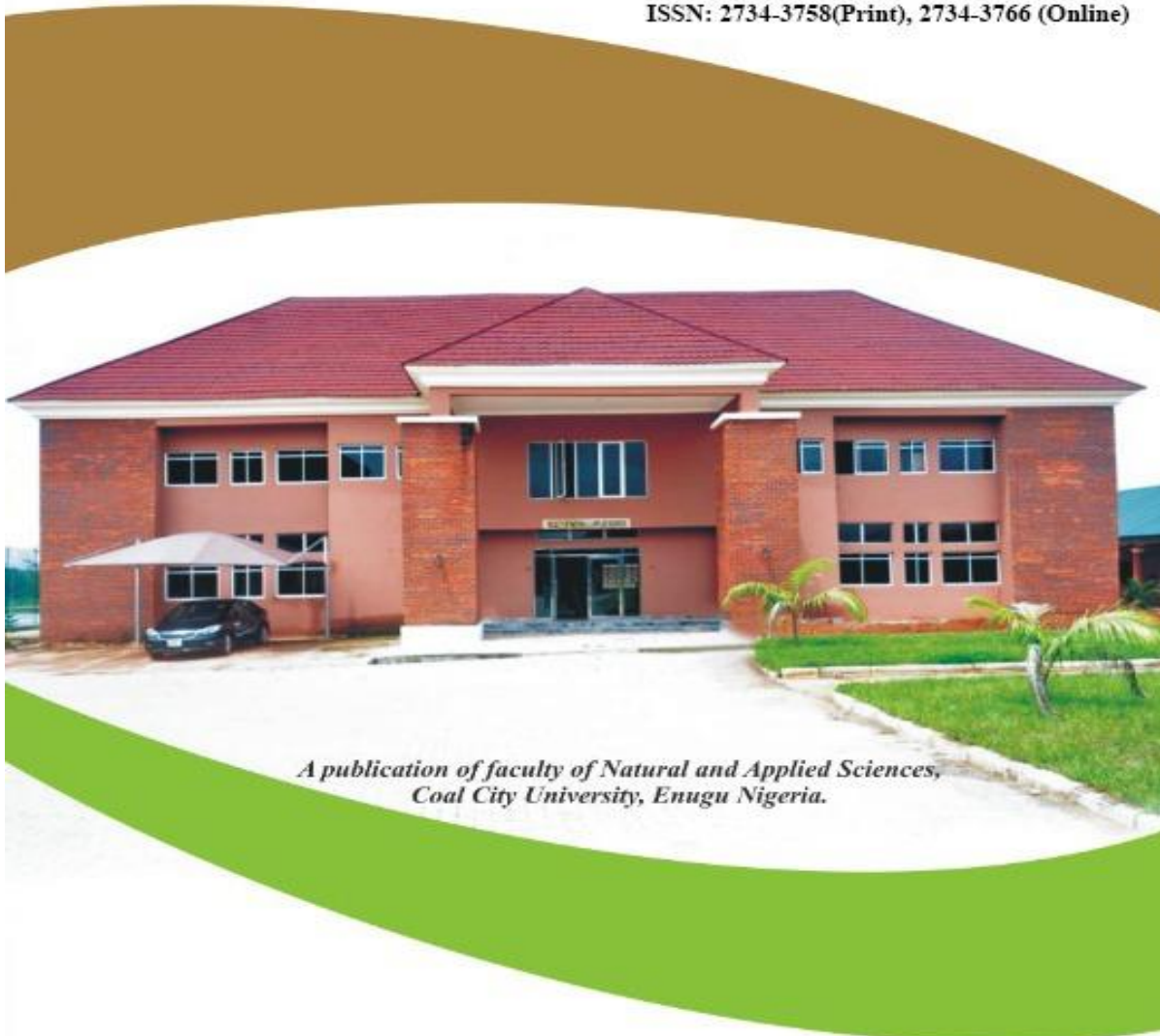




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## **Computer-Based Academic Monitoring and Control of Lecture Attendance at Michael Okpara University of Agriculture, Umudike**

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### **Abstract**

Academic monitoring depends on students' and Lecturers' prompt attendance to lectures and the result based on their examination reports. These facts are very challenging in the contemporary Nigerian Academic Institutions today. Therefore, it is essential to devise an automatic monitoring system that enhances regular attendance to lectures by students and lecturers because the manual method of taking attendance is very cumbersome and ineffective. There are attempts to solve the problem of this manual approach using electronic cards and a clock-in system which presents the problem of reading information connected to someone else. In the light of these defaults, computer-based face recognition technology (FRT) was successfully applied to address the problem. The objective of this research is to develop a computer-based academic monitoring and control of lecture attendance that captured the number of lecture attendance, and related the number of attendance at lectures with examination reports. The methodology we used to for the academic monitoring and control system is Object-oriented analysis and design methodology. The system gathered and stored data of the Students and Lecturers in the system database created with MY Structured Query Language Database Management System (MYSQL-DBMS) and generates a unique ID for each user. The results showed that the platform performed automatic face recognition for accurate time monitoring of Students' and Lecturers' attendance at lectures. The accuracy started with the fisher face algorithm for face recognition. Fisher face algorithm built into the python library and work with OpenCV are used for face detection and recognition. In conclusion, the system records the video of lectures automatically while lectures are in progress and take still pictures for the purpose of monitoring. The system was also able to generate students' results which showed a relationship between Students' lecture attendance and examination reports.

**Keywords:** Examination, Lecture attendance, Monitoring, MOUAU, Computer-based and Face recognition technology

## 1. Introduction

Monitoring lecturers based on class attendance and the lectures delivered is vital to enhance regular attendance to lectures by students and lecturers. The control is based on comparing students' attendance to lecture with their performance. The use of technology appears helpful in enhancing effectiveness in many aspects of education including attendance systems (Onyema et al, 2021). The main purpose of this study is to determine the significant impact of lecture attendance on lecturers' and students' reports based on their performance and result using Face Recognition Technology (FRT). It actually looks at the context of lecturers and the result of the student based on the number of times the student attended lectures. Administrators in most educational institutions' are concerned about the irregular attendance of students and lecturers at lectures. Lecture attendance for both lecturers and students in the first place is an important prerequisite for academic performance in any academic institution. This is because a Teacher must teach one well in order to guarantee good performance. Secondly, the regularity in attending lectures ensures a smooth flow of information and concepts being communicated between the students and lecturer. The use of e-learning platforms should be encouraged, but the transition has to be gradual to enable the users understand the new learning strategy, and how to maximize its potentials (Edeh *et al.*,2020). Ugorji, *et al.*, (2022) reported that the common areas of usage of mobile technologies for education purposes were; communication, mobile-learning, virtual teaching, access to internet, online instructional materials, electronic mails, and researches.

The overall academic performance of a student who is absent from lectures even for a day can be affected. Poor academic performance of Students drags the reputation of the Lecturer and that of the university in the general down (Jain *et al.*, 2015). Edeh et al., (2020) add that the need for all educators, and learners to adopt technology, and improve their digital skills in line with the emerging global trends and realities in education. The predominant manual method of taking attendance in the Nigerian Educational Institutions either by calling students' names or asking them to sign on paper, wastes man-hours, ineffective, crude and uneconomical as it wastes ink and paper (Garcia *et al.*, 2008). It also requires an additional workforce to check the attendance. Control of Lecturers to duty by timing their entry and exit where the rate of transparency to duty is highly needed in an institution is not guaranteed (Kumbhare *et al.*, 2014). Attempts to solve the problem of this manual approach using electronic cards and a clock-in system present the risk of reading information connected to someone else without his/her actual presence. According to Angell and Kietzmann, (2006), since RFID tags can be attached to money, garments, and property or implanted in animals or persons, there will be the risk of reading information connected to someone without his or her permission. One best solution to address these problems is the use of face recognition technology which this study aims at achieving. This new approach would enable school authorities to enforce quality assurance and monitoring. With the electronic system that monitors the lecture attendance and lecture being delivered, Lecturers and students will sit up to their responsibilities. It is also essential to monitor the examination process to enable students attend lectures regularly, read and enhance their performance.

## 2. Review of Related works

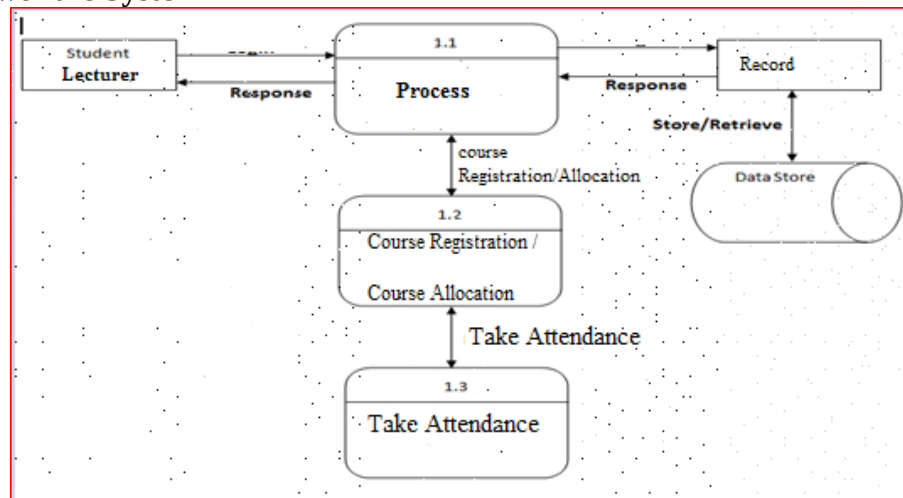
**Table 1: Related works**

| Name/Year                   | The Gap                             | Addressing the gap                   |
|-----------------------------|-------------------------------------|--------------------------------------|
| Aditya, et al,(2016)        | manual process                      | use of computer base                 |
| Aruniet <i>al.</i> ,(2012)  | Use of Principal Component Analysis | Use of fisher face algorithm         |
| Frank, (2007)               | Use of surveillance video           | Use of facial recognition technology |
| Otokunefor, (2011)          | Attendance not monitored            | Automatic Attendance monitored       |
| Phillips, (2018)            | Use of Support vector machines      | Use of Fisher face algorithm         |
| Priyanka&Yashpal, (2015).   | SIFT extracts                       | Use of Fisher face algorithm         |
| Thakur <i>et al.</i> , 2009 | Use of fingerprint recognition      | Use of facial recognition            |
| Ugwuja and Onu, (2018).     | Checking regular attend             | Automatic Attendance                 |
| Ugwuja&Asogwa, (2022).      | captures attendance                 | Automatic Attendance capturing       |

### 3.0. Methodology

This research used the following data collection techniques to gather information about the existing and proposed system, namely: interview, observation, internet, evaluation, and inspection of documents. Object-oriented analysis and design research methodology was used to develop the Academic Monitoring and Control System. Object-oriented design relates to the development of applications. The design was based on software organization as a collection of discrete objects that incorporated both data and behavior. The use-case, sequence, and model diagram of the Unified Modeling Language (UML) were used to model the proposed real-time monitoring system of attendance. The system was tested in a real-time environment for efficiency and effectiveness in application.

### 3.1 Dataflow of the System



**Figure 1: Dataflow of the System**

### 3.2 Flowchart of the proposed System

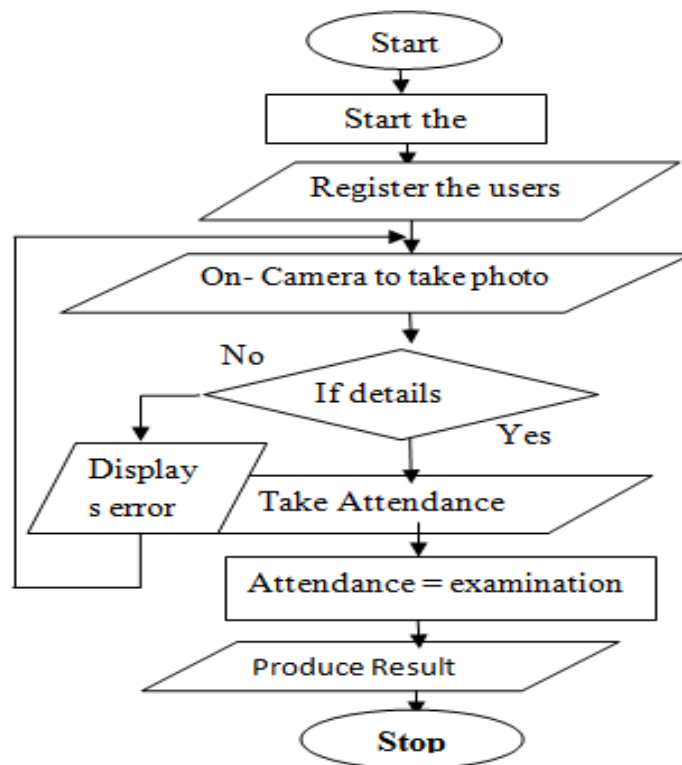


Figure 2: Flowchart of the proposed System

## 4.0 DISCUSSION

### 4.1 Lecturer course allocation

When lecturers have been assigned courses for the semester, the lecturer uses a username and password to login to their platform to view the courses allocated to them by their HOD.

### 4.2 Lecture Attendance

When the system is executing on the browser, the information is captured based on real-time response in the sense that the system captures information from users and gives appropriate feedback immediately. On registration, the administrator captures the students' and lecturers' photos, stores them in the image folder, and the bio-data and other details are stored in the database. The fisher face algorithm was used and it recognizes the user face with the accuracy of about 98.3%. During lectures, once the faces of the students and the lecturer are directly facing the camera installed in the Lecture Hall; the faces are captured as a frame and tested against any face stored in the image directory. Once it matches any face in the directory, it will get the filename, query the database for the user attendance record and then increment attendance by one and store it back per course. The system only requires the face of the student and lecturer to increment the number in attendance in the classroom per course, per time allocated for the lecture.

### 4.3. Analysis of the Variables Used

The variables of our analysis are described as variable 1- attendance point and variable 2 – examination point.

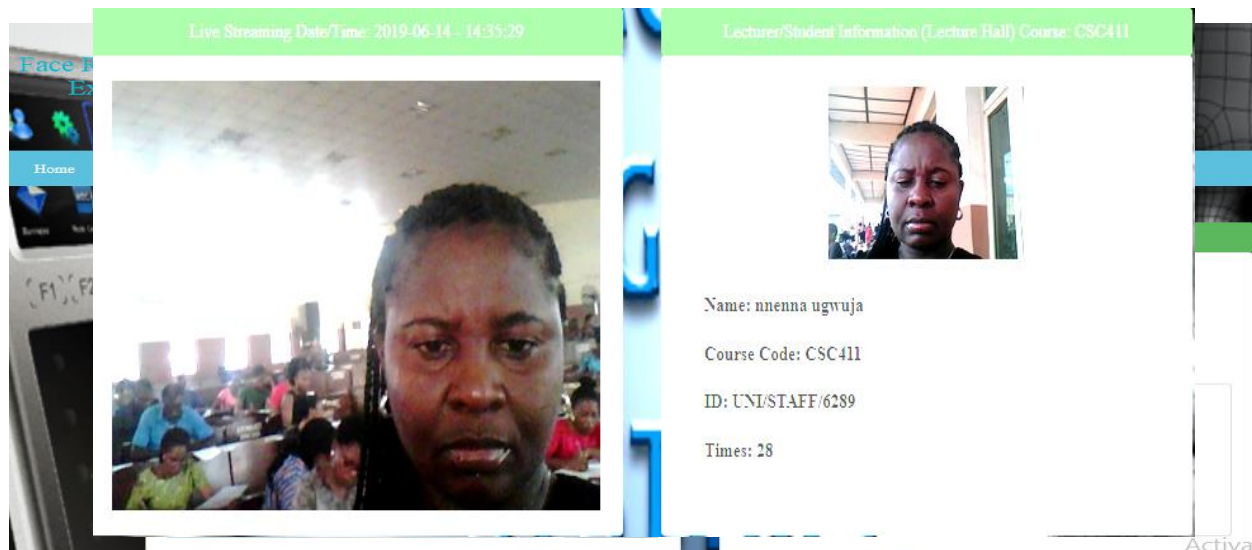
#### i. Variable 1- Attendance Point

According to the lecture Time Table, this is the number of lectures attended by a student per course or the number of times the lecturer allotted the course actually taught the students. The attendance point is based on academic session, which consists of 135 – 162 weeks divided into two semesters of 15 – 18 weeks each. A semester is made up of 15 weeks of lectures and two weeks of examinations (NUC, 2013). Each course is taught twice a week, making up 30 lecture periods per lecturer. The NUC Bench Mark requires that a lecturer attends lectures at least 25 times per semester to justify setting examinations on the course. As an illustration, therefore, face recognition of attendance was performed using the image of the lecturer and two images of the students in a class to evaluate their attendance and examination points, lecturer (Plate 1), students 1 and 2 (Plates 2 and 3 respectively). The lecturer with staff Number UNI/STAFF/6289, attended CSC411 lectures for 28 times in a semester. Student 1 attended lectures for the CSC411 course up to 10 times in a semester, while Student 2 attended lectures up to 3 times in a semester for the same CSC411 course. The registration number of Student 1 is UNI/BSC/6973, while Student 2 has a registration number, UNI/BSC/0455.

#### ii. Variable 2 – Examination Point

This was used as an indicator of each student's examination performance. It is the number of points obtained by the students in the final examination. Grading was based on a point scale where attendance was -10 %, test -10 %, project -10 %, and examination - 70 %. No less than 45 % is required to pass the final examination.

**Plate 1: Lecturer Attendance capture**



**Plate 2: Student 1: Attendance capture**



**Plate 3: Student 2: Attendance capture**



### 5.1 Data Analysis: Student 1

Variable 1 – Examination point for student 1 with registration number UNI/BSC/6973. He scored in attendance (10), test (9), project (9) and examination (67 %). Total result was 95 %, and his final grade was “A” (Table 1). The result was excellent, most probably because the student attended lectures consistently and attentively.

|                                     |    |                     |             |                  |            |               |                   |        |
|-------------------------------------|----|---------------------|-------------|------------------|------------|---------------|-------------------|--------|
| Student Attendance App   Admin L: X |    |                     |             |                  |            |               |                   |        |
| localhost:5000/result-search        |    |                     |             |                  |            |               |                   |        |
| admin@gmail.com                     |    |                     |             |                  |            |               |                   |        |
| Result sheet for UNI/BSC/9586       |    |                     |             |                  |            |               |                   |        |
| Register Students                   | ID | REGISTRATION NUMBER | COURSE CODE | ATTENDANCE (10%) | TEST (10%) | PROJECT (10%) | EXAMINATION (70%) | Result |
| Enter exam record                   |    |                     |             |                  |            |               |                   | Grade  |
| View Result                         | 9  | UNI/BSC/9586        | CSC411      | 10               | 9          | 9             | 67                | 95     |
| Logout                              |    |                     |             |                  |            |               |                   | A      |

**Table 2: Sample Result Computation for Student 1**

## 5.2 Data Analysis: Student 2:

Variable 2 – Examination point for student 2 with registration number UNI/BSC/0455. This Student scored in attendance (1), Test (4), project (2) and examination (20 %). The total score for this student was 27 % (Table 2). He had F grade probably because his attendance was very poor. He failed his course because he did not attend lectures frequently.

|                                     |    |                     |             |                  |            |               |                   |        |
|-------------------------------------|----|---------------------|-------------|------------------|------------|---------------|-------------------|--------|
| Student Attendance App   Admin L: X |    |                     |             |                  |            |               |                   |        |
| 127.0.0.1:5000/result-search        |    |                     |             |                  |            |               |                   |        |
| admin@gmail.com                     |    |                     |             |                  |            |               |                   |        |
| Logout                              |    |                     |             |                  |            |               |                   |        |
| Result sheet for UNI/BSC/0455       |    |                     |             |                  |            |               |                   |        |
| Register Students                   | ID | REGISTRATION NUMBER | COURSE CODE | ATTENDANCE (10%) | TEST (10%) | PROJECT (10%) | EXAMINATION (70%) | Result |
| Enter exam record                   |    |                     |             |                  |            |               |                   | Grade  |
| View Result                         | 7  | UNI/BSC/0455        | CSC 411     | 1                | 4          | 2             | 20                | 27     |
| Logout                              |    |                     |             |                  |            |               |                   | F      |

**Table 3: Sample Result Computation for Student 2**

## 6. Monitoring and Control

The findings are based on monitoring lectures delivered and attendance and comparing students' Lecture attendance with examination performance. The effectiveness of using review sessions to monitor learning is clearly revealed in the work of (Franklin *et al.*, 2008). The

researcher provided a platform that evaluates the relationship between students' lecture attendance and examination performance. This serves as a control measure based on comparing students' lecture attendance with the examination report. Peter Okebukola, cited in (Yusuf *et al.*, 2010), said that the graduates of Nigerian faculties of education, as example, were insufficiently prepared academically; for this reason, they cannot teach very well or impact accurate knowledge, which contributes negatively to the quality of students they produce. According to (Geetha, 2016), students' overall academic performance may considerably be affected because they are not consistent in lecture attendance and this leads them to be involved in Examination misconduct.

The implication of the study is that when the lecture attendance of student one (1) was compared with examination performance, it shows that his performance was high based on the fact that he attended lectures regularly. On the other hand, when the lecture attendance of student two (2) was compared with the examination performance, it shows that his performance was poor because he did not attend lectures regularly. These facts are automatically generated in the Face Recognition Technology (FRT) system because the accuracy of the system performance evaluation first started with the fisher face algorithm. The algorithm is built into the python library called Dlib and work with OpenCV. The library responsible for binding the integration process is the openCV. The opencv, python flask and Dlib are used as security measures for face detection and recognition to ensure privacy. With this, face of a user is recognized and the system could differentiate between users and mark for attendance. The function also generates a unique ID for each user and MYSQL application is interface between the python flask application to ensure security of data.

## **7. Result and Reports Generated**

The results showed that the platform performed automatic face recognition for accurate monitoring of students' and lecturers' attendance at lectures and was able to generate students' results which showed a relationship between students' lecture attendance and examination reports. The test parameter used is the final examination and attendance. The students' performance based on the number of times they attended lectures shows that the student 1 who attended lectures up to 10 times score A and the student 2 whose attended is 3 times failed. From the report generated, it is highly recommend that attendance should be considered as criteria that enable students to pass in the final examination.

## **8. Conclusion**

The study highlights the need for the computer-based academic monitoring and control of lecture attendance in MOUAU. The study establishes the positive influence of students' attendance on the examination performance. Results generated from this system will showcase the true picture of the report of Students and Lecturers involved in the system. With the electronic system that monitors the lecture attendance, the lecture being delivered, and picks the images of the Lecturer and Students while the lecture lasts, both Students and Lecturers will sit up to their responsibilities squarely. The information processed from the monitoring enables course advisers to advise the students and the university management at large.

## 9. Future Work

More researches are needed to enable the installation of digital cameras in Lecture Halls/Theaters and Laboratories for the Face Recognition Technology system. Compatible sensors should also be installed in the Offices of the Monitoring and Control Units of the University to checkmate indolence, truancy, and cheating on the system. Students' lectures should be monitored automatically to promote productivity and excellence in education sector.

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