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Analysis of unfair means cases in computer-based examination systems



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ABSTRACT

There are mainly two systems of examination used by educational institutes to evaluate the performance of students. Most institutes use the conventional examination system, and some use computer-based examination systems. Unfair means is an illegal act by a student in either type of examination systems. In this paper, we will provide an overview of the types of examination systems. We will discuss types of unfair means cases in computer-based examination systems and will discuss some patterns and trends discovered using data mining techniques. After discussing the patterns, we will also suggest some key points for avoiding and diminishing the unfair means cases.

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1. Introduction

This research is based on the Virtual University of Pakistan. Educational institutes provide the facilities for students to gain knowledge and skills. To evaluate student performance, institutes use assignments, quizzes, general discussions and examinations. There are two types of examination systems: a paper-based examination system and a computer-based examination system.

2. Types of examination systems

There are two types of examination systems: one is a paper-based examination system, and the second is a computer-based examination system.

2.1. Paper-based examination system

In the paper-based examination system, students attempt their exams on paper; answer sheets are provided to the students with the question paper. The students write the answers on the paper and submit them to the respective invigilator. The papers will be sent for grading to the respective evaluator. This examination

system is conventional and easy to conduct because it only requires some chairs in an examination hall where students can sit and complete their exams. The answer sheets are provided to the students for attempting or answering the asked questions. The examiners monitor the students to prevent unfair means cases or any misconduct.

2.2. Computer-based examination system

In the computer-based examination system, students attempt their exams on computers. There are two types of computer-based examination systems:

- Online examination.
- Offline examination.

2.2.1. Online examination

In the online examination system, exams are conducted on the internet. Electronic files are placed on a dedicated server, from which students access the file and answer the questions. After answering the questions, the solution file is uploaded back on that server. The solution file may be uploaded after the student completes it or through an auto-save procedure that automatically saves the students' data to the server after some specific time.

Here, the following question arises: how can an institute monitor the students during the online examination? If all students complete their exams from a designated exam centre, the

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institute can appoint invigilators or a superintendent in that specific examination centre. However, because these exams are conducted on the Internet, it is possible that one can complete his/her exam from his/her home or even in his/her living room. It is not possible for an institute to arrange a specific superintendent for invigilation of all such students who attempt the exams from their living places. In this situation, students are monitored by web cams, which are placed in such a way that those cameras cover all the surroundings of the student to ensure that nobody is near the student. These web cams are monitored by invigilators checking the computer screen. The invigilator can use software that displays the student's computer screen, such as Team Viewer.

2.2.2. Offline examination

In the offline examination system, the question file is placed on the server of a local area network (LAN) in each exam centre (for example, if there are 10 exam centres selected for the examination, then every exam centre has its own LAN). The students access their exams from the server on the LAN and answer the questions on a computer that is connected to that specific LAN. For invigilation purposes, invigilators and superintendents perform the duties at their designated exam centres. Each student's solved file or data is saved on the server of that LAN, from which it is uploaded to a main server of the institute, where it will be available for grading. The student's solution is saved on the local server of the LAN after the completion of the paper or automatically after some specific time interval. When all the papers are completed, every exam centre uploads the solution files to the main server of the institute, where they will be available for grading.

The Virtual University of Pakistan uses both types of computer-based examination systems. The online examination system is used for its overseas students. The exam file is uploaded on the dedicated server, from which students access their exams and solve the problems; the students' answers are saved automatically on the server after some specific time period. The offline examination system is used for its more than 100 examination centres. All exam centres download their respective exam files and load them on the server of their LAN, and students access their papers from the computers that are connected to that LAN. At the end of the day, when all papers are completed, the solution files are uploaded on the exam server of the Virtual University of Pakistan.

3. Unfair means cases

In every type of examination, there are many students who use unfair means and seek help from other people or things during the examination. Although students use unfair means in every type of examination system, here, we discuss unfair means cases in computer-based examination systems, analyse the real data of unfair means cases that are filed in computer-based examination systems and try to identify some trends or patterns using data mining techniques.

3.1. Unfair means cases in computer-based examination systems

We have collected the unfair means cases (UMC) data of undergraduate students from the Virtual University of Pakistan for 13 semesters from Fall 2009 to Fall 2015. The Virtual University uses a computer-based examination system. In Virtual University UMC, cases were registered against the students, and these cases were sent to the Committee on Unfair Means (COUM). The COUM sends a show cause notice to the student, and the student replies

to that notice explaining his/her view. After a proper inquiry based on evidence provided by the superintendents and invigilators, COUM makes a decision and issues a verdict accordingly.

3.2. Missing values treatment

We analysed the unfair means cases and found that some values are missing in the column of verdict/decision issued by COUM. After further analysis, we observed that there are two basic types of decisions: fail in the subject or exonerate the student. We have filled in these missing values by applying some modified missing value treatment using the mean method. Using this method, we take the mean value of all the entries and fill in the missing entries with that mean value. In our data, there are only two types of verdicts; therefore, we took the average of both verdicts and filled in the missing entries accordingly.

4. Types of unfair means cases

There are eight main types of unfair means cases, as listed in Table 1.

If we analyse Table 1, it clearly shows that the number of male students involved in UMC cases is higher than the number of female students. The ratio of male to female students in each type of UMC is shown in Graph 1.

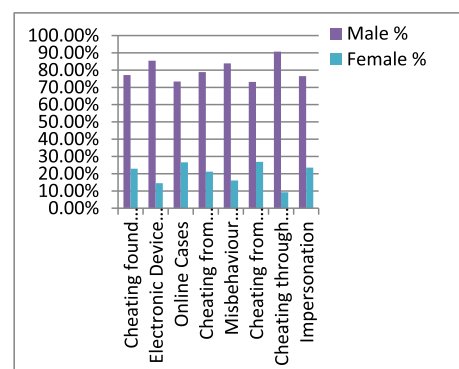
4.1. Cheating from helping material

Cheating by using a helping material means cheating by book, written material found on a piece of paper, notes or material written on the student's own body such as on a hand or arm. We found that in this category, most students used notes written on a piece of paper.

As we see in Table 2, the number of cases in which the verdict was failure in the subject is higher for all other case types than for cases involving notes written on the hand. The reason for this is

Table 1
Types of UMC.

UMC type/category	No of cases	Male	Female
Cheating found during marking	2582	1991	591
Electronic device found during paper	778	665	113
Online cases	556	408	148
Cheating using a helping material	397	313	84
Misbehaviour cases	298	250	48
Cheating involving another student	231	169	62
Cheating through computer	205	186	19
Impersonation	34	26	8



Graph 1. Male-to-female ratio.

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