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REAL TIME FACIAL RECOGNITION SYSTEM USING FACIAL EXPRESSIONS

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Abstract: **The sentimental analysis is a process of extracting human feelings from data. It is an application of natural language processing, computational linguistics, text analysis. Its basic idea is to classify human emotions in different moods such as happy, sad, neutral, etc. It uses the pattern of movement of both the lips and the eye shape that it takes during different feelings of human. It has a huge variety of applications because of its ability to extract insights from data sets and the social media. It will be using machine learning algorithms for the detection of emotions and it will be trained on the huge dataset with varying sample size. It will also use facial recognition to perform a specific analysis of a person after identifying their face. This will provide a separate report for each person on their emotional state. This report then will be used for the expression mining in different modern systems such as online streaming, video interviews, etc. This report will help to empower the existing tools to perform multi task and gives a lot of data to work with.**

Index Terms **- Opinion Mining , Sentiment Analysis, Face Recognition ,Data Visualization, Customer Reviews**

1. INTRODUCTION

1.1 Sentimental Feature Extraction

Image processing is the processing of digital image using some acquisition tool like digital camera etc. in for extract some useful information. A digital image is made up of a finite number of elements. Each element has a particular value at a specific location. They are called as pixels. The complete process of sentimental analysis is given in figure 1.1

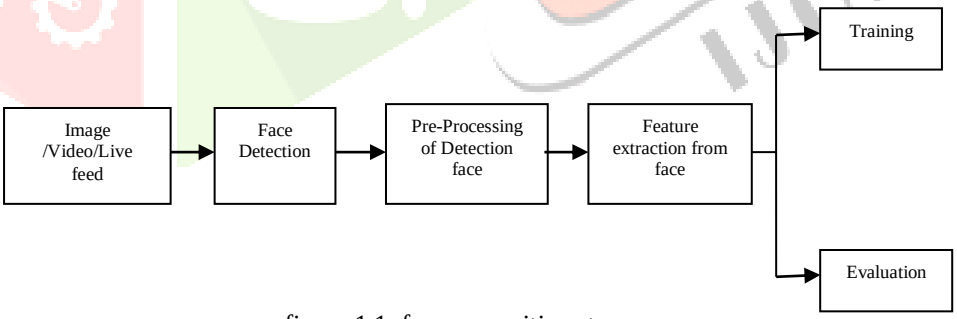

figure 1.1: face recognition steps

Facial sentiment analysis is being used a lot these days since it provides a natural and efficient way to communicate between humans. Understanding human look has many aspects like from information processing system analysis, lie detectors, emotion recognition, non- verbal communication and even the role of expressions in art. Some other applications related to face and its sentiments are personal identification and access control, teleconferencing, forensic applications, movies, human-computer interaction, automated surveillance etc.

1.2 Phases in facial expression recognition

In expression recognition, we are extracting the features on three different stages as mentioned in the figure: 1.2
We see that the complete process of face recognition is covered in three stages,

- Face Detection
- Feature Extraction
- Face Recognition

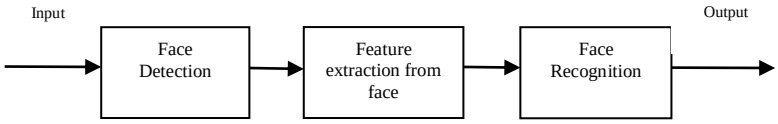

figure 1.2: three main phases of face recognition

In this case machine uses the input as image and detects the face of the person. This face is used for feature extraction and these features are being processed. This processed image used for face recognition based on the images is stored in the data set. `Facial recognition is a category of biometric software that maps an individual's facial feature mathematically and stores the data as a face print extracts features from it. The software uses deep learning algorithms to compare a live capture digital image or previously captured videos to the stored face print in order to verify an individual's identity. Facebook uses facial recognition software to tag individuals in any photographs. Each time individual is tagged in a photograph, the software stores mapping information about the person's facial features characteristics. Once enough data has been collected, the software can use the information to identify a specific individual's face in new incoming photograph. To protect privacy of individuals, a feature called photo Review notifies to that individual that these specific Facebook member who has been identified. Software identifies 80 nodal points on a human face. In this concept, nodal points are endpoints used to measure variables of a person's face, such as the length of face or width of the nose, the depth of the eye sockets and the shape of the check bones. And similarly many other features.

1.3 Feature Extraction Techniques

Every unique human face shares some properties that are same. These commonalities might be utilized using Hear Features.
A couple of properties basic to human face like:

- The eye area is darker than the upper cheeks.
- The nose connect area is brighter than the eyes.
- Area and size: eyes, mouth, extension of nose.

When the data input to an algorithm is too large to processed and it is expected to be redundant(such as the same measurement in both feet's and meters unit, or the repetitiveness of images presented as pixels for quality), then it can be converted into a reduced set of features (also called feature vector). Determining a subset of the initial features is called feature selection. The selected feature are expected to contain relevant information from the input data given, so that the desired work can be performed by using extracted representation instead of the complete initial data taking. Feature extraction involves reducing the amount of resources required to describe a large set of data. When performing analysis of complex data one of the major problem stems from the number of variables involved. Analysis with large number of variables generally requires a large amount of memory and computation power also it may cause a classification algorithm to over fat to training samples and generalized poorly to new samples. Feature extraction is a general term for methods of constructing combinations of the variables to get around this problem while still describing the data with sufficient accuracy. Many machine learning practitioners believe that properly optimized feature extraction is the key to effective model construction.

1.4 Face Recognition

In Facial recognition an individual face is compared to the live capture with the stored record for that person. Facial recognition systems are commonly used for security purposes but are increasingly. being used in a variety of other applications. In this report we have recognize the faces for three different things. These are recognizing the face of a person based on data available in the data sets on different types of images. It can be jpg, jpeg, png and etc. and recognize that detect the features. Same times we have been implemented on a pre-captured video or short movies. We have also tried extracting the feature from the live camera captured images also.Facial recognition system is a widely considered technology identifying recognize or verifying a person from digital images or a video frame from a video source datasets. While initially a type of computer application, it has seen wider range of uses in recent times on mobile platforms, similar other platforms and in other forms of technology, such as robotics. It is typically used as access control in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems. Although the accuracy of facial recognition system as a biometric technology is lower than iris recognition, it is widely adopted due to its way of contactless and non-invasive process. Current trends also show it more future scope and too much new work has to be done at all level of it. Every big company to put their hand in it to do more and in this new technology. Large number of research is being going on to get new more. Even government agencies are taking much more interest in it. It is assumed that is a future technology and we can succeed if and only if we can understand as much as possible. Many research papers are being published each year all over the world related to it.Recently, it has become very popular as a commercial identification and marketing tool in this new technical world. Other applications has advanced human -computer interaction, video surveillance, automatic indexing of images, and video database, among others but this technology is being expected to be wide range.

1.5 Face Detection

Face detection involves separating image windows into two classes; one containing faces (turning the background (clutter). It is difficult because although commonalities exist between faces, they can vary considerably in terms of age, skin color and facial expression. The problem is further complicated by differing lighting cond000itions, image qualities and geometries, as well as the possibility of partial occlusion and disguise. An ideal face detector would therefore be able to detect the presence of any face under any set of lighting conditions, upon any background. The face detection task can be broken down into two steps. The first step is a classification task that takes some arbitrary image as input and outputs a binary value of yes or no, indicating whether there are any faces present in the image. The second step is the face localization task that aims to take an image as input and output the location of any face or faces within that image as some bounding box with (x, y, width, height).

The face detection system can be divided into the following steps:-

1. Pre-Processing: To reduce the variability in the faces, the images are processed before they are fed into the network. All positive examples that is the face images are obtained by cropping Department of ECE Page 3 images with frontal faces to include only the front view. All the cropped images are then corrected for lighting through standard algorithms.

2. Classification: Neural networks are implemented to classify the images as faces or no faces by training on these examples. We use both our implementation of the neural network and the Mat lab neural network toolbox for this task. Different network configurations are experimented with to optimize the results.

3. Localization: The trained neural network is then used to search for faces in an image and if present localize them in a bounding box. Various Feature of Face on which the work has done on:- Position Scale Orientation Illumination.

2. LITERATURE REVIEW

Two different approaches are used for facial expression recognition, both of which include two different methodologies, exist. Dividing the face into separate action units or keeping it as a whole for further processing appears to be the first and the primary distinction between the main approaches. In both of these approaches, two different methodologies, namely the 'Geometric based' and the 'Appearance-based' parameterizations can be used. Making use of the whole frontal face image and processing it in order to end up with the classifications of 6 universal facial expression prototypes: disgust, fear, joy, surprise, sad ness and anger; outlines the first approach. Here, it is assumed that each of the above mentioned emotions have characteristic expressions on face and that's why recognition of them is necessary and sufficient. Instead of using the face images as a whole, dividing them into some sub-sections for further processing forms up the main idea of the second approach for facial expression analysis.

As expression is more related with subtle changes of some discrete features such as eyes, eyebrows and lip corners; these fine-grained changes are used for analyzing automated recognition. There are two main methods that are used in both of the above explained approaches. Geometric Based Parameterization is an old way which consists of tracking and processing the motions of some spots on image sequences, firstly presented by Suwa et al to recognize facial expressions. Cohn and Kanade later on tried geometrical modeling and tracking of facial features by claiming that each AU is presented with a specific set of facial muscles. The disadvantages of this method are the contours of these features and components have to be adjusted manually in this frame, the problems of robustness and difficulties come out in cases of pose and illumination changes while the tracking is applied on images, as actions & expressions tend to change both in morphological and in dynamical senses, it becomes hard to estimate general parameters for movement and displacement. Therefore, ending up with robust decisions for facial actions under these varying conditions becomes to be difficult. Rather than tracking spatial points and using positioning and movement parameters that vary within time, color (pixel) information of related regions of face are processed in Appearance Based Parameterizations; in order to obtain the parameters that are going to form the feature 8 vectors. Different features such as Gabor, Haar wavelet coefficients, together with feature extraction and selection methods such as PCA, LDA, and Ad boost are used within this framework. For classification problem, algorithms like Machine learning, Neural Network, Support Vector Machine, Deep learning, Naive Bayes are used. Raghuvanshi A. et al have built a Facial expression recognition system upon recent research to classify images of human faces into discrete emotion categories using convolution neural networks. Alizadeh, Shima, and Azar Fazel have developed Facial Expression Recognition system using Convolution Neural Networks based on Torch model.

3. PROPOSED SYSTEMS

The proposed Face detection and image recognition system has been developed which is itself divided into 3 modules, first one is face detection while the second one sentimental analysis and third one is a simple Graphical User Interface that allows user access to the system's features. The elements of the system are illustrated in Figure 3.1.

We detect real time faces and then we will interpret different facial expressions or sentiments like:

- HAPPY
- SAD

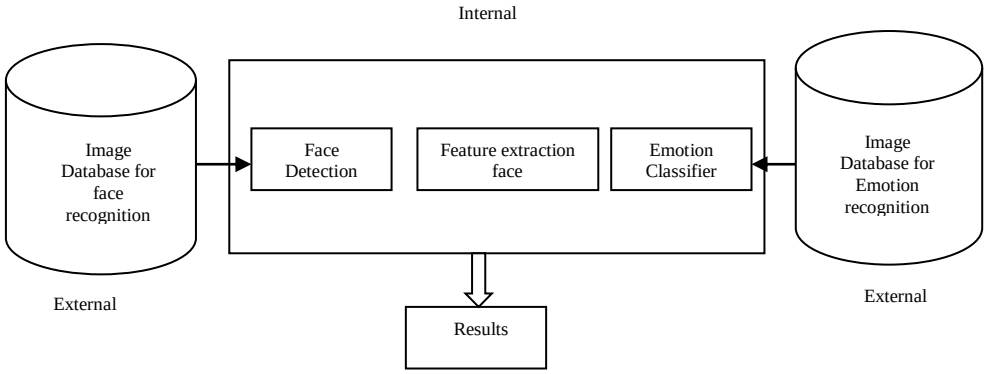

figure 3.1 internal and external components of a system

All the sentiments are based on different features of face and actions
The key elements of faces like:

1. Movement of lips.
2. Distance between eyes.
3. Nose Shape
4. Jaw movement

Then crawler will navigate through web pages to extract all the reviews. Extracted reviews are classified in two datasets which are used for training and testing. 70% of reviews are used for testing, rest of 30% reviews are used for testing.
The process of text classification is divided into two phases: Training phase and testing phase.
The Fig.3.2 shows proposed system architecture. It gives an overview of the complete process pipeline. The system comprises of modules involved are:

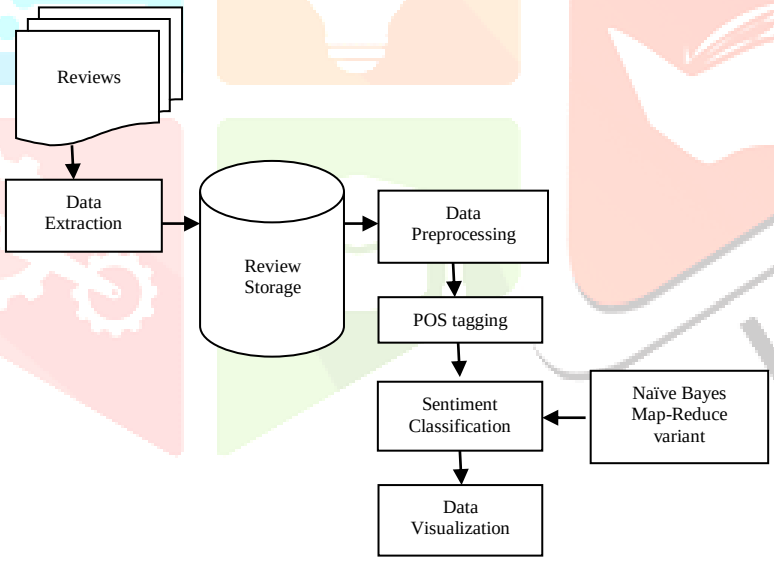

fig .3.2 proposed system architecture

3.1 Data Extraction
In proposed system www.amazon is used as a source for testing dataset. In the testing stage, the accuracy of classification is evaluated using classification module. The map-reduce environment is used to implement Naïve Bayes classifier. The processing is carried out as shown in Fig 3.2. Classification of different classes of facial expression for the analysis of sentiments.

3.2 Data Preprocessing
Data preprocessing includes proper fragmentation of data and cleaning of data. Here, in research work NLP preprocessing technique like the removal of stop words, chunking data, stemming etc. are used. Data preprocessing will lead us to robust data which has less noise. For data preprocessing, use of Natural Language Tool Kit(NLTK)library implemented in python is considered. NLTK is a platform for natural language processing developed in python. Part of speech tagging is also done using NLTK.

3.3 Sentiment Classification

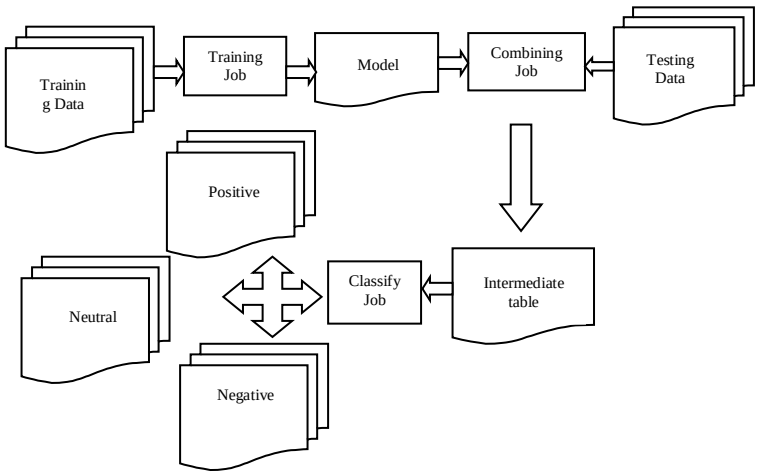

fig.3.3 classification in hadoop environment

The process of text classification is divided into two phases: Training phase and testing phase. In the training stage, the classification model is created using testing dataset. In the testing stage, the accuracy of classification is evaluated using classification module. The map-reduce environment is use.

4. IMPLEMENTATION DETAILS

The data source to extract product reviews is www.amazon.in.All available reviews for a considered product are extracted and stored using web crawler. Data cleaning includes removal of digits, hyperlink, special characters from review text as they don't matter in sentiment evaluation. Contraction-expansion assists in the handling of negations. Using contraction expansion, terms like "don't" to "do not", "I'm" to "I am" are expanded.

Then tokenize converts sentence into word tokens. Word tokens are then subject to stop word removal deals with common words like for, above, etc. Part of Speech(POS) tagging is applied to define grammatical tagging based on both its definition and its context. Data preprocessing is done using NLTK framework in python. Sentiment classification is to be done in Hadoop environment. SentiWordNet is used to assign sentiment values using mapped job. SentiWordNet is a dictionary which has a positive, negative and objective score for each sentimental word. It has around 19000 adjectives and noun which express emotion. Naïve-Bayes classifier is used to classify polarity using reducer job. Naïve Bayes is classical machine learning algorithm based on probability. This type of classifiers is highly scalable, and can handle a number of parameters effectively. Property of scalability of classifier lead stoma reduce variant of the classifier. After training a dataset, a model is created by storing input and output softest dataset. Then combiner job will combine testing dataset with trained dataset and then results of final classification can be achieved.

5. CONCLUSION

The proposed method in this paper aims how to improve the quality of sentiment analysis on textual product reviews using Hadoop framework. Also, the methodology is based on training and testing will improve the accuracy of results of analysis. The focus is on the use of open source technologies mainly. However proposed system has tremendous practical applications for both individual customer and service provider. The individual customer takes its benefit for decision making and service provider can take advantage to improve the quality of service as well as for new product design.

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