International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 08 | Aug 2023 www.irjet.net p-ISSN: 2395-0072

# Human Emotion Detection for Customer Feedback & Food Classifier

**Ayesha Samreen [1], Srividya M.S [2]**

*[1]PG student, Department of Computer Science & Engineering, RV College of Engineering, Bengaluru-560059, India*
*[2]Assistant Professor, Department of Computer Science & Engineering, RV College of Engineering, Bengaluru-560059, India*

---

**Abstract -** *This study analyses the level to which hotel employees are aware of their facial expression/emotion recognition abilities in interacting with customers. As a sign of satisfaction and service quality delivered, facial expressions and emotions may have significant implications. The results show that a significant proportion of hotel employees are not fully aware of their facial expression/emotion recognition abilities and that many of them tend to engorge their abilities. This study has important implications in terms of employee efforts put into tasks (such as effort and concentration), self-development and training, and employee risk-taking behavior in their service encounters. In addition, Food Recommendation based on Emotion Analysis is proposed. An IoT device which first detects the human emotion and then using its artificial intelligence and pretrained images, suggests some food items to the customers at that moment. For the functioning purpose, we used a pretrained emotion detection model and tested it on an image pretrained images from Kaggle.*

***Key Words***: emotion recognition, facial expressions, etc.

## 1. INTRODUCTION

Feedback is a vital part in the process of self- improvement in any service sector. This study computes hotel and restaurant service sector. In the conventional model, feedback is collected by means of questionnaires (whether manual or digital), and through online screens or kiosks. The model displays various delicacy messages related to the customers overall experience of the service.

This proposed application can be technologically advanced by incorporating digital video cameras to capture the mood/emotion of the customers at various key strategic places within the vicinity of the particular hotel or restaurant outlet and by using artificial intelligence and machine learning to extract frames from the continuous video stream to record the exact emotion expressed by the customer with respect to and in reaction to the various services offered by the soliciting organization.

These frames which includes emotions displayed by the consumer is passed through various established human emotion detection algorithms to extract the exact feeling felt by customer in response to the service efficiency of the service provided.

For instance, when a user passes in front of such a camera-cum-display device, the device may display a message such as "please rate the ambience of the hotel with respect to your experience" or "please indicate through a gesture how you felt about the food". When the response is recorded, based on the intensity of the feeling in the user, the algorithm may classify the response into "excellent ", "outstanding" "happy", "not satisfactory "etc.

This system thus delivers the customer feedback to the service-provider organization, which can then use the information to take corrective measures to improve the quality of service to the end customer.

Between food and mood apparently there exists a relationship, various things like eating foods and thinking or reacting etc. Foods and emotions are two different entities which differs from person to person still interconnected. Emotions play an important role in food choice. Studies shows that foods precisely raise the brain neurotransmitter system that have the greater effects on mood. Thus, food can impact our mood and mood can impact our food. Food and emotion are routine and logical components of our lives that is alluring they don't get confine together. Even though, there are many research on of effect and cause of food and mood relation such as, brain chemicals, neurotransmitters like serotonin, dopamine and acetylcholine can be influenced by eaten and also variations in blood sugar levels are influenced by what we eat. Healthy foods, such as vegetables, fruits, fish, nuts, seeds, help to promote being cheerful, satisfaction and happiness. Few other foods can increase negative feelings, such as frustration, anger, tension, anxiety. Sad: Chocolate, tea, coffee, nuts peanuts, cashew, almonds and walnuts. Angry Tea, coffee, light food like chips, waffles Fear Eggs, nuts, turmeric Disgust Water. For Surprise: water, any available chilled drink. Shown in table1.

## 2. LITERATURE SURVEY

[1] This system proposes sentiment analysis model based on images. Pretrained models (VGG-19, DenseNet121, and ResNet50V2) are compared to predict the sentiments from pictures. The performance of the model is improved by freezing the initial layers and unfreezing part of the model. Over fitting effect is been reduced by addition of layers like dropout, batch normalization, and weight regularization layers in turn helped to predict sentiments from the database. With DenseNet121 model 0.89 accuracy is obtained for image sentiment analysis.

[2] This research work uses social media platforms, which is the easiest way to express emotions pertaining to any

occasion and expressing their feelings through social media is by uploading pictures. Based on the emotions in picture they are classified into positive, negative and neutral. This classification is used in automatic tag available on social media based on the available image through which emotions and sentiments of person can be found by Natural language processing (NLP). Two pretrained and one custom model are used comparison and to predict the emotions. Better results are shown in custom model and by using web camera.

[3] This research study is based on the facial expression of the person, there emotions and sentiment are found which is conducted with available database using MATLAB. Gaussian filtering is used to remove the noise in the image, canny is used find out heavy edges, geometric ratios remove errors which increases the performance of image processing. The expressions such happy, sad, angry, confused etc. are classified based the sentiment recognition.

[4] In this study, Convolutional Neural Networks is used to determine different emotions like fear, happy, angry, sad, surprise etc. This type of classification helps in application where automatic tag predictor, usually in social media where in the sentiment of person is understood based on their emotions. Two pretrained model are compared and accuracies of image sentiment is determined. First sentiment is determined and then emotion is predicted which describes happy, sad, fear, surprise or no emotions etc.

[5] This study aims at improving signal to noise ratio of seismic data by using median filtering, mean filtering which has yielded to high signal to noise ration and put forwards Convolutional neural network noise reduction framework. Presents deep learning Convolutional neural network based on fault noise suppression method which results in high performance. The network comprises of input layer, convolution layer, activation layer, normalization layer and output layer. The usage of residual learning, RELU function, and batch normalization has improved accuracy FD-Net model and preserving the original datasets and high signal to noise ratio and retains fault information pertaining to the image.

[6] This project reports a sewing defect detection method based on CNN with per-trained VGG-16 to find broken stitch from a picture of a sewing operation. The efficacy of 92.3% was obtained, determined with the set of sewing, normal and rotated images. In order to reduce the computing time, computing devices and deep learning libraries were analyzed. The result confirms the usefulness in manufacturing technology for garment production.

[7] The main aim of this work is found a alternative method for the conventional pooling method i.e., combpool layer consists of three architectures. It's observed that, addition of arithmetic means and maximum as a combination as yielded better results. The combination of Sugeno integral had an improved performance. Do Sugeno integral obtains good results when combined with other functions. Since positive results were obtained through the generalization of the Sugeno integral, performance of models which include the Choquet integral and generalizations as a combpool layer were tested and also combpool is used in modern architectures.

[8] This work presents, detection of food spoilage from the production stage to consumption stage. Freshness of fruit is detected by computer vision-based technique which uses deep learning with CNN. Later the model is analyzed with available dataset with fresh fruits images and rotten and classified from Kaggle.

[9] This paper presents larger value of analysis on facial responses. Where in eyebrow raises, sad, happy, disgust, positive and negative expressions were measured frame by frame basis and mapped with ad liking and brand purchase and effectiveness is measured. A model has been built to predict the emotional responses; results showed high liking scores. And also, one more model has been created for predicting changes in intent based on automatic facial responses, results show good effectiveness of the model. The work tested in this paper is for short-term purchasing decision like chocolate. This approach can be combined with content analysis audio and visual ads.

[10] This study presents various problems related to sentiment analysis. The techniques used is divided into machine learning, lexicon-based, and hybrid approaches. sentiment analysis based on machine learning is classified supervised, unsupervised, and deep machine learning techniques. Social network post and reviews which is in the form of textual data is analyzed in decision making process based on their emotional behavior and are classified preprocessing, feature extraction, and classification or clustering. All the three techniques were applied for sentiment analysis are compared; outcome had high accuracy rate.

[11] This study exhibits the functionality of image pre-processing and augmentation techniques present in HistoClean can be improved in the field of deep learning by CNN. HistoClean is used as open-source software to implement image preprocessing techniques, time is saved and there's transparency and data integrity. HistoClean provides a rapid, strong and reproduced, Without the knowledge of coding. It also saves the running and re- running of scripts The application is created to minimize and procedure instruction thereby creating user-friendly experience.

[12] This study proposes a comparison among various sentiment analysis classifiers using three different techniques – machine learning, deep learning, and an

evolutionary approach called EvoMSA. Comparison is done by developing two corpora of expressions into the programming domain, which determines the emotional state of student regarding teachers, exams, homework, and academic projects. A corpus called sentiTEXT has polarity i.e., positive and negative labels, while a corpus called eduSERE has positive and negative learning-centered emotions like sad, happy, exhausted, excited, bored, and frustrated labels. Comparing the three techniques, its concluded that evolutionary algorithm (EvoMSA) generated better results for corpus sentiTEXT= 93%, and corpus eduSERE = 84% accuracy.

[13] This work presents a inclusive study on face recognition methods based on deep learning. Deep learning techniques is totally applied on face recognition and have played vital role in avoiding challenges in FR, pose variations, illumination, age, facial expression and heterogeneous face matching. Deep learning methods have yielded better results in processing RGB-D, video, and heterogeneous face.

[14] The main aim of this study, A method is created for implementing a fully connected deep neural network and convolutional neural network inference system on a FPGA. In CNN, systolic array architecture present along with parallel processing potential is used. Algorithmic analysis requires minimum memory for fixed point trained parameters. results shows that the for block over distributed memory saves ≈62% look-up- tables for the DNN, and for distributed over block. Memory saves ≈30% BRAM for the LeNet-5 CNN unit. This study gives intuition for developing FPGA-based digital systems for applications requiring DNN and CNN.

[15] Different types of Machine Learning and depth learning methods are used in Sentiment Analysis like Support Vector Machines, NB, Haar Cascade, LBPH, CNN, etc. This as lead in hotels to express their opinion on the food, ambience, etc. which can be a useful resource to obtain feedback from the Customers. Proposed work determines Sentiment Analysis pictures pertaining to users along with their faces from the hotel reviews revealing it to high efficiency in finding and classifying emotions from images.

[16] This work describes textual sentiment analysis along with visual sentiment analysis for the given image and classifying as positive or negative or neutral. Visual sentiment analysis can be put together as image classification using deep learning methods like CNN. But sentiment the captured image is affected by three factors: image factor, user factor, and item factor. item-oriented and user-oriented CNN has been developed with the interchange of image features with specific expressions of users. Results shows that images from restaurant have been more effective in classifying the sentiments.

[17] This paper proposes, sentiment analysis is classified based on the facial expressions and visual analysis to find whether the image is positive or negative based on the emotions. An image sentiment prediction model is built using CNN. And the sentiments are classified efficiently and increases the accuracy of hotel picture posted on social media. The results yield best performance analysis of reviews from images compared to naive bayes in ML technique.

[18] Image sentiment ideas are Adjective Noun Pairs i.e., automatically finds the tags of picture which is useful in finding the emotions. The deep learning techniques are used for sentiment analysis, as they have the ability to effectively learn the image polarity. This paper proposes a Deep Neural Network, Convolutional Neural Network, Region-based CNN and Fast R-CNN with the suitable to particular applications in image sentiment analysis.

[19] In this study, determines how CNN can be used to predict the various emotions like happy, surprise, sad, fear, exited, exhausted and neutral. There are several applications which automatically tag predictions for visual data on social media and for understanding emotions. They have used VGG16 model, ResNet model, customized CNN framework with 7 layers, which can predict the emotion and sentiment of the given image. By using CNN, the prediction was more accurate and efficient. The trained model was used to find the emotion on a live photo by loading a captured image using a GUI.

[20] This project describes Sentiment Analysis by facial recognition using Viola-jones algorithm to find an image and local binary pattern for expression recognition. Support vector machine is used for classification of expression. Based on the facial expression it can find facial expression and tell whether the person is happy, sad or exited. This framework first finds and read a person face. Later it computes different facial expressions. After finding it classifies the expressions such sadness, happy, sad, exhausted etc. Based on these frameworks decides emotional state.

## 3. IMPLIMENTATION

The input to facial feature locator is still image from face detector. The output from facial feature is given to the facial feature extractor to extract interest points on mouth and eye. Classification module takes the output of normalized face image as input which contains extracted eye and mouth outline obtained from the ending marker points for eye and mouth outline, which is the output of feature extractor module. The image is ready to classify out of 5 emotions listed. The emotion labelled image is given as input for the feedback rating, the outputs of the image which matches highest rating is assigned for every class. Later once the threshold is reached, segmented image is given as output. Lastly result recognizer gives the feedback with high accuracy.

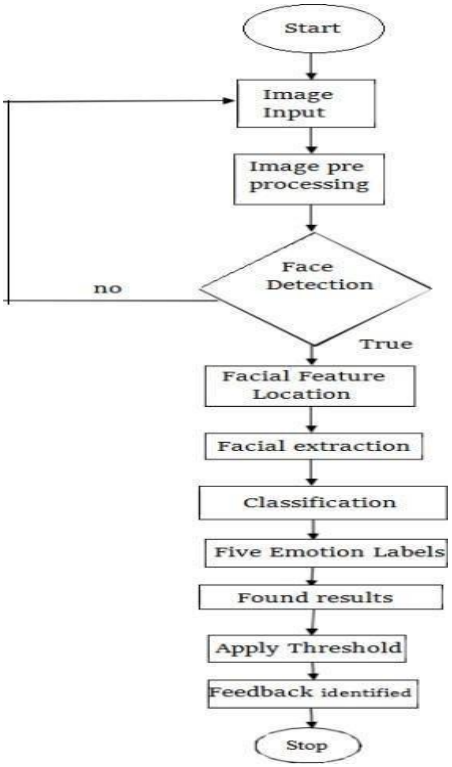


**Fig -1**: Flowchart for Emotion Detection using Machine Learning.

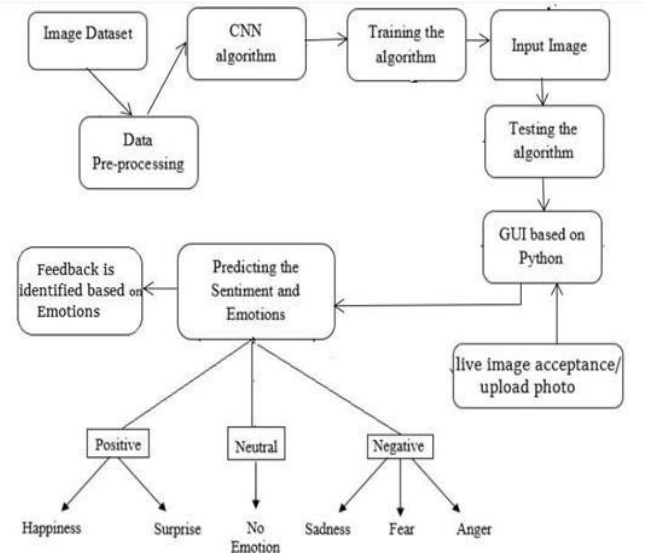


**Fig -2**: System Design for emotion detection using machine learning.

The dataset is pre-processed which removes noise and broken data from the available dataset. Then CNN model is used for training purpose which predicts the emotion and sentiment of the picture. Later GUI is used to load a specific picture or capture a live image on trained model which will predict the emotion depicted by the picture from the classification such as happiness, surprise, sadness, fear, anger and neutral.

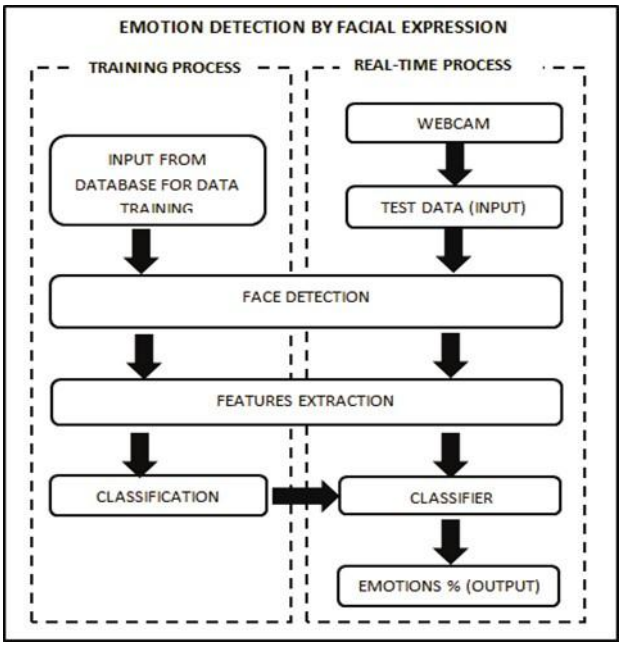


**Fig -3**: Algorithm for emotion detection using machine learning.

- The emotion detector finds a user image from particular picture or capture a live image as input.
- Detector extracts the facial features and then normalized to feature vectors.
- Then by using classifier user emotions are classified into happiness, surprise, sadness, fear, anger and neutral produced from a training model.
- Lastly percentage is calculated for each emotion for more analysis.

**Validation Process:**

Accuracy is calculated by proposed methodology, emotions as well as food items are suggested. First pretrained model are loaded, Next is to move through the entire file set of each emotion like happy, sad, etc. using a for loop and predicting for every picture and comparing it to the actual emotions. If matching if found, a counter is increased and the total picture counter is also increased in every iteration. Later accuracy is calculated using below formula.

$$\text{accuracy} = \frac{\text{correctly predicted images}}{\text{total images infolder}} * 100$$

$$\text{total accuracy} = \frac{\text{happy accuracy} + \ldots + \text{disgust accuracy}}{7}$$

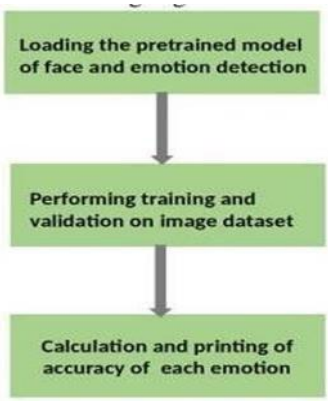


**Fig -4**: Validation process

| EMOTION | FOOD SUGGESTION |
|---|---|
| Happy | Healthy vegetables, fruits, fish, coffee, seeds, chocolate. |
| Sad | Chocolate, tea/coffee, nuts (specifically peanuts, cashew, almonds and walnuts). |
| Angry | Tea/coffee, light food like chips, waffles |
| Fear | Eggs, nuts, turmeric |
| Disgust | Water..(probably shouldn't eat anything) |
| Surprise | Water, Any available chilled drink |

**Table -1:** Food Suggestion According to Emotion

## 4. COMPARISON TABLE

| AUTHORS | YEAR | METHODOLOGY | LIMITATIONS |
|---|---|---|---|
| Antoanela, Andrei | 2022 | Different DL methods for classification such as using VGG-19, ResNet50V2, DenseNet-121 | Accuracy achieved VGG-19 =73%, ResNet50V2 = 75%, and DenseNet-121, 89%. |
| Ruchika Prakash Nagekar | 2022 | Natural language processing (NLP) | Custom model and web camera provides better results |
| W. K., Park, Y. C., Lee | 2022 | Defect detection method based on CNN with pretrained VGG-16 | Efficiency of 92.3% was obtained, determined with the set of sewing, normal and rotated images |
| M. M., S Shivakumar, V. R. sanjay | 2022 | Visual analysis using CNN | Results yield best performance analysis of reviews from images compared to naive bayes in ML technique. |
| Yash Gherkar, Parth Gujar | 2022 | ML and depth learning methods Cascade, LBPH, CNN, | Results shows high efficiency in finding and classifying emotions from images |
| Valentino, F., Cenggoro, T | 2021 | Computer vision-based technique using CNN. | Fresh fruits images and rotten and classified from Kaggle |
| Viratham Pulsawatd i a, Javier I. Quezada-Marín | 2021 | Deep learning by CNN and Histoclean | Suggests for the applications of deep learning technologies in hospitality |
| Barot, V., & Gavhane | 2020 | Convolutional Neural Network | CNN provides 80% for testing set and 60% for validation test |
| Estrada, M. L. B., Cabada | 2020 | Machine learning, deep learning, corpus sentitext, edusere | The accuracy for corpus sentiTEXT = 93%, and corpus eduSERE = 84% is obtained |
| Guo, G., & Zhang, N. | 2019 | Deep learning techniques on face recognition | Deep learning methods yields best results in processing RGB D, video, and heterogeneous face |
| QuocTuan, Truong, Hady W, Lauw | 2017 | Sentiment analysis using CNN | Results shows that images from restaurant is been more effective in classifying the sentiments. |
| Nyoung Kim a, Hyun Rim Choi | 2015 | DNN and CNN inference system on a FPGA | Block over distributed memory saves ≈62% look-up-tables (LUTs) for the DNN |

**Table -2:** Comparison Table

## 5. CONCLUSION

This paper presents solution to get proper feedback from the customers, which helps in proper development of the business. Here, the issue is to take review or feedback from

the customers who visit the place(hotel). Those who are interested in giving feedback regularly they give it but major percentage of people think it as a waste of time so they will not give the review or feedback, so this project helps us to get proper feedback from the customers. In simple terms we have developed technique in which customer need not spend more time holding a pen and paper fulling according to their wishes we just need a small glimpse of image which the customer will have a look and the camera automatically captures the expression and updates it in the database accordingly. Meaning the question about the particular property e.g., service, cost, food is taken and is analyzed using the technology and is auto updated in the database like good, excellent, bad. Based the expression the customer gives for the particular asked question by our server. In addition, a new idea to detects human emotion by analyzing the facial images and recommending food. The proposed model also analyzes the emotion and suggest food items which can make us happier and ecstatic. Food influences the mood in various ways. The results of emotion analysis and food recommendation were accurate and shows how emotion detection and food suggestion can go hand-in-hand.

## REFERENCES

[1] Chandrasekaran G, Antoanela N, Andrei G, Monica C, & Hemanth J. "Visual Sentiment Analysis Using Deep Learning Models with Social Media Data "Applied Sciences (Switzerland) -2022.

[2] Swapnil Sanjay Nagvenkar, Ruchika Prakash Nagekar, Tanmay Naik, Amey Kerkar, "Emotion detection based on facial expression" (IJCRT)-2022.

[3] Aynur Sevinç, Buket Kaya, Ayten Geçmez, "A Sentiment Analysis Study on Recognition of Facial Expressions: Gauss and Canny Methods" (IEEEI)-2020.

[4] Doshi U, Barot V, & Gavhane S, "Emotion detection and sentiment analysis of static images" (IEEE)-2020.

[5] Gherkar Y, Gujar P, Gaziyani A, & Kadu S, "Sentiment Analysis of Images using Machine Learning Techniques Yash" (ICCDW)-(2022).

[6] Kim H, Jung W K, Park Y C, Lee J W, & Ahn S H, "Broken stitch detection method for sewing operation using CNN feature map and image-processing techniques. Expert Systems with Applications" (IEEE)-2021.

[7] Rodriguez Martinez I, Lafuente J, Santiago R H N, Dimuro G P, Herrera F, & Bustince H," Replacing pooling functions in Convolutional Neural Networks by linear combinations of increasing functions Neural Networks". (IEEE) 2022.

[8] Valentino F, Cenggoro T W, & Pardamean B, "A Design of Deep Learning Experimentation for Fruit Freshness Detection. IOP Conference Series: Earth and Environmental Science" (IEEE)-2021

[9] D McDuff, R El Kaliouby, J F Cohn and P Picard, "Predicting ad liking and purcha se intent: Large-scale analysis of facial responses to ads" (IEEE)- 2015.

[10] Shaha Al-Otaibi and Amal Al-Rasheed, "A Review and Comparative Analysis of Sentiment Analysis Techniques" (Informatica)-2022.

[11] Kris DnMcCombe, Stephanie G Craig, Amélie Viratham Pulsawatdi, Javier I Quezada-Marín, "Open- source software for histological image pre-processing and augmentation to improve development of robust convolutional neural networks" (IEEE)-2021.

[12] Estradam MLB, Cabada R Z, Bustillos R O & Graff M,"Opinion mining and emotion recognition applied to learning environments"(Expert Systems with Applications)-2020.

[13] Guo G, & Zhang N, "A survey on deep learning-based face recognition". (Computer Vision and Image Understanding)-2019.

[14] Mukhopadhyay A K, Majumder S, & Chakrabarti I. "Systematic realization of a fully connected deep and convolutional neural network architecture on a field programmable gate array" (IEEE)-2022.

[15] Yash Gherkar, Parth Gujar, Siddhi Kadu, "Sentiment Analysis of Images using Machine Learning Techniques" (itmconf)-2022.

[16] QuocTuan, Truong, HadyW, Lauw, "Visual Sentiment Analysis for Review Images with Item Oriented and User- Oriented CNN" (Corpus)-2022.

[17] S Shivakumar,V R sanjay, "Visual SentimentClassification of Restaurant Review Images using DeepConvolutional Neural Networks" (Corpus)-2022.

[18] Namita Mittal, Divya Sharma, M. Joshi, "Image Sentiment Analysis Using Deep Learning" (Corpus) -2018.

[19] Udit Doshi, Vaibhav Barot, Sachin Gavhane, "Emotion Detection and Sentiment" (IJESC)-2017.

[20] R.N Devendra Kumar, Dr. C. Arvind, "Facial Expression Recognition System "Sentiment Analysis" (Jour of Adv Research in Dynamical & Control Systems)-2017.