

# GCIS-605 Scholarship Seminar

## Face Recognition Attendance System

Hashish Gyajangi  
Computer & Information Sciences  
Gannon University  
Erie, USA  
Gyajangi001@gannon.edu

**Abstract:** Technology is now very prominent in the world economy, and it is growing on various fronts with researchers trying to get every possible corner to improve the existing technology or introduce a new one. Just like any other biometric technology like the fingerprint scan, iris scanner, and the blood scanner, the facial recognition systems with the help of very well managed deep learning technology and complex algorithms which manages their functionality. The systems just like other recent technology powered by the capabilities of the Artificial Intelligence (AI) capabilities have been very useful in various sectors in so many ways making them highly valued in the smart-device and smart systems. As its technology is still being researched depending on the available data thanks to Big Data Analytics, the facial recognition technology is getting better with the release of each new upgrade making it quite reliable. Many users are using it to verify users of various systems or devices. Different levels of educational institutions have been able to register the use of facial recognition attendance systems to monitor attendance and various activities. This paper discusses the automation of the facial recognition attendance system.

**Introduction:** One of the greatest achievements of the twenty-first century in the field of technology is Artificial Intelligence which has brought with it several advantages because today almost every system has a model of artificial intelligence. Facial recognition is the latest addition to the collection of AI high-functioning models with unique capabilities which make highly sort. Institutions, businesses, companies, and security sectors of various sectors of the society have been able to incorporate the technology into their operations for various reasons like security, register maintenance, data security, and so many other reasons (Rao and Satoa, 2013, Zainal et al., 2016, Zainal et al., 2014). Attendance checked on hardcopy registers like in classes and colleges are difficult to maintain because at some point they become bulky as they pile up (K. Venkata Narayana et al, 2004). AI has been used in schools for various reasons one of them being for security and why not try them in managing the attendance? The technology helps in providing security and the management of the students which helps in avoiding truancy (Ekman et.al, 1978). It's also important to note that even though the schools are the biggest users of this

technology it's also used by various other organizations like hospitals to admit patients, companies for record of the employees, etc. the process of face detection happens in various phases that are based on a dataset from specific databases like the school database, hospital database or a particular company database. The algorithms used are so complex and are well designed to ensure they function with a lot of accuracies.

## Methods

A camera was used as the primary photo input device. Different algorithms were used depending on various papers, for example, the Viola-Jones algorithm was employed for the detection of faces and the camera would acquire the detected faces (Viola and Jones, 2004). The algorithms were implemented using the C++ programming language and the test database had a maximum of 20 people and each was accorded a maximum of 50 pictures. The main components of the designing systems were a webcam, a computer, and a modem as the hardware and used SQL to create a software database and Qt Software Development Kit (SDK) was employed by the researchers to develop the user and graphical interfaces. OpenCV library provided allowed the Fisher-faces algorithm to be used in C++ (Viola and Jones, 2004).

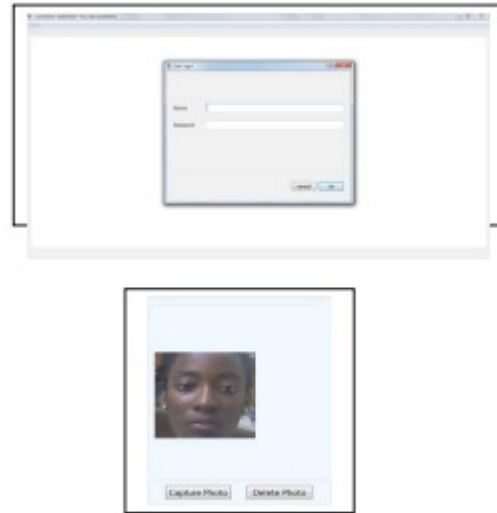


Fig. 2. Sample Face Image

The database created was capable of holding up to twenty entries with each entry allowed up to a maximum of 50 photos. The database organized the data of each individual into columns i.e.

Use case diagrams helped with the process as shown below:

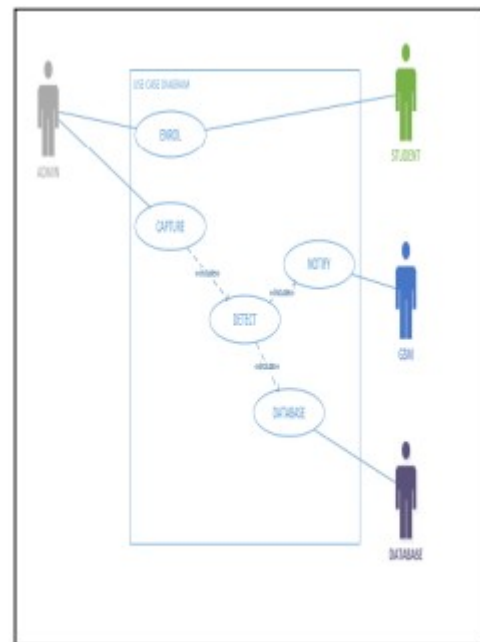


Fig. 3. Use Case Diagram

The process was rigorous and for verification a user ID portal was created to match the various users to the images while deploying their details via the information relay system. The data was recorded depending on the attendance so that the system would create a chat of the attendance from the information gained from the face recognition system. The

Fig. 4. Bio Data Table

modem was used to provide cellular network so that the information recorded was remitted to the cell phones.

## Results

There are various impacts of the introduction of the facial recognition attendance systems in various educational institutions and they are all significant. The first few experimental scenarios involved all face imagery information being put to train a classifier for face recognition activity. The classification yielded results for every image. An effective database helped manage the process efficiently. The process occurred in the following stages.

### 1) Testing

This was necessary so as to determine the system's (facial recognition) accuracy. For example;

- I. Varying light conditions and varying facial expressions were used in various angles.
- II. The tests were then conducted on the information of four individuals who were already in the system. The identification was run ten times to ensure accuracy.

The results were recorded in the table below:

ID	Name	Email	Phone	Address	Date of Birth
101	John Doe	john.doe@university.edu	08001234567	123 Main St, Lagos	1995-01-15
102	Jane Smith	jane.smith@university.edu	08007654321	456 Oak St, Abuja	1996-03-22
103	Michael Johnson	michael.johnson@university.edu	08009876543	789 Pine St, Kano	1997-05-10
104	Emily White	emily.white@university.edu	08005432109	101 Elm St, Ibadan	1998-07-05
105	David Brown	david.brown@university.edu	08002109876	202 Birch St, Port Harcourt	1999-09-18
106	Sarah Green	sarah.green@university.edu	08008765432	303 Cedar St, Enugu	2000-11-03
107	James Black	james.black@university.edu	08004321098	404 Maple St, Benin	2001-12-20
108	Alice Grey	alice.grey@university.edu	08006543210	505 Willow St, Oyo	2002-02-14
109	Robert King	robert.king@university.edu	08003210987	606 Poplar St, Sokoto	2003-04-08
110	Olivia Lee	olivia.lee@university.edu	08009012345	707 Sycamore St, Kaduna	2004-06-25

Fig. 5. Application Database for Enrolled Students

Table I. Results from Tests carried out by Varying Facial Expressions and Angles along with the Lighting Conditions.

S/ N	Name	NOP	NFN	Accuracy
1	Jane	7	3	70
2	Grace	6	4	60
3	Nkechi	7	3	70
4	Damilola	6	4	60
5	Gift	9	1	90
6	Uche	8	2	80
7	Chiamaka	8	2	80
8	Temilola	7	3	70
9	Jonathan	6	4	60
10	Chisom	6	4	60
11	Ajulibe	7	3	70
12	Kusimo	8	2	80

The average accuracy (by varying facial expressions and angles along with the lighting conditions):

$$Accuracy = \frac{70 + 60 + 70 + 60 + 90 + 80 + 80 + 70 + 60 + 60 + 70 + 80}{12} = 70.83\%$$

Where NOP is the number positive IDs and NFN is the number of false negative ID.

Table II. Results from tests carried out under various lighting conditions but unvarying facial expressions.

S/N	Name	NOP	NFN	Accuracy
1	Jane	5	5	50
2	Grace	4	6	40
3	Nkechi	5	5	50
4	Damilola	5	5	50
5	Gift	7	3	70
6	Uche	6	4	60
7	Chiamaka	8	2	80
8	Temilola	4	6	40
9	Jonathan	3	7	30
10	Chisom	6	4	60
11	Ajulibe	7	3	70
12	Kusimo	5	5	50

The average accuracy of the system (under various lighting conditions but unvarying facial expressions):

$$Accuracy = \frac{50 + 40 + 50 + 50 + 70 + 60 + 80 + 40 + 30 + 60 + 70 + 50}{12} = 54.17\%$$

The results revealed that the system clearly reacts more accurately to better facial expression variation than to lighting variation. The algorithm must ensure there is a minimized rate of the number of false IDs to give the system a high credibility status.

Researchers believed that the eyes and the face alignment are detected first and then the data is converted to data-binary information

to allow the face recognition performed using the SVM classifications. The face is detected by segmentation and by the various eye regions. In some cases, face recognition has been given better robustness and reliability by making it capable to change its search depending on various expressions through hormonal therapy.

## Discussion

Schools and college attendance have a very tremendous impact on students concerning their academic performance. Schools always try to ensure that students attend the classes and ensure that those who don't will be able to go uncaught (Arulogun et al., 2013, Bhalla et al., 2013, Hussain et al., 2014, Rjeib et al., 2018). It is believed the attendance of students relatively affects their results directly and therefore students who don't attend classes are expected to fail. The old way of calling names manually in the school register was effective because of the little less population of school in those days while with the increased population the school and other institutions need a more sophisticated method to monitor their students in an effective way in terms of time efficiency and accuracy (Bayoumi et al., 2015). Remember the old attendance register meant that someone could impersonate a friend to cover for them but today that is not possible as one as to be there in person. The fact that the students are logged in by face recognition a student has to take his exams without paying someone to impersonate them.

Even though the system has been helpful in quite a number of ways it has a few concerns. People might just refuse to adopt it because they find it an invasion of their privacy and

therefore might decide to put on the anti-face recognition gear which ensures no one can see them. Since the whole system depends on the effective databases, they might be unreliable if the data is corrupted in any way possible like a cyber-attack or if someone doesn't provide enough photos or if someone uses so much makeup. RFID is used to track the attentiveness of the system and therefore it is safe to conclude that the face recognition system is difficult to implement due to the numerous requirements and the dependence on various other technologies it might be unreliable if any of them is unreliable (Bradski, 2000, Pedregosa et al., 2011)

## Conclusion

This research has been done to carry out the effectiveness of the face recognition systems mostly in regard to school attendance but we can say that it has also been useful in other areas. In the research, we noticed that the Artificial Intelligence (AI) and the Big Data Analytics have played a lot of contributions to the growth of this new technology as it depends on deep machine learning for the facial recognition machines to be able to detect the faces of human even from pictures with different things. It is clear that even though the technology is good and growing it's not 100% accurate and needs to be improved with time to ensure that it is fully accurate and effective in all conditions.

## References

- Kawaguchi, Y., Shoji, T., Lin, W., Kakusho, K., & Minoh, M. (2005, October). Face recognition-based lecture attendance system. In The 3rd AEARU workshop on network education (pp. 70-75).
- Kar, N., Debbarna, M. K., Saha, A., & Pal, D. R. (2012). Study of implementing automated attendance system using face recognition technique. *International Journal of computer and communication engineering*, 1(2), 100.
- Jha, A. (2007). Class room attendance system using facial recognition system. *The International journal of Mathematics, science, technology and Management*, 2(3), 4-7.

Sunaryono, D., Siswantoro, J., & Anggoro, R. (2021). An android based course attendance system using face recognition. *Journal of King Saud University-Computer and Information Sciences*, 33(3), 304-312.

Wang, Y. Q. (2014). An analysis of the Viola-Jones face detection algorithm. *Image Processing On Line*, 4, 128-148.

Kamalakumari, J., & Vanitha, D. M. (2017). Image Sequences Based Facial Expression Recognition Using Support Vector Machine. *Int. J. Eng. Technol*, 9, 3605-3609.

Rahim, M. A., Azam, M. S., Hossain, N., & Islam, M. R. (2013). Face recognition using local binary patterns (LBP). *Global Journal of Computer Science and Technology*.

Shafiuddin, M. S. A., Student, U. G., Sanjay, B. R., Pravin, K. A., & Bankar, A. A. Attendance System Based on Face Recognition System Using Real-Time Camera With Message Passing.

Mansoor, S., Sadineni, G., & Kauser, S. H. (2021, November). Attendance Management System Using Face Recognition Method. In *Journal of Physics: Conference Series* (Vol. 2089, No. 1, p. 012078). IOP Publishing.

Winarno, E., Al Amin, I. H., Februariyanti, H., Adi, P. W., Hadikurniawati, W., & Anwar, M. T. (2019, December). Attendance system based on face recognition system using the CNN-PCA method and real-time camera. In *2019 International Seminar on Research of Information Technology and Intelligent Systems (ISRITI)* (pp. 301-304). IEEE.

Okokpujie, K., Noma-Osaghae, E., John, S., Grace, K. A., & Okokpujie, I. (2017, November). A face recognition attendance system with GSM notification. In *2017 IEEE 3rd international conference on electro-technology for national development (NIGERCON)* (pp. 239-244). IEEE.