

Class Room Attendance System Using KNN

¹S. Sai Kumar, ²S. Adithya Varun, ³Dr. P. K. Sahoo, ⁴K. Eswaran

^{1,2,3,4}Dept. of CSE, SNIST, Hyderabad, Telangana, India

Abstract

Marking the attendance in schools and colleges is a key activity by the teachers. They face problems when there are a large number of students in a class. These difficulties can be overcome by using computer aided face recognition techniques. In this paper we use the KNN algorithm and compare our results with the LDA (linear discriminant analysis).

Keywords

Image Processing, K Nearest Neighbours, Face Recognition

I. Introduction

In 1960, facial recognition started on photographs which is a semi-automated system to locate the features such as nose, ears, and eyes etc. In 1970, for recognizing face, 21 special features like different hair color, eye lobes and lip thickness etc. were considered. In 1988, standard linear algebra technique is used for facial recognition [5]. Now a day's biometric is being used for authentication. One among the biometric techniques is face recognition. Most importantly, facial detection and recognition decreases the manual work for human [13].

Face recognition is used to identify the name of given person from the faces database, it will recognize the candidate by the features of a candidate's face compared with features of faces in the database. Face recognition is used in many applications like criminal identification, face unlock etc., [6] Face recognition is based on artificial intelligence where the face is identified by the facial features. Face recognition can be done using images or any video which has different faces. These results may vary with differing positions, lighting conditions, expressions etc.

Face recognition can be used to recognize individual faces or multiple faces at a time. There are many algorithms to identify faces. Face recognition is one of the biometric artificial intelligence based system. There are different kinds of biometric systems like fingerprint, voice, signature, iris recognition [16].

By using face recognition we are implementing the attendance system. Initially we will collect faces of each individual person in every class room along with their details and store them into database, then each day we can take a picture of every student who are in the classroom, now it will detect the faces from the picture and compare the faces with existing database faces. Attended student details are stored in csv file [8].

For facial recognition, we have two comparison methods here,

Steps:

Verification: This image of face is verified with all faces in the database and tells whether it is matching or not.

Identification: Here one face image is verified then, will compare with all other faces in the database and concludes the majority of matching among them.

There are four stages for recognizing the face:

- **Capture:** It will capture image or video which contains faces in it.
- **Extraction:** From the captured photo or video we will extract the unique faces and store them in the database.
- **Comparison:** Here we will compare the face with what we

have extracted with the faces in our database.

- **Match/non-match:** After comparison, if the face is matched then it says matched otherwise it doesn't match to any of the face in database [7].

There are different kinds of face recognition methods:

1. **Holistic Matching Methods:** In this method total face region is taken as the input data for recognition of face
 2. **Feature-based (structural) Methods:** In this method we will consider some features in face like eyes, nose.
 3. **Hybrid Methods:** This method is a combination of both holistic and feature based methods. It is mainly used for 3D images.
- Applications:
 - Surveillance
 - General identity verification
 - Image database investigations
 - Security
 - Access Control
 - Face Identification [9].

II. Literature Survey

There are various algorithms used for face recognition previously like PCA (Principal Component Analysis) and LDA (Linear Discriminant Analysis).

A. PCA:

PCA is a dimensionality reduction algorithm. In PCA following steps are performed:

1. Find the mean vector
2. Arrange all data points in mean vector matrix
3. Find the covariance matrix
4. Compute the Eigen values and Eigen vector
5. Compute the basis vector
6. Represents each sample as a linear combination of basis vectors [2].

B. LDA:

Linear Discriminant analysis is one of the classification algorithms which is mathematically fast. LDA is developed in 1936 by R.A. Fisher. In LDA we will find the linear combination of variables which separates two or more classes to find the individual of separability.

1. Class-dependent Transformation

This type of approach involves maximizing the ratio of between class variance to within class variance. The main objective is to maximize this ratio so that adequate class separability is obtained. The class-specific type approach involves using two optimizing criteria for transforming the data sets independently.

2. Class-independent Transformation

This approach involves maximizing the ratio of overall variance to within class variance. This approach uses only one optimizing criterion to transform the data sets and hence all data points irrespective of their class identity are transformed using this

- Sort the distances which have calculated
- Apply majority voting based on the k value and predict the class it belongs to [17].

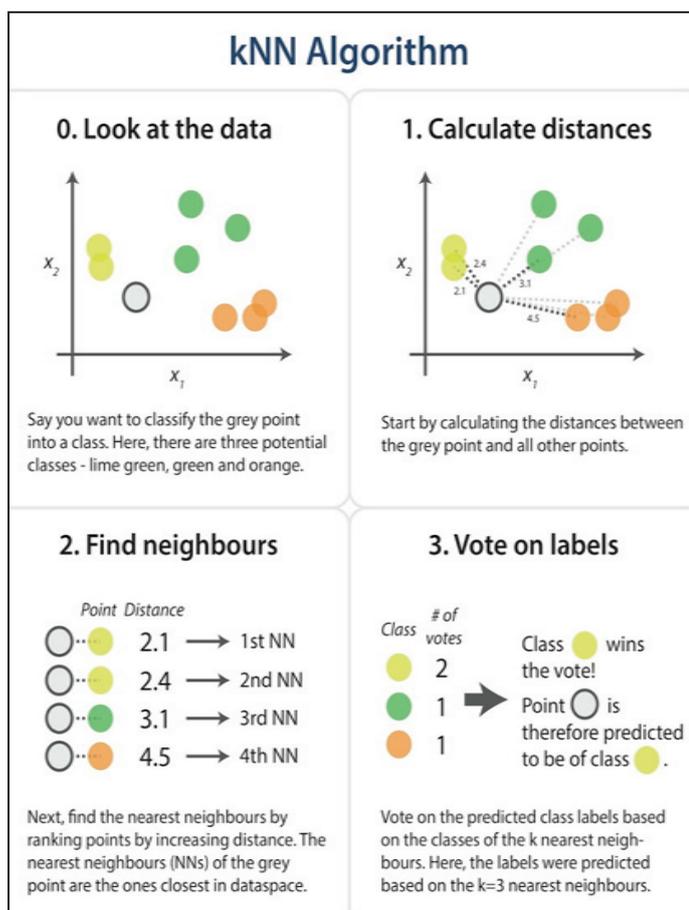


Fig. 3: Knn Implementation Diagram [12].

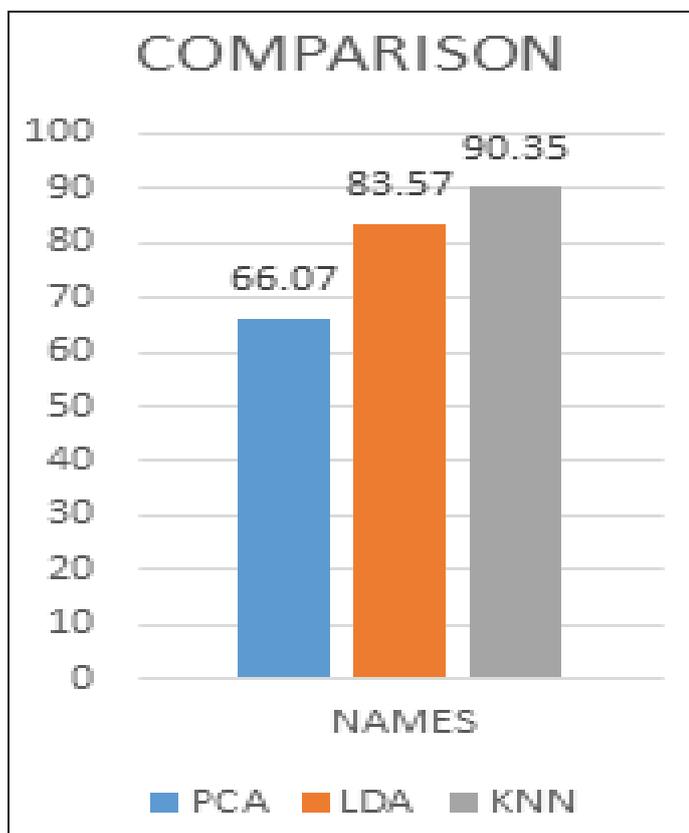


Fig. 4: Orl Database Comparison

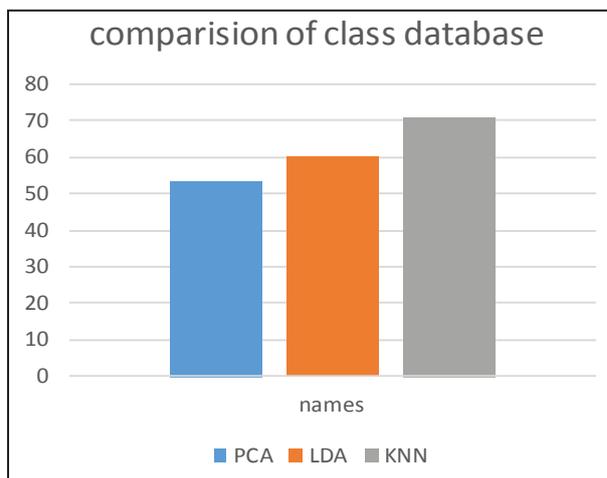


Fig. 5: Class Database Comparison

No	Data set name	C	Train	Test	Tot	Acc	T sec
1	ORL Database	40	120	280	400	66.07	0.009 sec
2	ORL Database	40	120	280	400	83.57	0.05sec
3	ORL Database	40	120	280	400	90.35	0.47sec
4.	Class database	5	10	15	25	53.33	0.009sec
5.	Class database	5	10	15	25	60	0.05sec
6.	Class database	19	57	133	190	71	0.06

Table 1: Results comparison

C – Classes, Tot – total number of images, T – Time, Acc – Accuracy

Table 1(cont...)

Dimension	Algorithm
92*92*k Where k is 15	PCA
92*92*(40-1)	LDA
512	VGG19+KNN
92*92*k Where k is 15	PCA
92*92*(40-1)	LDA
512	VGG19+KNN

IV. Conclusion

Extracting the features of face is done by VGG19 feature extraction and for recognizing the face KNN algorithm is used. We achieved good results in terms of time and accuracy using this KNN algorithm. Here we have used images only in classrooms, in the future it may extend to crowded locations.

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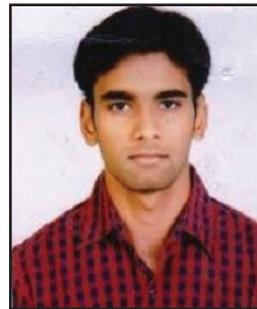
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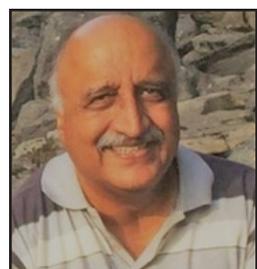
S.Sai Kumar received his Bachelor degree in computer science and engineering from Mahatma Gandhi Institute of Technology, Hyderabad, India, in 2016, pursuing Masters from Srinidhi institute of science and technology doing research on machine learning.



S.Adithya varun received his Bachelor degree in computer science engineering from Nalla Malla Reddy Engineering College, Hyderabad, India, in 2013, pursuing Masters from Srinidhi institute of science and technology doing research on machine learning.



Dr.P.K.Sahoo, completed his Ph.D. from Fakir Mohan University, Odisha in Computer Science Engineering. He has 14 years of teaching, research and administrative experience. He has earlier worked as Head of the Department for both CSE and IT in various reputed Engineering Colleges. His Research interest includes Cyber Security, Information Security and Data Mining. He has published around 21 research papers in various reputed journals at national and International levels. He is a certified professional from BalaBit, completed Electronic Contextual Security Intelligence, exam for Intermediate Level (ECSI).



Dr. Kumar joined SNIST from 1999 after leaving BHEL R& D as Additional general Manager. He has Masters and Ph. D, degrees from IIT Kanpur and University of Madras respectively. He now works in the area of Artificial Intelligence involving Neural Networks and Image Processing using pattern recognition methods. He has more than 40 publications in various reputed International Journals and conferences. Many of his publications are referred to by present researchers, even after several decades. He has also won several best teacher awards- the latest being as Best Faculty Award 2013-14, Computer Science from Cognizant for the South India Area.