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ENHANCED EXAMINATION MALPRACTICE DETECTION MODEL USING XGBOOST AND DECISION TREE TECHNIQUES

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ABSTRACT
The research examines the Enhancement of Examination Malpractice Detection System Using XGBoost Machine and Decision Tree Algorithm. A Gradient boosting machine learning algorithm and a decision tree algorithm using the captured student fingerprint are used to track student's bio data during examination so as to detect examination malpractices. Findings revealed that machine-learning application improved the efficiency and performance of Examination malpractice detection system through neural analysis, interpretation and interface to the existing database management system which contains the sample of students' handwriting. The software development methodology adopted for the development of the system is Structured System Analysis and Design Methodology (SSADM). The programming language used is java, php and the database used is MySql. The designed system was implemented as the Enhanced Examination Malpractice Detection System Using XGBoost Machine and Decision Tree Algorithm which was tested and found successful.

Keywords: XGboost, Decision Tree Algorithm, Examination Malpractices, Database Management System

INTRODUCTION

A major problem which influences the education sector is the issue of examination malpractice. Examination malpractice can take up different forms such as impersonation, copying, inscription, external assistance and so on. Malpractice is identified due to the absence of credible identity verification system for offline and also for online examinations (Wilcox, 2017).
In order to overcome the issue of examination malpractice, several researchers have focused on the use of artificial neural networks. Artificial neural network (ANN) is a computational model that consists of several processing elements that receive inputs and deliver outputs based on their predefined activation functions (Akram, Farida, and Ram, 2015).

This study presents an enhanced examination malpractice detection model using Xgboost and Decision Tree techniques. Examination malpractice also known as cheating is the illegal action that students take during their examinations to try to make good grades by cutting corners. Examination malpractice is an act or irregular manner of testing candidates which contravenes the rules and conventions guiding the conduct of examinations.

Examination malpractice has done a lot of harm to students since many of them have neglected their books with the hope of performing the magic they are used to in every examination. Examination malpractice in Nigerian educational system has been widely discussed and viewed as a major challenge not only to examination bodies but to school administrators, the entire education system, the government and the society at large (Wilcox, 2017).

Statement of the Problem

This study addresses the problem of impersonation as an examination malpractice issue in Tertiary Institutions. Examination malpractice can be defined as the activity of cheating in an examination by a student. Several researchers and scholars most especially Markinwa et al., (2019) tried solving the problem of malpractice via the application of Information Communication Technology (ICT).

Furthermore, the periodic assessment of students' evaluation mechanism in institutions of higher learning cannot be over emphasized.

Observations have shown that most institutions are yet to digitize the process of admitting /exiting students into/out of examination halls as they are still using manual system which includes the use of Identity cards, school fees receipts and clearance papers to admit students to examinations and these gives room for examinations problems such as impersonation, exchange of writing materials and so on. These problems undermine examination process which is one of the core activities in educating students. Some of these problems can be explained further;

1. Impersonation of students: during examinations, the default of identifying whether the student bearing a manual document is the real owner becomes a serious challenge for examiners. Students leverage on this weakness and continued to exchange examination positions or materials within examination halls.

2. Large population of students: the usual large populations of students in schools poses a challenge during examinations as the ethics associated with process are hardly observed completely due to human errors on the side of the examiners. The manual system of admitting students into examination Hall becomes inefficient in the case of large crowd.
3. Forgery of documents: students go extra miles to forging documents for the purpose of examination in the case of manual system. The automated system will identify students by biometric capture, matching it to existing data in the database.

Aim and Objectives of the Study

The aim of the study is to develop an enhanced examination malpractice detection model using Xgboost and Decision Tree algorithms. The specific objectives of the study are to;

i) survey existing works on examination malpractice detection.
ii) develop a software for improved detection of examination malpractice.
iii) evaluate performance of the developed system model using a standard metrics.

Methodology of the Study

The study adopted Object Oriented Analysis and Design Methodology (OOADM). Object-oriented analysis and design (OOAD) is a software engineering approach that models a system as a group of interacting objects. Each object represents some entity of interest in the system being modeled, and is characterized by its class, its state (data elements), and its behavior. Various models can be created to show the static structure, dynamic behavior, and run-time deployment of these collaborating objects. There are a number of different notations for representing these models, such as the Unified Modeling Language (UML).

Analysis of the developed System

The new system is an enhanced examination malpractice detection model using Xgboost and Decision Tree techniques. The new system detects malpractices in quick response time due to its machine-learning oriented technique. The new system consists of four components: user interface, system database, enrolment module, and authentication module. The user interface provides mechanisms for a user to indicate his/her identity and input his/her fingerprints into the system. The system database consists of a collection of records each of which corresponds to an authorized person that has access to the system. Each record contains the following fields that are used for authentication purpose: user name of the person, minutiae templates of the person's fingerprint, and other information. The new system is made up of a fingerprint scanner that acquires images of the students and propels the captured image to the image enhancement module. Subsequently the enhance images compare with those sitting or the examination (Fingerprint Detection and Recognition) modules. The attendance will then mark on the database server.

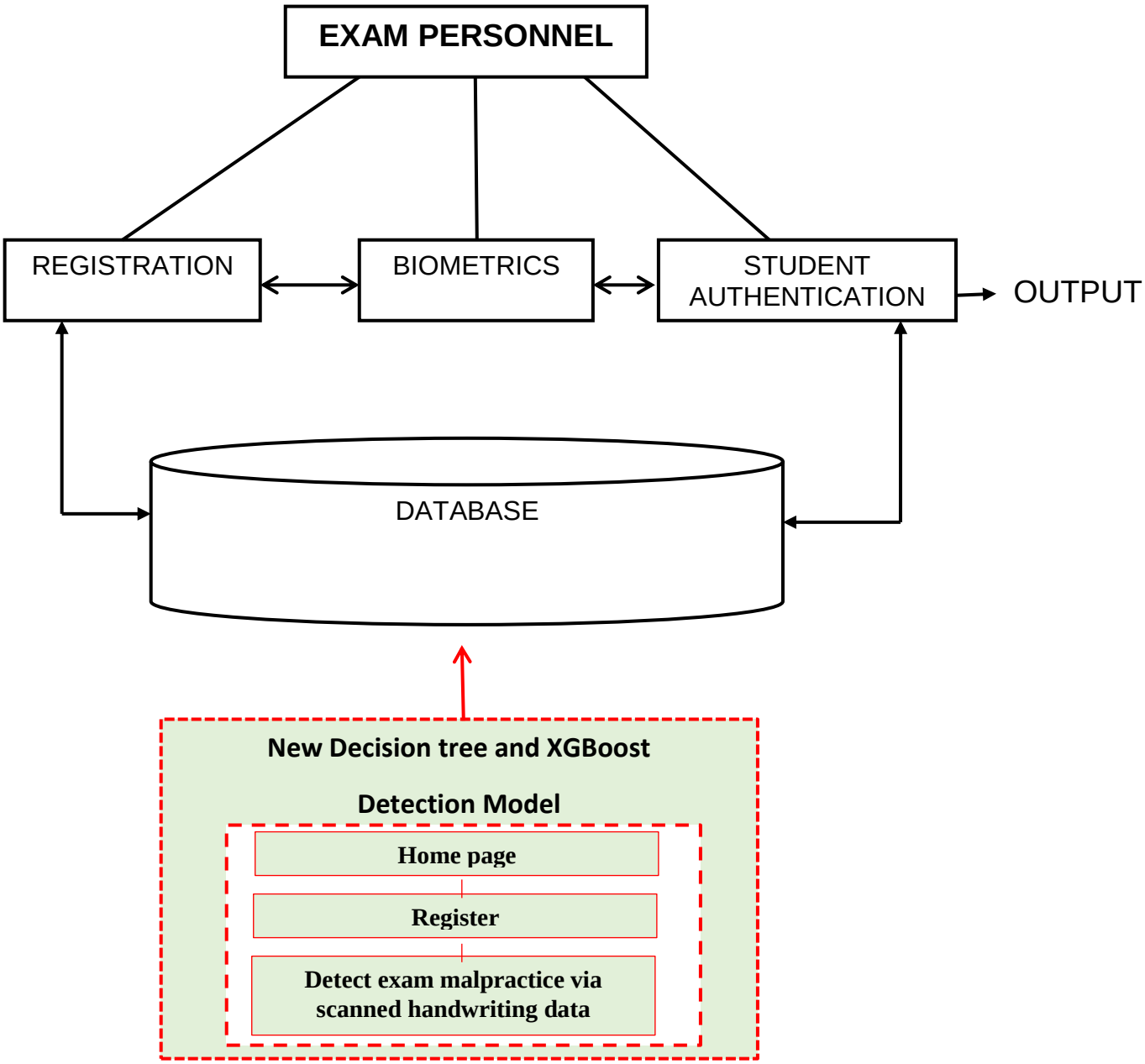
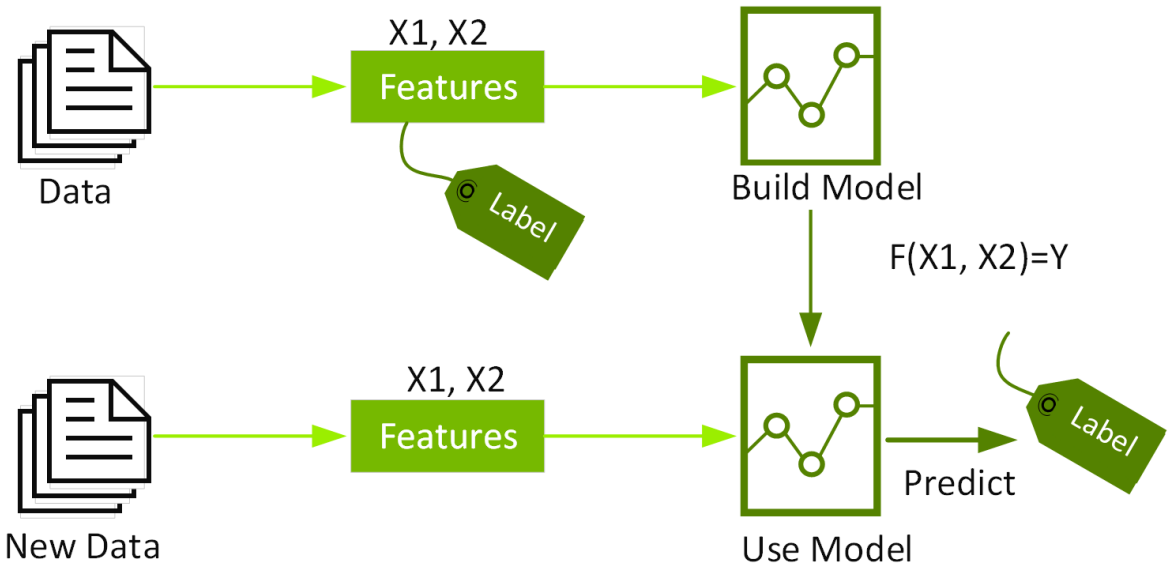


Figure 1: Architectural Design of the developed System

The application of the Xgboost model to the enhanced examination malpractice detection system encompasses data prediction processes and features used for predicting examination impersonation detection.



Application of Decision Tree Model to the Enhanced Examination Malpractice Detection System

The application of the Decision tree model to the enhanced examination malpractice detection system encompasses crime historical data, new crime data, data processing and data warehousing.

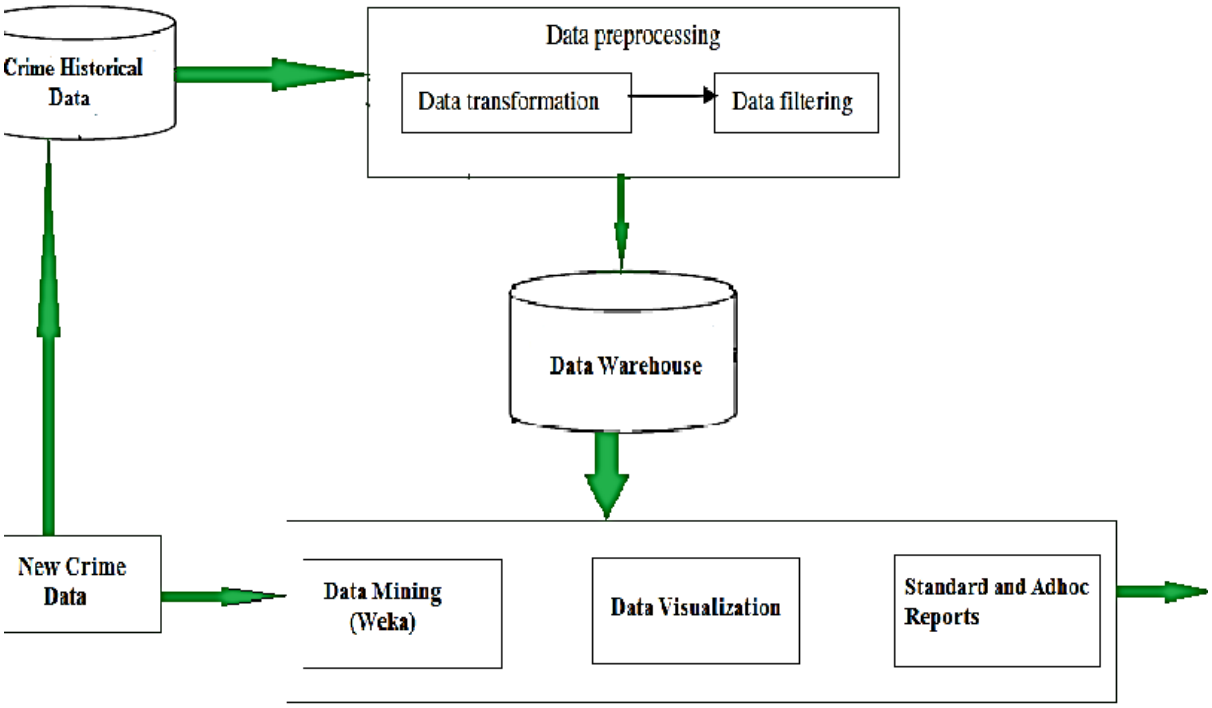
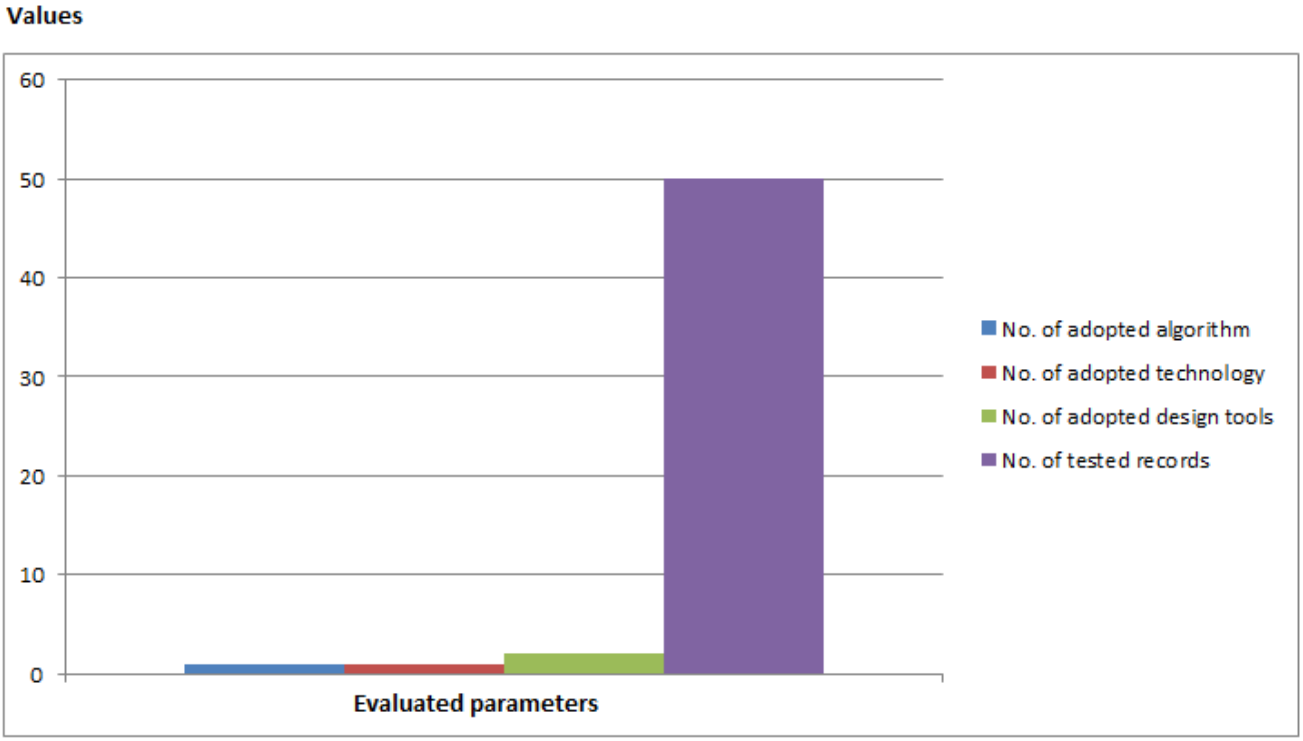


Figure 3: Application of the Decision Tree Model



Results and Performance Evaluation of the existing system and the developed system

Table 1 shows result of the existing system
(Source: Markinwa et al, 2019)

Sn.	Evaluated parameters	Values (V)
1.	No. of adopted algorithm	1
2.	No. of adopted technologies	1
3.	No. of adopted design tools	1
4.	No. of tested records	45

Accuracy level of the present diagnostic system is given by:
Summation of values x 1/100
= (1 + 1 + 1 + 45) x 1/100
= 48/100
= 0.48%

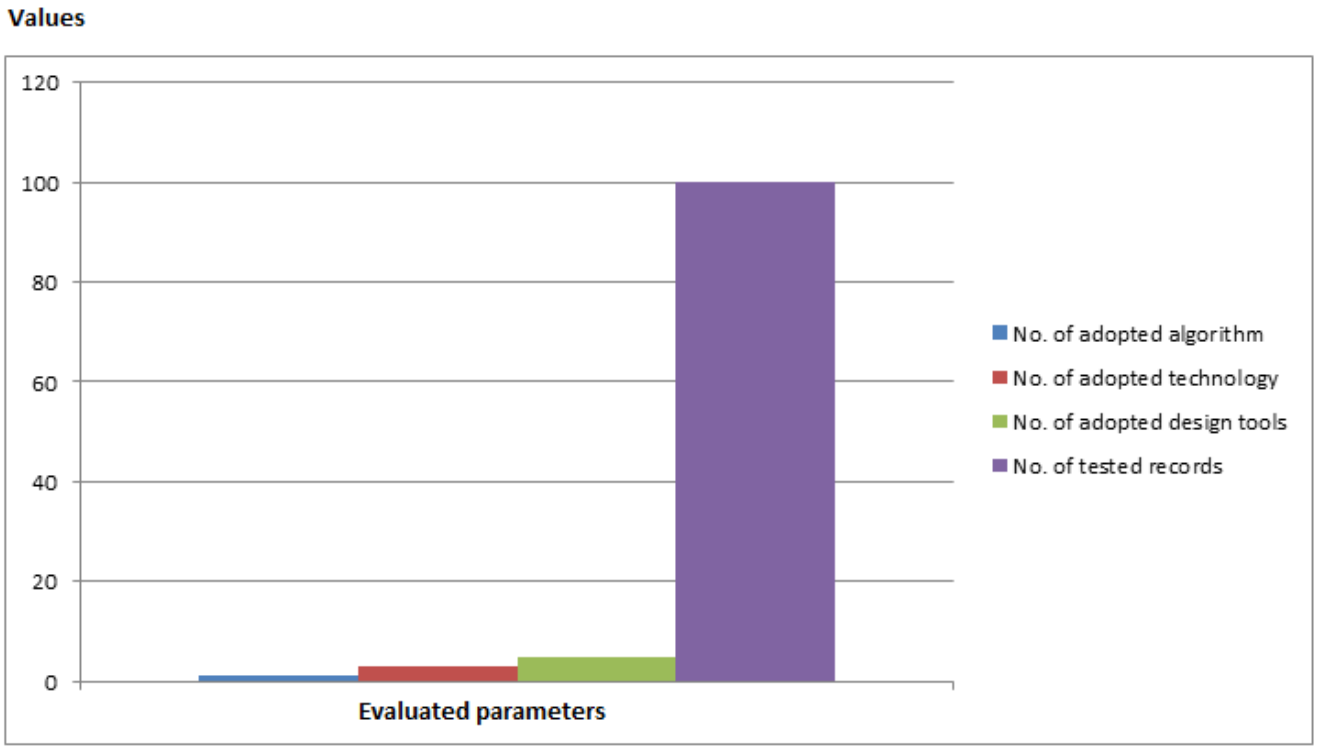
Figure 4: Performance evaluation chart of the existing system

Table 2: Result evaluation of the developed System

Sn.	Evaluated parameters	Values (V)
1.	No. of adopted algorithm	1
2.	No. of adopted technologies	3
3.	No. of adopted design tools	3
4.	No. of tested records	100

Accuracy level of the improved diagnostic system is given by:
Summation of values x 1/100
= (1 + 3 + 3 + 100) x 1/100
= 107/100

= 1.07%



Discussion of Results

From table 1, the proposed system was implemented and tested for examination malpractice. Tables 1 and 2, show the results of the existing and new systems for examination malpractice detection. Parameters for analyzing and evaluating the results of both systems encompassed the number of adopted algorithm, the number of adopted technologies, the number of adopted design tools and the number of tested records. From the performance evaluation, the proposed system showed better performance than the existing system as it achieved an accuracy rate of 1.07% as compared to the existing system which achieved an accuracy rate of 0.48%.

The study findings revealed various forms and styles of examination malpractices including but not limited to; impersonation, disorderliness, cheating, giraffing, conspiracy and aiding, forging of results, machinery, microchips, smuggling of question papers out of examination venues, smuggling answer scripts into examination venues, sorting and rewriting. The study also identified various tricks employed by students to cheat during examinations and found the following features manifesting frequently in answer scripts. Some of them are similar answers, the same mistakes, exceptionally neat or rough answer scripts as if written outside, out of range answer scripts, some scripts containing more than one hand writings, using of different ink or biros in between work, forgetting microchips in answer booklets, providing verbatim answers as contained in marking scheme and so on.

The study revealed an array of factors responsible for examination malpractice in Nigeria which includes: wrong value system, quest for certification instead of knowledge and skills, Laziness, lack of preparation or in-adequate preparation for examination and lack of self-confidence.

Advantages of the Proposed System

The following advantages of the Proposed System are:

i) provision of in-depth knowledge for exploring students identity

ii) economical, fast, reliable, flexible and easy setup methodology by management of Tertiary Institutions.

iii) complementation of graphical projective technique in order to detect slight or profound conflicts and to contribute to the diagnosis and follow up of examination malpractice cases.

iv) introduction of a machine-learning application that will improve its efficiency and performance through neural analysis, interpretation and interface to the existing database management system which contains the students' handwriting.

CONCLUSION

In this study we developed an enhanced detection model for examination malpractice in tertiary institutions in Nigeria. The study revealed an array of factors responsible for examination malpractice in Nigeria which includes: wrong value system, quest for certification instead of knowledge and skills, Laziness, lack of preparation or in-adequate preparation for examination, lack of self-confidence, poor school facilities, (Lack of or in-adequate examination hall) poor sitting arrangement, socio-economic factors, political- undertone, poor invigilation, weak parental function and so on.

RECOMMENDATIONS

The study recommended the application of machine learning techniques such as decision tree and Xgboost for the detection of examination malpractices in Nigerian Tertiary Institutions. This is because it is the subset of artificial intelligence (AI) that focuses on building systems that learn or improve performance based on the data they consume. Artificial intelligence is a broad term that refers to systems or machines that mimic human intelligence.

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