

# Facial emotion based recommender system

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## 1 MOTIVATION AND PROBLEM STATEMENT

Emotions play an important role in human behavior and action. We are highly influenced by the music we listen to and the movies we watch. Mostly the music and movie service providers make use of genre, title and album to search music and movies and user's listening history for retrieving the user's preference. However this system does not focus on extracting the user's preference based on the user's emotion. So our work will recommend movies and music preference by focusing on the user's emotions. There are many recommendation systems in the market but what makes our recommendation system stand out is, we even recommend movies based on user's emotion as novelty. The dataset for facial emotions is [FER 2013](#) and for movie recommendation is [IMDB dataset](#) from kaggle.

## 2 LITERATURE REVIEW

In [1], the authors have suggested the steps for a movie recommendation system from facial expressions. Based on the previous works in the field, it is suggested that CNN is a better model for facial expression recognition. Then based on the emotions obtained it is fed to a recommender system which will recommend movies based on the emotion. Although the research was thorough, and the facial emotion detection was implemented with an accuracy of 99.81%, still the movie recommendation system part was not implemented by the team.

In [5] Human facial expressions are linked to emotions, which in turn are linked to communication. In real life, facial expressions play a vital role in non verbal communication. To build an emotion detection system, the research presents a method for recognising human emotions using the convolutional neural network (CNN) algorithm, a deep learning technique. Majorly, there are two phases to the system implemented : Training a model using the dataset proposed and then once trained, it can be used to classify the new images. The training phase comprises procedures such as face detection and feature extraction. The Viola-Jones algorithm is used for face detection, which employs Haar Feature Selection to crop out undesired parts of the image, such as the backdrop, before converting the image to grayscale. An analytical approach is used for feature extraction, which solely employs the precise features of the face. A three-layer Convolutional network is used to learn: n input layers, seven output layers for each emotion, and a hidden layer. The Face Expression Recognition dataset was utilized for this (FER2013). The accuracy for the proposed model was 79

In [3], the paper aims at scanning human emotions for building an emotion-based music player based on emotions. One of the most prominent tasks was using Deep Neural Networks to learn the most relevant features in real-time and handling the limitations from handcrafted attributes. The model used was VGG16 CNN to detect the facial expressions of the individual user after which the most relevant song based on the user's expression was played. Implantation could be broadly classified into three tasks, including emotion-based detection which makes predictions from the user's emotion and forwarding the emotion target, then Spotify implementation for sending requests to the active Spotify accounts to track down the audio features and tracking playlists, at last implementing the results on the server using flask framework.

In [4], the authors have proposed a real-time emotion-based recognition system using the CNN model. For tuning the model, techniques such as Batch Normalization, Dropout Regularization and Max Pooling have been used. Shapes of 48\*48\*64 and 24\*24\*64 were used for Batch Normalization and Dropout Regularization respectively. They have also used the IMDB dataset for extracting emotion from movies using movie reviews and description with the help of the text2emotion library. After extracting the emotion (and its intensity value) from the user's captured image, they have matched and recommended 10 movies on the basis of content based filtering approach using cosine similarity.

In this proposed work [2], the most promising CNN model for emotion detection task of the FER-2013 dataset was described along with face detection methodologies like Haar Cascade and Viola Jones Face detectors. Here, 3 experiments were conducted using Neural Networks for emotion recognition task of the FER-2013 dataset. In the first experiment of networking programming, three convolution and two connected layers were aggregated with max-pooling layers. In the second one, 3 convolution layers instead of 5 were used and the nodes were reduced to 1024 from 4096. In the last one, 48 by 48 layers in the input layer were taken and after this input layer, the model contained a convolution layer that was followed by a contrast normalization layer which was again followed by a max-pooling layer. At the end of the network, there was another two-convolution layer and an output layer that in turn was connected to a softmax layer. After the final evaluation, the performance of the last network was found to be better for the emotion recognition task.

In paper [6], Integrate computer vision and machine learning techniques for extracting emotions and suggest music based on that. Using the camera, facial emotions have been extracted using a point detection algorithm. OpenCV has been used to train input images. Apart from that, they have used the Canny edge detection algorithm in image pre-processing, tensor flow for severe computations, and Pygame for music recommendation techniques. Their work proved to recommend music with a good precision level.

In paper [7], Initially, Dataset has divided into 7 classes after splitting into 80-20 ratio and then engaged in a neural network-based approach. The system has been divided into 3 parts 1) face detection using HAAR cascades which scan an image and return face coordinates. 2) Then they have utilized 6 layers CNN model for emotion detection into 7 classes. Based upon the detected emotion, 3) finally, music has played out of seven folder maps mood and music.

### 3 PLAN OF WORK

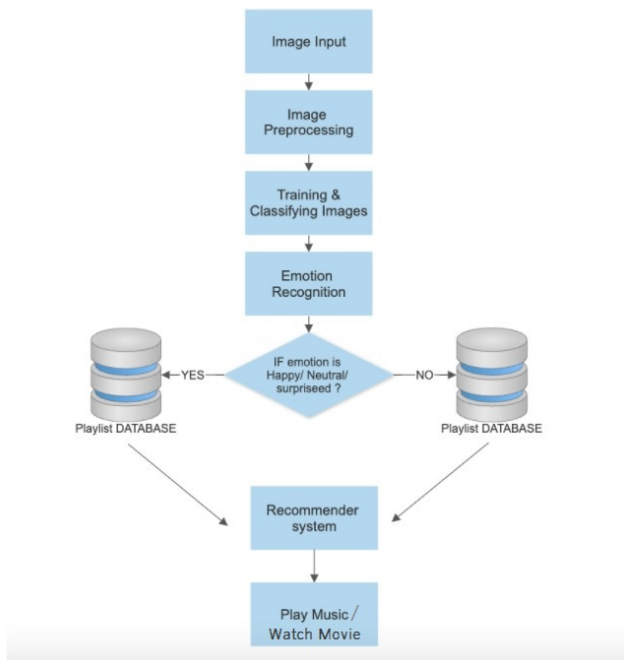


Figure 1

### 4 BASELINES

[1] The first baseline that we went with for the emotion recognition system was SVM (Support Vector Machine). SVM are supervised learning algorithms that help in classification and regression. The dataset was divided into three categories the training model, the testing model and the validation model. We trained the SVM with the training dataset, which contains 28709 images and then tested on the test dataset containing 3589 images. The parameters taken

were 'C': 1000, 'gamma': 0.01. The accuracy that we achieved was 47.19%.

[2] The second baseline model used was KNN which is a supervised learning algorithm. The model was trained on the dataset using hyperparameter tuning with different k values ranging from 1 to 5. The best accuracy obtained was 40.23% at k = 1.

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