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Movie Recommendation System

Mr. Yash Ketan Bhanushali[1], Mr. Yash Shankarbhai Patel[2]

[1]Student, Information Technology Department, of Shah and Anchor Kutchhi Engineering College, Mumbai, India
[2]Student, Information Technology Department, of Shah and Anchor Kutchhi Engineering College, Mumbai, India

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Abstract - Recommendation system have emerged as the essential part of many E-commerce websites, applications like youtube, Netflix. The fundamental aim of the recommendation system is to provide a prediction of the different items in which the user would be interested. Most of the previous studies used explicit feedback of users, like and dislike proportion to recommend movies. In this paper movie recommendation based on emotion recognition from the speech is proposed to find relevant movies for customers. Recognition of emotion is always a difficult problem particularly if the recognition of emotion is done by using a speech signal. We use RAVDESS dataset for classification purposes. We extract three main features such as mfcc, chroma, mel from the dataset for classification. Afterward, our recommender which used content-based filtering approch recommends a list of movies based on user mood. for the recommendation system, we used the IMDB dataset. We achieve approximately 73.40% accuracy.

***Key Words*: Recommedation System, Emotion recognition from speech, mfcc, chroma, mel, Content based filtering**

1.INTRODUCTION

In the past 50 years, there has been an explosion of data. This mass of data is useless unless we analyse it and find the patterns hidden within it. Machine learning techniques are used to automatically find the valuable underlying patterns within complex data that we would otherwise struggle to discover. revolution in the entertainment industry, the source of entertainment has been increasing rapidly in today's world. Users have to choose entertainment products from a vast amount of options which can be overwhelming for any user[4]. Recommender systems encapsulate powerful filtering.

methodologies and techniques, and construct software tools that are able to recommend favorite resources[1]. Moreover, it provides a framework for e-commerce web sites and OTT platforms to represent their products and items to the target users. In this paper, we have used emotion recognition based on a speech to recommend movie and machine learning approaches. The objective of this paper is to provide a list of movies based on user mood at that particular time with the help of speech recognition.

The main focal point in the speech emotion recognition system is the signal processing unit in which appropriate features are extracted from the available speech signal and another is a classifier that recognizes emotions from the speech signal. The widths for detecting emotion from the speech are still few and limited. In the present day, researchers are trying to figure out what features are the actual symptoms of influencing the recognition of emotion in speech. There is also unpredictability to choose the best algorithm for the classification of emotion and which emotion to class together[6].In our paper, we use the MLPClassifier stand for Multi-layer Perceptron classifier which in the name itself connects to a Neural Network. Unlike other classification algorithms such as Support Vectors or Naive Bayes Classifier, MLPClassifier relies on an underlying Neural Network to perform the task of classification.

After the mood of the user was detected, Now, It time to create the Mood Based recommender system with a more complex matching logic than before. For the Mood Based recommender system, we use the data model in order to match a specific mood with a movie. The data model takes the input from the user (mood of the user) and lets it run through the algorithm. The algorithm then calculates the probabilities for every single genre and the one with the highest probability is prompted to the user.

2. RELATED WORKS

R. Cami, H. Hassanpour, and H. Mashayekhi proposed the A content-based movie recommender system based on temporal user preferences in which they used movielens dataset and it recommends the movie based on user preferences. the algorithm used in their proposed system is SVD++ and k-mean clustering[1]. Depending on the cluster, this system showed 65-70% accuracy on average in predicting and recommending user-preferred Movies.

M. K. Kharita, A. Kumar, and P. Singh proposed the Item-Based Collaborative Filtering technique in which the Movie Recommendation system is to provide a prediction of the different items in which a user would be interested based on their preferences. item-based collaborative filtering technique is used to provide recommendations of items[2].In

Item-based collaborative filtering in movie recommendation cosine similarity matrix are generated which contains the predicted ratings of the movies. From these predicted ratings top rated movies are selected and recommended to the particular user. In this Technique, they achieved 79.92% accuracy.

R. E. Nakhli, H. Moradi, and M. A. Sadeghi proposed the Movie Recommender System Based on Percentage of View in which they proposed a machine learning approach to recommend movies to users using a temporal database which renders users preferences and user-specific details using SVD++ algorithm and K Mean Clustering.[3] The Dataset utilized is MovieLens.Depending on the view count, this system showed 60% accuracy on average in predicting top-grossing video/movie and meagerly works 50% faster than traditional recommendation systems.

M. Ahmed, M. T. Imtiaz, and R. Khan proposed the Movie recommendation system using clustering and pattern recognition network in which they proposed a machine learning approach to recommend movies to users using K-means clustering algorithm to separate similar users and creating a neural network for each cluster[4]. Depending on the cluster, this system showed 95% accuracy on average in predicting rating from new user data which can be used to analyze which movie should be recommended to new users.

Richong Zhan, Gyon Gyimao proposed the Factorization of Matrix Processes in which they proposed a new model family termed Markovian factorization of matrix process (MFMP). On one hand, MFMP models, such as timeSVD++, are capable of capturing the temporal dynamics in the dataset, and on the other hand, they also have clean probabilistic formulations, allowing them to adapt to a wide spectrum of collaborative filtering problems. Two simple example models in this family are introduced for the prediction of movie ratings using time-stamped rating data. The experimental study using the MovieLens dataset demonstrates the two models[5].

Md. Sham-E-Ansari, Shaminaj Towfika Disha, Atiqul Islam Chowdhury, and Md. Khairul Hasan proposed A Neural Network Based Approach for Recognition of Basic Emotions from Speech in which a method for speech emotion recognition is presented using Neural Network (NN) with Mel Frequency Cepstral Coefficients (MFCC) features. Recognition of emotions from speech is one of the most researched topics nowadays in the field of signal processing and human-machine interaction systems. human-computer interaction can be improved with an emotion recognition automation system by reducing the need for human access[6]. in this system they had used Berlin Emotional Speech dataset (EmoDB) is used here for classification purposes. This system showed an average accuracy of 73.40% and the highest accuracy of 82.35%.

Saikat Basu, Jaybrata Chakraborty, Md. Aftabuddin proposed Emotion Recognition from Speech using Convolutional Neural Network with Recurrent Neural Network Architecture in which they talked about recognition of emotion by using speech signals. they also mentioned some challenges like choosing emotion recognition corpora, identification of features related to speech, etc. in this paper they use 13 MFCC (Mel Frequency Cepstral Coefficient) with 13 velocities and 13 acceleration component as features and a CNN (Convolution Neural Network) and LSTM (Long Short Term Memory) based approach for classification. they had used the Berlin Emotional Speech dataset (EmoDB) for classification purposes. In this technique, they achieved approximately 80 percent of accuracy on test data[7].

3. METHODOLOGY

3.1 Dataset

The dataset that we are using for emotion recognition is the Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS). RAVDESS dataset contains a number of emotions like calm, happy, fearful, disgust, neutral, surprised, etc [6]. And Another dataset that we are using in the recommendation is the Internet Movie Database (IMDb) is an online information base committed to a wide range of data about a wide scope of film substance, for example, movies, TV and web-based streaming shows, etc.

3.2 Steps for emotion recognition using neural networks.

We have used a Feed-forward Neural Network approach that is a Multilayer Perceptron (MLP) classifier which consists of an input layer, a hidden layer, and an output layer. Apart from the input nodes, each neuron uses a nonlinear activation function. we have to divide our work into several steps for the better processing and output of data. The flow diagram of those steps is shown in Figure. 1.

- In the first step, the input signal which has to be experimented is loaded.
- Then MFCC, MEL, Chroma features of the voice sample are extracted.
- Next step, input data is trained with the neural network.
- Then, the network simulation is performed with the support of the neural network.

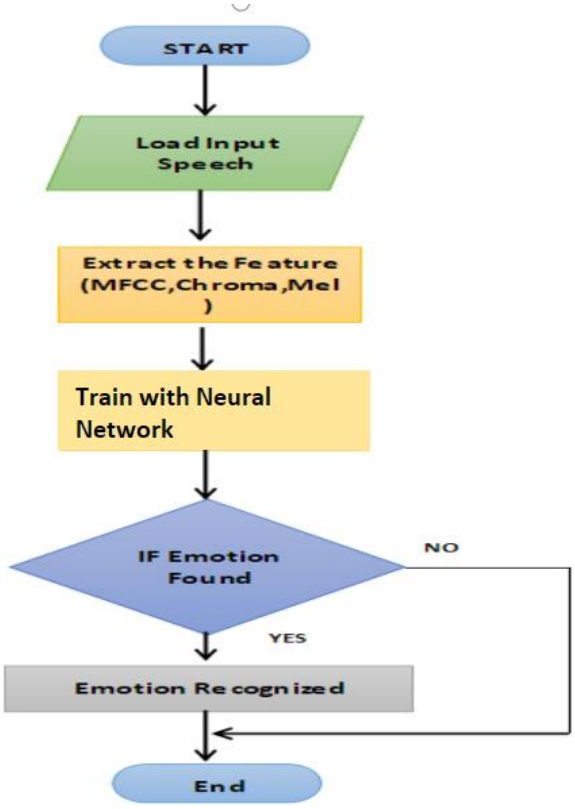

Figure 1. Steps for Emotion Recognition.

3.3 Recommendation System

After the mood of the user was detected, Now, It time to create the Mood Based recommender system with a more complex matching logic than before. For the Mood Based recommender system, we use the data model in order to match a specific mood with a movie.

The data model takes the input from the user (mood of the user) and lets it run through the algorithm. The algorithm then calculates the probabilities for every single genre and the one with the highest probability is prompted to the user[2].

In our Recommendation system, we use Content-based filtering approaches that give user preferences for items and recommend similar items based on a domain-specific notion of item content. This approach also extends naturally to cases where item metadata is available (e.g., movie stars, movie genres, movie rating)[2].

We are building a recommendation system based on the movie's plot summaries given in the overview column. A fairly common approach for this problem is to use a tf-idf vectorizer. While this approach is more commonly used on a text corpus, it possesses some interesting properties that will be useful in order to obtain a vector representation of the data. The expression is defined as follows:

$$W_{t,d} = TF_{t,d} \log (N/DF_t) \quad (1)$$

Where:

- TFt,d is the number of occurrences of t in document d.
- DFt is the number of documents containing the term t.
- N is the total number of documents in the corpus.

Similarity between vectors

The next step will be to find similar tf-idf vectors (movies). Recall that we've *encoded* each movie into a tf-idf representation, now we want to define a proximity measure. we use the sigmoid kernel function. The function sigmoid_kernel computes the sigmoid kernel between two vectors. The sigmoid kernel is also known as a hyperbolic tangent, or Multilayer Perceptron (because, in the neural network field, it is often used as a neuron activation function). It is defined as:

$$K(x,xi) = \tanh(\alpha xi.xj + \beta) \quad (2)$$

where:

- x, y are the input vectors
- γ is known as slope
- C0 is known as the intercept

The below Figure 2. shows the overall overview of how a mood-based movie recommendation system works.

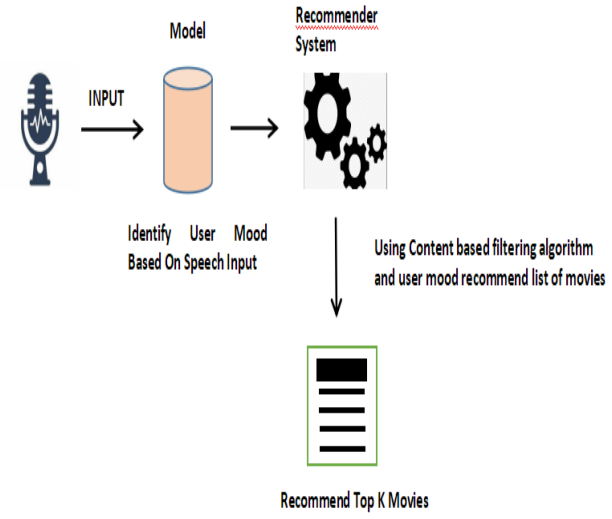

Figure 2. Movie Recommendation system

4. RESULT AND ANALYSIS

First, after testing the sample, the waveform of tested sample is generated. The waveform of one of the tested sample is shown in Figure. 3.

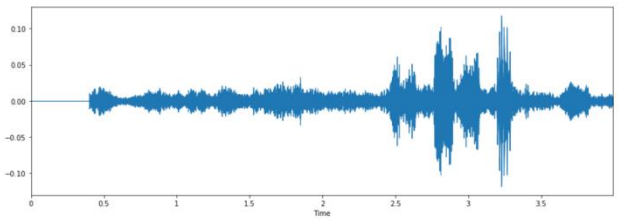

Figure 3. Waveform of tested sample

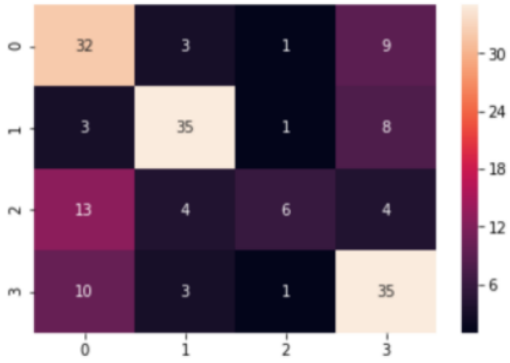

Figure 4 : Confusion matrix for speech recognition

The diagonal elements of confusion matrix represents the actual recognition of emotion. For most of the emotions our network is able to recognize the proper emotion with a high level of accuracy.

5. CONCLUSION

So far, a lot of work has been done in the field of recommending products like movies. In this paper, we worked on different approaches to make movie recommendations as good as possible. We developed the mood-based movie recommendation system using speech recognition. Let's break down our system into two parts: first is recognizing the emotion from human speech and the second is to recommend a movie based on the mood which we get in the first part. Emotion recognition is enacted with the help of a neural network. and for a recommendation, we used a content-based filtering approach. Once the system gets the user's mood it map with the corresponding genre and the recommender will recommend a list of the movie to the user. The current accuracy for our proposed system is 73.40%.

In the future, we will try to take care of the problems which clog the accuracy of the result, so that our research can be successful and we may have better accuracy.

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