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CNN implementation for detect cheating in online-exams during COVID-19 pandemic: A CVRU prespective

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ABSTRACT

Here, the use of CNN-based technologies is provided with a new method for the detection of fraud during e-exams. This technology will assist providers in identifying any unknown situation during online tests, which are recommended by the majority of governments worldwide owing to the Covid-19 pandemic. Most colleges and students worldwide are severely impacted by their academic programmers, and the universities' role of testing using conventional approaches is a challenge. Thus, the students undergo several of their classes from various kinds of online third-party apps. The universities cannot, however, rely on these service providers for a long time to perform online examinations. Therefore, this work provides a full set-up of computing applications for students who can use them on their own laptops/personal computers with strict university guidance.

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1. Introduction

India has been concerned with the life of its population and economy since the discovery of the coronavirus in all over world. The big effect of the pandemic of Covid-19 is its exponential dissemination of the virus from person to person. Most people are caused by direct touch and droplets that a human is polluted with when he or she is coughed or sneezed. Direct interaction is also not advised between two people and it is essential to preserve a distance from society of at least five feet. As a result, the pandemic is hampering most corporate divisions, production and product growth operations worldwide. The operation of schools, on the other hand, is severely impaired by the fact that the closing of schools around the country was the only choice open to different governments across the world. There are about 1,190,287,189 students, which is equivalent to 68% of students enrolling in a worldwide setting, according to the UNESCO Institute for Statistical Data [1]. In their respective countries more than 150 countries proclaimed the lockout and specifically ordered all educational institutions to close. School management promotes online educational services to cover curricula and encourages them with a range of online resources to carry out various school events. Online classes, web-base resources for learners and scheduling coverage are a challenge when multiple computers are involved at various student places. This is a challenge. However, undertaking examinations during pandemic conditions with most organizations is another major obstacle. Any of the problems cannot be addressed if the parents do not know about computer processes or if they use various internet resources. Thus, teaching students using online resources needs extra parental care, though at the same time carrying out online tests it has its own disadvantages (i.e. eExam). For their timely, monitored, and summative evaluation using a special and streamlined operating system, the eExam principle is known. Of course, in some universities where organisations adopt the BYOD approach, this approach is very popular. Sindre and Chirumamilla explored, assessed and recommended several steps for cheating safety risks during the eExams [2]. A) Excessive presence of parents, family members and friends which ruin the actual intent of the eExams. This list contains some of the disadvantages and challenges often seen. b) Several approaches, including pen drives, smart phones, tabs, etc. will be

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attempted during eExam to be tried to cheat. (c) The provider can often use technology like digital image recognition, the keystroke procedure, etc. to recognize students' emotions during the online tests.

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 OECPs 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 [11]. The writers proposed in this work a curriculum that would meet the needs of a broader institution. In order to detect fraud in a real-time world, where internet use is enabled, Kasliwal developed a method for monitoring the student browsing activity [12]. In a comprehensive analysis, Hiller and Lyon performed two tests in order to explain the writing types, patterns, and techniques students apply during exams for texts and in computerized assessments for students [13]. These elements correlate and compare their effect on grades, word count, and handwriting. Umar & Wilhelm tried in the same way to explain how students perceive their undergraduate students to evaluate their e-exams [14]. Any of the problems outlined included the students' frustration with the questions posed, questions, timescales, etc. Khlifi later proposed an advanced approach in solving e-exams and e-evaluations protection problems [15]. The author argued that the method suggested would not need new components or that continuous security is provided by the use of existing knowledge that has randomly generated questions.

2.1. Existing technologies

Several techniques for e-exams with strongly assured research integrity have been used in recent times. Several studies show that with the increase in technologies and multiple forms of online resources to prevent plagiarism, academic fraud increases. Many British universities have confirmed stupidity among students and several websites provide resources to avoid being caught up in any of the online tests [16]. Some students also use wearable micro earpieces to trick e-examinations and these are available in various kinds of online shops such as eBay. These machines are generally used in the interrogation of criminal suspects by private detectives, police etc. 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. In the following pages, some of the anti-cheating techniques are addressed to thaw the nonsense.

2.2. Verification ID protected online

You can do this from distant places such as house, workstation, vacation spot, etc. The examiners will change the applicant authentication when configuring the provision environment for an e-exam by using this on-line authentication ID. In this approach, students need to click through the entire registration process on a test page, their photograph, and ID document and authentication information (where available). The proxy should check on their web portal the specifics and the legal candidates [16,17]. The use of various forms of facial recognition software helps to prevent bogus examiners or impersonators. But it is not a flawed system and so many tests using this method are necessary. The proof of identity includes biometrics, verification of keystrokes and cross-questioning.

2.3. Browser setup protected review

A stable environment with predefined users and helpful websites is provided with this approach. The student clicks on the application and immediately shuts down the device, and the system runs the only tools or websites that are connected to the system [18]. These types of approaches support deactivating the capturing of screens, projections, smartphone apps and other online apps. This technique can be used for open book examinations using a whitelisting methodology with limited/selected tools available for students. The use of this technique to combat cheating practises is nevertheless not as successful as the examiner also has access to external tools to identify solutions.

2.4. Preventing mobile phones

Preventive steps are taken to reach the test responses by means of mobile telephones and to ban certain websites, which usually have the answers to certain questions. Nearly 35% of students use cell phones to cheat online examinations [16]. It monitors

devices in use, searches for similar material relevant to the exam and, if found by any operation, it is flagged [19]. It also scans web browsers and blocks the websites that are navigated and reports that include the test questions and answers. This strategy tends to prevent some sort of internet leaking of questionnaires.

2.5. Auto-proctoring

In an integrated software procurement process, the student's actions and work using recordings can be monitored for irregular activity [20]. The creator uses algorithms based on artificial intelligence to track the actions of students, expressions, gadgets, etc. Any irregular conduct is notified/flagged. This technique was one of the cost-effective solutions and many add-ons are still being created.

2.6. Proctoring using record and reviews

This approach allows a team of experts and examine the sessions to find cases of a corrupted credibility. The auto procurement process is performed using this system by design and only requested by specialist providers for irregularities. Proctors are supported in carrying out thorough checks [16,20] with flags raised by AI algorithms. Compared to live production, this is cheaper but takes a lot of time.

2.7. Live proctoring

This is an automotive and human prototype mix (which is generally used in schools, colleges, etc.). The programmer helps to create red flags on suspected behavior, and the credibility of the examination is evaluated [16]. The odds of stealing using this strategy are small and the honesty is often very difficult to scale. Flexibilities for changing costs are also available, though in general, this approach is more costly relative to auto-proctoring.

2.8. 360° sourcing cameras

In a space or examination center, some businesses provide the cameras with the flexibility to capture images for 3600 display. These cameras will be used to catch the eyes of the candidates and their conduct in the examining hall with aid of a computer screen or headgear [21]. It gives us excellent audio and video coverage, but it is an expensive option for all students at their own expense.

3. Proposed methodology

Before beginning an e-exam, the proposed web portal on Covid-19 provides a limited list of safety tips and precautionary steps for the students. This ensures the students recognise the relevance, in their respective areas, of social distancing, cleanliness and sanitation. The key aim of this work is to prevent fraud using techniques of image processing and machine learning.

4. 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. 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, the 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)

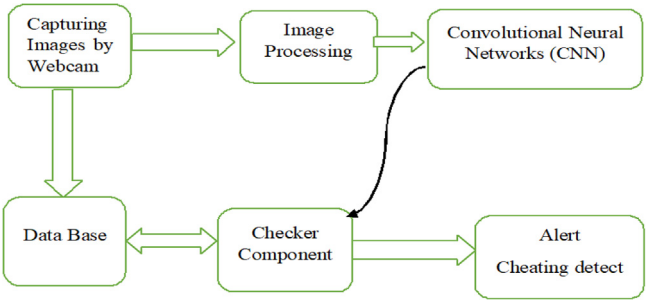

Fig. 1. Block Diagram for Capture the Student Images.

Fig. 2. Arrangement of experimental webcams to take pictures of students from two separate ways spanning the whole setting.

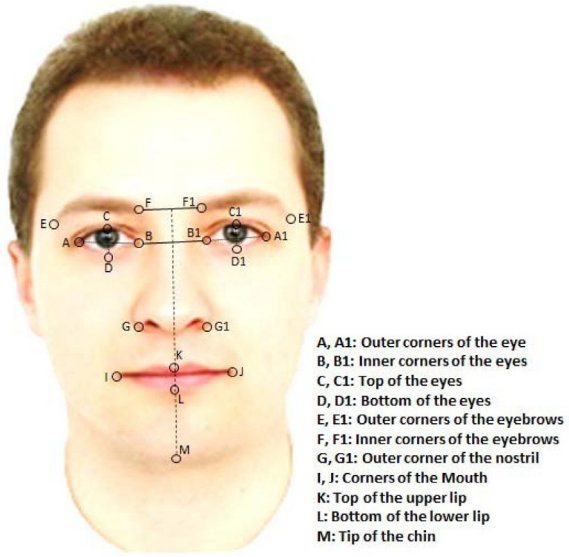

Fig. 3. Labeling of various key points used by the emotions of eExam students.

Table 1
The distance calculated (in pixels) between human faces for various feelings, including happiness and wrath.

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

- The room lighting must be identical throughout the exam period (for better detection of cheating from images)

5. Student data collection

The length of the eExam is 30 min and every 10 s the webcams will catch an image. So 10 students created 3,600 images with RGB-colored high-resolution images for the eExam. At the beginning, the collected images were processed using the geometric method of digital image treatment and then processed using a CNN approach to retrieve various facial features, textures and even segmentation purposes. The suggested set-up as seen in Fig. 2, where the videos from cameras 1 and 2 create an image every 10 s, i.e. 12 photographs from webcams and 6 snapshots of the computer screens for review are taken to increase eExam precision and online proctoring. The collection of data is an ongoing process from online classes to online examinations. At the time of the online classes, user registration, dataset collection and data set training will be subject to the CNN-based system. However, it is directed at facial recognition and facial inspection at the time of eExam. This ensures that student face photos are constantly educated in the networks. The accuracy of identification improves and the checking procedure for various possibilities and lighting conditions increases with the continuous training process [22]. In this way, CNN-based models are deemed more effective as runtime control schemes for educational establishments, by the reliability and precision of identification of cheating [23].

6. Image analysis using image processing and CNN

There are two methods in the industry that help classify the facial and facial characteristics in the student's conduct analyses in the eExam: the approach to geometric characteristics and the approach to presentation. In the first example, the dates are interpreted on the basis of the facial expressions and in the latter case the main points of the photographs from the webcam are established. The collected face pictures are evaluated through geometrical facial feature-based methods for understanding the shifts in appearance, textures or locational details of students appearing for the eExam in various facial expressions. Eyes, nose, jaw, mouth and eyebrows, as seen in Fig. 3, are the most important elements to aid in this study.

The disparity between the distinctive main point on the face of any gesture or feeling produced by humans is small (such as I-J; K-L, C-D, and C1-D1). When a person is happy or irritated, for example, the size of these key points is different, as shown in Table 1. Normally, when a student has a 5.5 pixel gap in a regular state,

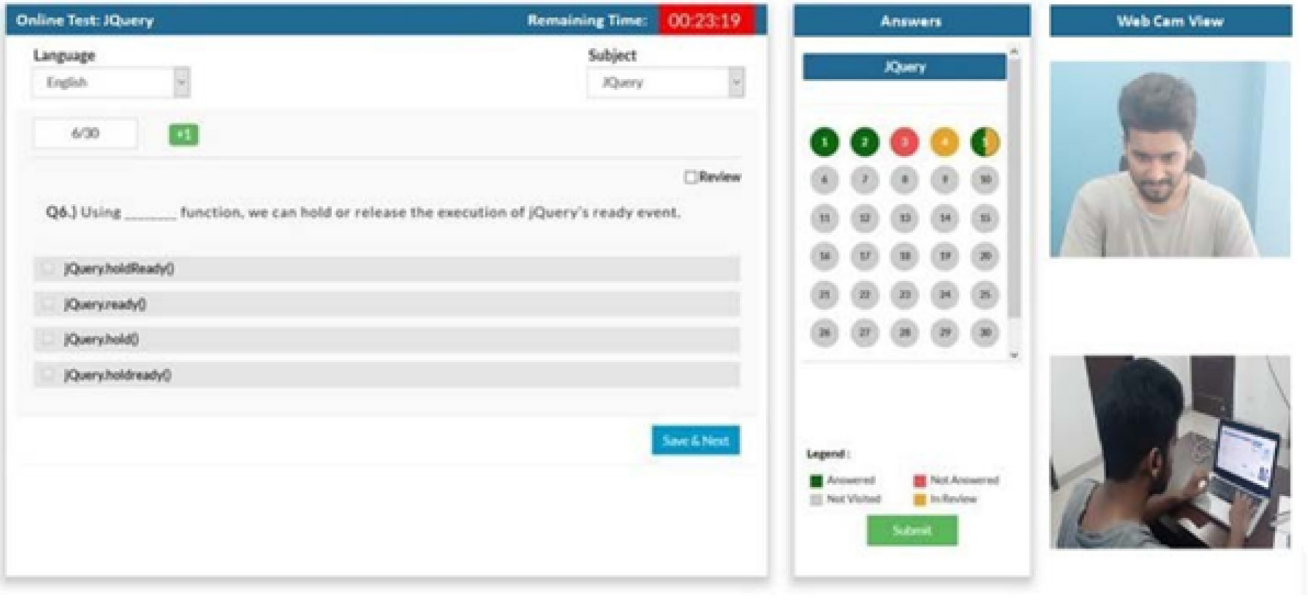

Fig. 4. Front and rare camera View of eExam web portal.

he/she shifted to various stages when feelings of 5.71 and 5.21 pixels respectively changed into good mood and annoyance.

7. Result analysis

The suggested CNN solution yielded fascinating results by providing a significant relation between the neural networks and the adaptive filters focused on the image processing. The implementation of a CNN-based methodology contributed to the pace at which photographs taken from webcams in student areas were detected and analyzed. Every kind of unknown occurrence is found in the real-time world faster than with database standards by means of a checker. Any of the findings were based on the distance between the various main points mentioned in Table 1. These basic points were key to consider an e-exam emotional student's emotions (such as Eye Brow to Eye, breadth and mouth height). Mostly, as feelings are transitioning from mood to mood, the difference between these main points (measured in pixels) tends to be changing. The risk of being ignorant by students during examinations is partially eliminated by adding the front camera view and the rare camera view at the time of the screen examinations, as shown in Fig. 4. This is a kind of alarm that during the examination the student is calm and reliable.

A provisional end to the inspection procedure prevents environmental damage by using the proposed programmer where several faces are identified as soon as the examination is under way. In the same way, any kind of new material on the computer table or any new object in Students' hands is considered infringement of the Rules and the device considers it to be a negative object present at the time of the examination. The rules are also strictly observed by the students who appear at home for eExam.

8. Conclusion

For the Indian Universities, especially Dr. C.V. Raman University (CVRU), Bilaspur and Chhattisgarh Swami Vivekanand Technical University (CSVTU), Bhilai the proposed CNN identification is really helpful. The software tool provided in this paper ensures additional data protection during the e-examination process. Complete lockup conditions as a result of Covid-19 must be vigilant to enforce such safety guidelines for students. The academic success with the preparation and education process can however finish without exams. The suggested CNN solution thus not only helps identify the fraud, but also helps to automatically conduct the online proctoring. To increase the accuracy of the correct student to undergo an online test, this requires consistent teaching. Furthermore, the compare of regular values in the database allows to boost the facial authentication. Precision calculations, FAR and FRR have been measured and demonstrably provide superior performance relative to previous proctoring programmers with varying facial expressions and illuminations.

CRediT authorship contribution statement

Nitesh Kumar Sharma: Software, Validation. **Deepesh Kumar Gautam:** . **Shanti Rathore:** Conceptualization, Methodology, Visualization. **M.R. Khan:** Investigation, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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