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Classification of Human Faces and Non Faces Using Machine Learning Techniques

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ABSTRACT

Face discovery procedure is utilized for confront validation and check and face identification is a front piece of face acknowledgment. It is utilized as a part of many fields, for example, confirmation security, video reconnaissance and human cooperation framework. In this paper we have gathered information of 400 appearances from school understudies in Muzaffarabad, Azad Kashmir. In addition, 50 non-faces are additionally gathered. The two countenances and non-faces are pre-handled utilizing Foundation Disposal, Clamor Decrease, Width Standardization and Diminishing. After the pre-handling, we have separated highlights from 400 countenances and 50 non-faces including Geometric Highlights, for example, Picture Trimming, Vertical/Even Projection, Worldwide Highlights, for example, Angle Proportion, Standardized Territory of Appearances and Non-faces, Focus of Gravity, Incline of Line joining the focal point of Gravity and surface highlights. At long last, we have connected Machine Learning Techniques, for example, Bayes, Capacity, Apathetic, Meta, Misc, Guidelines and Tree to arrange the countenances and non-faces utilizing 10 overlay cross approval. Hyper Channels gives a general higher precision of 99.8%, while ADTree, LWL and LogiBoost gives exactness of over 99%. The normal AUC of ROC esteem was figured as 96.08%.

Keywords: classification, receiver operating curve, feature extraction, pre-processing, cross validation

I. INTRODUCTION

Face acknowledgment is a procedure that is utilized to distinguish a man from his/her advanced picture .It is useful in day by day life, for example, for security get to, control frameworks, content based ordering and bank employee machines. In confront acknowledgment, include based methodologies are utilized. Different methodologies have been utilized as a part of grouping and perceiving faces including standards segment investigation, nearby element extraction, neural systems similar examination and outspread premise work. Face location is front end of face acknowledgment. It finds and portions confront locales from jumbled pictures, either got from video or still picture. The Vital Segment Examination (PCA) is one of the numerical strategies that have been utilized as a part of picture acknowledgment and pressure. The occupations which PCA can do are forecast, excess expulsion, highlight extraction, Original copy got November 1, 2013; updated February 11, 2014 information pressure and so forth. Since PCA is an established method which can accomplish something in the straight space applications having direct models are reasonable, for example, flag preparing, picture handling

framework and control hypothesis, interchanges, and so on. From numerous years loads of work on Face Identification and Acknowledgment has been completed as it needn't bother with human collaboration. We have dataset of Face pictures after Location confined countenances are shaped from which expelled foundation at that point extricated faces are gotten. Pre-preparing is additionally performed then we will prepare the dataset for which we utilize preparing classifiers and after that we perceive the face. Facial pictures are fundamental for astute based human PC communication and it needn't bother with the human collaboration. Numerous strategies are utilized for confront identification from a solitary picture. At the point when a face district is separated in pre-preparing then confinement is finished. In pre-handling of picture brightening to decide particular highlights and picture measure at that point confined picture is coordinated with database by utilizing coordinating calculations. Throughout the most recent couple of decade loads of work is been done in confront location and acknowledgment. Since bunches of strategies are presented for location and acknowledgment which considered as a breakthrough.

Face acknowledgment has gained extensive consideration from both your own PC vision and furthermore esteem handling. The intrigue can be spurred from applications extending from static coordinating of controlled photos similarly as in mug shot coordinating notwithstanding confirmation so as to observation video pictures. Your initial step all through mechanized face acknowledgment is confront location in which City along width size of each face will be resolved. The dependability has a noteworthy impact to the execution and convenience of the entire face id framework.

To deliver completely mechanized frameworks, strong and productive face recognizable proof calculations for the most part are required. Your own particular face can be identified promptly after a man's face comes into a decent view directly after a face will be distinguished, the face district will be edited from the visual to give As "Test" into your present information to keep an eye on for conceivable matches. Ones face 116 obvious is normally pre-prepared viewing things like tasteful size and in addition light and for you to identify Specific has. The points of interest by the realistic are then coordinated against your insight. Your own coordinating calculation will most likely create a closeness measure to its match of the test look into your own particular learning. Preparing the neural system for its face i.e. Business is troublesome from the trouble in describing prototypical "non-confront" pictures. Not at all like face acknowledgment, which the classes keeping in mind the end goal to be segregated are different countenances, you're a few classes with a specific end goal to wind up being separated all through face acknowledgment for the most part are "pictures containing faces" notwithstanding "pictures not containing faces". The thought is easy to get a delegate test of pictures that contain faces, yet considerably harder for getting an extraordinary agent test of the individual which don't.

The target of this examination is to build up a framework which can naturally perceive the substance of a person from a picture and can order the feeling of that person. The framework will initially distinguish the face and afterward separate the facial focuses. In the wake of separating the highlights utilizing diverse strategies, these facial focuses are consolidated together and after that prepared and characterized into various feelings with the assistance of various classifiers.

II. LITERATURE REVIEW

There exist a number of techniques for feature extraction such as geometry based, template based, and appearance based and colour based techniques. Supervised and unsupervised classifier is the existing methods for emotion classification.

Bakshi Urvashi (2014) concludes that feature detection techniques are divided as: Feature based technique and Image based technique. In feature based technique facial features are used for detection process and in image based technique multiple faces with clutter intensive backgrounds are detected. To extract feature or facial points from the image different approaches are existing. They are geometric based technique, template based technique and appearance based technique. In geometric based techniques facial points are obtained using the size and positions of principal elements of images. Using appropriate energy function template based methods extract features. Appearance based approach process the image as two dimensional patterns. For face recognition different approaches of such as holistic, feature-based and hybrid approach are existing. Geometric shapes of principal component of faces are identified in geometry based method. In the holistic approach whole face region is taken into account as input. Hybrid approach is the combination of both methods.

Serban Ovidiu (2013) features from video inputs as well as transcription on audio as text are combined together. This system uses a method called segmented detection instead of using individual classifiers. The emerging idea of multimodal fusion are studied in this research [11]. NGrams, Smile Presence or Valence are the features used for fusion. SVM classifier is used for classification process. YouTube Opinion corpus containing 48 videos are selected for training and testing.

Shigeru Akamatsu (2005) proposes a technique which will automatically recognize images of faces. This system uses a two dimensional Gabor wavelet representation for classification process. Three image sets are tested with sex, race and expression as class labels. Dataset contains 193 images of emotions done by nine female Japanese models. Another dataset used is a facial expression image set with 51 male expressers and 59 female expressers.

Wan-Chi Siu (2004) proposes a more reliable approach for face detection and extraction using genetic algorithm and Eigen face technique. Firstly possible eye contender are detected and based on this possible face regions are detected with the help of genetic algorithm. Every face contender are then normalized by adjusting the shirring angle during head movement. An histogram equalization is done reduce the lighting effects. After that the fitness value of the face is calculated by projecting onto the eigenfaces. Selected facial points are then verified by calculating the similarity and existing facial features. This work shows a great result even though when the image undergoes a shadow or shirred.

Hua Gu Guangda Su Cheng (2003) proposes a method in which feature extraction are automatically performed. The operator SUSAN (Smallest Univalue Segment Assimilating Nucleus) is used to obtain the edge and ridge position of feature. The experiments are conducted on face database that has been created in their own lab itself with 270 people each provided 7 face images. Experimental result shows that locating of feature points is correct and faster.

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III. PROPOSED METHODOLOGIES

Step 1: Collect the database from different persons for face expression using Matlab and collect the raw data into excel sheet.

Step 2: Pre-process and filter the collected raw data into formatted format and also apply filtration techniques like replace missing values etc.

Step 3: Classification using naïve bayes, KNN, MLP, Decision tree using Weka tool.

KNN: K Nearest Neighbour k-NN algorithm is used to classify the data instances. It is an easy technique with low complexity. It is basically a machine learning technique used for pattern recognition, prediction and classification. This technique is iterative in nature to classify unclassified datasets into user specified classes represented by k. The value of k plays important role in this algorithm, selecting the value of k larger may include some not so similar datasets. On the other side, using smaller k may exclude some potential candidates of datasets. In both of these cases, accuracy of classification will decrease. The k-NN algorithm must compute the distance and sort all of the training datasets distance at each prediction. Another issue with this methodology to merging the class labels. It uses the simplest method to take a majority vote, but this can be a tricky if the adjoining neighbors' differ broadly in their distance. In this algorithm, we specify class for confidential attributes.

MLP: Multi-Layer Perceptron: Artificial neural networks are the part of artificial intelligence and MLP is a type of neural network. Multi-Layer Perceptron (MLP) is a feed-forward network that maps the group of inputs to their corresponding outputs. Fig. below demonstrates a feed-forward multi-layer perceptron neural network. MLP is made up of simple neurons termed as a perceptron. Neural network generates information by enabling input perceptron's consisting the values labelled on them. The activation function of neurons is calculated by the formula mentioned below in the output layer.

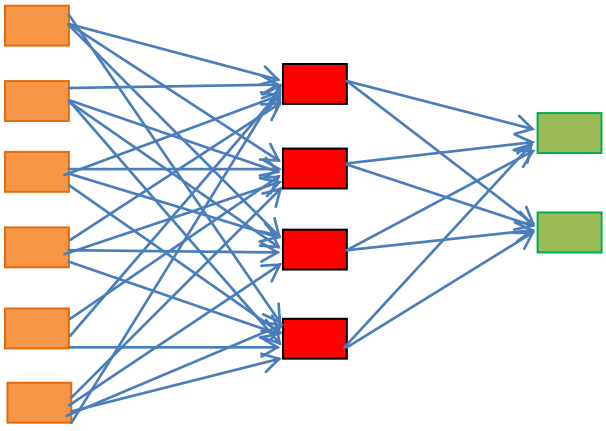

Fig. Multi-Layer Neural Network Architecture

A back-propagation strategy based on delta rule is used to train multilayer perceptron network. MLP consist of various neurons divided into various layers, as follows:

- **Input Layer:** This layer generates the input for the network. The number of neurons depends upon the number of input given to the network.

- **Hidden Layer:** The layer that maps the input to the corresponding output is named as a hidden layer. Hidden layers vary in number.
- **Output Layer:** The layer from where the resultant can be seen. The number of neurons in output layer depends upon the learning of the kind of problem.

The type of relationship between the input and output vectors in MLP is a non-linear relationship. This is done by interconnecting the neurons in the antecedent and succeeding layers. Outputs are achieved by multiplying them with weight coefficients. In the training phase, the neural network is given the information regarding training only. Later on, the weights of the network are tuned between [-0.5, 0.5] to minimize the error rate between the expected and observed outputs and to enhance the frequency of training to a predicted level. A sequence untrained inputs are applied to the input to formalize the training. These input set are different from the inputs that are used for the training of the network. Training of the neural network is highly complex due to a large number of variables. MLP holds lots of advantages over other algorithms even if a correct relationship is not induced between the input and output or if the essential and exact information is not achieved. Non-Linear Activation Function of MLP makes MLP different from other networks.

Decision Tree: A DT classifier uses a tree model to predict the class of an example. The tree consists of one root node, which is where the classifier starts. The other nodes are either leaf nodes, when they have no branches or internal nodes. The internal nodes and the root node represent a feature and a test that has to be performed on that feature. For each possible outcome of the test, the node has a branch that leads to the next node. The leaf nodes eventually indicate a class. A DT classifier predicts the class of an example by following a path from the root node of the tree until it encounters a leaf node. At every node (except leaf nodes) a test is performed to choose which branch to follow to the next node. When a leaf node is encountered, the classifier predicts the class that the leaf nodes indicate.

Parameters for evaluation: The parameters for the evaluation of sentiment analysis include various terms. The terms are True positives, true negatives, false negatives and false positives. These are the terms that are used to compare the class labels assigned to documents with the classes the items actually belong to by a classifier. True positive terms are truly classified as positive terms. False positive are not labelled by the classifier as positive class but should have been. True negative terms are correctly labelled as in negative class by the classifier. False negative terms are those terms that are not labelled by the classifier as belonging to negative class but should have be classified. Confusion Matrix contains these terms that are used for evaluation.

		Correct Labels	
		Positive	Negative
Classified Labels	Positive	True positive	False positive
	Negative	False negative	True negative

Fig. Contingency table

Following are the parameters for evaluation of performance

- **Precision and recall**

Precision and recall are the two metrics that are widely for evaluating performance in text mining, and in text analysis field like information retrieval. These parameters are used for measuring exactness and completeness respectively.

$$\text{Precision}=\frac{\text{True Positive}}{\text{True Positive}+\text{False Positive}} \quad \text{Eq. (1)}$$

$$\text{Recall}=\frac{\text{True Positive}}{\text{True Positive}+\text{False Negative}} \quad \text{Eq. (2)}$$

- **F-measure**

F-Measure is the harmonic mean of precision and recall. The value calculated using F-measure is a balance between precision and recall.

$$\text{F measure} = \frac{2*\text{recall}*\text{precision}}{\text{precision}+\text{recall}} \quad \text{Eq. (3)}$$

- **Accuracy**

Accuracy is the common measure for classification performance. Accuracy can be measured as correctly classified **instances** to the total number of **instances**, while error rate uses incorrectly classified instances instead of correctly classified instances.

$$\text{Accuracy}=\frac{\text{True Positive}+\text{True Negative}}{\text{True Positive}+\text{False Positive}+\text{True Negative}+\text{False Negative}} \quad \text{Eq. (4)}$$

IV. CONCLUSION

In this paper we will collect group faces and non-faces utilizing Machine Learning classifiers. We will build up our essential information of appearances and non-faces utilizing Advanced Camera of 12 Super Pixel from male and female offspring of class 5^{th} to 8^{th} in school. In the wake of gathering the information, we will pre-prepare it for appropriate element extraction and better characterization execution. We will create program in Matlab for pre-preparing and includes extraction. The exactness will check for confirming number of countenances and non-faces subject utilizing distinctive classifiers.

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