EDUVISION: AI- POWERED REMOTE PROCTORING FOR AUTHENTICATION OF REMOTE CANDIDATE DURING ONLINE EXAM

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ABSTRAK

Disebabkan kemunculan isu kesihatan COVID-19, kebanyakan institusi pengajian tinggi di seluruh dunia terpaksa beralih dan menyesuaikan diri dengan pantas daripada peperiksaan di tapak kepada peperiksaan dalam talian pada tahun 2020. Sebenarnya, pengesahan identiti dan pengawasan calon dalam talian menjadi salah satu daripada cabaran utama peperiksaan dalam talian hari ini. Tambahan pula, untuk mengekalkan integriti peperiksaan dalam talian, adalah penting untuk mengesahkan bahawa calon dalam talian yang menamatkan peperiksaan dalam talian dan memperoleh kredit akademik adalah mereka yang mendaftar untuk kursus tanpa terlibat dalam penipuan atau menyamar sebagai calon lain. Dalam kertas kerja ini, penyelesaian khusus dicadangkan berdasarkan pengesahan teknologi biometrik seperti pengecaman muka untuk mengesahkan identiti calon dalam talian daripada pangkalan data dan sistem pengawas automatik dengan algoritma kecerdasan buatan (AI) untuk membenderakan dan memberi makluman untuk tingkah laku yang mencurigakan secara langsung. Berdasarkan System Usability Scale (SUS) yang telah dijalankan dalam kajian ini, seramai tiga puluh orang telah dipilih secara rawak untuk menguji aplikasi dan menjawab soal selidik. Maklum balas mengenai aplikasi EduVision itu dikumpul menggunakan soal selidik daripada borang Google Forms. Berdasarkan analisis menggunakan System Usability Scale (SUS), jumlah skor purata ialah 70% untuk aplikasi web ini.

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ABSTRACT

Due to the emergence of COVID-19 health issues, most of the higher education institutions throughout the globe had to quickly shift and adapt from on-site examination to online examination in 2020. In effect, identity verification and proctoring of online candidates became one of the key challenges to online examination today. Furthermore, in order to maintain the integrity of the online examination, it is crucial to confirm that the online candidates who finished the online examination and obtained academic credit are those who registered for the courses without engaging in cheating or impersonating other candidates. In this paper, a specific solution is proposed based on the authentication of biometric technology such as facial recognition to verify online candidate's identity from the registered database and automatic proctoring system with artificial intelligence (AI) algorithms to flag and generate alerts for suspicious behavior in live proctoring with high accuracy. Based on the System Usability Scale that was conducted in this study, a total of thirty respondents were selected randomly to test the application and answer the questionnaire. The responses about the application were collected using a questionnaire from Google Forms. Based on the analysis using System Usability Scale (SUS), the total average score is 70% for this web application.

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CHAPTER 1

INTRODUCTION

1.1   Introduction

With the outbreak of Coronavirus (COVID-19) disease, online examinations for academic evaluation have been standard procedure for higher educational institutions and remote candidates. Gorgani, H. H., & Shabani, S. (2021) agree that additionally, there are a number of positive aspects in taking examinations online, including time savings, usability, increased adaptability, and the availability of quick feedback. The improvement of remote candidate's cognitive, problem-solving, and time management abilities is another advantage. However, on the flip side, accessibility to computers and the internet, a lack of prior computer or online assessment expertise, test anxiety, and higher cheating rates are some of the key issues with online examinations.

Academic integrity is still an essential element of higher learning. Exam fairness protects academic integrity while increasing students' drive to improve their performance. There are various obstacles to online exam fairness, such as restricted proctoring alternatives and increased cheating rates. When students take an online

examination without a proctor present, it may be easier for them to look up answers elsewhere or discuss the task with others. Shuja, Y., Hannah, S. and Hozafa A. (2020) says that this not only defies the goal of the exam, which is to measure students' competency, but it can also create additional stress to remote candidates who are competing against one another. In-person tests are generally effective deterrents to cheating. However, because online exams are difficult to supervise, cheating can go unnoticed. Shuja, Y., Hannah, S. and Hozafa A. (2020) also stated that cheating might be considered as contrary to the motto of honesty and integrity in medical ethics. Despite this, we recognise that ethics may not prevent cheating online where proctors are unaware of students' activities. A more robust method for online testing, such as student authentication and an automated remote proctoring algorithm, could be good alternatives to this problem.

One of the most significant problems to today's online learning is the identity verification and proctoring of remote candidates (Mikel Labayen, 2016). Without confirmation of the validity of the remote candidate's identity, the desire for wholly online education is impacted, and the evaluation of the remote candidate's knowledge and skills is unreliable. To avoid jeopardising the legitimacy of online accreditation, validation must be performed on a consistent or continuous basis. A face recognition system is a piece of technology that can recognise and authenticate people in digital photos and video footage (Ben W. M., Rodrick W., Jonathan S. and Andrew K., 2021). There are many facial recognition algorithms in academia, and some of the research findings are rather advanced. VGGFace from the University of Oxford, DeepFace from Facebook, Open-Face from Carnegie Mellon University, and FaceNet from Google are examples of turning face recognition algorithms (Ben W. M., Rodrick W., Jonathan S. and Andrew K., 2021). Face recognition has always been a prominent subject of research due to its unobtrusive aspect and because it is people's standard mechanism of person authentication.

In traditional examinations, the proctor's monitoring can greatly reduce the potential of cheating and prevent pupils from cheating. Human proctoring is currently the most popular method of evaluation, requiring test takers to visit an examination centre or

supervising them visually and audibly throughout exams via a webcam. However, such approaches are time-consuming and expensive. Remote proctoring, also known as online proctoring, is the use of technology in internet-based testing to achieve a process that operates similarly to human proctors that present at a physical testing centre. Online proctoring systems are classified into three types: live remote proctoring, recorded remote proctoring, and automated remote proctoring. In automated proctoring, critical instances of potential fraud or cheating are detected by the proctoring system rather than by human proctors who monitor (or analyze) the entire exam (Muhammed J. H, 2020). The proctor is notified to analyse these actions to determine if the student committed fraud or cheating (Sietses, 2016). AI-powered Remote Proctoring for Authentication of Remote Candidate During Online Exam is a system designed and developed for university students, specifically Universiti Pendidikan Sultan Idris (UPSI) students, that integrates biometric authentication (like facial recognition, ID scan) through a webcam to verify remote candidate's identity from the registered database, as well as automated remote proctoring that uses AI algorithm to flag and generate alerts for suspicious performance.

1.2   Research Background

AI-powered online proctoring is a viable alternative to traditional proctoring since it creates a cheat-resistant environment in which exam integrity and security are assured through the use of machine learning technologies. API facial recognition distinguishes the student's face to their remote candidate identification photo to authenticate the exam participant's identity and any malpractices. The solution provides audit logs of proctored session data, allowing teachers to easily evaluate questionable conduct if necessary. Fully automated proctoring is ideal for synchronous or asynchronous low-stakes assessments.

The employment of AI-based remote proctoring and online examination technology primarily increases the legitimacy of remote exams. AI systems are capable of identifying suspicious behaviours faster than human sight can. It generates notifications for anything and everything that indicates exam misconduct or cheating.

As a result, it has the potential to improve the accuracy of candidate assessments. Because of the time and travel involved, many professions are hesitant to attend to certificates. However, with the proposed solution, most test takers will enjoy the flexibility and peace of mind that fully automated proctoring provides.

To alleviate issues regarding exam integrity, the automated proctoring system's AI assists in ensuring exam integrity, from identification verification before the test begins to the final evaluation. The remote candidate's photo will be recorded to authenticate their identification without needing them to deploy anything on their device. The proctoring system then records footage of the test takers and analyses and flags any unusual conduct.

There are numerous advantages to using AI-based remote proctoring and examination technology for online examinations. However, universities encounter a few problems when it comes to integrating virtual proctoring tests. Many prerequisites are required, including a laptop or desktop computer, a stable internet connection, and various equipment such as speakers, webcams, microphones, and so on. Regardless of the difficulties, AI-based remote proctoring systems provide a foundation for improved and more secure exam administration. It has the potential to significantly improve the credibility of online exams and prohibit applicants from engaging in unethical behaviour.

1.3   Problem Statement

Fair and effective approaches for enhancing academic integrity have long been debated in higher education. The COVID-19 epidemic has resulted in extensive changes in higher education, with many schools implementing online learning models. As the number of totally online courses grows (Allen and Seaman, 2010; Johnson, 2019), instructors and administrators face the problem of creating techniques to appropriately assess student learning in an online context while ensuring academic honesty. One significant issue with online evaluation is that it opens up a variety of technological alternatives that encourage students to engage in unethical activity.

When examinations are held online, students exploit the fact that they are not in the presence of their teachers and cheat. Students could, for example, answer questions using notes, a Google search, or other resources. They could also communicate and collaborate throughout exams through teleconferences and/or social media. This raises various problems about academic integrity while using an online learning system.

This further on raises the following difficulties and challenges in connection to plagiarism and overall academic integrity Plagiarism, defined as the use of another's work without acknowledgment or citation, is and has been a main consideration in higher education since far before the advent of online learning. "In academic writing, it is considered plagiarism to derive any concept or any language from someone else without correctly citing that source in your paper," according to the Harvard Guide to Using Sources. Plagiarism, both deliberate and unintentional, occurs at all levels of higher education, including formal education systems and elearning. However, online course educators may have an advantage when it comes to identifying plagiarism. Because online courses require digitized submissions of all coursework where plagiarism detection is built in. The institutional investment in LMSs that put plagiarism and academic integrity front and centre in the software development process is one major factor that plagiarism is so infrequently able to transmit through the online submission procedure. Plagscan, for example, is a plagiarism detection solution that works smoothly with popular LMS software such as Blackboard, Moodle, and Schoology. Furthermore, the California Community Colleges Online Education Initiative collaborated with VeriCite to integrate plagiarism detection tools into their learning management system. As a large network of online universities, this is yet one further indication that educational institutions consider plagiarism severely and are always looking for the finest detection tools. Online submission applications, such as those mentioned above, can detect malicious for formatting mistakes in copied and pasted content and unreferenced paragraphs that correspond to other papers or resources.In the event of unintended plagiarism, students could always use their LMS to scan their own worksheets through all these classifications of detection algorithms. It is essential to comprehend the factors that motivate students to cheat in order to assist educational institutions in developing a fair evaluation system for students'

performance and implementing rigorous measures to reduce dishonesty in the future, which will likely increase academic integrity among many of the institutions.

Next major concerns are the lack of supervision during the exam session which jeopardizes the credibility of remote candidate's online examinations. As distance learning grows more widespread at the varsity level, one persistent question is how to maintain academic integrity in a digital environment. One topic that has gotten a lot of interest is minimizing cheating throughout unproctored online assessments. The percentage of cheating candidates is probably certainly more than the percentage caught or reported. According to research, teachers believe cheating occurs considerably less frequently than students, which implies they may not be investigating it. When they do uncover it, many simply give offenders a F instead of reporting the occurrences. According to a recent Wiley (2020) survey, 93 percent of instructors believe that students are more likely to commit fraud on online unproctored examinations than on proctored assessments.

This brings to the last issue which is the lack of efficient mechanisms that assure user authentication. As a result, many educators and institutions are turning to technologies like Lockdown Browser (Respondus, 2020a) or webcam-based remote monitoring to provide remote proctoring (e.g., Respondus, 2020b). However, these technologies have significant downsides in that they are both expensive and intrusive (Flaherty, 2020). The primary priority during the COVID 19 epidemic is to perform tests securely, preserve social distance, and maintain examination integrity. The ideal method to accomplish this is to create an artificial intelligence-based automated exam proctoring system that is totally safe, correctly tracks a candidate's attendance during the examination, and assures that the candidates are not involved in any wrongdoing.

1.4   Research Objective

In developing a an Artificial Intelligence (AI) based automated exam proctoring system, the objectives that will be reached are as followed:

a) To identify the requirements needed for an Artificial Intelligence (AI) based automated exam proctoring system.

b) To develop a prototype of a web based system, using AI based on the problems discovered in O1.

c) To test the functionalities of the prototype developed in O2.

1.5   Research Question

These research questions are created based on the research objective. The followings are the research questions of this study:

a) Which requirements are needed for users to use an Artificial Intelligence (AI) based automated exam proctoring system?

b) How to develop a web based system based on the user requirements gathered from potential users?

c) Does the system meet the needs of the users after the system has been developed?

1.6   Research Scope

The scope of this EduVision web based application are:

- Field of specialization

  This EduVision web based system focuses on AI-powered remote proctoring for authentication of remote candidates during online examinations.

- Targeted audience

  Targeted audience for EduVision web based application are examiner , remote candidates and higher educational institutes such as universities, schools or colleges, certification agencies and corporates.

1.7   Significance of the Study

This study would be highly focused on identifying and prototyping a new technique for a web-based automated exam proctoring system. The conclusions of this study may give an important informational base for the enhancement of the automated remote proctoring system, which is desperately needed in the era of online learning today. The findings of this study will allow administrators and planners to establish appropriate strategies for the future plan of action, improving the quality of higher education as the foundation of the education system, and enabling the country to compete with the world's advanced countries.

a) Examiner- No restriction that the examiner needs to be present when the candidate sits for the exam.

  Due to the sheer tremendous benefits online examination brings, campus testing institutions are implementing online proctoring services. Remote proctoring eliminates the requirement for in-person proctors and physical testing facilities. It relieves the exam organisers of a significant financial load. Testing centres can remove necessity in-person proctors by integrating AI with live proctoring, making scheduling easier and perhaps lowering expenses..

b) Educational Institutes- Enables faculty to observe the students' behaviour and identify activities that may indicate cheating such as talking to others or looking up information in books.

  The benefits and features of proctored online exams stated above are intended to establish a fair assessment experience for online candidates. By preventing and

discouraging academic dishonesty, candidates are assured that the quality of their education will be preserved, and institutions' reputations will be safeguarded.

1.8   Limitation

This AI-powered remote proctoring web-based technology is only for Higher Educational Institutions like universities and colleges. Before enrolling students to take online assessments, the system will require an Internet connection to log into the website. Finally, while the system only offers multiple choice questions, it may not be able to integrate mathematical and descriptive questions. This could result in a solution that is not genuinely adaptable and would need to be modified before it could be used by the EduVision system.

1.9   Operational Definition

a) AI- Powered Remote Proctoring

AI-based proctoring is the most advanced version of proctoring. A remote test monitoring system that supervises and analyzes candidats' proctored exams using powerful, secure, and dependable artificial intelligence (AI). It also practically eliminates the requirement for human proctoring. AI-based proctoring systems can monitor and trace suspicious behaviour of candidates in real-time by using face detection, eye gaze, and object tracking capabilities provided by the webcam.

b) Remote Candidate

Students who complete assessments, such as examinations on their own devices and from their own residences. To simulate the in-class setting, they are typically run at a particular start and end time. Open-book examinations are more customizable for

students and frequently include multimedia elements as components of some skill-testing tasks.

c) Remote Test

Online tests that are securely proctored. Students' identities can be validated online to guarantee that only the authorized candidates are taking the assessment, and their behaviour during the exam is supervised to detect any potentially unusual behaviour. Remotely proctored testing services additionally ban printing, downloading, and screenshot capture, ensuring that exam content is not shared with other students.

1.10   Conclusion

Chapter 1 introduced the study and described the problem statement, purpose of this study, objectives, research questions, and significance of this study. This chapter also explored the study's scope and limitations. This study aims to discuss the research issues provided in Chapter 1 in the following chapter. The concepts and findings that guided the development of the study questions are detailed in Chapter 2 (the Literature Review). Chapter 3 (the Methodology) describes the methodology to the study and the aim of the study based on the Literature Review. Chapter 4 (the Results) discusses the findings, and Chapter 5 (Interpretations and Conclusions) discusses the study's findings and suggests future action.