AUTOMATIC ATTENDANCE SYSTEM USING FACE RECOGNITION USING NOVEL LOCAL BINARY PATTERN OVER PRINCIPAL COMPONENT ANALYSIS

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Abstract

Aim: This paper presents a mechanised framework for human face acknowledgment in an ongoing foundation world for an enormous natively constructed dataset of people's faces.

Material and methods: The assignment is extremely challenging as the constant foundation deduction in a picture is as yet a test. Expansion to this there is a tremendous variety in human face picture as far as size, posture and appearance. The framework proposed implodes the majority of this difference. To identify ongoing human faces, AdaBoost with Haar course is utilised and a straightforward quick PCA and LDA is utilised to perceive the appearances identified. The coordinate with the face is then used to check participation in the research facility, for our situation. LBP has an accuracy of 99.5% whereas PCA has an accuracy of 89.42%. The statistical significance difference is 0.215 ($p > 0.05$)

Result: It takes input pictures through a web camera consistently till the framework is closed. The caught pictures are then trimmed by the Face Detection module and saves just the facial data in a JPEG organisation of 100 x 100 network.

Conclusion: It can be used in recognize facial expressions for facial recognition systems which are used in take online attandance system.

Keywords: Face Recognition, Eigenface, AdaBoost, Accuracy, Principal Component Analysis, Novel Local binary pattern.

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1. Introduction

In the course of the most recent ten years or something like that, face acknowledgment has turned into a well known space of examination in PC vision (Chen et al. 2019; Juszkiewicz 2014). Face acknowledgment is likewise one of the best uses of picture examination and comprehension (Choi et al. 2022). In light of the idea of the issue of face acknowledgment, not just software engineering specialists are keen on it, however neuroscientists and therapists are likewise intrigued for something similar (Rabbani, Lee, and Desai 2022; Choi et al. 2022). It is the overall assessment that advances in PC vision exploration will give valuable experiences to neuroscientists and therapists into how human cerebrum functions, as well as the other way around (Tistarelli, Bigun, and Jain 2003).

The Subject of ongoing face acknowledgment for video and complex certifiable conditions has accumulated huge consideration for understudies to go to class every day implies online participation framework just as a security framework dependent on face acknowledgment (Neerja, Neerja, and Walia 2008). Mechanised face acknowledgment framework is a major testing issue and has acquired a lot of consideration from the most recent couple of years (Hatzilygeroudis and Palade 2013). There are many methodologies in this field. Many proposed calculations are there to distinguish and perceive individual face structure given the dataset (Pathak and Kulkarni 2011). The new improvement in this field has worked with us with a quick preparation limit and high precision. Haar Cascade Classifier (Dey and Santhi 2016). The endeavours are likewise heading toward the path to remember learning procedures for this intricate PC vision innovation (Mekhilef et al. 2021). There are many existing frameworks to distinguish faces and remember them. In any case, the frameworks are not really productive to have computerised face location, recognizable proof and acknowledgment y4m. A great deal of examination work is heading toward this path to build the visual force of the PC. Thus, there is a great deal of degree in the improvement of visual and vision framework (Pathak and Kulkarni 2011). In any case, there are troubles in the way, for example, improvement of productive visual components, removing calculations and high preparation power for recovery from a colossal picture information base (Lee-Morrison 2019).

The picture is a mind boggling high measurement (3D) lattice and preparing network activity isn't so quick and awesome. Thus, this causes us to deal with a colossal picture data set and spotlight on the new calculations which are all the more continuous and more effective with the greatest level of precision. Proficient and compelling acknowledgment of human face from picture data sets is currently a prerequisite. Face acknowledgment is a biometric technique for distinguishing people by their elements of face. Utilizations of face acknowledgment are generally spreading in regions like criminal ID, security framework, picture and film handling. From the succession of pictures caught by the catching gadget, for our situation camera, the objective is to track down the best match in the information base. Utilising a pre-capacity information base we can distinguish or check at least one character in the scene. The overall square chart for face acknowledgment framework has three principle obstructs: Haar Cascade Classifier, the first is face identification, second is face extraction and the third face acknowledgment

2. Materials and Methods

This work is carried out at Saveetha School of Engineering. The study consists of two sample groups i.e LBA and PCA. Each group consists of 10 samples with pre-testpower of 0.18. The sample size was collected from (Wadawadagi and Pagi 2020) by keeping the threshold at 0.05, G power of 80%, confidence interval at 95%, and enrolment ratio as 1. The dataset used for classification is taken from the github Database of automatic attendance using face recognition, an open-source data repository for Facial recognition.

The dataset contains 3 columns. In the Satz column, it represents the facial images in image files format. In the erkannt (recognized emotions) column, it represents the selection of the sentences that take place with at least 80% correctly recognized emotion. whereas in natuerlich (natural emotion) column, it represents at least 60% of the assessments as AdaBoost natural. The dataset contains 816 instances. The independent variables in this study are image -files and the dependent variables are recognized emotions, natural emotions. The dataset was split into training and testing parts accordingly using a test size of 0.2.

Our institution is passionate about high quality evidence based research and has excelled in various domains (Vickram et al. 2022; Bharathiraja et al. 2022; Kale et al. 2022; Sumathy et al. 2022; Thanigaivel et al. 2022; Ram et al. 2022; Jothi et al. 2022; Anupong et al. 2022; Yaashikaa, Keerthana Devi, and Senthil Kumar 2022; Palanisamy et al. 2022).For training of the LBP, the test set size is about 20% of the total dataset and the remaining 80% is used for the training set. The LBP training set consists in determining a hyperplane to separate the training data belonging to two classes, whereas the PCA model uses backpropagation for training.

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The whole dataset is fitted for training the LBP and PCA model. Accuracies of both models are tested with a sample size of 10.

Novel Local Binary Pattern

A Novel Local Binary Pattern (LBP) algorithm for regression is proposed in this paper. Group 1 is a Novel local binary pattern. A Novel Local Binary Pattern tries to find the hyperplane in a N-dimensional space that distinctly classifies the data points. The data points here are called Novel local binary pattern,which are obtained from extraction and labelling. X-axis is time and the Y-axis is frequency of audio waves taken from a dataset. Using the past labelled data, the Novel Local Binary Patterntries to identify and predict the new data done by model training

$$Accuracy = \frac{TP+TN}{TP+TN+FP+FN}$$

(1)

The accuracy is calculated as in equation 1. First the variables are taken from the dataset. Then perform feature extraction using Mel-frequency cepstral coefficients and classify them into extraction labels i.e facial expression, Hair style, Looks,Facial structure and shapes . Now data is split into a training set and test set using test size=0.2. Scaling the sets using the standard scaler. Fitting the training set with Novel Local Binary Pattern (LBP) and fitting the test set to the model to get final predictions done. Checking the accuracy of the predictions. Pseudocode for the algorithm is mentioned in Table 1. Table 3 consists of accuracy of the Novel Local Binary Pattern.

Principal Component Analysis:

Head Component Analysis, or PCA, is a dimensionality-decrease technique that is regularly used to lessen the dimensionality of enormous informational indexes, by changing a huge arrangement of factors into a more modest one that actually contains the majority of the data in the huge set of AdaBoost. The Z value is computed as in equation 2.

$$Z = \frac{value - mean}{standard\ deviation}$$

(2)

Lessening the quantity of factors of an informational collection normally comes to the detriment of exactness, however the stunt in dimensionality decreases is to exchange a little precision for straightforwardness. Since more modest informational indexes are more straightforward to investigate and imagine and make dissecting information a lot simpler and quicker for AI calculations without incidental factors to process. So to summarise, the possibility of PCA is basically to diminish the quantity of

factors of an informational collection. Pseudocode for the algorithm is mentioned in table 2. Table 4 consists of accuracy of Principal Component Analysis

Statistical Analysis

The minimum requirement to run the softwares used here are intel core I3 dual core cpu@3.2 GHz, 4GB RAM, 64 bit OS, 1TB hard disk space personal computer and software specification includes Windows 8, 10, 11, Python 3.8 and MS-Office.

The Face Detection is predicted by the randomised method, a forest of randomised trees is trained and the final prediction is based on the majority vote outcome from each tree. This method allows weak learners to correctly classify data points in an incremental approach that are usually misclassified.

Statistical package for the social sciences version 26 software tool was used for statistical analysis. An independent sample T-test was conducted for accuracy. Standard deviation, standard mean errors were also calculated using the SPSS software tool. The significance values of proposed and existing algorithms contains group statistical values of proposed and existing algorithms.

3. Results

The framework proposed is an ongoing framework. It takes input pictures through a web camera consistently till the framework is closed. The caught pictures are then trimmed by the Face Detection module and saves just the facial data in a JPEG organisation of 100 x 100 network size (Patnaik, Yang, and Sethi 2020). This is a hued picture grid having three layers. The layers are intended for the red, green, and blue tone in the picture. The pictures are saved in a succession of their event time. That is, the face which is identified first is saved first in the data set and the following is saved at the following spot in the information base. The name of the face picture is basically the numbers with expansion Haar Cascade Classifier jpg. These numbers are the grouping number created at the hour of catching (Cendrillon and Lovell 2000). Descriptive Statistics is applied for the dataset in SPSS and shown in Table 5, Group statistics is shown in Table 6, Two Independent Sample T-Tests in Table 7. Fig. 1shows the Graphical User Interface of the application and attendance system file is shown in Fig. 2. Sample training images used in this work are given in Fig. 3.

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Fig. 1. Initial screen of the system Application GU.
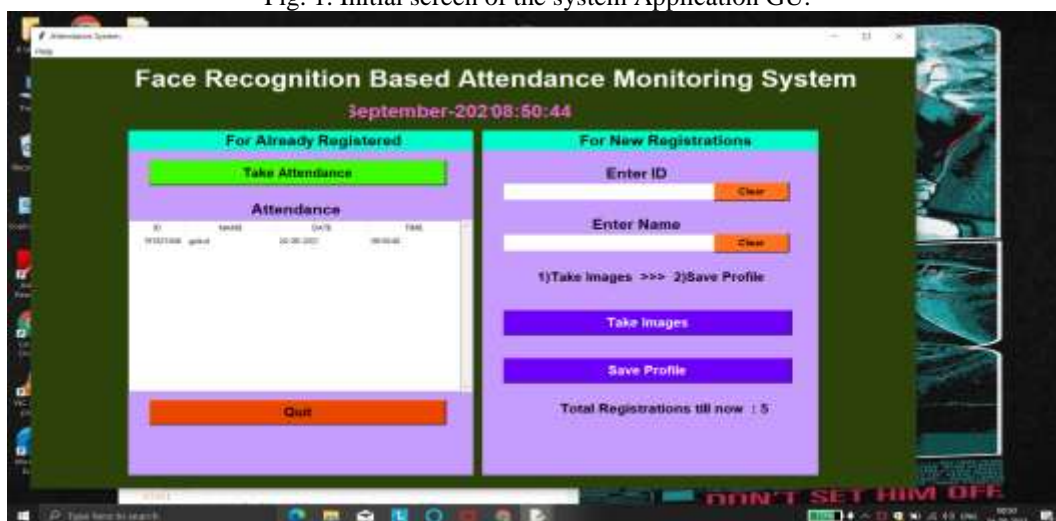
Fig. 2. Real time face detection for attendance System file

Fig. 3. Training Image

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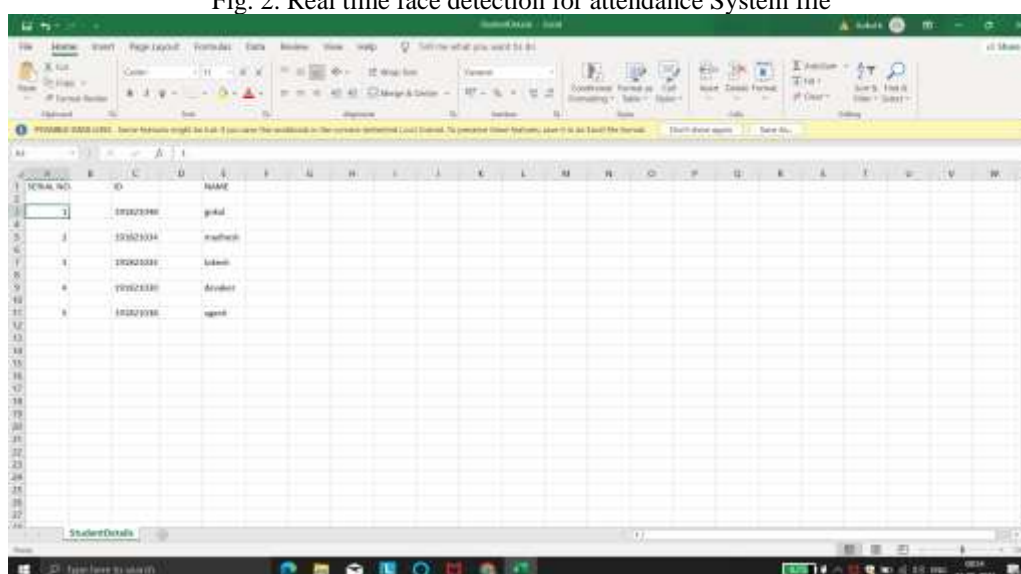## 4. Discussion

From the results of this study, Face Recognition is proven to be having better accuracy than the Principal Component Analysis model (Patnaik, Yang, and Sethi 2020). LBP has an accuracy of 99.5% whereas PCA has an accuracy of 89.42% the group statistical analysis on the two groups shows that Novel Local Binary Pattern group 1, has more mean accuracy than Principal Component Analysis (PCA) group 2, and the standard error mean including standard deviation mean is slightly less than Novel Local Binary Pattern (Tistarelli and Nixon 2009; Mekhilef et al. 2021).

There are two elements for having a record name as the number name (Joshi, n.d.) First is that it plainly demonstrates the arrangement of the individual they have come before the camera (Fayek, Lech, and Cavedon 2017). Also, the subsequent factor is, at the hour of preparing the framework consecutively takes the preparation dataset of face pictures. It's exceptionally simple to make a data set of eigenfaces utilising this strategy as any for circle is proficient to expand the arrangement number till the finish of record. While on the off chance that the document name is something, say text, this would have been hard to do. In the wake of making the data set the framework is prepared itself by computing the face space. This is finished by eigenface utilising the foremost part examination calculation followed by direct discriminant investigation calculation AdaBoost. These two calculations are clarified previously. They decrease the element of the face space. These face space continues to change after every alteration made to the TRAINING DATABASE (Tistarelli, Bigun, and Jain 2003). The pictures which are distinguished by the web camera are saved in another record organiser called TEST DATABASE (Wechsler et al. 2012).The comparative analysis of Novel Local Binary Patternand principal component analysis is given in Fig. 4.

The limitation in this model is that the accuracy of LBP may get affected due to the inconsistent data and difficulty in getting the right datasets for analysis. Most of the data is simulated from nature which is far from reality. The availability of more cross-Peoples skin tone ,hair style and different facial expressions related datasets of emotion, effective data preprocessing techniques, and the combination of LBP with other Artificial intelligence algorithms such as PCA and LBP may give better accurate results in the future.

5. Conclusion

Based on the experimental results, the Novel local binary pattern has been proved to facial recognition more significantly than principal component analysis. It can be used in recognize facial expressions for facial recognition systems which are used in take online attandance system.LBP has an accuracy of 99.5% whereas PCA has an accuracy of 89.42%.

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Table 1. Pseudocode for automatic attendance face recognition.

// I : Input dataset records
1. Import the required packages.
2. Convert the Data Sets into numerical values after the extraction feature.
3. Assign the data to X_train, Y_train, X_test and Y_test variables.
4. Using train_test_split() function, pass the training and testing variables.
5. Give test_size and the random_state as parameters for splitting the data using LBP training.
6. Calculate the accuracy of the model.
OUTPUT: Accuracy

Table 2. Pseudocode for automatic attendance face recognition.

// I : Input dataset records
1. Import the required packages.
2. Convert the Data Sets into numerical values after the extraction feature.
3. Assign the data to X_train, Y_train, X_test and Y_test variables.
4. Using train_test_split() function, pass the training and testing variables.
5. Give test_size and the random_state as parameters for splitting the data.
7. Compiling the model using metrics as accuracy.
7. Evaluate the output using X_test and Y_test function
8. Get the accuracy of the model.

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OUTPUT: Accuracy

Table 3. Accuracy of facial recognition us LBP.

Test size	Accuracy
Test 1	99.5
Test 2	98.87
Test 3	97.46
Test 4	96.21
Test 5	95.45
Test 6	94.75
Test 7	93.34
Test 8	92.34
Test 9	91.38
Test 10	90.72

Table 4. Accuracy of facial recognition uses PCA.

Test size	Accuracy
Test 1	89.42
Test 2	88.95
Test 3	87.52
Test 4	86.73
Test 5	85.47
Test 6	84.65
Test 7	83.74
Test 8	82.56
Test 9	99.56
Test 10	80.38

Table 5. Descriptive Statistic analysis, representing Local Binary Pattern and Principal Component Analysis.

	N	minimum	maximum	mean	std.Deviation

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group1 accuracy loss	20 20 20 20	1.00 80.38 .50	2.00 99.50 16.26	1.5000 90.0650 7.3835	.51299 5.87209 5.27522

Table 6. Group Statistic analysis, representing Local Binary Pattern and Principal Component Analysis.

group1		N	Mean	std.Deviation	std.Error Mean
Accuracy	LBP PCA	10 10	95.0020 85.1280	3.05980 3.04425	.96759 .96268
Error	LBP PCA	**10** **10**	2.8590 11.9080	2.13965 2.94594	.67662 .93159

Table 7. Independent Sample Tests results with confidence interval as 95% and level of significance as 0.05 (Local Binary Pattern appears to perform significantly better than Principal Component Analysis with the value of p=0.431).

Accuracy	F	Sig.	t	df	Sig	Mean Difference	Std. Error Difference	95% Conf. Interval Lower	95% Conf. Interval Upper
Accuracy Equal variances assumed Equal variances not assumed	1.653	.215	7.234 7.234	18 18.000	.000 .000	9.87400 9.87400	1.36491 1.36491	7.00643 7.00642	12.74157 12.74158
Error Equal variances assumed Equal variances not assumed	1.653	.215	-7.859 -7.859	18 16.428	0.000 0.000	-9.04900 -9.04900	1.15138 1.15138	-11.46795 -11.48465	-6.63005 -6.61335

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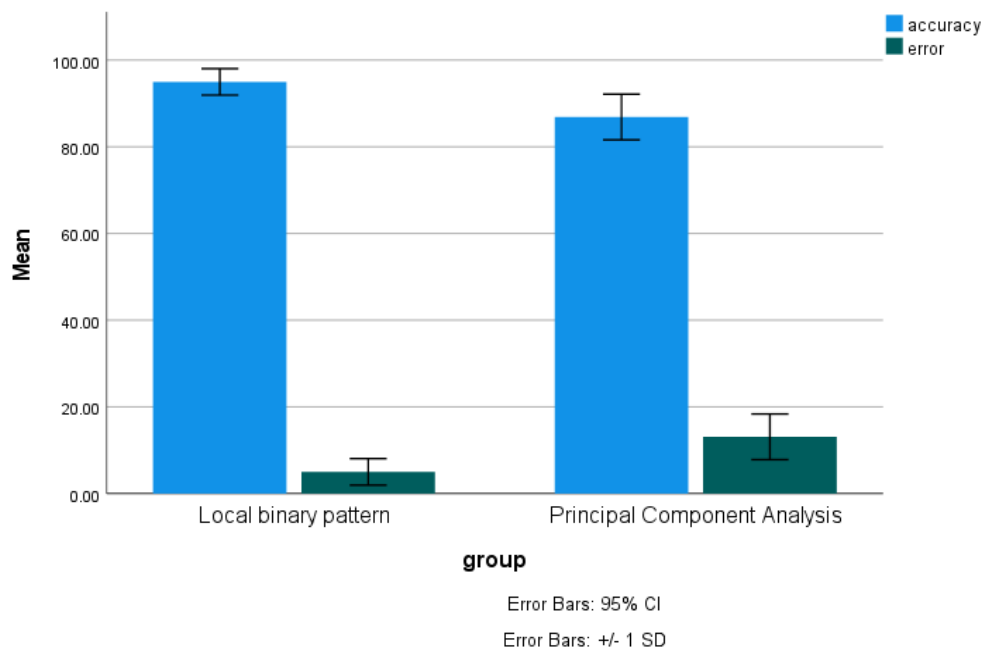
Section A-Research paper

Fig. 4. Comparison of Novel Local Binary Patternand principal component analysis in terms of accuracy. The mean accuracy of is Novel Local Binary Patterngreater than principal component analysis and the standard deviation is also higher than principal component analysis. X-axis:Novel Local Binary Patternvs principal component analysis. Y-axis: Mean accuracy of detection + 1 SD.

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