Movie & Song Recommender System Based on Emotion Detection using Machine learning

Dr. Sanjeev Kumar Singh, Shruti Gupta, Shivam Prajapati, Rahul Tewari

Department of Information Technology

Galgotias College of Engineering and Technology

Greater Noida, Uttar Pradesh, India

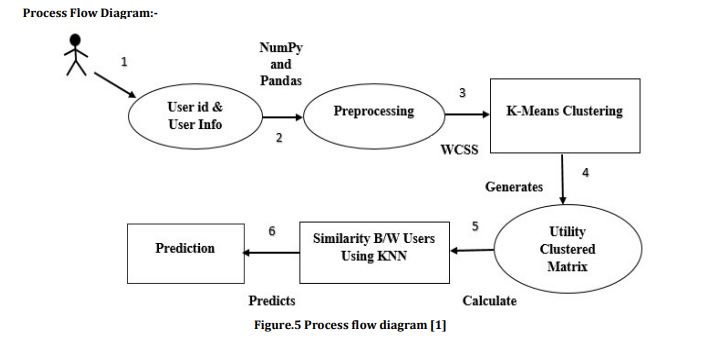
[sksingh72@gmail.com](mailto:sksingh72@gmail.com), [shrutiguptajk@gmail.com](mailto:shrutiguptajk@gmail.com), [shiva1008ji@gmail.com](mailto:shiva1008ji@gmail.com), [rahultewari00@gmail.com](mailto:rahultewari00@gmail.com)

Abstract— **Emotions play a great role in human lives. Our mind unconsciously notices the emotions of people we meet every day, interprets the signals people emit through these emotions, and tries to determine how to respond to and deal with people around us. Emotions can be verbally expressed through how we speak, what we speak, etc. and can also be expressed nonverbally through body language or facial expressions. Facial expressions can reveal emotions like happiness, anger, sadness, surprise, fear, excitement, desire, contempt, disgust, confusion and many more. Our Research work focused on using facial expressions to recommend movies to the user. Based on what expression users reveal at some moment we can best recommend movies that suit his current mood.**

Keywords— movie and song recommender system; movie recommender system; song recommender system; recommender system; emotions detection;

# Introduction

Recommendation system is a type of information filtering system that predicts user interests. These systems collects information about user's choices and provides recommendations as per system’s knowledge domain. Our Research paper is focued on developing a python-based recommendation engine by making use of user based collaborative filtering (CF) engine and combining context-based rule mining techniques. The system is based on facial expressions of the active user and knowledge base of in-active users of the system to assess the detected emotions of users’ and performs recommendations of movies and songs to the active users. It also makes use of Pearson's correlation to evaluate for similarity measurement betweed users choices.



1. Recommendation System

The system has an assumption of active users that the facial expressions of the users are real and not a made up expressions. In this research paper, we are proposing a convolution neural network-based detection of facial emotions and rule mining based on collaborative filtering to recommend movies and songs. This paper also focuses on using various similarity measures like Cosine, Correlation, Euclidean and Manhattan which are very effective in providing the desired results for recommendation systems. We have also noticed content based, and collaborative filtering offers more power to recommendation system

# LITERATURE SURVEY

Research on recommender systems has suggested various approaches to recommend users the items of their choice. One of the approach says that Percentage of View is a good indicator of users' like and dislike rather than using feedback of users, through likes and dislikes [1]. With this approach recommender system can effectively recommend movies matching the movies that has higher percentage of views. What if some movie is new and doesn’t have that many views that recommender system can pick it as a recommendation?

In such cases we can use Facial expressions because Facial expressions can play a crucial role in movie recommendation. Capturing the emotions to recommend movies save time of the user rather than searching individual movies[2]. Using Neural Networks seems more appropriate to obtain the best possible accuracy. Also, the combination of both the types of recommendation system i.e., content-based filtering (which uses features of one movie to recommend other similar movies based on what the movies user has liked in past) and collaborative filtering (which uses similarities between users to provide recommendations) offers more power for recommender system. User based collaborative filtering has some certain challenges which increases as the number of users and items increases. So we can use item-based technique of collaborative filtering to provide the recommendations of items, which is dynamic and will learn from the positive feedback[3].

Hybrid recommendation system based on the integration of collaborative and content-based content, takes into account the top critic consensus and movie rating score [4]. Comparision of User-based and Item-based Collaborative filtering show that performance of User-based Collaborative filtering provide better results[5]. Hybrid movie recommendation using sentiment analysis can be also very effective in recommendation based on the user preference and ordinal ratings of the movies[6] and focusses on user assessments rather than user reviews to recommend the movies.

Content/collaborative hybrid approach, make use of ratings to enable collaborative filtering and use either user tags or movie keywords retrieved from IMDB, to capture movie content information. Results showed that the information from keywords can help build a movie recommender system competitive with other neighbourhood-based approaches and even with more sophisticated state-of-the-art approaches[7].

Using rule mining can be used to satisfy individual's requirement. Rule mining is done on the rating matrix for providing perfect recommendation. Correlation measure-based rule mining yields better F1Score [8]. Collaborative filtering technique for recommender systems, is either memory-based or model-based. While the memory-based is more accurate, its scalability compared to model-based is poor[9]. Hybrid movie recommender system that retains accuracy of memory-based collaborative filtering technique and scalability of model-based collaborative filtering technique. This approach is fast and compact, and also it outperforms the classical one.

# METHOD

The methodology begins with capturing face images in realtime through camera or direct input of image or video files followed by preprocessing of these images, then emotions extraction from these images, subjective selection and lastly classification of the facial images based on facial expression. We have used Viola John Algorithms in this process.

Viola-Jones Algorithm has two stages Training and Detection. This algorithm first detects the face on the grayscale image and then finds the location on the coloured image. It is essentially searching for edge features, line-features, four-sided features. The algorithm learns from the images we supply it and is able to determine the false positives and true negatives in the data, allowing it to be more accurate. It also uses Adaptive boosting (AdaBoost).in which the weights are re-assigned to all the instances that have higher weights are assigned to classifications which are incorrect. The algorithm recognizes the facial expression and outputs the expressions. This data is used by recommender system for providing movies recommendation based on emotions.

Our research work is divided into two major parts :

(i) Facial Emotion Detection

(ii) Movie and Song Recommendation System

A picture containing diagram

Description automatically generated

1. Pipeline of Facial Emotion Detection

# IMPLEMENTATION

The first step in the process of implementation is acquisition of data. This research used primarily visual data in three formats i.e. real time data, video and images. For image processing, we have used the user provided image dataset in png, jpg or jpeg format and for video processing, user can provide any video in mp4 format only and finally for real time processing of user’s face expressions we used a camera connected to the same device. Movie and song dataset is downloaded from Kaggle ( www.kaggle.com ).

The next step is Data Preprocessing. The stored data pre-processed using inbuilt python libraries. Video and real time data is converted into keyframes and then annotation along with labelling is done using Viola-John algorithm. The movie and song dataset are pre-processed using average and missing values followed by exploratory data analysis and visualization.

Then comes Facial Emotion Detection in which the annotated image keyframes are now compared with haar-cascade dataset on the basis of different types of similarity measure like correlation, Pearson and Manhattan distance matrix. The training model is built on the top of haar-cascade pretrained model. The emotion which occurs in maximum probability is detected and returned as final output.

Machine Translation of emotions step works on emotions detected by emotion detection system and test it before transforming against textual data. These textual data are stored in dictionary format and being provided as input to recommender system. These machine translations may have any of the emotions like Anger, Disgust, Fear, Happy, Neutral, Sad, etc.

Recommender System then comes into picture. Movie and song recommender basically outputs the most relevant movies and song on the basis of similarity measures followed by exploratory data analysis (EDA). Genre is used as principal component for recommendation. Every emotion is mapped with

A picture containing letter

Description automatically generated

1. Block diagram and System Integration

its similar genre and whole recommendation and accuracy is based on genre column. Hybrid (Collaborative + Demographic) filtering is used for better recommendation. Training of model for movie and song dataset is performed using Support Vector Machine (SVM) and correlation matrix.

Display and Testing is the final step. Here most relevant movies and songs according to facial emotion detected is returned in dataframe format. Recommendation results can be tested against testing dataset to better ensure accuracy of overall model. Top 10 songs and movies will be displayed in coulumn wise manner. Along with that table of movies and songs will be generated based on recommendations.

# Future scope

Weather it’s about online shopping, watching movie, or anything. Users has plenty of options to choose from and businesses can lose their customers if they are not able to find the items of their choice efficiently. User can’t spend hours searching for some items. This is the reason companies need some ways of arranging the content for the customers, since browsing through millions of products on a website is just impossible. Recommender systems recommends customers what they are looking for, it can also help them discover new products or media that suits their area of interest.

The future scope of this research paper suggests use of emotions detections not only through face expressions but also through

voice. We can add auto capture feature in recommender system so that user can be given recommendations without manual interference of the users and that makes recommender system self-sufficient. Talking about movie recommender system if some new movie is launched the recommender system can check the keywords attached with the movies that can be easily fetched through IMDB and along with listening to user conversations and sensing emotions from that. When User comes in front of the TV it sees the movie suggestions that fits the mood user has at the particular time.

# Conclusion

Item-based collaborative filtering is the best approach that we used and implemented it using the cosine and the Pearson correlation as the distance function and also, we performed emotion detection from facial expressions using very time efficient Viola-John Algorithm. Further we used CNN Model-based content filtering and performed matrix factorization, and finally we used supervised learning methods used for classification, regression and outliers’ detection.

# References

1. E. Charniak, Statistical Language Learning. Cambridge,Mass.: MIT Press, 1993. [1] R. E. Nakhli, H. Moradi and M. A. Sadeghi, "Movie Recommender System Based on Percentage of View," 2019 5th Conference on Knowledge Based Engineering and Innovation (KBEI), 2019.
2. S. Chauhan, R. Mangrola and D. Viji, "Analysis of Intelligent movie recommender system from facial expression," 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), 2021.
3. M. K. Kharita, A. Kumar and P. Singh, "Item-Based Collaborative Filtering in Movie Recommendation in Real time," 2018 First International Conference on Secure Cyber Computing and Communication (ICSCCC), 2018.
4. A.N. Varma and K. Petluri, "Movie Recommender System using critic consensus," 2021 International Conference on Advances in Computing, Communication, and Control (ICAC3), 2021.
5. N. Shrivastava and S. Gupta, "Analysis on Item-Based and User-Based Collaborative Filtering for Movie Recommendation System," 2021 5th International Conference on Electrical, Electronics, Communication, Computer Technologies and Optimization Techniques (ICEECCOT), 2021
6. R. Lavanya and B. Bharathi, "Systematic analysis of Movie Recommendation System through Sentiment Analysis," 2021 International Conference on Artificial Intelligence and Smart Systems (ICAIS), 2021.
7. A.Stanescu, S. Nagar and D. Caragea, "A Hybrid Recommender System: User Profiling from Keywords and Ratings," 2013 IEEE/WIC/ACM International Joint Conferences on Web Intelligence (WI) and Intelligent Agent Technologies (IAT), 2013.
8. T. Anwar and V. Uma, "MRec-CRM: Movie Recommendation based on Collaborative Filtering and Rule Mining Approach," 2019 International Conference on Smart Structures and Systems (ICSSS), 2019.
9. M. Y. H. Al-Shamri and K. K. Bharadwaj, "A Compact User Model for Hybrid Movie Recommender System," International Conference on Computational Intelligence and Multimedia Applications (ICCIMA 2007), 2007.