

Online Proctoring Using Artificial Intelligence

Dr.Harish B G¹, Tanushri G K²

¹Co-Ordinator, Department of Master of Computer Application,UBDTCE,Davangere

²Tanushri G K,PG Student,Department of Master of Computer Application,UBDTCE,Davangere

Abstract: This study addresses the current issues in online examination, which are particularly relevant during the online mode of exams. Our focus is on academic dishonesty associated with online assessments. Allowing students to take exams from home through online where they will be monitored by a proctor for the whole duration of the exam was quite difficult. Further implementing this process at a large scale will not be plausible due to the workforce required. To overcome this problem, an artificial intelligence (AI) in python is used, which can be able to monitor the students using their laptop or system webcam and microphone itself and would enable the invigilator to monitor multiple number of students once at a time, e-cheating intelligence agent is a mechanism for detecting the practices of online cheating, which is composed of two major modules: the internet protocol (IP) detector and the behavior detector. The intelligence agent monitors the behavior of the students and has the ability to prevent and detect any malicious practices. A novel approach for the detection of cheating during e-Exams is presented using convolutional neural networks (CNN) based systems. This system will help the proctors to identify any kind of uncertain event at the time of online exams.

Keywords: Online mode, e-cheating intelligence agent, online cheating, internet protocol and behaviour detector.

1. INTRODUCTION

Online courses have become a feasible option in education. This platform is increasingly recognized in colleges and higher education institutions such as universities, and even implemented in elementary schools – for example, during the Covid-19 pandemic. However, the detached nature of online education raises concerns about the potential risks of academic dishonesty, particularly when students sit for exams at remote locations, in the absence of the disciplinary procedures that are typically employed at examination centers. There is exponential growth in online education, in terms of both student enrolment and the corporate market it entails. However, existing literature indicate a prevalence of online cheating, which involves academic dishonesty by both the

faculty and the students. Although online education provides valuable learning opportunities for people

who do not have access to traditional quality education due to time. Online proctoring enabling candidates to take exams from any location. The proctored exam software is

used during online proctoring to allow students and proctors to take exams at any place. It must be sufficiently reliable and internet connected. Proctoring an online exam is no longer difficult. Monitoring software is employed to monitor the students through audio and video after establishing the exam's credibility and authenticity. A proctored exam is associated with having an individual proctor monitoring an exam and monitoring the students. A proctor completely impacts an exam's integrity with strict invigilation. In case a student violates the rules of conduct, a proctor can dismiss the test and report the matter to the institution conducting the assessment.

2. Literature review

Prevention of fraud during eExam (it can be often pronounced when online examinations are conducted in this paper) thus becomes a major problem for examination managers. Cuskey et al. proposed an approach of not using eight protocols for proxy monitoring. This procedure asserts a decrease in overall costs by reducing the cumulative amount of time and resources the Institute and students spend [3]. The authors said this approach would help to decrease the similarity of fraud when eExam is performed. The eight OECs included: (i) a single set of exam time for all students; (ii) the computer available for on-line examination will be available for a short time (assume 15 min on the window; (iii) a random sequence of questions; (iv) an issue will be presented at a time; (v) a design for on-line examination for a limited period; (vi) only one-time access to the exam; (vii) make students use the blackboard answer lockout browser (ALB) only when the examination is over (which limits exit/return, cut/paste, use of device electronic computers, etc.), (viii) changing one-third of multiple-choice questions each time they conduct an exam. The interactions between the students and the teachers were also a basis for other work to identify the ability of the students to cheat [4]. The students' conduct against trickeries during online examinations was influenced by emotional factors, environmental factors in schools and teaching methodologies followed by teachers. Often, under financial circumstances, they also hack online examinations. Keresztury & Cser indicated that students should not take all kinds of flash-based memories, hand-held drives, mobiles, calculators and computer devices to exam centers to prevent some sort of nuisance at online testing centers [5]. In order to help the student recognize accountability and team practices to improve their own selves in the academic training courses, in addition to

technical and non- technological influences, certain trusted factors are stressed by Miguel et al. [6].

Even best-conducted and secondary students participate in deception during online exams under certain strict circumstances under certain conditions. Hylton et al. proposed using camera proctoring to detect potential students engaged in cheating [7] to prevent those scenarios. However, using this approach means that the captured images of the webcam must be checked and monitored regularly, which is like standard protocols of paper tests. Later on, Korman stressed the methodology used to diagnose people engaged in cheating during e-Exams by using a form of contact between the computer and humans [8]. The potential identification criteria for fraud students may be speed of typing, distractions, erratic typing, etc. In functional and theoretical words, Zhang & Ke attempted to develop a paperless evaluation scheme for the SQL language [9]. This kind of exam is useful if computer programmers are unavailable for usability. Likewise, the fingerprint detection of biometric authentication was employed by Alotaibi [10]. Various solutions related to poor input consistency, bogus inputs and database manipulation were addressed by the author. For the use of high-stability tests for the tertiary industry, Hiller & Fluck firmly advocated performing e-Exams.

In the existing system some organizations employ employees to monitor the online process of examination; they suppose to continuously monitor the activities of the user to ensure fair examination is done. Several studies show that with the increase in technologies and multiple forms of online resources to prevent plagiarism, academic fraud increases. The e-examination has been a major obstacle for most Universities and educational establishments with a vast number of companies offering sophisticated and undetectable gadgets. Some of the anti-cheating methods are discussed in the following sections towards thwarting the neaky cheating attempts.

A. Secured Online Authentication ID

This can be used from remote locations like home, workplace, holiday spots, etc. This online authentication ID helps the examiner to switch candidate authentication during the configuration of e-exam proctoring settings. In this method, the student needs to click a test link, their photo, ID proof, and authentication information (if any available) across the registration process. The proctor will be able to verify the details using their online portal and verify the legitimate candidates [5, 6]. It will help to avoid fake exam takers or impersonators by using the different types of facial recognition tools. However, it is not a foolproof method and therefore multiple checks are essential using this method. Biometrics, keystroke, authentication, and cross-questioning are needed to prove the identity.

B. Secured Examination Browser Setup

In this method, a secured environment is hosted with predefined applications and useful websites. Once the student clicks the application, it makes the system to shut down automatically and the only app-related tools or websites will run on the system [7]. These type of methods help to disable the screen recording, projections, desktop-based applications, and other web applications. This method can be more applicable for open book exams with limited/selected resources available for the students using the whitelisting approach. However, anti-cheating methods using this approach is not as effective as the examiner can still access external resources to find the answers.

C. Preventing Mobile Phones

In this method, the preventive measures are taken to access the test answers using mobile phones and blocking some of the sites that are taking place which generally contains the answers for certain questions. Almost 35% of students use mobile phones for cheating in online exams [16]. The technology detects devices that are under usage, searching for similar content related to the examination and will be flagged if detected with some activity [8]. It also scans internet browsers and blocks the sites that are browsed for answers and reports the same which contains the related test questions and answers. This technique helps to avoid any kind of leakage of online question papers. The biggest disadvantage of this method is that it is not a stand-alone anti-cheating solution. Apart from that it is not having any kind of auto-proctoring process.

D. Auto-Proctoring

Having an automated proctoring method with in-built software helps to monitor the student's behavior and activities using the recordings to detect suspicious activity [9]. The developers are using artificial intelligence (AI) based algorithms to monitor student behavior, gestures, gadgets used, etc. Any kind of suspicious behavior will be notified/flagged. This method proved to be one of the cost-effective solutions and it is still under progress with various add-ons.

D. Proctoring using Record and Reviews

In this method, an expert team will review the sessions to identify the instances where integrity was compromised. Using this method auto-proctoring process is made to run by default and then reviewed for anomalies by the expert proctors.

The flags raised by AI algorithms will assist proctors for conducting detailed checkings [5, 9]. This method is cheaper as compared to live proctoring but consumes a lot of time.

E. Live Proctoring

This is a combination of auto and human proctoring (which is generally used in schools, colleges, etc.). The proctoring software helps to generate red flags on the detection of suspicious behavior and will be assessed for the integrity of the exam conducted [5]. Using this method chances of cheating are low and it is very difficult to scale the integrity at times. Also, this method has the flexibility of adjusting the cost and generally, it is more expensive as compared with auto-proctoring technique.

F. Using 360° Cameras for Proctoring

Some of the companies are providing the cameras with flexibility of image capturing for 360° views in a room or examination center. These cameras can be operated with the help of a computer screen or headgear to capture candidate's gaze and actions in the examination hall [10]. It will allow us to have great audio and video coverage but is an expensive choice to adopt by all students at their own cost.

3. Conclusion

According to the author the proposed project is an attempt to make use of Deep learning concept of AI to train the model and predict the violation of rules while writing an online mode examination. The proposed model has to detect user activities using webcam and alert them if any misconduct are encountered. AI improves the quality of the online examination platform giving the best of experience to its users making it interesting software to use. Especially when taking an online exam, AI enhances the process of proctoring and interfaces easy for both candidates as well as teachers and makes better decisions according to it [11].

Proposed eExam method flow process

Due to the dedicated programmer that has been created in this study, the e-Exam was performed for 10 students. However, such resources such as technical calculators, catalogues, data sheets, online records and so on, are essential to the students at the time of the test for certain specific subjects (engineering/medical). Such installations are excluded from the usage and can be used during eExam by means of a separate, integrated software tool authentication mechanism. These materials are

supplied on the screen as a separate folder. The computer screen of each pupil is registered and processed for remote proctoring in the database during the test cycle. In order to define various facial expressions on the basis of the distinguishes of main points on a forehead, the images collected from the webcam are handled using a geometric approach. The photographs are treated in this work and are analyzed in the form of pixels using the convolutional neural networks (CNN) to explain various emotions displayed by pupils during an eExam. The CNN outputs are correlated with the appropriate ideal values contained in a database using a part checker as seen in Fig.1.[11].

When an unknown occurrence takes place, the evaluation results produce warnings for the examination coordinators/online proctors.

Any conclusions are made in this study for participating students

- Students must be alone in the examination room and not interact with their peers, their families and acquaintances of any sort. (Measure of safety)
- The student must sit on the screen without technological devices like smart phones, thumb drives, flash memory sticks, etc (to avoid cheating).
- Students can use writer materials like books, paper, pencils and crafts.
- The surroundings must be the same during the inspection period, i.e. the desk, chair, the clothing and the machine
- peripherals like the keyboard, mouse, etc (to check the consistency of environment).
- The webcam can be arranged by the student to display the same images again and again. The cameras with image capture versatility are extremely recommended for 360 views (for a complete online proctoring and reviews)

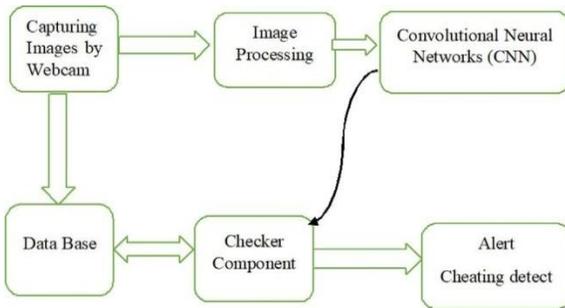


Fig. 1. Block Diagram for Capture the Student Image..

Image Analysis using Image Processing and CNN

Two approaches existing in the market which help to identify the face and facial features for performing the student behavioral analysis in the eExam based on facial expressions: geometric features approach and appearance-based approach. In the first case, data interpretation takes place based on the facial expressions, and in the later case, the distinguished key points are identified from the images obtained from the webcam.

Using the **geometric facial feature-based methods** the obtained face images are analyzed to understand the changes in shapes, textures, and location information with different facial expressions of the students appearing for the eExam. The prominent components that are involved to help in this analysis are eyes, nose, chin, mouth, and eyebrows as shown in Fig. 2.[11]. Each expression or emotion made by the humans has a slight difference between the distinguished key point on a face (such as I-J; K-L, C-D, and C1-D1). For example, when a person is happy or angry means the size between these key points varies as listed in Table I.[11].

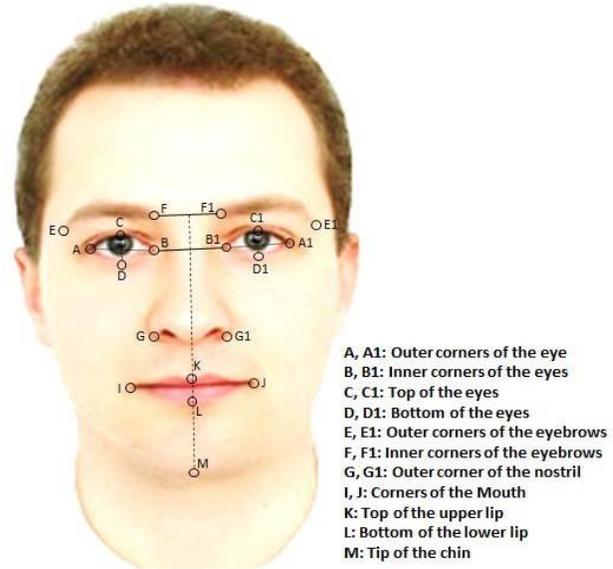


Fig. 2. Labeling of different key points used to identify the emotions of the students appearing for eExams.[11]

Normally distance between eyes and eyebrows in case of a student was 5.5 pixels in normal condition, changed to different levels when the emotions changed to a happy mood and angry mood with 5.71 and 5.21 pixels respectively. Similarly, changes in width and height of the mouth are also noted using the geometric facial features approach

TABLE I. THE CALCULATED DISTANCE (IN PIXELS) BETWEEN KEY POINTS OF A HUMAN FACE FOR DIFFERENT EMOTIONS SUCH AS HAPPY AND ANGER..

Emotion	Neutral	Happy	Anger
Eye Brow-Eye	5.5	5.71	5.21
Width of Mouth	13.1	13.4	13.9
Height of Mouth	1.4	1.53	1.46

In the case of an appearance-based approach, some of the image filters (such as Gabor wavelets) are applied over the captured face image to obtain the facial features for a whole-face or a defined specific region. The role of the webcam is key in this method by distinguishing the key points and classify the images accordingly. In this work, some of the observations towards emotions (Neutral-1, Smile-2, Laugh-3, Anger-4, Sad- 5, and Surprise-6) expressed by the ten students during eExam are tabulated in Table II.[11].

TABLE II. THE FACE COLLECTION OF TEN STUDENTS PARTICIPATED IN E- EXAM AND THE RELATIVE DATA (UNITS: PIXELS)

	(1)	(2)	(3)	(4)	(5)	(6)	
S1	Eye Brow	6.9	8.26	8.29	6.2	6.64	6.82
	Eye	2.45	2.33	2.22	4.3	3.1	2.8
	Width of Mouth	13.58	13.36	14.65	17.46	13.48	17.4
	Height of Mouth	1.1	1.5	3.1	1.19	0.59	2.56
S2	Eye Brow	7.56	7.49	7.1	6.52	6.46	7.45
	Eye	2.35	2.55	2.3	2.6	2.88	2.86
	Width of Mouth	17.1	15.6	16.92	14.45	20.27	13.4
	Height of Mouth	2.4	1.15	4.46	1.19	2.78	1.35

S3	Eye Brow	6.66	7.2	7.06	6.9	7.59	8.1
	Eye	3.29	2.82	2.34	3.18	2.84	2.5
	Width of Mouth	21.19	13.7	13.23	13.7	12.42	13.7
	Height of Mouth	1.73	1.05	3.5	1.36	1.35	1.83
S4	Eye Brow	7.52	7.19	6.84	6.96	7.96	7.35
	Eye	2.61	2.75	2.69	3.27	2.46	3.4
	Width of Mouth	15.89	14.89	16.75	12.84	12.6	11.7
	Height of Mouth	2.9	1.1	3.61	1.3	1.23	1.98
S5	Eye Brow	7.3	7.48	6.79	7	6.89	7.19
	Eye	2.81	2.65	2.74	2.76	3.31	18.2
	Width of Mouth	13.99	15.55	13.7	13.66	13.2	18.1
	Height of Mouth	1.15	1.33	2.22	1.26	1.24	2
S6	Eye Brow	7.51	7.51	7.11	6.53	6.48	7.4
	Eye	2.39	2.54	2.32	2.63	2.86	2.89
	Width of Mouth	17.12	15.63	16.9	14.48	20.23	13.42
	Height of Mouth	2.45	1.13	4.44	1.2	2.8	1.39
S7	Eye Brow	7	8.29	8.31	6.23	6.6	6.8
	Eye	2.49	2.36	2.2	4.31	3.15	2.83
	Width of Mouth	13.6	13.39	14.6	17.44	13.5	17.44
	Height of Mouth	1.11	1.53	3.11	1.2	1	2.6
S8	Eye Brow	7.54	7.15	6.89	6.9	7.94	7.37
	Eye	2.64	2.71	2.73	3.28	2.49	3.45
	Width of Mouth	15.7	14.85	16.74	12.8	12.64	11.73
	Height of Mouth	2.92	1.14	3.65	1.33	1.28	1.92
S9	Eye Brow	6.69	7.22	7.01	6.87	7.56	8.15
	Eye	3.27	2.85	2.32	3.17	2.83	2.54
	Width of Mouth	21.15	13.72	13.24	13.72	12.48	13.9
	Height of Mouth	1.79	1.06	3.54	1.33	1.37	1.86
S10	Eye Brow	7	8.21	8.26	6.24	6.65	6.81
	Eye	2.47	2.36	2.21	4.33	3.17	2.84
	Width of Mouth	13.55	13.32	14.68	17.42	13.44	17.42
	Height of Mouth	1.13	1.51	3.11	1.16	0.55	2.58

Guarantee High Test Integrity". [Online] available URL:<<https://blog.mettl.com/assessment-technology-technologies-that-can-prevent-cheating-in-online-examinations>>, (Accessed on May 28, 2020).

[4] A. Mhenni, E. Cherrier, C. Rosenberger, and N. E. B. Amara. "Towards a secured authentication based on an online double serial adaptive mechanism of users'keystroke dynamics." 2018

[5] T. M. Sjøgaard. "Mitigation of cheating threats in digital BYOD exams." Master's thesis, NTNU, 2016.

[6] D. W. Bedford, J. R. Gregg, and M. S. Clinton. "Preventing online cheating with technology: A pilot study of remote proctor and an update of its use." *Journal of Higher Education Theory and Practice* 11, no. 2 (2011): 41-59.

[7] Y. Atoum, L. Chen, A. X. Liu, S. D. Hsu, and X. Liu. "Automated online exam proctoring." *IEEE Transactions on Multimedia* 19, no. 7 (2017): 1609-1624.

[8] J. J. Mazzilli. "360° automobile video camera system." U.S. Patent 6,333,759, issued December 25, 2001.

[9] Automated Online Proctoring System Using AI, ¹Siddhesh Karpe, ²Akash Mishra, ³Krishna Oza, ⁴ Prof.Madhura Phadke.

[10] <https://www.leewayhertz.com/remote-proctoring-using-ai/>

[11] https://www.researchgate.net/publication/35923669_CNN_implementation_for_detect_cheating_in_online-exams_during_COVID-19_andemic_A_CVRU_perspective

References

[1] Warren A. Rosen and M. Eric Carr "An Autonomous Articulating Desktop Robot for Proctoring Remote Online Examinations" Engineering Technology Program Drexel University Philadelphia, PA, USA 2013 .

[2] N.L Clarke P. Dowland1 & S.M. FurnU "e-Invigilator-A Biometric-Based Supervision System for eAssessments" iCentre for Security, Communications & Network Research (CSCAN), Plymouth University, United Kingdom; Security Research Institute, Edith Cowan University, Western Australia 2013

[3] R. Kanchan. "7 Online Proctoring Technologies That