

Online proctoring. How it works? Part I.

Who can benefit from using Online proctoring technology? Everyone who develops remote education systems in educational institutions and companies, as well as HR-managers, employees of IT-departments.

Main themes of this article:

Structure and operation of the Online proctoring platform, and key stages of online exams

The modes of online proctoring system

We will try not to go into details; otherwise, it's going to be a long book. At the same time, we will try to give you the most complete picture of the online exam system software.

Structure and operation of the online proctoring system, key stages of online exams

Online proctoring extension works from browser, no additional installations needed. The service is integrated into a testing system - LMS (learning management system).

Exam.us online proctoring service is offered as SaaS (Software as a Service), while the entire infrastructure is stored in cloud services. Students does not need to install anything on the computer. They just open the browser, go to the specified link, pass system verification and identity verification, and start taking the exam.

Important decision: shall student use a computer or a phone? *Our experience shows that only the desktop version gives reliable results, so we always strongly recommend it to our customers. The mobile version gives the user too many opportunities to exploit the system. However, we understand that in some cases, there is no chance to use a computer, e.g. when field workers are located in a remote plant or factory. We will describe all the features of the mobile version of the system in one of the following articles.*

The proctoring system requests access to the camera and microphone and checks its functionality, as well as the stability of the Internet connection, the presence of a second screen, and all attempts to simulate or imitate the screen. If the system can pass all the tests, the student has to pass the identification process, i.e. to take a photo and send a photo of themselves with an identity document (it could be a driver's license, a student ID card, or a credit card).

After that, the student can start the examination. At the same time, the online proctoring system acquires information from 3 different sources:

- Camera
- Microphone
- Desktop

After completing the exam, the online proctoring system will gather and combine information from all the sources into a single combined record.

During the exam, the Online exam proctoring software analyzes the physical actions of a person and their actions in the environment of the computer. The system is flexible, thus the rules can be adjusted for each exam. In some cases, student can use a calculator, while in others, one needs a paper and a pen.

During the examination, the system automatically detects the following types of violations:

- Changing the direction of the gaze, i.e. when the user is looking somewhere else;
- Lack of the face in the frame, i. e. if the user is not in the field of view of the camera, or the face is not fully visible;
- The presence of other faces in the frame, it is also recommended to remove the portraits of great people from the wall because they can be automatically recognized as violators of the examination rules;
- Substitution of the student, i.e. if the person in the frame is not the same person that was intended to participate in the examination;
- Any human voices in the frame, even if it is the voice of the student (e.g., the student can pronounce questions to another person in the room);
- Change of the windows and tabs on the desktop, i.e. if the user decided to switch from the test window to a search engine or open a third-party application.

In the online proctoring mode, when the entire process is controlled and monitored by a person, the number of violations increases, because the person can notice the violation by indirect signs.

The following additional violations are registered:

- The usage of phones, tablets, and other gadgets and devices;
- The usage of TeamViewer, Skype, RemoteAdmin, and other desktop broadcasting software;
- The usage of virtual machines and thin clients to pass an examination by a third party;
- The usage of books, notes, and drafts;
- The usage of calculators (if prohibited);
- All cases of non-verbal communication (winks, hand movements, nodding, etc.).

Examus automatically marks all potential rule violations and adds them to the report. Each violation entry contains information about the type of violation, such as moving the eyes away from the screen or changing a window, and a timestamp.

Based on the results of the exam, the online proctoring system calculates the overall probability of violations during the exam: green zone means low probability, yellow – medium, and red-high.

In other words, Examus can immediately determine who has to be checked first.

It means that based on the results of the exam, we can do the following actions for each of the students:

- View and listen to recordings from the camera, microphone, and desktop;
- View all potential violations in chronological order;
- By clicking on any violation, one can view the records of what was happening at that particular moment.

Types of online proctoring

Automatic proctoring: everything is done by AI proctor without a human proctor. The obvious advantage of this mode is that it reduces the overall costs of exams. However, in many situations human participation is simply irreplaceable:

- If the fate of a person depends on the results of an exam, we can't leave the decision to the machine;
- Even the most precise automation system can't track certain non-obvious violations;
- At the same time, the automation is very sensitive, and one can't explain that a stranger in the room is the mother, who accidentally came in and will leave in a matter of seconds;
- There are many cases when one needs to control all the stages of the exam process, e.g. one may need to pass the student by using one of the predefined protocols before giving access to the examination;

- The operator of the proctoring system can make sure that the student follows the procedure for a particular exam. In some cases, the student must show that their palms are not full of hints and answers, while after another exam, they must tear the draft into small pieces;

Therefore, in addition to automatic AI proctoring, there are 3 modes with human participation:

1. Asynchronous mode: it means that an operator will review the recording after the examination;
2. Synchronous mode: it involves remote online monitoring and control of the examination process by an operator of the proctoring system;
3. Identification mode: in this case, the operator only confirms the identity of the student before entering the exam;

Each mode has its interface and methodology for working with operators, which we will discuss in detail in the following articles.

We hope now you have a glue of how the online proctoring system works in general. In our next articles, we will explore the technologies behind the Proctoring Solution for Online Exams.

How to Cheat on Online Exams with proctoring

We live in a highly changeable and tech-led world and nowadays, due to a pandemic, education becomes online in almost all aspects. Webinars, zoom-calls, google-hangouts, MOOCs, online lectures, online tests, online exams. It seems that there is only one thing, that stays the same: students, and their desire to cheat on exams. So is it possible to cheat on an online exam? How to cheat on an online proctored exam?

There are several ways to do it. They might work from time to time, but students should be aware, that online proctoring platforms are aware of these methods.

1. Cheating on proctored exams: Old-School Method

Many students still don't realize how advanced online proctoring really is. Some students still use the "old-school" cheating methods. Just like for regular in-class exams, students prepare small notes on paper, their palms, or even on their legs if they are lucky to have a good enough vision! What they don't realize is that online proctors pay close attention to students' surroundings. AI-automated remote exam proctoring solutions now use facial recognition and detection technology that not only verifies student identities, but also detects when test takers leave the area, move around or turn their head, flagging potential concerns for faculty.

2. Cheating on proctored exams: Rage Against The machines

On the other hand, there are many tech-savvy (or the ones that pretend to be) students who try using tools for cheating. Cellphones, smart watch, ear bugs, you name it! It is

funny to see how creative students are when it gets to cheating the online exam. Yes, to see, we still see it all. Examus proctoring solution camera works both ways and on top of that are able to detect other technology in use by the student.

Ok, if a separate piece of technology doesn't help, maybe some shortcuts will be left unnoticed, they wonder. Good luck with that! Examus Live proctors can tell the difference between a student who is typing an answer and one who's trying to take a screenshot on most occasions.

3. Cheating on proctored exams: Operation Hydration

Education is important, as well as staying hydrated. Some exams take longer time than others and proctors allow students to bring their own water bottles. Water bottle may seem to be an innocent object, but not when it is used by a skilled cheater! Some students manage to turn the bottle's cover to a cheat sheet. This method might work successfully in the classroom, since one or two proctors simply cannot watch every student evenly at any point in time. Unfortunately for online exam takers this will not work. Examus online proctoring solution has a gaze detection feature that flags the situation when a student keeps looking at a particular spot for a long time or too often (in this case - bottle).

4. Cheating on proctored exams: Under Cover

My home is my fortress, and a hideaway from proctors for many! Exam takers use furniture to cover cheat sheets - closets, desks, chairs and beds - all act as shelter for cheaters looking to game the system. Blinds and curtains are on the list of favorites for some dodgy students.

To cheat during an online exam students tape the answers to white curtains or blinds in front of them. Good work! We really hope that writing down the cheating sheet helped

remembering material better. Unfortunately though, Examus online proctoring solution asks you to show your surroundings before the exam and to remove the “extras”. Use your time wisely!

5. Cheating on proctored exams: Partners in Crime

“Just remember if we get caught, you are deaf and I don’t speak English”. Good friends are a blessing. They truly want us to succeed in life, including passing the online exam. Some use tech help with calls and messages, some use a Bluetooth headset, but Examus webcam technology can immediately spot the device. Others use less techy undercovers, but not everything that happens behind the curtain stays behind the curtain. Just because you can’t be seen, doesn’t mean you cannot be heard. Online proctoring high-quality audio detection in both live and automated proctoring flags suspicious sounds on a spot.

Obviously, cheating ways on online exams are not limited to the named above methods. If you came across some interesting way of remote exams cheating, feel free to discuss it with us on Facebook or Twitter.

We also found some idioms about exam cheating and honesty:

"Plan how to study for exam. Not how to cheat on exam";

"Life is the most difficult exam";

"Honesty - is the best policy at all times";

"A clean hand wants no washing."

So, stay safe, wash your hands before and after the exam, good luck&stay tuned!

Online proctoring. How does it work from the technology side?

In previous part we defined what is online proctoring technology in general. Now its time to dig deeper into tech side of it, using as example Examus AI solution for online proctoring.

The online proctoring technologies usually include following modules:

- Workplace compliance inspection Module
- Photographing and Identification Module
- Cyber-proctoring Module
- Data storing and proctoring session post-verification Module
- Control Panel Module

Workplace compliance inspection module

Workplace compliance inspection module is an important part of the online proctoring platform. At the initial stage, the module checks that the camera and microphone are connected and that images and sound are accessible from both devices.

To make sure that the app can record and transmit video to the server, the module starts broadcasting the video as if it was a real examination. If the module is not able to start the broadcasting process, the student won't be able to start the examination.

At the same time, a successful broadcasting attempt is not always enough. The quality of the transmitted video may be unacceptable, and the broadcast itself is often interrupted. Therefore, the module checks the quality of the network connection.

Module for photographing and identification

The photographing and identification module is responsible for obtaining, processing, and storing in the database reference images of a person, as well as images of user

documents, until the end of the user's examination session (including receiving a grade for the exam). Or for any other period agreed by the Customer.

Examus proctoring system uses a neural network to recognize the student's face. For automatic identification, the user must take a reference photo, which will subsequently be used by the cyber identification module during the exam to confirm the identity of the user, as well as for the second and subsequent entries into the exam with proctoring.

Cyber-proctoring module

The cyber proctor module consists of five large blocks:

- **Audio cyber** - is responsible for recognizing voice signals in a broadcasted audio stream;
- **Face-cyber** - is responsible for reading the facial vector and recognition of gaze direction, face identification in the frame and the presence of more than one face in the frame;
- **Cyber-identification** - is responsible for determining the substitution of the examinee;
- **Cyber desktop** - is responsible for controlling the user's screen and fixing the change in the state of the screen;
- **Cyber-search of the same person** - is responsible for finding a person who passes the same exam using different accounts, one of the types of fraud in the system when an excellent student passes the exam several times. For example, one time for himself and four extra times instead of four his friends;

Face-cyber is based on a neural network (Artificial Intelligence) that recognizes a face by the face-vector: eyes, mouth, and nose. The AI online proctoring neural network is trained on a database consisting of thousands of different photographs of people's faces. The neural network recognizes the same face even with glasses, a beard, long hair or even other hairstyle.

Audio cyber uses libraries for recognizing human voices among mixed audio streams. When a voice is detected, the system automatically captures the violation and sends an alert to the control panel. Afterwards all the violations during the exam are saved to a report with rating for each student, according to the number of alerts they got from cyber-proctor.

Cyber-identification remembers the face of the user who went through the stage of photographing before the exam, writes a reference photo to the database and during the exam periodically compares the face in the frame and the reference photo. In the event of a face change, a violation is automatically recorded.

Cyber-desktop uses libraries for frame-by-frame comparison of desktop images, in the presence of more than 10% of changes, an automatic violation is recorded, which is transmitted for confirmation to the human proctor control panel.

A cyber search of the same face captures each photo of the face at the stage of photographing, then considers the face vector, and the photo is searched in the database of matches by the face vector. In case of matches, information about all is transmitted to the report and sent to the Customer.

Data storing and proctoring session post-verification Module

Module for storing data and post-verification of proctoring sessions. The module for storing data and post-verification of proctoring sessions (archive) contains video files of users (camera and desktop), as well as all violations recorded by the cyber proctor and the human proctor.

All information about messages and session violations can be downloaded to a PDF file.

Also in this module information is displayed on the automatic assessment of the session on the “traffic light” scale: green - completed, yellow - attention, red – cheater. Violations are also displayed on the video timeline in the form of a color indication: the yellow part indicates violations, the red part indicates more than 3 violations per minute.

Control Panel Module

The control panel module allows the customer to work independently with the proctoring system. Online proctoring is working from browser, no additional installations needed.

Depending on access rights, the following operations are possible:

- creating exams;
- creation of system users: students, proctors, offline proctors, system administrators;
- create a schedule in the calendar;
- viewing exams statistics for a day / week;
- viewing status and managing students during the exam online;
- recording proctors for online sessions;
- report generation for all sessions, including statistical reports (how many violators were there, which violation was the most frequent, how many people passed the exam more than once, the scope of automatic assessment results, etc.).

In this blog post, we introduced you to the various modules of the Examus online proctoring solution.

Want to know what are the trending EdTech solutions for online proctoring?

Want to try one of the best proctoring solutions? - try the demo

Have questions about online proctoring technology? - Ask Examus