Customer Satisfaction Recognition through Emotions

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ABSTRACT

Customer satisfaction is one of the mandatory things in day-to-day life like mall customers, and organization customers. Here we propose whether the facial emotion-based feedback of the customer is happy or not, for that we need to analyze the customer's Facial Emotion is an important factor in Human-Computer Interaction. Among non-verbal components, facial features are one of the main information channels. Hence, we are proposing a CNN Model and Haar_Cascade Classifier recognize facial Emotions, Age, and Gender to recognize Customer Satisfaction. The technology used is Convolutional Neural Networks from Machine Learning. The dataset consisting of pixel sets of images of people with different Emotions is used to train the model. The proposed model is a real-time model used to detect the face using a live video stream and determine the Emotion, and hence in turn determine if the customer is satisfied or not. The main advantage of the proposed system is that it uses a real-time live video stream through a webcam. The key concept of this system is to use a Machine Learning algorithm to determine the Emotions of the Customer.

Keywords:– ***Customer Satisfaction Recognition, Convolutional Neural Network, OpenCV, Emotion, Machine learning, CNN Model, Haar Cascade Classifier.***

1. INTRODUCTION

Facial expression investigation includes estimation and acknowledgment of articulation. Computerization of Facial expression prediction comprises three ideas initial Face Detection (FD), second one Facial Feature Extraction (FFE) lastly the Facial Expression Recognition (FER)

Emotion and recognition of faces are one of the basic capabilities of human beings. Extending this capability to machines is of great interest in many application areas. The ubiquitous and universal use of computational systems requires improved Human-Computer Interaction.

Customer Satisfaction is one of the important factors for checking the suitability of the product or service with customer expectations. Today, many companies compete with

each other to improve the quality of products and services by conducting customer satisfaction surveys such as questionnaires, telephone surveys, etc. But not every customer gives feedback to the survey. Also, there is no guarantee that the given survey is genuine. Hence, we are introducing a solution to this problem.

In our proposed system, Customer satisfaction will be recognized by using facial features. The datasets are used to train the Convolutional Neural Network models for recognizing the Emotion of the customer. Based on the emotion, Customer satisfaction will be determined.

The proposed system will help to enhance the accuracy and efficiency of customer satisfaction recognition.

2. LITERATURE REVIEW

The face is one of the main techniques for human correspondence. It accepts a central occupation in every social affiliation. Facial enunciations are non-verbal insinuations of emotions. To start with, face securing is a preparing stage to naturally find the face area in the information pictures. The subsequent stage is to extricate and speak to facial changes brought about by outward appearances. At long last, the arrangement task permits to derive the outward appearances. The extraction strategies are utilized to portray face appearances and changes on a face.

2.1 TITLE: Appreciation of Customer Satisfaction Through Analysis Facial Expressions and Emotions Recognition.

AUTHOR: Moulay Smail Bouzakraoui, Abdelalim; Sadiq, Abdessamad Youssef Alaoui.

DESCRIPTION: This article presents the modeling of a system that aims to predict the satisfaction of a customer through his emotions. This system must predict customers' behavior in the decision-making process. For this end, first, we extract geometric features

extract geometric features from customers' emotional faces, captured from a local camera placed near the products. Then, to predict customer satisfaction, we have classified these features using an adapted SVM classifier. The kinds of customer satisfaction are satisfied, not satisfied, and neutral. Our system shows a good performance, testing it on the JAFFE dataset.

2.2 TITLE: Convolutional Neural Networks Models for Facial Expression Recognition

AUTHOR: Burhanudin Ramdhani, Esmeralda C. Djamal*, Ridwan Ilyas

DESCRIPTION: Emotion is a psychological representation of an event that arises spontaneously in a short time and can be reviewed of them from facial expressions, which facial expressions can indicate consumer satisfaction. Facial recognition as an image can be viewed as identity, emotion, age, race, and gender. This is what makes the extraction of emotional patterns from other patterns not easy. This research has built an image recognition system of emotion expression Customer Satisfaction Recognition Through Emotions using Convolutional Neural Networks (CNN) by comparing two configurations using batch sizes 8 and 128 with two datasets that are FER-2013, a self-created dataset, and a cross dataset against four emotion expressions related to customer service that is happy, disappointed, angry and natural. The test results showed better results on the configuration made by researchers with batch size 8 which achieved the best results of 73.98% on the dataset made by researchers and 58.25% in the FER-2013 dataset. Whereas when using batch size 128 best accuracy achieved by the previous research configuration with the FER-2013 dataset is 69.10%.

2.3 TITLE: Multi Facial Expression Recognition (MFER) for Identifying Customer Satisfaction on Products using Deep CNN and Haar Cascade Classifier

AUTHOR: DNVSLS Indira, L Sumalatha, Babu Rao Markapudi

DESCRIPTION: Face Expression is one of the most normal, remarkable, and general signs for individuals to convey their enthusiastic states and it is not restricted to national borders, linguistics, and gender. This article presents the modeling of a framework that plans to foresee the fulfillment of a customer through his facial feelings. The cutting-edge innovation of the Facial Expression Recognition framework is the consumer satisfaction

estimation. MFER, a Novel procedure is proposed in this paper for identifying consumer satisfaction levels. This sound methodology of client satisfaction estimation is an alternative option to the ordinary method of gathering clients' reactions. This model must anticipate the client's behavior in the dynamic cycle. To expect consumer trustworthiness, we have characterized mathematical highlights of the face by utilizing Deep CNN and Haar Cascade Classifier. The kinds of consumer fulfillment are classified as satisfied, not-satisfied, and neutral. Our framework shows a decent exhibition, testing it on the FER2013 dataset. Our MFER –Multi Facial Expression Recognition procedure identifies multiple objects in the same image which consists of the same and different expressions.

3. PROPOSED METHODOLOGY

When arranging a modified system, three things are thought of; they are face recognition, facial feature extraction, and characterization of articulations or expressions. At first, face recognition is a phase to normally discover the face district in the given pictures. The accompanying stage is to discover facial changes achieved by articulations. Finally, the arrangement determines the outward appearances that are the expressions. Here are three significant strides for building this model. One is face recognition which identifies the person who is giving the response the latter one is feature extraction by identifying geometric features and the final one is emotion recognition which indicates the type of response from that person.

The proposed framework actualizes a Deep CNN model and a classifier for recognizing expressions by building a system. The reason for MFER is used to identify the customer satisfaction with a purchased product when he/she gives an opinion as an image file like an expression for further recommendations.

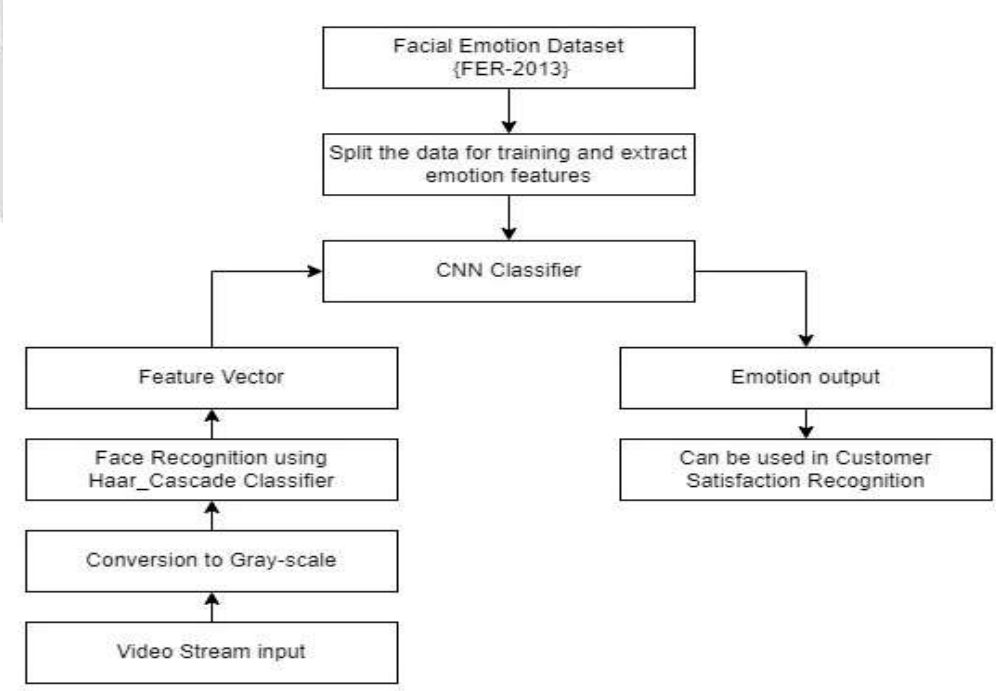

Fig 1. Flow chart for Facial Emotion Recognition

4. SYSTEM ARCHITECTURE

It consists of the following steps:

1. Data Preparation
2. Feature Extraction using Deep CNN

3. Visualization
4. Training and Testing of Data
5. Identifying Expressions
6. Result with the Polarity of the person like- Satisfactory, Not Satisfactory and Neutral

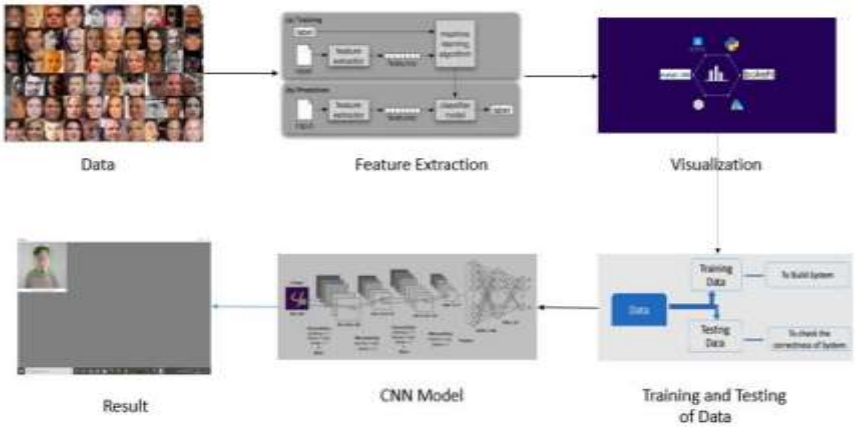

Fig 2. System Architecture for Facial Emotion Recognition

4.1 Convolutional Neural Network (CNN)

CNN is mainly used for image recognition and image classifications. In CNN image classification takes an input image, processes it, and classifies it under certain categories. CNN is another type of neural network that can be used to enable machines to visualize things and perform tasks such as image classification, image recognition, object detection, etc. Image classification is the task of taking an input image and outputting a class (Handgun, Hammer, Axe, Knife, etc) or a probability of classes that best describe the image. CNN is a specialized type of neural network model designed for working with image data.

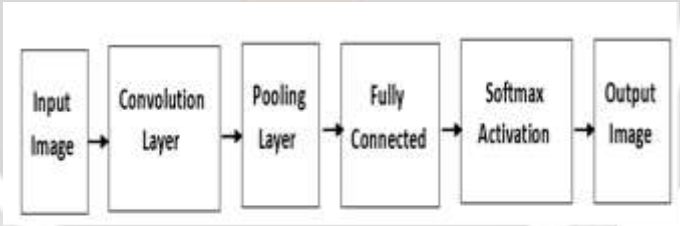

Fig 3. CNN model

The convolutional layer operates called a convolution, hence the neural is called a convolutional neural network. It extracts features from the input image. Convolution is a linear operation that involves the multiple of a set of weights with the input by Paul Viola and Michel for recognizing faces in the given image. Haar features are different from the primary features of images which are color, text, and shape. Generally, these Haar features are Edge, Line, and Rectangle like in convolution networks. It is just like the kernel in CNN. Every feature obtained from this is a single value. This can be achieved by subtracting the sum of pixels in the white area by the sum of pixels in the black area on one edge

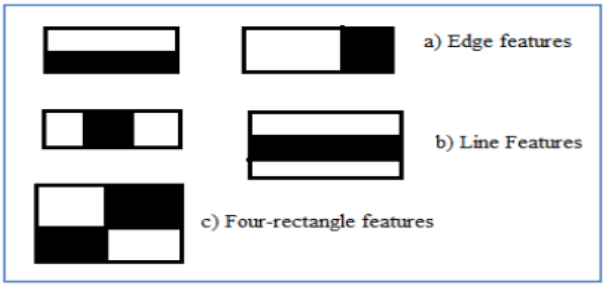

Fig 4. Haar Features

This algorithm passes into four steps. 1. Selection of Haar Features 2. Integral Image Creation 3. Training of input images dataset with AdaBoost algorithm. 4. Finally Apply Cascading Classifier for detecting face images and non-face images.

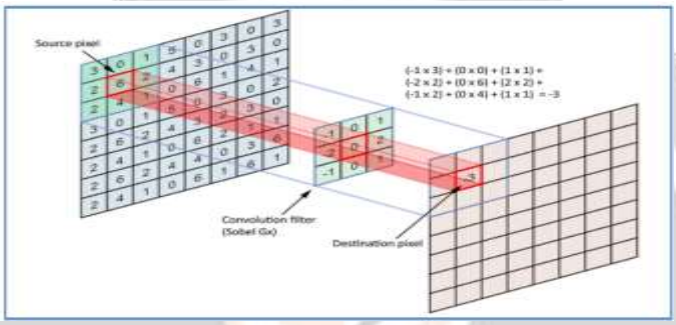

Fig 5. Calculating output one-pixel value using four rectangular edge features in the input image

Grayscale conversion and noise removal- Commonly known as smoothening to avoid noise and to get clear data Subtraction operation between the background and the foreground- To differentiate between the background and the foreground Apply a threshold to the image resulting from the subtraction- The threshold will ensure that we keep pixels that exceed the defined threshold.

5 RESULTS

These six emotions are classified into three customer satisfaction levels. Happy and Surprise are classified as Satisfactory, Sad, Angry, and Disgust are Completely Not Satisfactory, and Neutral are Neutral class.

Fig 6. Detection of Emotion

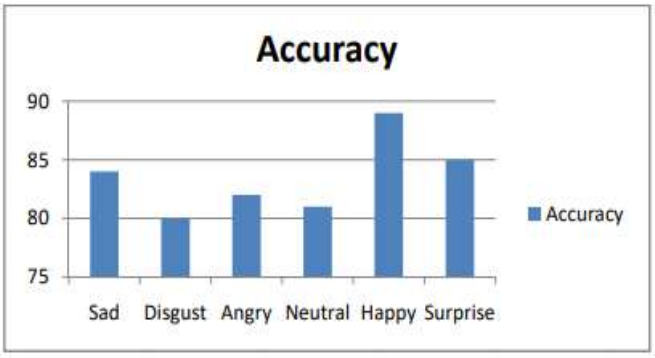

Chart -1. All six expressions are accurate on test data. Identified happy expression is nearly 89% accurate using the Deep CNN algorithm.

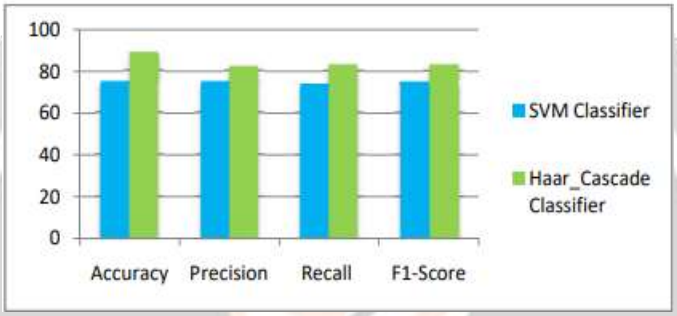

Chart -2. Comparison of Proposed Haar_cascade Classifier with SVM for detecting faces in Images

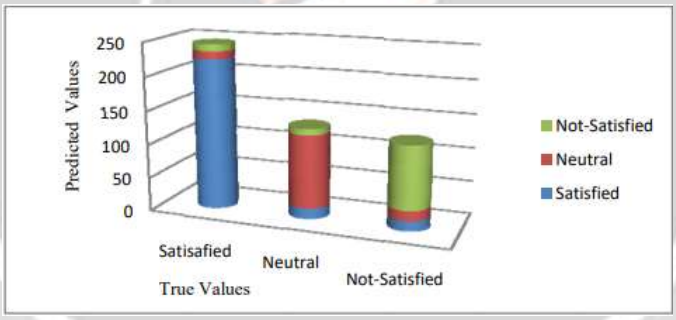

Chart -3. Kinds of Customer Satisfaction levels.

6 CONCLUSION

Facial Features are one of the most potent channels for Emotion recognition. We have developed a computer vision system that performs face detection, age and gender classification, and emotion classification in a single integrated module. Convolutional Neural Networks (CNN) can be used as a solution in recognizing Emotion and hence recognizing Customer Satisfaction. Different techniques like VGG and OpenCV are studied and are used to implement the customer satisfaction, recognition model.

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