Integration of Arficial Neural Network To A Web Based Students Information System For Tertiary Institutions

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Abstract

The development and economic growth of any nation solely depend on the human resources in the educational system. A lot of data about the students activities are involve in the education system, therefore there is need for managing, securing and accessing the data in real time. One of the main problems facing most of the university lecturers is the ability to use traditional paper-based operation to manage bulky quantities and different types of data they encountered in daily operation, starting from non-public data to numerous varieties of documents. Also students' records in most institutions have been held in low esteem, especially in the third world where most archival records on students are held in physical systems, giving rise to complications in recovering vital information and reduced access time. Some the university lacks a predicting system that will help student to predict their result, so as to enable know the area to put more effort to improve their academic performance. The aim of this study is to develop a web based student information system integrating artificial neural network. The methodology adopted in this paper is the Object-oriented analysis and design methodology (OOADM) and the application languages used was Hypertext Markup Language (HTML), Hypertext Preprocessor (PHP), MySQL, Cascaded Style Sheet (CSS), Java Script, Dream weaver, and Fireworks. The effective deployment and management of this system will improve greatly the speed and accuracy of student's information. The Artificial Neural Network used in the study was able to achieve 91% accuracy in predicting student's academic performance.

Keywords: student's information system*, ANN, OOADM, LECTURER*

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Introduction

The development and economic growth of any nation solely depend on the human resources in the educational system. A lot of data about the students activities are involve in the education system, therefore there is need for managing, securing and accessing the data in real time. The student's data that form the important part of the education system are the student's personal and academic records. One of the main problems facing most of the university lecturers is the ability to use traditional paper-based operation to manage bulky quantities and different types of data they encountered in daily operation, starting from non-public data to numerous varieties of documents. The data have numerous access privileges and restrictions and will be entered by a whole lot of

sources, starting from the present student to a faculty staff down to the administrator of the department. Automatically, the generated statistic concerning this data will be utilized by numerous stakeholders in the university. Therefore Traditional paper-based operation is not only pricey however additionally ineffective and time wastage. Therefore, since time is of essence in the digital age, there is need to develop systems that are flexible, reliable and accurate for the purpose of delivering accurate information anytime needed. Meanwhile, availability of such information must not require physical presence except in exceptional cases when physical authentication is necessary. Today, the era of digital age has made possible for online registration, issuing of digital results and transcripts notification and application into the higher institutions through the web have come to be the norm (Uka and Ekwonwune, 2019).

The introduction of a web based students' management system in higher institutions will consequently enhance the efficiency, reliability, cost-effectiveness and management of students' academic transactions. The web based system offers human-computer interactive interface that makes it easy for maintenance and processing of students' data/information. Though, attaining these goals is tough when applying manual system in managing students' records, since the information needed is not well-organized, as a result it might give room for students' data redundancy and poor integrity, which will then led to poor services rendered to the students and staff by the university. Therefore the proposed

Review of Literature

Uka and Ekwonwune (2019) proposed web based students' record management system for Tertiary Institutions. Their paper was borne out due to the problems associated with student academic record management which include improper course registration, late release of students' result, reconciliation of students' result, malpractices at various students clearing units, inaccuracy due to manual and tedious calculation and record retrieval difficulties in the institution. The objective of their paper is to develop a portal that would incorporate online registration, profile creation, students' final clearance and payment, transcript processing, checking of admission status, verification of both O'level /A'level and degree certificates and checking of results, thus it is expected to reduce paperwork and Maria et al. (2015) in their research titled ―Mobile Web-Based Student Integrated Information System‖

system will guarantee to overwhelm these setbacks encountered in the existing (manual) way of managing student information, which include delays in the release of examination results, complaints from students about mistakes in their results, student and parents unable to get access to students' results, difficult experienced by the school management or department to get statistics over a period of time about students such as gender and age representation, students' GPA (Grade Point Average) and CGPA (Cumulative Grade Point Averages) not properly calculated etc.

Student academic performance is very vital in the educational system. The lack of qualify human resources in the building of a nation economic growth is as a result of poor academic result performance of the students. These can les to student's dropout, carry-over of courses etc. there is need for the institutional management to deliver a way of minimizing student's failure and improve their academic performance. Rao et al. (2017), classifying and predicting of student's performance is difficult to be done manually because the database is multidimensional. Therefore, using different classification algorithm will help to eradicate the issue of students' failure in courses (Costa et al., 2017). The Artificial Neural Network employed in this paper will be used to predict student's academic performance. This will help the parents and the teachers to be able to assist the students that performance poorly in some course, either but counseling them or organizing extra-moral classes for them to pick up

automate the record generation process in the tertiary institution. The methodology deployed in packaging their paper is the Object Oriented Analysis and Design Methodology (OOADM) while the programming languages used was Hypertext Markup Language (HTML), Hypertext Preprocessor (PHP), Cascading Style sheet (CSS), Java Script (JS), and My Structural Query Language (MySQL). The results provided solution to inefficiency and at the same time maintain information accuracy and ease of access to students, lecturers, parents and management in the tertiary institution. The paper failed to address the issue of security as they recommended future works to develop a school portal that could make use of face recognition as its security measures.

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describes a conducive and structured information exchange environment for the students of the College of Computer Studies in Manuel S. Enverga University Foundation in Lucena City, Philippines. The system was developed to help the students check their academic result every end of the semester, make self-enlistment that would assist the students to manage their academic status that can be viewed in their mobile phones. The system also helps the dean to predict how many number of sections to be created for the next semester. The researchers applied Hill Climbing Algorithm search technique for the system particularly in creating self-enlistment and finding the best set of courses to the class schedule, and in projection of number of sections to be created for the next semester. Rapid Application Development (RAD) was utilized for the system development; PHP as the programming language, and MySQL as the database. The testing process of the system was done before deploying it to the internet. The process was done in different processors, operating systems and different mobile device platforms. The researchers made use of functionality, reliability, usability, efficiency, maintainability and portability for the testing of the application. The results of the evaluation for the prototype yielded a general weighted mean of 4.44 that describes the respondents strongly agree that the developed system was acceptable. Their work did not apply the technics for prediction of student results. The system is not a mobile application. The development did not focus on numerous courses.

Isijamovic et al. (2012) carried out a comparative study on several classification/prediction algorithms to predict student performance on selected courses in technology enhanced learning environment. They concluded that Artificial Neural Network (ANN) was among the best algorithms by several evaluation criteria. Costa et al. (2017), encounter the above study of Isijamovic by using four classification/prediction algorithms (Naïve Bayes, Neural Network, Decision Tree and Support Vector machine) to predict student failure in programming courses. The sources of the two data used for applying these algorithms came from the campus and distance education in the University of Braze. The result from their study claims that support vector algorithm perform better than the other algorithms.

Further research was carried by Hikmat et al. (2019), using five data mining algorithms (Neural Network, Decision Tree, support vector machine, Naïve Bayes and K-Nearest Neighbor. They concluded that Neural Network performed better than others. From the result of

their research, it was shown that the Neural Network had (98%) prediction accuracy; Decision Tree had (91%), Support Vector machine had (83%) and Naïve Bayes had (76%), which is the smallest prediction accuracy. Unlike the research study of Costa et al., (2017), that claims that Support Vector is better than other algorithms.

Moreover, other researchers such as (Thomas & Hass, 2001, Schumacher et al., 2010 and Wu et al, 2008) in their research study also claims that Neural Network is the best algorithm when it comes to predict students' performance.

Methodology

Due to there are numerous approaches that can be used in designing a system, only one was adopted in this research which is the Object-oriented Analysis and Design Methodology (OOADM). OOADM is a set of standards for system analysis and application design. It uses a formal methodical approach to the analysis and design of information system. Object-Oriented Design (OOD) elaborates the analysis models to produce implementation specifications. OOADM was chosen for its functionalities, in that it allows object oriented abstractions for analysis and design of information-intensive web applications. Besides the modeling abstractions, it also provides a methodology which guides a developer through different activities in the web application development.

Analysis of the Proposed System

The proposed system is a web based student information system. The system automates all the activities in the tertiary institution making it accessible from any internet access point. The research develop a portal that would incorporate online registration, profile creation, students' final clearance and payment, transcript processing, checking of admission status, and checking of results. The new system provides features that are accessible by various categories of users including students, lecturers, support team, bursary, exams and records, and administrators. During the online registration, the student can register all his/her courses for the session. Therefore, the system maintains a centralized database for the student's bio data and course registrations. Students can edit their data and make necessary corrections within a stipulated time before the registration portal closes. The registration information submitted by student's are subject to approval by academic adviser and this done electronically. Once the registration information approved or rejected, the student gets an automatic SMS and E-mail notifying him/her of the registration

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status. In addition, on getting the approval, the student can no longer edit his/her registration information.

Lecturers at the end of every semester can upload student's scores in each of the courses to the online platform. Once the scores are uploaded, the system automatically computes student's grades in the courses and compile each student's result for the semester; and it is only accessible to individual students thou and administrator has access to all the results and departmental heads will equally access their departmental results. During result checking, students equally use their registration number and the PIN code to check their result online.

In the system, there is provision for the bursary unit to manage students' payment information and financial status. With this, the institution authority can get electronic report on the revenue generated and the defaulting students.

With the integration of artificial neural tudent's performance in an exam over time. This made possible by the system-using student's previous scores in their examination to predict performance in coming exams. Students have access privileges to this prediction platform so that with the predicted performance the student can put more effort to perform better
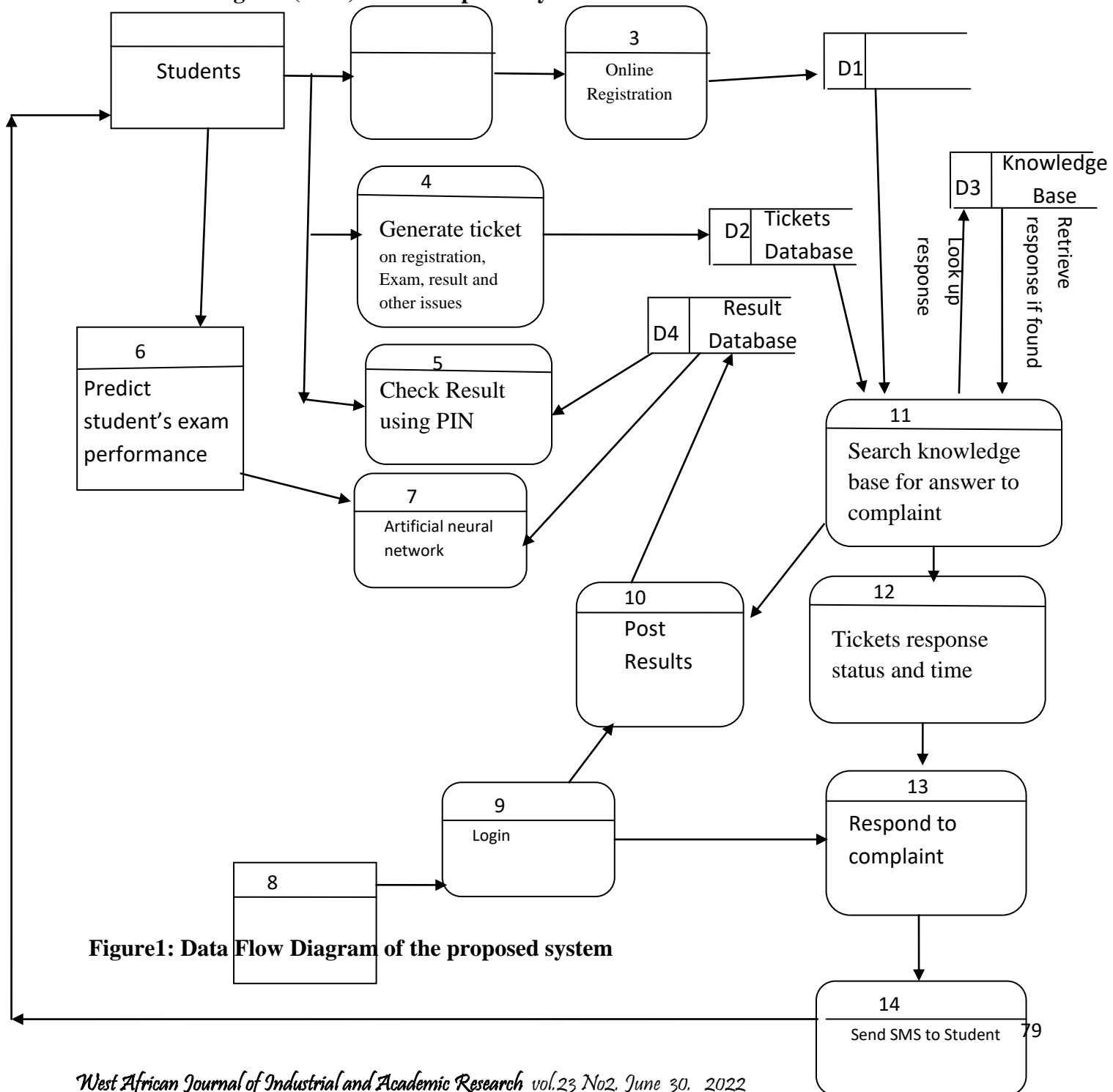
Data Flow Diagram (DFD) of the Proposed System

Figure1: Data Flow Diagram of the proposed system

Use Case Diagram

The use case diagram of the various users of the proposed system is shown in figure below indicating privileges and duties of various users of the web based Student information system.
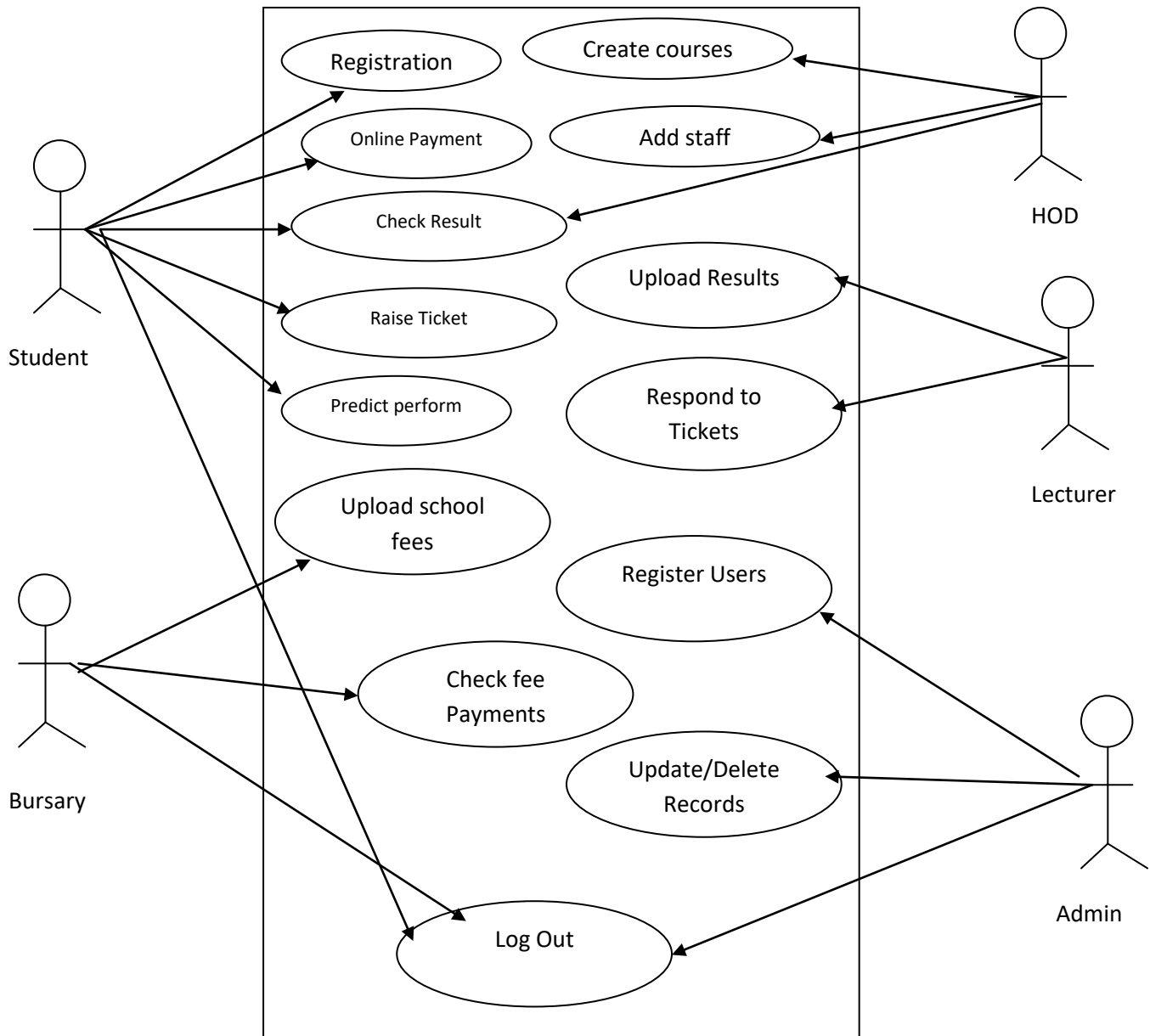

Figure 2: Use Case of the Proposed System

System Requirements
The system requirement divided into software and hardware requirement. Below is the detailed requirement for the proposed security mode.

Hardware Requirements
The list below describes the hardware components and software requirements needed for effective and efficient running of the system. For the implementation of the proposed system, the following hardware is required:
- 2.4 GHZ of processor speed
- 4GB RAM
- 300 GB Hard disk

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- Internet Modem
- Coloured Monitor
- Printer

Software Requirements
   The following software installed on the computer system to run the new system developed.

- window 7, Window 8 or windows 10
- Microsoft Dream Weaver 8
- Wamp Server
- JQuery
- Fireworks
- Php-Mysql
- Java Virtual Machine
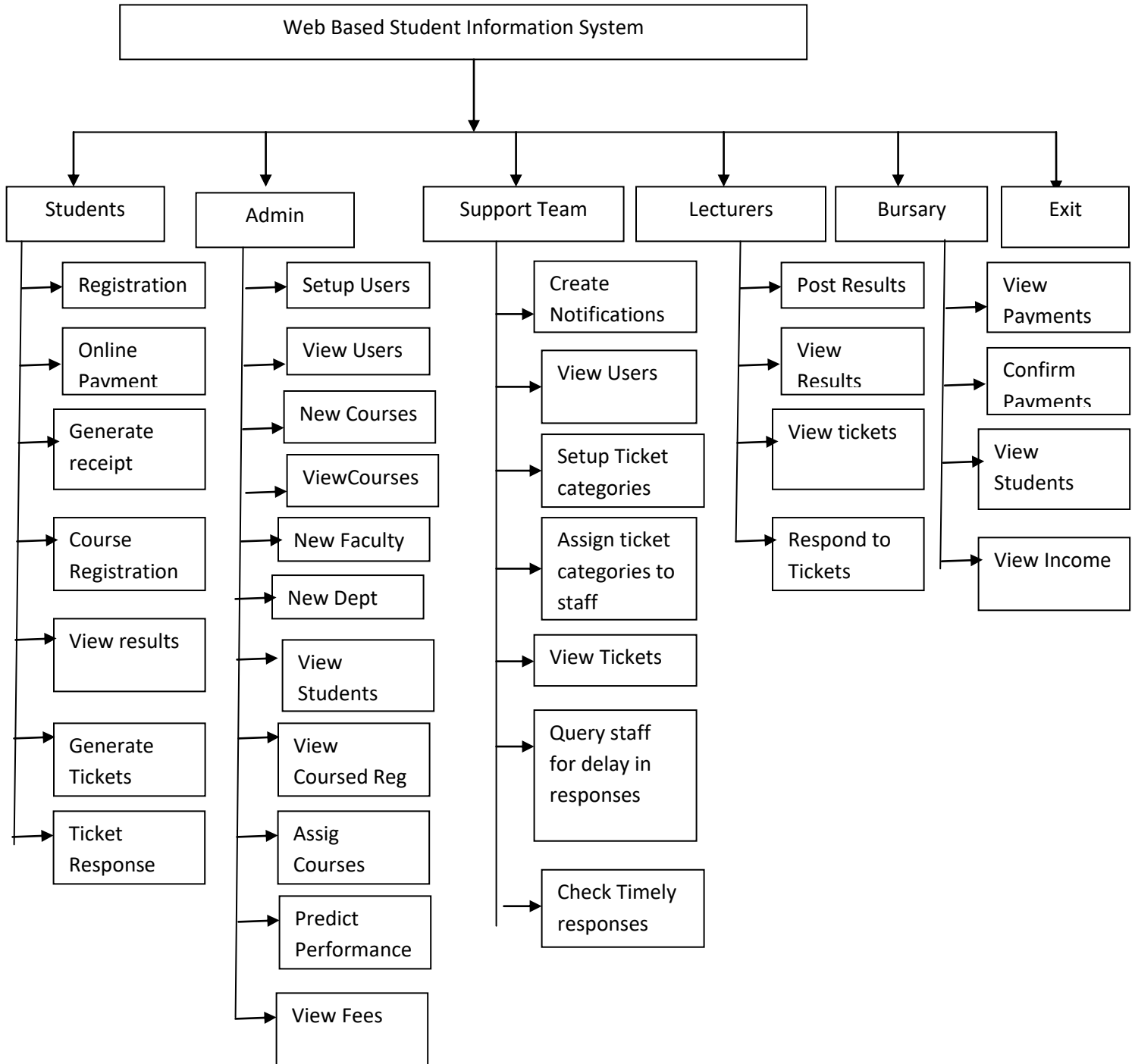
Control Centre/Main Menu

Figure 3: High-level Model of the Proposed System

Program Module Specificatio

The proposed web based student information system using artificial neural network and hidden markov model.is divided into several modules, which come together to give the solution to the problem. The modules are as follows:

Login Module

The login module authenticates users on the platform using username and password. Failure to authenticate all the criteria will lead to denial of access to the system.

The Main Menu

The main menu contains all the available commands and serves as a link to all other modules in the program. To access any of the menu command, click at the menu.

The Registration Menu

This menu contains the commands used for registering new students, new courses, and new departments.

Course Registration

The menu used mostly by students to register their courses. At the end of the registration, a printout
All of the courses registered appears on the screen.

Result Posting

It used to enter the student's scores and hence computation of Grade points and grade of the score takes place here.

Student RegistrationModule

The students use this module to register their details on the platform. The student submits

his/her details including the username and password.

Users RegistrationModule

The admin uses this module to register users on the proposed systemplatform.

View Users Module

The admin uses this module to display all users on the platform.

SMSModule

This module used to send SMS to students and support team staffs.

Ticket Module

The students use this module to generate ticket and submit to the database for response. This module once used will generate an SMS and send it to the support team staff assigned to the ticket category raise.

Ticket RespondModule

The platform allows support team staff to use this module to respond to tickets raised by students.

NotificationModule

The admin uses this module to send SMS notifications to students registered on thisplatform.

View TicketModule

This module used to display the dataset of the tickets generated.

Delete Module

The admin uses this module to delete unwanted record from the database.

View Result Module

This module displays student's examination results

.Conclusion

Student's information management is a critical issue in most universities in developing countries. Timely access to information and security of the information is very crucial for effective implementation of electronic data management. This paper discussed on the development of a web based student information system, with the integration of artificial neural network technique for the prediction of student's performance in an exam over time. This made possible by the system-using student's previous scores in their examination to predict

performance in coming exams. Students have access privileges to this prediction platform so that with the predicted performance the student can put more effort to perform better or the courser adviser to call the student for counseling.

The effective deployment and management of this system will improve greatly the speed and accuracy of student's information.The Artificial Neural Network used in the study was able to achieve 91% accuracy in predicting student's academic performance
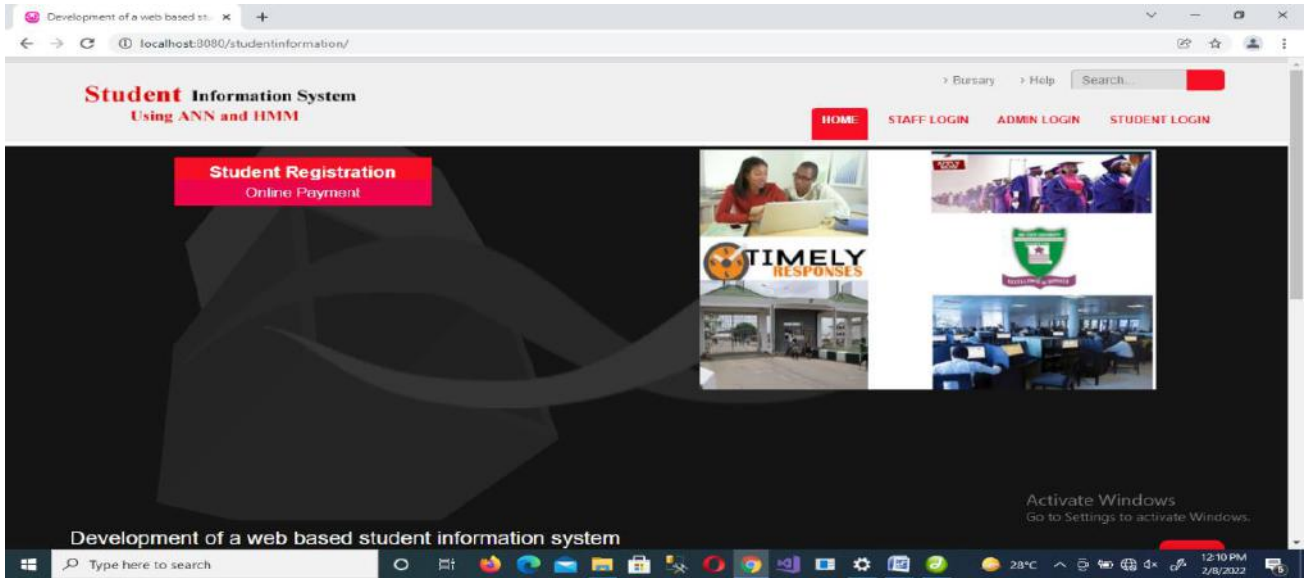
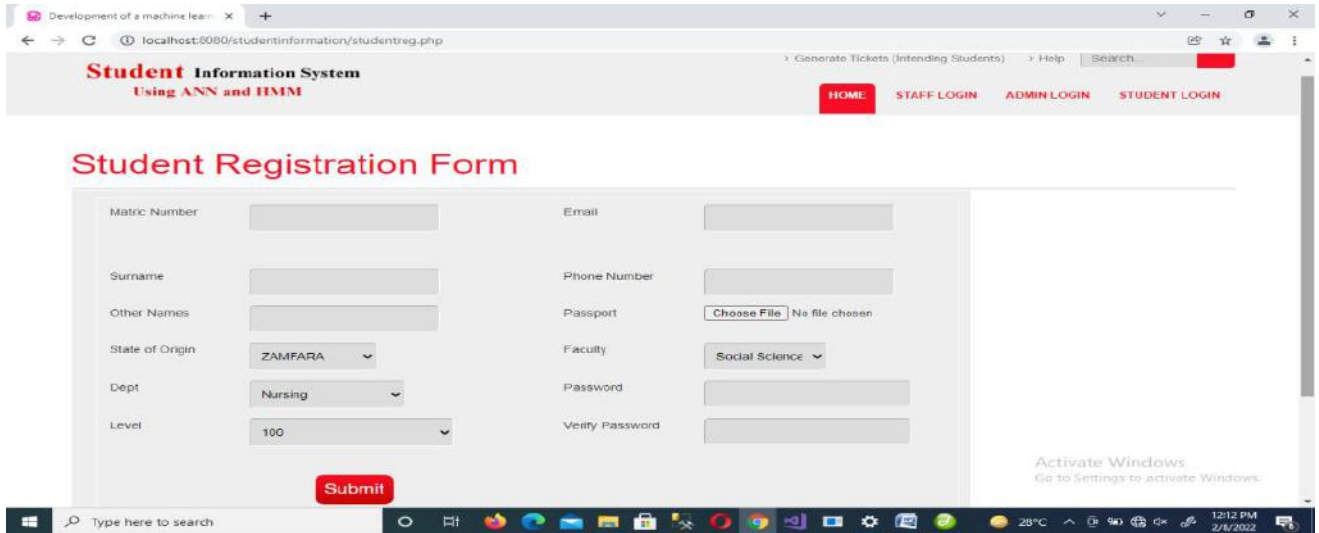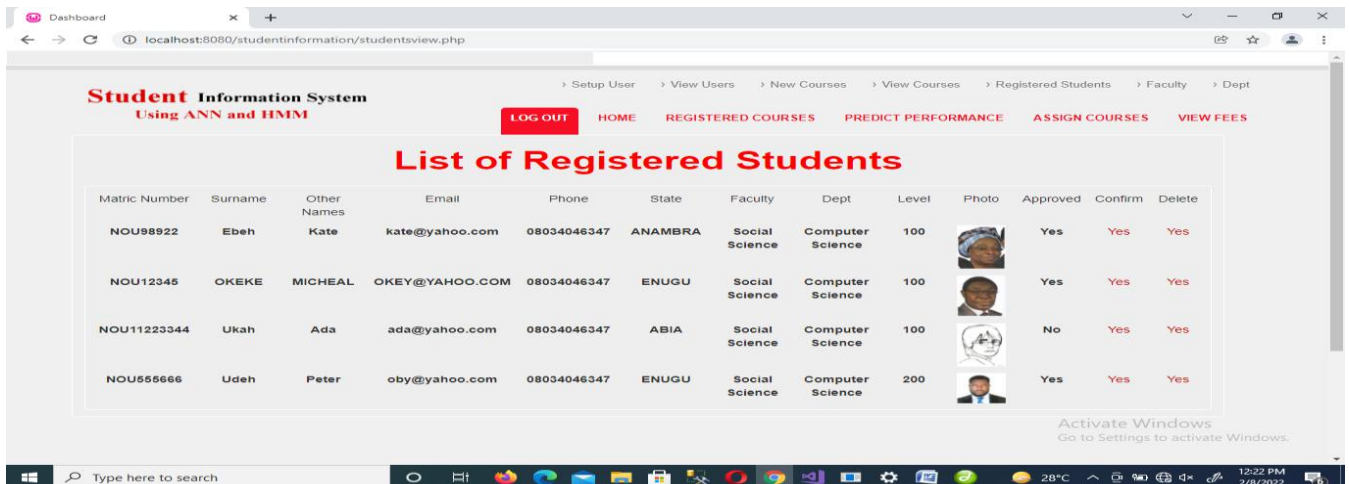## Design Output Results

Figure 4: Home Page

Figure 5: Student

Registration Page
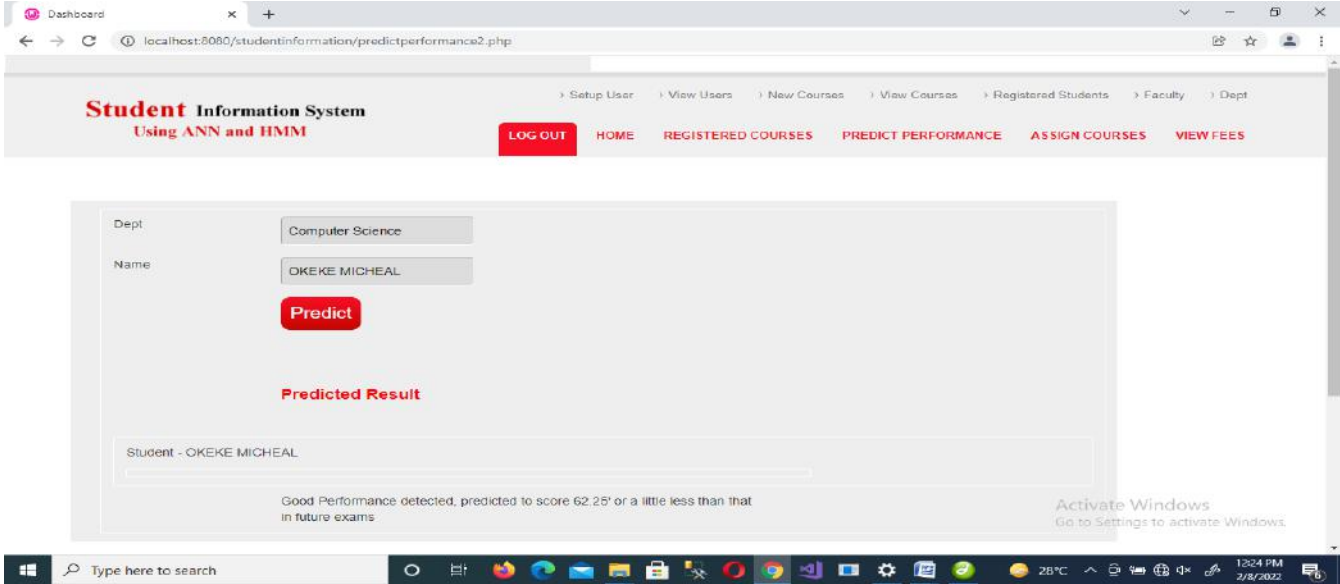
Figure 6: List of Registered Students

Figure 6: Predict Student's performance

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