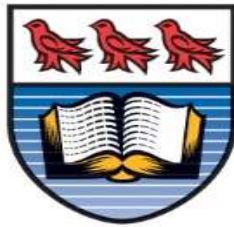


Artificial Intelligence

Project Report on Human Face Recognition System



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Index

Chapter 1: Introduction	1
1.1 Emotion Recognition	2
1.2 Facial Expressions of emotion	2
1.3 Facial Expression Classification	5
1.4 Basic Structure of Automatic Facial Expression Recognition Systems	7
1.5 Viola Jones Algorithm for Facial Emotion Recognition System	8
Chapter 2: Literature Survey	12
Chapter 3: Problem Formulation and Objectives	19
3.1 Problem Formulation	19
3.2 Objectives	19
Chapter 4: Research Methodology	20
References	24
Appendix	26

List of Tables & Figures

Fig 1: Basic Structure of Facial Expression Recognition Systems	7
Fig 2: Research methodology for method	20

Chapter 1

Introduction

A facial appearance is an obvious indication of the emotional state, psychological movement, goal, identity, also, psychopathology of a man, it plays an informative part in relational relations. Facial articulations, and different motions, pass on non-verbal correspondence prompts in up close and personal cooperation. These prompts may likewise supplement discourse by helping the audience to inspire the proposed importance of talked words. Outward appearances have an extensive impact on a listening questioner; the facial articulation of a speaker represents around 55 percent of the impact, 38 percent of the last is passed on by voice pitch furthermore, 7 percent by the talked words [1].

Facial appearance acknowledgment is a procedure performed by people or PCs, which comprises of:

1. Finding faces in the scene (e.g., in a picture; this step is likewise alluded to as face identification),
2. Separating facial components from the distinguished face area (e.g., distinguishing the state of facial segments or, then again portraying the surface of the skin in a facial territory; this progression is alluded to as facial element extraction),
3. Investigating the movement of facial components or potentially the adjustments in the presence of facial elements what's more, grouping this data into some facial expression-interpretative classes, for example, facial muscle initiations like frown or smile, feeling (influence) classes like bliss or outrage, state of mind classifications like (dis)liking or inner conflict, and so on (this progression is likewise alluded to as facial appearance translation).

The issue of machine acknowledgment of human facial articulation incorporates three subproblem zones (1) discovering faces in the scene, (2) extricating facial highlights from the distinguished face area, (3) dissecting the movement of facial components as well as the adjustments in the appearance of facial components, and ordering this data into some facial appearance interpretative classes (e.g., feelings, facial muscle activities, and so on.).

In this theory, we will analyze different emotions of face from the dataset of face images using viola jones algorithm and we present our work to show a trust on that it will help in future research in the field of machine learning.

1.1 Emotion Recognition

An emotion is a mental and physiological state which is subjective and private it includes a great deal of practices, activities, musings and emotions. Starting research has been carried out by Charles Darwin and he concluded that emotions are actually species-specific not culture-specific. Other researchers found other six emotional expressions like happiness, disgust, sadness, fear and surprise. Facial enunciations can be considered not similarly as the most customary sort of indicating human emotions yet furthermore as a key nonverbal correspondence procedure. In case beneficial strategies can be acknowledged to subsequently see these facial enunciations, striking updates can be expert in the zone of human PC affiliation. Therefore, research in facial recognition has been started to make enhancements or to detect various facial expressions and emotions. Artificial Intelligence and Machine Learning Algorithms are the most advanced areas in order to gain intelligence to understand how to model and identify emotions. With the recent advancements and improvements, most researchers are extending its applicability to areas like video conferencing avatars and chat room avatars.

1.2 Facial Expressions of emotion

Face plays an important role in non-verbal communications. Facial Expressions figure noticeably in inquire about on nearly each part of feeling. Facial expressions can have non-emotional data related with them also: they help with turn taking, pass on purpose, convey culture-particular signals (for instance winks), and are demonstrative of certain therapeutic conditions, for example, depression or pain. Obviously, this multi-faceted apparatus for expression and correspondence has intrigued analysts for hundreds of years.

Two main approaches are there to measure the facial expressions. The first approach is *message judgment* in which face is read out of emotion and it should be interpreted by the observer. The second approach is *sign judgment* which considers only meaning of expressions and gives conclusions. Message judgment describes the expressions in terms of emotions. Emotions are basically describes by the facial expressions. For example: an anger look is described by tightened

lips and lowered eyebrows. On the other hand, surprise look is described by open mouth and raised eyebrows.

A facial expression is a visible manifestation of an affective state, cognitive activity, intention, personality, and psychopathology of a person; it plays a communicative role in interpersonal relations. Facial expressions can be detected by various methods of biometrics and is useful for the lie detection purpose that is also known as deception detection. There are various general techniques that are used for deception detection on the basis of responses to the questions, body language or the gestures and postures of the person during answering the questions. Facial expressions techniques are much more useful and proved to be more accurate for deception detection. Facial expressions, and different signals, convey non-verbal correspondence prompts in facial-to-facial interactions. These signals may likewise supplement discourse by helping the audience to inspire the expected importance of talked words. One analyst Mehrabian announced that outward appearances considerably affect a listening questioner; the outward appearance of a speaker represents around 55 percent of the impact, 38 percent of the last is passed on by voice pitch and 7 percent by the talked words. As an outcome of the data that they convey, outward appearances can assume an imperative part wherever people collaborate with machines. In this method examination of chose highlights from the picture and a facial database is finished. This system can work in two distinctive courses as indicated by our prerequisite, these are:

- **Facial Verification (or Authentication):** In this, problem picture matches to just a single picture in the database (balanced coordinating), if picture highlights coordinated then confirmation is given else not.
- **Facial Identification (or Recognition):** If the point is to distinguish the facial at that point picture is contrasted with a few pictures (one to many coordinating) in the database one by one and scores are given to each coordinating. The picture that got most elevated scores is chosen to be the nearest to the issue facial.

1.2.1 Head Pose and Eye Gaze

Head pose and eye gaze plays an important role in communications and in expressing affects. Head pose is important to describe some state like interest where the tilting of head is very important. The expression of embarrassment is conveyed by gaze aversion, with nervous smile and downward head motion. Gaze direction is also essential while assessing things like fascination, mindfulness, ability, social aptitudes and emotional wellness, and in addition power of feelings. With a specific end goal to gauge look heading, be that as it may, we likewise need to figure head introduction.

1.2.2 Lie Detection systems

For the lie detection, various expressions of the human face are used. These are:

- Smiles
- Depth of the eye socket
- Anger
- Gap between words
- Movement of lips
- Movement of eyes

Lie Detection Systems using facial expressions is very popular as they are very cost effective and also they don't require any interaction with the user which makes it easy to use. There is no need to make contact with the user because image can be taken anytime without disturbing the user. Image can also be taken from distance. Good cameras are used to take the pictures from distance. People are great at perceiving facials and complex examples. Indeed, even an entry of time doesn't influence this ability and along these lines it might be ideal if PCs progress toward becoming as vigorous as people in facial acknowledgment. Lie identification utilizing Facial acknowledgment framework can help from numerous points of view:

1. Checking for criminal records.
2. Enhancement of security by utilizing reconnaissance cameras in conjunction with facial acknowledgment framework.
3. Finding either individual is correct or off-base.
4. Knowing the correct criminal.
5. Detection of a criminal at open place.

6. Can be utilized as a part of various ranges of science for contrasting an element and an arrangement of elements.
7. Pattern Recognition.

Facial acknowledgment has the advantage of being a detached, non intrusive framework to check individual personality in a "characteristic" and benevolent way. Facial acknowledgment begins with the discovery of facial examples in here and there jumbled foundation, continues by normalizing the facial pictures to represent geometrical and brightening changes, conceivably utilizing data about the area and appearance of facial points of interest, recognizes the facials utilizing suitable arrangement calculations, and post forms the outcomes utilizing model-based plans and strategic input.

- It requires no any physical association for the benefit of the client.
- It does not require any master to translate the correlation result.
- It can distinguish a man from the substantial group.
- It can be utilized for the check of Visas, individual ID, travel permit and other security purposes.
- There is no compelling reason to reach the individual whose picture is to be taken.
- No any damage to the body of the human.

The Lie detection using facial recognition technique used as protocol in facial recognition literature is FERET. It uses three types of sets i.e. training set, gallery set and probe set. The training set is utilized to make the algorithm fit for describing the entire human facial. The gallery and probe set are utilized as a part of testing stage. The gallery set contains the known characters and probe set contains obscure personalities. The algorithm distinguishes the probe pictures by contrasting with gallery pictures.

1.3Facial Expression Classification

Communication of human has two primary perspectives: verbal and non-verbal. In a discourse the trading of data does not happen just through words but rather additionally through outward appearances. In the vast majority of the exploration, specialists consider the six fundamental enthusiastic classes that are generally perceived by [3] in particular: glad, disgust, anger, sadness, surprise and fear. The implications of articulations are as per the following.

Glad: Happiness is the feeling that the vast majority need to involvement. It is a feeling or disposition of accomplishing sub objectives and of being occupied with that one is doing. It is utilized practically synonymous with the joy and fervor. In any case, Pleasure is characterized as a result of positive physical vibes that is an inverse of the physical vibe of torment. Fervor is characterized as the inverse of bluntness. Fervor and delight are diverse encounters, which regularly include bliss.

Disgust: Disgust is a sentiment detests and is the feeling of abhorrence and shirking of anything that makes one debilitated. Individuals can feel sicken from any taste, a scent, a sight, a touch or a sound or even a thought. Nauseate as a rule includes getting rid-off also, making tracks in an opposite direction from reactions.

Anger: Anger is a feeling identified with one's mental elucidation of having been affronted, wronged or denied and a propensity to fix that by striking back. Anger is likely the most perilous feeling. At the point when individuals are furious, they hurt others intentionally. Be that as it may, as per Lazarus, in spite of the fact that outrage is ordinarily named pessimistic feeling, individuals frequently report liking their outrage. Then again, he included that when outrage is acted out, it can have hurtful social or physiological results, particularly when it is not overseen.

Sad: There are many words to portray pitiful sentiments: troubled, disillusioned, down and out, blue, discouraged, despondent, lamented, powerless, hopeless, and troubled. Bitterness can be portrayed just as the feeling of losing an objective or social part. Pity is seldom a brief and detached feeling that incorporates for the most part disillusionment and sadness. It is one of the durable feelings.

Surprise: Surprise is a concise enthusiastic state experienced as the consequence of a sudden occasion. Astonishment can have any valence; that is, it can be impartial or direct, wonderful, or obnoxious. On the off chance that a man encounters an effective or dependable astonish, it might be considered shock.

Fear: Fear is the feeling of expected threat, physical or mental mischief [4,5]. Dread renders a method of preparation to adapt to threat. In this manner, it advances sharpness for the dreaded occasion that can be an envisioned or genuine.

1.4 Basic Structure of Automatic Facial Expression Recognition Systems

In this facial motion and analysis of expression are measured by facial expression analysis. Face Acquisition, facial data extraction and representation and facial expression recognition or classification are the three main steps in Automatic Facial Expression Recognition Systems.

Face acquisition is a handling stage to consequently discover the face area for the information pictures or arrangements. It can be an identifier to recognize confront for each casing or simply identify confront in the primary casing and after that track the face in the rest of the video arrangement. To deal with expansive head movement, the head discoverer, head following, and posture estimation can be connected to a facial acquisition examination system.

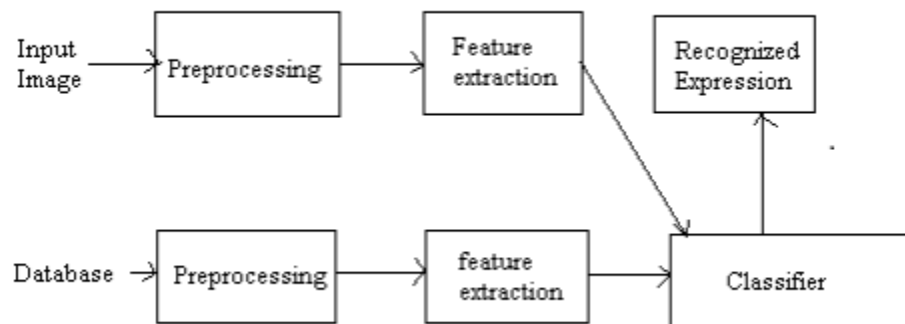


Fig 1: Basic Structure of Facial Expression Recognition Systems

After the face is found, the following stage is to extricate and speak to the facial changes caused by outward appearances. In facial component extraction for demeanor examination, there are primarily two sorts of methodologies: geometric element based techniques furthermore, appearance-based strategies. The geometric facial elements display the shape and areas of facial segments (counting mouth, eyes, foreheads, and nose). The facial segments or facial element indicates are extricated shape a component vector that speaks to the face geometry. With appearance-based strategies, picture channels, for example, Gabor wavelets, are connected to either the entire face or particular districts in a face picture to extricate a component vector. Contingent upon the distinctive facial include extraction techniques, the impacts of in-plane head pivot and distinctive sizes of the appearances can be disposed of by confront standardization before the component extraction or by include portrayal before the progression of articulation acknowledgment. Facial appearance

acknowledgment is the last phase of programmed outward appearance acknowledgment frameworks. The facial changes can be recognized as facial activity units or prototypic enthusiastic articulations.

1.5 Viola Jones Algorithm for Facial Emotion Recognition System

Object recognition is recognizing a predetermined question class, for example, autos, confronts, plates ext. in a given picture or a video grouping. Question identification has numerous applications in PC based vision, for example, protest following, question acknowledgment, and scene observation.

Face discovery has been viewed as the most perplexing and testing issue in the field of PC vision, because of the vast intra-class varieties caused by the adjustments in facial appearance, lighting, and demeanor. Such varieties result in the face dispersion to be very nonlinear and complex in any space which is straight to the first picture space. Besides, in the uses of genuine observation and biometric, the camera confinements and stance varieties make the conveyance of human faces in include space more scattered and entangled than that of frontal countenances. It additionally confounds the issue of powerful face identification.

Face discovery systems have been investigated for a considerable length of time and much advance has been proposed in writing. The majority of the face discovery techniques concentrate on identifying frontal appearances with great lighting conditions. As indicated by Yang's study, these strategies can be classified into four sorts: information based, include invariant, layout coordinating and appearance-based.

- Information based techniques utilize human-coded tenets to demonstrate facial elements, for example, two symmetric eyes, a nose in the center and a mouth underneath the nose.
- Highlight invariant techniques endeavor to discover facial components which are invariant to posture, lighting condition or pivot. Skin hues, edges and shapes fall into this class.
- Format coordinating strategies compute the connection between's a test picture and pre-chosen facial layouts.
- Appearance-based, receives machine learning strategies to remove discriminative elements from a pre-named preparing set. The Eigen face strategy is the most crucial technique in this class.

Any of the techniques can include shading division, design coordinating, factual examination and complex changes, where the shared objective is arrangement with minimum measure of blunder. Limits on the characterization exactness change from strategy to strategy yet the best systems are found in zones where the models or guidelines for arrangement are dynamic and delivered from machine learning forms.

Paul Viola and Michael Jones exhibited a quick and hearty strategy for confront location which is 15 times snappier than any method at the season of discharge with 95% precision at around 17 fps.

1.5.1 Viola Jones Algorithm Introduction

The algorithm depends on the utilization of basic Haar-like components that are assessed rapidly using another picture portrayal. In light of the idea of a "Fundamental Image" it creates a substantial arrangement of elements and utilizations the boosting calculation AdaBoost to lessen the over-entire set and the presentation of a degenerative tree of the helped classifiers accommodates powerful and quick impedances. The indicator is connected in a checking style and utilized on dark scale pictures, the filtered window that is connected can be scaled, and in addition the components assessed.

In the procedure just straightforward rectangular (Haar-like) highlights are utilized, reminiscent to Haar premise capacities. These components are equal to power contrast readings and are very simple to process. There are three element sorts utilized with shifting quantities of sub-rectangles, two, two rectangles, one three and one four rectangle include sorts. Utilizing rectangular components rather than the pixels in a picture gives various advantages, specifically a kind of especially appointed space information is suggested and in addition a speed increment over pixel based frameworks. The count of the elements is encouraged with the utilization of an "essential picture". With the presentation of a necessary picture Viola and Jones can ascertain in one go of the specimen picture, and is one of the keys to the speed of the framework. A necessary picture is like a "summed are table", utilized as a part of PC designs yet its utilization is connected in pixel range assessment.

It was plot that the usage of a framework that utilized such components would give a list of capabilities that was extremely substantial, thus the list of capabilities must be just limited to few basic elements. This is finished with the utilization of

boosting calculation, AdaBoost. Obstruction is upgraded with the utilization of AdaBoost where a little arrangement of components is chosen from an expansive set, and in doing as such a solid theory is framed, for this situation bringing about a solid classifier. Basically having a lessened arrangement of elements was insufficient to diminish the huge measures of calculation in a finder assignment, since it is normally a probabilistic one, henceforth Viola and Jones proposed the utilization of degenerative tree of classifiers.

Portrayed by Viola and Jones as a degenerative tree, and at times alluded to as a choice stump, its utilization additionally speeds the location procedure. A degenerative tree is the daisy tying of general to particular classifiers, whereby the initial couple of classifiers are sufficiently general to markdown a picture sub window et cetera the season of further perceptions by the more particular classifiers down the chain, this can spare a huge level of calculation.

1.5.2 Components of the framework

The attributes of Viola–Jones calculation which make it a decent recognition calculation are:

Strong – Very high true-positive rate and low false-positive rate dependably.

Real-time – For applications which are practical required no less than 2 outlines for each second should be prepared.

Face discovery just (not acknowledgment) - The objective is to recognize faces from non-confronts (identification is the initial phase in the acknowledgment procedure).

1.5.3 Viola Jones Features

In Viola-Jones framework a basic component is utilized, with connection to the capabilities.

Viola and Jones make take note of that the reality the selection of components rather than a measurable pixel based framework is critical because of the advantage of specially appointed space encoding. On account of face identification this is especially critical. Elements can be utilized to speak to both the measurably close facial data and inadequately related foundation information in an example picture.

In its easiest shape the elements can be thought of as pixel power set assessments. This is the place the entirety of the luminance of the pixels in the while area of the element is subtracted from the aggregate of the luminance in the staying dark segment. This distinction esteem is utilized as the component esteem, and can be joined to shape a feeble speculation on areas of the picture. Inside the usage four of the Haar-like components are picked, the first with flat division, the second a vertical, the third containing two vertical divisions and the last containing both the even and vertical division. The elements are called Haar-like as a result of their similarity to Haar-premise capacities.

Chapter 2

Literature Survey

KM. Rajesh et.al (2016) presents a system for recognition of face and face emotions on the basis of actions and features of face. Different numbers of key features are considered in order to predict the user and their emotions of face. The different emotions of face can be determined by analyzing the difference in each facial features or expressions. In order to recognize and classify emotions of face, various Machine Learning Algorithms are used. Different set of images are taken and training is provided to those images. In this paper, the algorithm which is proposed is implemented using Machine Learning with python and open source computer vision (OpenCV). To detect the different emotions of faces, Support Vector Machine Classifier has been used. This classifier helps to classify the different classes of emotions in a very correct way. If the numbers of images get increased then the accuracy can also be increased significantly. By using this classifier, the detection time is very less due to which the system takes less run time with high accuracy [3].

M. Divya et.al (2016) presented an approach to detect and recognize faces. Face detection has attracted colossal interest as it has many packages in automatic control system and computer vision conversation. Face detection is a technique to detect a face from a photo that has several attributes in that photo. A deep research in face detection, face tracking, expression recognition and pose estimation is required. The difficult task is to detect the faces which are different in their size, color and shape etc. The task get more difficult when the image is not clear like it is covered by other object and there is no proper lightning. In this paper, Principal Component Analysis technique is used for face recognition and Viola Jones algorithm is used for face detection. Combination of both these techniques gives the result of high accuracy and fast detection. The problem occurs here when the size and resolution of image is large as it takes large computation time to detect and recognize the face [4].

J. Yousra et.al represented Biometric machine of face detection and recognition in coloration photos. The face detection technique is primarily based on pores and skin coloration records. A new set of rules is proposed which will detect mechanically face features (eyes, mouth and nostril) and extract their correspondent geometrical factors. To attain the face recognition, two

architectures of neural networks are proposed and performances are compared. In this two types of features- Gabor coefficients and Geometric distances are also compared which can be used either jointly or independently. The result shows that the Gabor coefficients are more influential than Geometric distances. Two neural networks architectures are trained by three characteristic vectors. The first consists with the aid of geometrical distances routinely extracted, by means of our gadget, among the fiducial points, the second one is composed by means of the responses of Gabor wavelets applied inside the fiducial points and the 0.33 consists by using the combined information among the preceding vectors. A comparative look at among them is finished [5].

S. Mohammed et.al (2016) determined a Multi-feature characterization strategy for finding the efficiency of face recognition. Face reputation have become a day by day area in human life. At the paintings, with our PDP and clever phones, for our each day help, our safety and plenty of different utilities, face popularity has crossed the laboratory doorways and colonized the human quotidian. However, the effectiveness of the advanced programs still encounters many challenges. The supplied paintings in this paper attempts to cope with those challenges with the aid of proposing an advanced characterization manner to enrich the characteristic vectors utilized by the classifiers to confirm or become aware of faces. This technique became done by way of compiling three types of characteristic vectors. At first, we collect a characteristic vector related to the geometric data of the face using Zernike moments; then spectral components the use of DCT are extracted to form the second sort of feature vectors and ultimately, the final characteristic vector kind is fashioned via compiling the feel and luminance data the usage of LBP. The three vector types are then combined to shape an enriched characteristic vector which turned into submit-processed through a function selection technique then offered to center of a neural community classifier [6].

D. Surya et.al (2015) described that face popularity is a crucial and secured manner to guard the frauds at everywhere like authorities corporations are investing a considerable amount of assets into improving security systems as result of latest terrorist activities that dangerously exposed flaws and weaknesses in nowadays safety mechanisms. Password-primarily or Badge based authentication methods are too clean to hack. Biometrics represents a valid opportunity however they go through of drawbacks as well. In this paper, neural based algorithm is applied by feed forward neural network and fuzzy based neural network with infrared and optical image. The dimensionality of an image is

reduced by Linear Discriminant Analysis (LDA) and Haar Wavelet + LDA. The proposed algorithm is implemented on MATLAB framework. The test samples of infrared and optical images are feature extracted and testing is done by feedforward neural network fuzzy neural network for verification and security [7].

S. M. Lajevardi et.al (2013) represented PCA technique which is also known as eigen face approach for recognizing facial expressions. PCA reduces the dimensionality for effective face indexing and retrieval. The fundamental intention of PCA is to reduce the dimensionality for powerful face indexing and retrieval. PCA makes use of linear projection, which maximizes the projected pattern scattering. The identification of the character is the only changeable factor. PCA suffers problem when factors like lighting and viewpoints get changed. The Eigen facial result is stored in the repository along with diverse images of training set which is obtained by subtracting average facial from the training set facial.

M. Valstar et.al (2011) the investigation of utilization of neighborhood parametrized model of picture movement for recuperating and distinguishing the non-unbending and explained movement of human countenances. Parametric stream models (for instance relative) are prevalent for assessing movement in unbending scenes. We watch that inside neighborhood districts in space and time, such shows exactly display non-unbending facial movements as well as give a brief portrayal of the movement regarding a little number of parameters. These parameters are instinctively identified with the movement of facial characteristics throughout facial outflows and we indicate how articulations, for example, outrage, bliss, shock, fear, disdain and pity could be distinguished from the neighborhood parametric movements in the vicinity of noteworthy head movement. The movement following and outflow distinguishment methodology performs with high correctness in far reaching research facility analyses including 40 subjects and additionally in TV and film successions [8].

S. Moore et.al (2013) developed a method which is based on Fisher's LDA. To improve the accuracy of face recognition 1DLDA and 2DLDA are extended in color space. In order to generate color LDA subspace a 3-D color tensor is used. In this paper, recognition rate of 2DLDA is increased by horizontal unfolding while recognition rate for 2DPCA is increased by vertical unfolding.

H. Meng et.al (2011) we propose a technique for programmed feeling distinguishment as a component of the FERA 2011 rival. The framework

concentrates pyramid of histogram of slopes (PHOG) and neighborhood stage quantization (LPQ) characteristics for encoding the shape and appearance data. For selecting the key edges, K-methods grouping is connected to the standardized shape vectors determined from imperative neighborhood model (CLM) built face following in light of the picture groupings. It contains both individual particular and individual autonomous segments. For feeling order we utilize help vector machine (SVM) and biggest edge closest neighbor (LMNN) and contrast our outcomes with the precomputed FERA 2011 feeling test gauge [9].

A. Dhall et.al (2011) The CERT framework naturally appraises facial movement power and head position utilizing educated appearance-built models in light of single casings of feature. CERT yields were utilized to infer a representation of the force and movement in every feature, comprising of the extremes of uprooting, speed and quickening. Utilizing this representation, feeling identifiers were prepared on the FERA preparing samples. Investigates the discharged allotment of the FERA dataset are introduced, and in addition comes about on the unseeing test. No attention of subject character was considered in the visually impaired test. The F1 scores were well over the standard measure for triumph [10].

G. Littlewort et.al (2011) investigated the expression based and geometry based data in every edge and also helps in investigating connection between the edges. In reality, here they introduced a technique which is picture based and also represented another reference picture called avatar reference. It helps to remove the outliers and also provides a good strategy to deal with the data of total element of different lengths. They have described the methodology in three steps: 1. Identification of face, 2. Face mobilization of feature edges with avatar reference, 3. Processing of different characteristics of face using quantization of neighborhood stage and paired examples of nearby region. 4. The sorting arrangement of characteristics of face with the machine classifier. The exploratory outcomes exhibit that the data caught in an EAI for a facial interpretation is an exceptionally solid signal for feeling deduction. Besides, our strategy stifles the individual particular data for feeling and performs well on unseen information [11].

F. Zhou et.al (2010) Most modified assertion examination systems try to recognize somewhat set of prototypic articulations, for instance, happiness, shock, astound, and fear. Human emotions and points are more customarily conferred by movements in one or several discrete facial aspects. In this paper, we make a customized face examination (AFA) schema to research facial

outpourings needy upon both never-ending facial attributes (brows, eyes, mouth) and transient facial qualities (reaching out of facial scores) in an about frontal-point of view face picture game plan. All around taking after, distinct parametric depictions of the facial qualities are concentrated. The generalizability of the system has been attempted by using independent picture databases assembled and FACS-coded for ground-truth by unique investigation bunch [12].

T. Wu et.al (2010) Spatial Gabor vitality channels (GE) are a standout amongst the best methodologies to speak to facial declarations in workstation vision provisions, including face distinguishment and statement investigation. This proposes that spatio-fleeting Gabor channels may give of service representations to provisions that include feature successions. In this paper we investigate Gabor movement vitality channels (GME) as an organically roused representation for element facial interpretations. Investigates the Cohn-Kanade statement dataset indicate that GME outflanks GE, especially on troublesome low power declaration separation [2].

M. Agarwal et.al (2010) projected that human face is a complicated multidimensional visual version and growing a computational version for FR is hard. Authors have utilized Feed Forward BPNN for faces recognition. An unsupervised PR system is unbiased of immoderate geometry & computation. Additional ANN was utilized for organization. Concept of NN is utilized due to its capability to examine from discovered information. ANN-based technique is impartial of any bug features decision [13].

B. Klarea et.al (2010) gives a local feature-based technique for alike facial sketch photos to face pictures, called feature -based approach for accomplishing such matching. Approach projected varies meaningfully from issued methods, which utilizes a local feature-based demonstration to evaluate sketches & images. In instruction to evaluate likeness among a sketch & an image, author first signifies every picture utilizing a SIFT- based feature descriptor at consistently tested covers throughout face. It is a famous approach for locating correspondences among photographs [14].

K. Ramesha et.al (2010) projected feature extraction- based FR with only minor training units & it produces desirable effects even with one picture according to individual. Geometric functions of facial picture like mouth, eyes, nose, and so on are situated with the aid of canny edge operator and FR is accomplished. Facial image Geometric features are received based on balance of human faces and

variant of grey levels. Canny algorithm for edge detection discovers edge through searching out local maxima of gradient of $f(x, y)$. In extraction of feature, an aggregate of global & grid features are utilized to feature extract [15].

E. Hjelmås et.al (2000) presented a Gabor features for strong FR. Conferring to his algorithm, for face image processing, picture was filtered with a series of Gabor filters [12] and multiply filtered picture with a 2D Gaussian to focus on face center, & evade features extraction at face outline. This picture is then looked for heights that are described as exciting feature points for FR. At every top, a feature vector is removed containing of Gabor coefficients & additionally save position and class label [16].

Caifeng Shan et.al (2009) described that facial expression detection is evaluated on the base of statistical local and binary local binary patterns. In this research work, further number of methods has been applied on the recognition process like SVM, LBP, and LBP boost. Finally it is concluded that for low resolution facial images, LBP method works effectively. **S.P. Khandait (2011)** represented that detection of still frontal facial appearance based on emotions is extracted. In this work, Feed Forward Neural Network has been applied for the classification of emotions and mainly seven emotions like surprise, neutral, sad, disgust, fear, happy and angry, has been detected. NN has been applied along with some pre and post processing methods like morphological operations, edge detection etc [17].

Nooshin NabiZadeh et.al (2013) find seven facial expressions by the use of ANN. Firstly segmentation is done using Wavelets then feature extraction is done using PCA and Finally ANN is applied to get the results. **C. Chen et.al (2011)** represented that facial expressions are recognized on the basis of time facial landmarks. Here two classification methods are used i.e. SVM and Ada Boost. The results obtained from SVM are 95% whereas from Ada Boost it is 91% [18].

L. Wiskott et.al defines Matching algorithm for Elastic Bunch Graph which identifies faces by corresponding probe series signified as input face diagrams, to set of arcade that is signified as model face diagrams. Essential to Elastic Bunch Graph Matching is nodes perception. Basically, every input face graph node is signified by using a face precise feature point. Such as, a node signifies an eye & additional node signifies nose & idea lasts for signifying additional features of face. Therefore, nodes for input face chart are organized to form a graph-like DS that's suited for face shape [19].

P. Kalocsai et.al discovered weighting Gabor kernels effect to enhance FR, wherein 40 Gabor kernels were formed from 48 face feature points. Authors establish from use of a Caucasian faces dataset that maximum biased face features were located across eyes and forehead. In comparison of, least biased face features were face mouth, cheeks, lower outline & nose. They resolved utmost weighted kernels would offer an extra compact face representation and obtain better recognition rates through usage of peak weighted kernels in comparison to deepest weighted kernels [20].

Chapter 3

Problem Formulation and Objectives

3.1 Problem Formulation

Emotions can be communicated from various perspectives that are visible like by various signs, outward appearances, speech and by other content which is written in papers and reports. Detection of emotions in different content reports is actually based on the region of machine learning and natural language processing areas. There were some issues because of the improper matching technique with the faces. Emotion detection is considered as one of the most important technique in human-machine communication. A lot of work has been carried out by lot of researchers to identify the feelings of different faces even to identify the facial information from the text based data is still a new topic of research. In the similar way, we need to prepare a framework to detect the emotions of faces. The original data required for setting up a recuperation display is generally procured by averaging the inclinations of subjects. This methodology, regardless, makes little usage of the one of a kind comments designated by every one subject.

3.2 Objectives

The essential target of this is the programmed recognition of human sentiments. Emotions are important for individuals, influencing general activities, for instance, wisdom and making decisions. Instead of talking the people are communicated through various facial expressions, signs and other non-verbal communications which don't involves any talking and written communication. Large number of physiological pointers stores the information about the various excitement faces of different persons. To describe the different emotions of faces different sensor signs are used.

The main objective of this research is to find and join new techniques for human emotion detection so that better outcomes can come in this most innovative field of research. We will also use the eye recognition phase that will enhance this detection system. For the trademark extraction of face, neighborhood twofold case will be utilized.

Chapter 4

Research Methodology

The methodology involves different phases for face emotion detection system.

The explanation of different phases of face emotion recognition system is as follows:

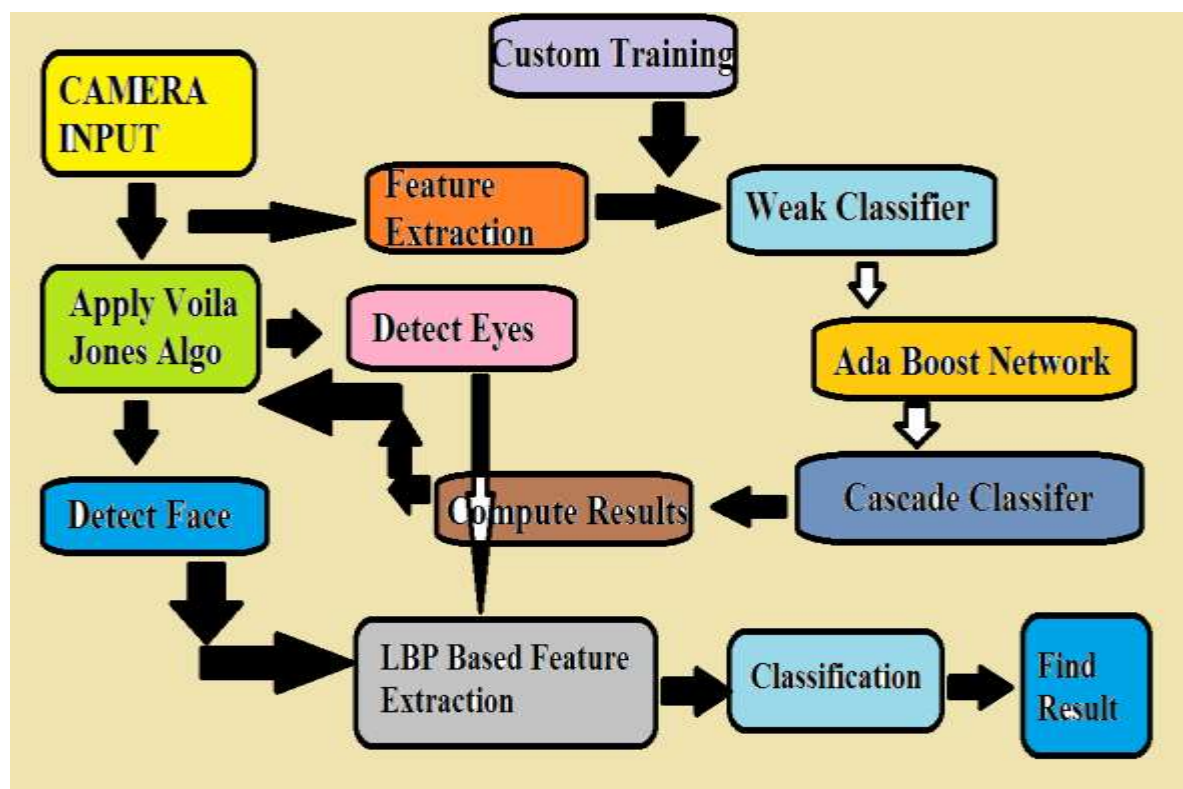


Fig 2: Research methodology for method

1. **Voila Jones calculation:** Viola-Jones entity discoverer acts as an indicator that uses numerous characteristics for sub-section of picture. The main target of this algorithm is to find various facial expressions and their edges and along these edges find the various movements of face and then make proposals according to them. On a mobile phone, we need plots from the Polaroid and start with the calculations on the android phone with the Open CV and do the changes in the server and after then send back the result to the phone. There may be the case when the human face is accessible and then the facial qualities of the face will be

retained. When the starting calculation gets completed, the phone transfers the whole data to the server with the help of http.

2. Neighborhood matched case for trademark extraction: In perspective of the easiness in calculations, administrator of LBP piece has been changed to an outstanding methodology in various acquirements. The most important property of the master of LBP in exact acquisitions is its drive to dull scale developments i.e. by illuminating blends. The hindrances in this framework is very much tricky and a long town approach which we are facing now. In order to remove this issue, new methodology is proposed.

3. Classifiers for highlight extraction: Ada Boost estimation and Haar trademark are used to set up the classifier. In this the OpenCV library is used in order to relate the conjunction with HCI, biometrics, mechanical building, and unmistakable degrees where representation is necessary and also combine the uses of Haar classifier technique with it. These pictures contain articles which are standard, in an indistinguishable way from paperclips, and of consistent point of view, in an indistinguishable course from photos of backcountry and mountains. Recalling the completed goal to deal with the most persuasive facial trademark ID conceivable, the main profitable arrangement of pictures should be capable of the modification between various characters which includes age, sexual presentation and race etc.

4. Ada Boost framework: AdaBoost is a forceful learning calculation which creates a solid classifier by picking visual elements in a group of basic classifiers furthermore, consolidating them straightly. The group of straightforward classifiers contains basic rectangular wavelets which are reminiscent of the Haar premise. Their effortlessness furthermore, another picture portrayal called Integral Image permit an exceptionally snappy registering of these Haar-like elements. At that point a structure in course is acquainted all together with dismiss rapidly the simple to order foundation locales furthermore, concentrate on the harder to order windows . For this, classifiers with an progressively many-sided quality are joined consecutively. This enhances both, the location speed and the identification effectiveness. The identification of countenances in input pictures is continued utilizing a checking window at various scales which licenses to identify appearances of each size without re-examining the first picture. Then again, the structure of the last classifier permits a constant usage of the locator.

5. Weak Classifiers: The center deduction gave in the framework is brought using "weak classifiers" where k_j is a weak classifier having a straightforward structure containing a parity vector t_j and a feature vector v_j . A classifier set which is weak is basically created when the total list of capabilities has been determined. From the list of capabilities it is conceivable to assess the individual classifier edges (over an extensive picture dataset) and furthermore characterize the equality of every classifier.

6. LBP Based Feature Extraction:

In the LBP approach for surface arrangement, the events of the LBP codes in a picture are gathered into a histogram. The characterization is then performed by processing straightforward histogram similitudes. In any case, considering a comparative approach for facial picture portrayal brings about lost spatial data and along these lines one ought to arrange the surface data while holding likewise their areas. One approach to accomplish this objective is to utilize the LBP surface descriptors to construct a few neighborhood depictions of the face and join them into a worldwide portrayal. Such nearby depictions have been picking up intrigue recently which is reasonable given the confinements of the all-encompassing portrayals. These neighborhood include based techniques are more strong against varieties in posture or brightening than all encompassing strategies.

7. Cascade Classifier:

The cascade classifier is made out of stages each containing a strong classifier from AdaBoost. The occupation of each organize is to decide if a given sub-window is definitely not a face or perhaps a face. At the point when a sub-window is arranged to be a non-confront by a given stage it is promptly disposed of. Then again a sub-window delegated a may be face is passed on to the following stage in the course. It takes after that the more stages a given sub-window passes, the higher the possibility the sub-window contains a face. The AdaCascade content contains the execution of AdaBoost learning under Cascade structure. In our execution the principal organize trains a solid classifier by the AdaBoost methodology with highlights from all preparation tests. At that point we utilize the solid classifier to characterize preparing tests and ascertain false positive and false negative means this stage. The second stage will prepare a solid classifier utilizing just the specimens named positive by the primary stage. Utilize the solid classifier to arrange the rest of the examples and ascertain the false positive also, false negative mean this stage. Rehash the stages until the point that one phase

accomplishes zero false positive and false negative. Every single solid classifier limit in each stage are spared to shape the last Cascade classifier.

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Appendix

Contribution of each team member

Mansi Lamba: Basically focused on the Literature Survey, Problem Formulation and its objective

Jaspreet Kaur & Prabhjot Kaur: Focused on Feature Extraction using Viola Jones Algorithm, Segmentation of the image into different parts and obtained histograms for the extracted feature using Local Binary Pattern

Manpreet Kaur & Maninder Singh: Focused on Introduction and implemented the code using Matlab