIQUES

Machine Learning (ML) is a subfield of Artificial Intelligence (AI) characterized by its ability to autonomously acquire knowledge from extensive datasets. It relies on statistical and mathematical

methodologies to address complex problems. Neural networks, which are a subset of ML algorithms, are currently applied in various domains, including Signal Processing, Pattern Recognition, Medicine, Speech Production, and Speech Recognition. ML empowers systems to discern patterns in data, leveraging both historical and contemporary information. Datasets consist of multiple features, and each data sample undergoes preprocessing to mitigate noise, identify outliers, and address potential data gaps that could affect prediction quality. The dataset is then split into two phases: Training and Testing. In the Training phase, approximately 80% of the data is used to train the system, enhancing its accuracy and predictive capabilities. In the subsequent Testing phase, the system's performance is evaluated based on its learned knowledge. To ensure statistical significance, the testing dataset must be sufficiently large.

ML algorithms are categorized into two fundamental types: Supervised Learning and Unsupervised Learning. Supervised learning utilizes labelled training samples to build predictive models. These algorithms analyse the training data and produce inferred functions, enabling the mapping of new, unlabelled data samples to make prediction. A supervised machine learning method is the K-nearest neighbor algorithm. The K-NN technique places the new instance in the category that is most similar to the existing categories on the presumption that the new case and the old instances are comparable. After storing all the previous data, a new data point is categorised using the K-NN algorithm based on similarity. This indicates that new data may be reliably and rapidly categorized using the K-NN approach. The K-NN approach may be used for regression even though classification problems are where it is most typically applied. The new data point x_1 will fall into which of the two categories, Category A and Category B, and we have a new data point x_1 , so this data point will lie in which of these categories. To solve this type of problem, we need a K-NN algorithm. With the help of K-NN, we can easily identify the category or class of a particular dataset. Consider the below diagram:

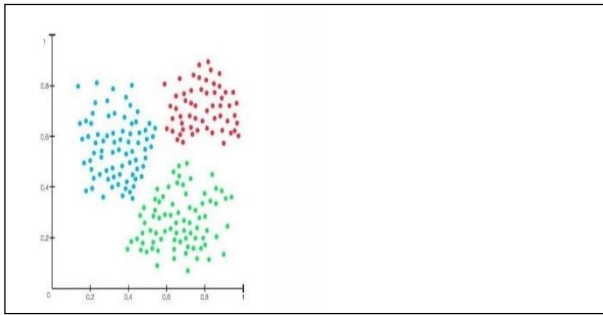


KNN Classification

ALGORITHM:

- Step 1: Choose the neighbors' K-numbers.
- Step 2: Calculate the Euclidean distance between K neighbors in step two
- Step 3: Based on the determined Euclidean distance, select the K closest neighbors.
- Step 4: Count how many data points there are in each category among these k neighbors.
- Step 5: Assign the new data points to the category with the greatest KNN neighbor count.
- Step 6: Our model is complete

Unsupervised learning is a machine learning paradigm where machines learn from datasets without predefined structures or labeled guidance. Within unsupervised learning, there are two prominent methods: Principal Component Analysis (PCA) and Clustering. Clustering, a subfield of Machine Learning (ML), focuses on grouping data into categories based on inherent similarities. It's a potent technique for organizing data and uncovering patterns within datasets. Unsupervised learning algorithms commonly used for clustering include K-Means clustering and Hierarchical clustering, among others. While unsupervised learning is adept at identifying patterns within data, it's crucial to rigorously evaluate the accuracy of the compressed representations it produces to gauge the suitability of its implementation. Below is an example of how the data points are plotted and the other explains how the plotted data points are clustered into 3 major categories.



Clustering

Deep Learning is considered as the most powerful technique that can train and learn from data more specifically. NN consists of a large number of simple processing components called neurons. Each neuron is associated with weight and has internal state called activation function. DL will scan the data to search for a feature that correlates and combine them to enable faster learning. DL can perform thousands of tasks in a shorter period. Deep learning algorithms include ANN, CNN, RNN and LSTM. Fig explains the working model of CNN.

MACHINE LEARNING APPLICATIONS

Machine learning and deep learning have found compelling applications in emotion-based music recommendation systems. These systems aim to provide music recommendations that align with a user's emotional state or mood. Emotion Detection from Music: Machine learning models can be trained to detect emotions in music. Features such as tempo, rhythm, lyrics, and even the key of a song can be used as input data. Techniques like sentiment analysis and audio analysis can be employed to classify music into various emotional categories, such as happy, sad, energetic, or calm.

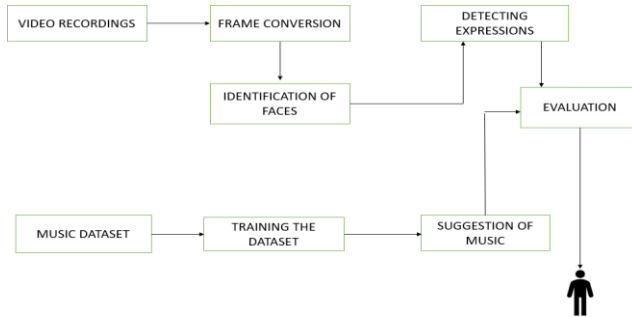
User Profiling: Machine learning algorithms can create user profiles based on their music preferences and listening history. By analysing the emotions associated with the music users listen to, the system can better understand their emotional states and preferences. Collaborative Filtering: Collaborative filtering techniques, which are widely used in recommendation systems, can be enhanced with emotion-based features. By considering the

emotional states of users and their historical music choices, the system can recommend songs that match their current emotional state or mood. Deep Learning for Music Recommendation: Deep learning models, such as recurrent neural networks (RNNs) and convolutional neural networks (CNNs), can be used to capture complex patterns in music data. These models can analyse the audio content of songs and extract features that represent emotions. They can also learn sequential dependencies in a user's listening history to make more accurate recommendations. Hybrid Models: Combining various machine learning and deep learning approaches can lead to more robust emotion-based music recommendation systems. Hybrid models can leverage both content-based features (e.g., audio analysis) and collaborative filtering (e.g., user listening history) to make personalized recommendations based on emotions.

Real-Time Emotion Detection: Some systems use real-time emotion detection from user inputs (e.g., facial expressions, voice tone) to recommend music that matches the user's current emotional state. This involves the integration of machine learning models for emotion recognition.

EMOTION BASED MUSIC RECOMMENDATION SYSTEM

One of the important applications of machine learning models is music recommendation using facial detection. This was accomplished by recording the mood rather than having the consumer sift through individual movies to save time. A recommender system has been created to deliver either the movies or songs depending on the output received from prior input, i.e. CNN, and some pertinent research has been done based on attentional convolutional neural (recognizes each facial micro expression). Boosting algorithms have also been used for facial recognition utilizing decision trees, however they have been shown to be far less effective than CNN. CNN therefore appears like a better choice to get the highest accuracy possible. Also, the combination of both the types of recommendation system i.e. content based and collaborative filtering offers more power for recommender system.



Block Diagram Of Emotional Based Music Recommendation System

video capturing, it's Capturing the video and converting the video in the frame. Frame conversion it's the processed image is compared with deep learning model file. The type of expression is obtained and then the result is sent to the knn algorithm then training and testing. Training the data using songs dataset and performing the classification and showing.

METHODOLOGY

PREPROCESSING:

Images come in different shapes and sizes. They also come through different sources. We must pre-process any picture data in order to account for all these changes. Most "natural images" are encoded in RGB, which is the most widely used format. Making the photos the same size is also one of the initial steps in data pre-processing. Here we have used auto resizing for training to make all the images in the dataset to convert in to same resolution.

FEATURE EXTRACTION

When less resources are required for processing without losing crucial or pertinent data, the feature extraction procedure is helpful. Additionally, feature extraction can help an analysis by reducing the quantity of duplicate data. Additionally, the computer's attempts to generate variable combinations (features) and the reduction of the data speed up the learning and generalization stages of the machine learning process.

CONVOLUTION NEURAL NETWORK

In deep learning, a convolutional neural network (CNN) is a type of deep neural networks, which deals with the set of data to extract information about that data. Like images, sounds or videos etc. can be used in the CNN for the data extraction. There are mainly three things in CNN. First one is local receptive field and then shared weight and biases and the last one is activation and pooling. In CNN, first the neural networks are trained using a heavy set of data so that the CNN can extract the feature of given input. When the input is given, first image preprocessing is done then the feature extraction occurs on the basis of set of data stored and then the classification of data is finished, and the outcome is displayed as output. The CNN can deal with those input only for what the neural network is trained and the data is saved. They are used in image and video recognition, recommender systems, image classification, medical image analysis, and natural language processing.

DATASET

You do not need to flatten the input photos to 1D since CNNs are capable of working with 2D image data, which is a significant benefit over NNs. This aids in keeping an image's "spatial" qualities

PRE-PROCESSING STEPS

Resizing, patching, and augmentation processes made up the pre-processing steps. The input photos' sizes are normalized in the first pre-processing stage. The majority of radiographs (median value of matrix size: 1,800) were rectangular shapes with varying heights. As a result, we used a mix of maintaining aspect ratios and zero-padding to scale all photos to a uniform 224x224 pixel square. Because the research of deep learning effectiveness depends on the input data, input photos were pre-processed using a patch (a cropped portion of each image) in the second processing stage. The training dataset alone was then subjected to data augmentation utilizing mirror pictures that had been rotated by 30, 10, 10, and 30 degrees and were reversed from right to left.

IMAGE LABELING AND DATASET DISTRIBUTIONS

All subjects were independently labeled twice. On a picture archiving communication system (PACS), labeling was first assessed using the original photos, and then it was assessed again using the shrunk images that were utilized for the real learning data. The temporal dataset was utilized to evaluate the test, and datasets were specified as the internal dataset and temporal dataset. The internal dataset was divided into subgroups for testing (15%), validating (15%), and training (70%).

ACTIVATION FUNCTION

The activation function acts as a decision-making function and aids in the recognition of complex patterns. The learning process can be sped up by choosing an appropriate activation function. In literature, different activation functions such as sigmoid, tanh, maxout, SWISH, ReLU, and variants of ReLU, such as leaky ReLU, ELU, and PReLU are used to inculcate non-linear combination of features.

NUMPY

A developer can carry out the following operations using NumPy: operations on arrays that are logical and mathematical. Routines and Fourier transformations for manipulating shapes. Operations in connection with linear algebra. There are built-in linear algebra and random number generating routines in NumPy.

TENSORFLOW

TensorFlow is an implementation for machine learning algorithms as well as an interface for defining such methods. On a wide range of heterogeneous systems, including mobile devices like phones and tablets up to large-scale distributed systems with hundreds of computers and thousands of computational devices like GPU cards, a calculation described using TensorFlow may be executed with little or no modification.

TensorFlow is a second-generation system for the development and deployment of large-scale machine learning models. TensorFlow is based on our experience with Disbelief and a deeper comprehension of the desirable system properties and needs for training and deploying neural networks. TensorFlow maps computations specified by a dataflow-like model onto a wide range of hardware platforms, including running inference on mobile platforms like Android and iOS, small-scale training and inference systems using a single machine with one or more GPU cards, and large-scale training systems using hundreds of specialized machines with thousands of GPUs. We have found that having separate systems for large-scale training and small-scale deployment leads to significant maintenance burdens and leaky abstractions, so having a single system that can span such a broad range of platforms significantly simplifies the actual use of machine learning systems. We concentrated on making the system both resilient and high performance for the production training and deployment of machine learning models, as well as flexible enough for fast experimentation with new models for research reasons. TensorFlow enables clients to easily express different types of parallelism for scaling neural network training to larger deployments through replication and parallel execution of a core model dataflow graph, with numerous different computational devices all working together to update a set of shared parameters or other state. Modest changes in the description of the computation allow a wide variety of different approaches to parallelism to be achieved and tried with low effort.

CONCLUSION

It is now a crucial component of several platforms, including those for movies, books, and music. They deal with significant challenges that affect both persons and corporations. Machine learning's development has shown to be a potent tool for tackling issues, particularly in the area of video identification. In this article, the research literature proving the efficiency of machine learning algorithms in music recommendation is reviewed in its entirety. These studies compare their accuracy

with other algorithms for higher quality music selection using various data with various attributes. Machine learning is a common expert in today's digital world since it successfully resolves many long-term problems. To provide customers fantastic movie suggestions, it's important to employ the appropriate tools at the appropriate moments. Recommendations have become a crucial component of the online experience in this internet-dominated era.

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