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Eklavya - Questionnaire generation and Monitoring system

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Abstract: In this pandemic, all the academic activities were conducted online using different platforms. Different platforms were used for different activities for e.g.: exams were conducted on google forms, assignment submissions were done on google classroom, and various other platforms were used for different activities. These platforms have many positive points but also have some negative points. In this paper we are implementing a unified platform where we will be integrating all the positive points of these existing platforms and also try to remove the negative points by adding new custom features. Our system named "Eklavya - Questionnaire generation and Monitoring system" provides a proctored mode for conducting online tests, a virtual classroom feature where students and faculties can collaborate and manage different assignments, announcements and it can also be used for generating reports.

Index Terms - Virtual platform, scraped questions, OCR, Quiz generation, API, Fetching question

I. INTRODUCTION

Eklavya is a virtual platform for school and colleges. This platform is a one stop solution for all the exams or classroom activity being conducted online now-a-days. The proposed solution enables faculties to conduct and automate online quizzes or tests and with different options to fetch set of question for examination or quizzes such as:

- Scrapping from different websites.
- Fetching questions from our in-house ever-growing repository.
- Scanning pdfs and images.
- Predicting questions based on given paragraphs or multimedia files.

Platform also provides users with a proctored mode of examination to conduct online tests or quizzes securely and generate reports based on user activities. Students attempting the exams will be restricted to switch tabs and will be proctored using video analytics. Faculties will have a live dashboard to analyze student activities during the exam. Platform also provides users with a virtual classroom environment by leveraging existing google classroom API and introducing custom features. Users will be able to create and grade assignments, announcements, create subject and topic-based classrooms. Apart from the application, will be providing developers with Eklavya API, which they can use to directly integrate our features into their application or any cloud based micro services.

II. IMPLEMENTATION

Eklavya Platform is divided into two major modules i.e., Proctored Exams module and Virtual Classroom module. Classroom module leverages the Google API services to integrate google classroom. Based on which student Analysis / Reports can be generated. Stakeholders of the systems are Faculties, Students and administrators. The Exam module is responsible for creating and conducting quizzes.

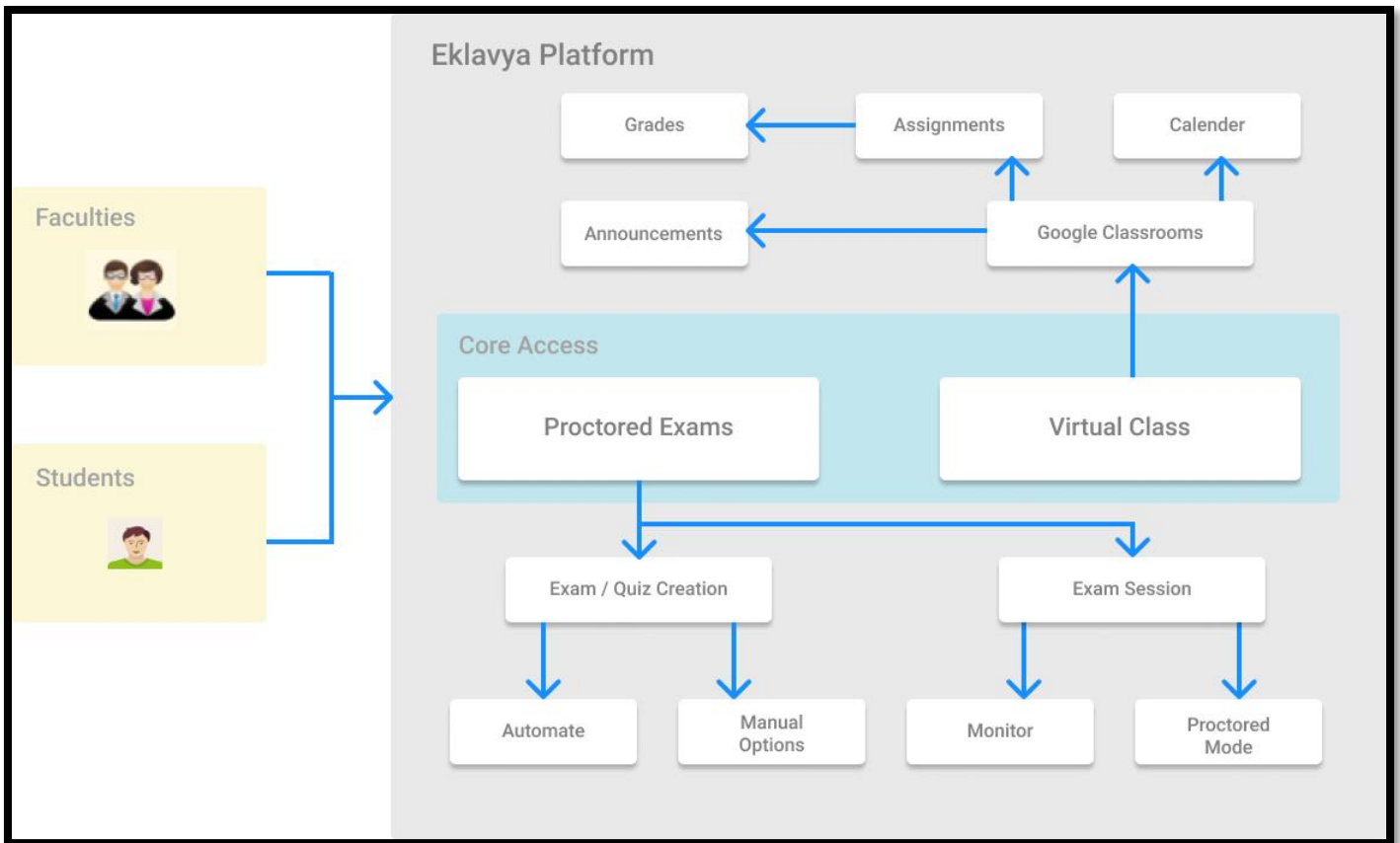


Fig. 1. Eklavya modular diagram

This diagram illustrates the entire flow of our system of “Eklavya - Questionnaire generation and Monitoring system”. The faculty and students are the main users of the system. Eklavya platform provides 2 core access i.e., Proctored Exam and Virtual class. Exams that are conducted online need to be created and monitored. Proctored exams module will provide faculties with the option of creating the test as well as monitoring them. The students will be able to appear for the test created by the faculties in a proctored environment. In the virtual classroom faculties can upload all the assignments, grade them, schedule tests as well as announce the different events in announcements.

1. Questions Generation

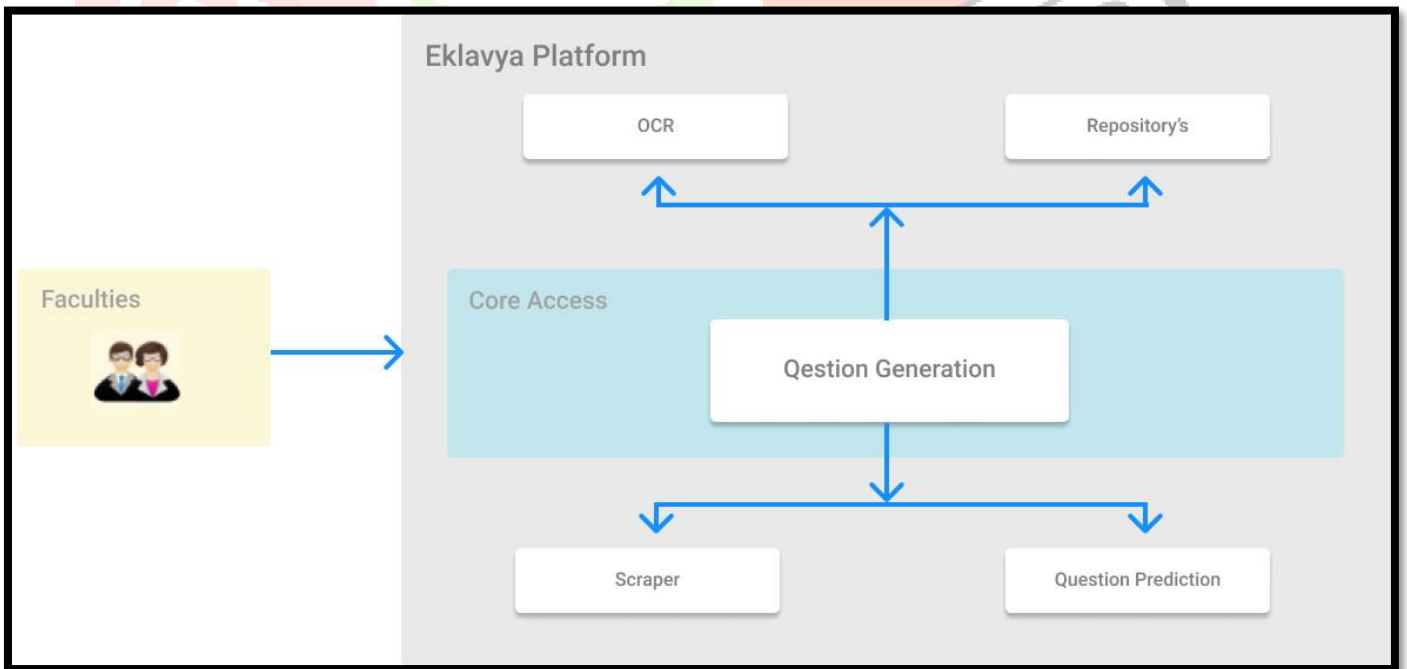


Fig. 2. Question generation modular diagram

Question generation module allows faculties to create the test using different available options like OCR, Repository, Scraper and Question Prediction.

1.1 Image OCR:

OCR i.e., Optical character recognition is an electronic service that converts an image into text. These images are often from a scanned document, a photograph of a document, or any image that you want to convert into text. In this option the faculty needs to upload an image of the MCQ question it wants to convert into text. After uploading the image, the system will automatically detect the questions along with the options for the MCQ from the image and will navigate to another page to schedule the test.() All the MCQ questions will be stored in the repository only if the questions are not already existing.

1.2 Repository:

Repository is a collection of the all MCQ questions that are collected or extracted from the different options like scraping from a website, detecting questions from image and predicting the questions from a paragraph. In this option, the faculty is able to choose the MCQ questions from the existing repository using the topic as the key to search. For example, if the faculty wants to conduct a test on the topic of java, then it needs to search JAVA as the topic.

1.3 Scraper:

Scraper is a simple mechanism of data mining that automatically extracts the data from a page or website into the required format like JSON. In this option, the faculty needs to provide a link of the website it wants to scrape the MCQ questions from. After providing the website link, the system will automatically fetch the questions and its options and will display them in a form. It works by checking through regex to determine questions, options and answers from different websites, the faculty would only need to send website URL and rest will be handled by the system.

1.4 Question Prediction:

Questgen AI is an open-source NLP library that helps to develop easy to question generation algorithms. It is one of the most advanced question generation algorithms that creates on search-built models like BERT, etc. In this option, the faculty needs to provide a simple textual paragraph from where they want to predict the questions along with its distractors. The system will take this paragraph and fetch its related topics and then predict different types of questions such as MCQ based, true or false based etc.

2. Proctoring Module

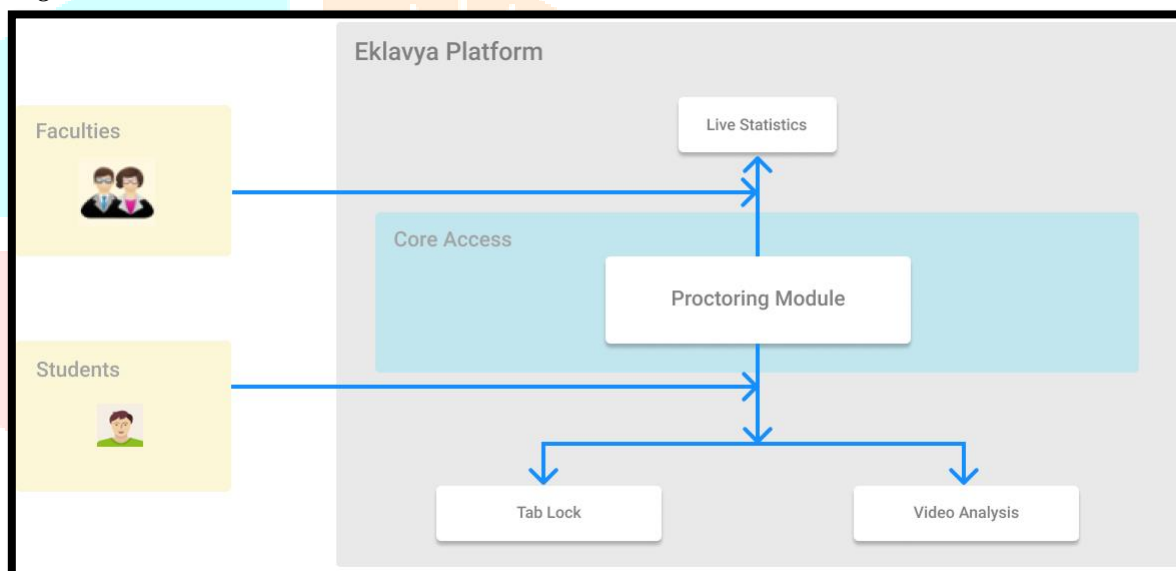


Fig. 3. Proctoring modular diagram

Proctored Module allows the students to attempt their exam in a proctored environment, where their behavior will be monitored continuously. The following are the features of this modules:

2.1 Tab Lock:

During any online test or exams, there is a possibility that some students do some malpractices or mischief behavior like searching the answers of the question from different websites. This module prevents them from changing tabs by applying a tab lock and immediately informing the faculty about their activities on the live statistics dashboard. The student will be restricted to switch between tabs. If a student tries to switch tabs a 3-stage warning will be generated. Once the student exceeds the final warning, the exam will automatically be submitted at current state.

2.2 Video Analysis:

Keeping the webcam on throughout the entire exam is one of the ways to monitor the student's behavior. It helps the faculty to identify the students doing any malpractices. Throughout the examination the student will be the proctored using video analytics i.e., they are restricted to move face away from the device screen. If they do so warnings will be generated.

2.3 Live Statistics:

Live dashboard is a feature that allows faculty to see the real time statistics. In this module the faculty will be applicable for invigilators during moderation. The invigilator will be able to get live statistics of the users appearing for exams and will enable them to view any warnings generated for the users. The report of the live statistics can also be downloaded.

3. Classroom

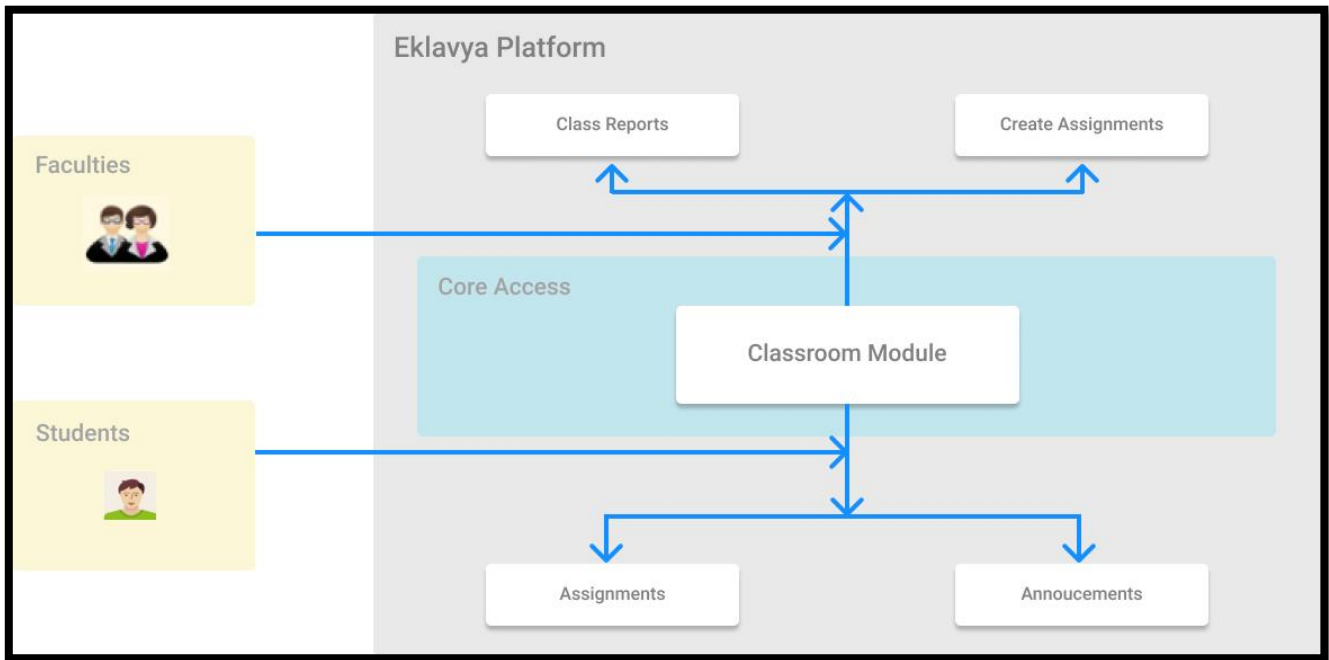


Fig. 4. Classroom modular diagram

Google classroom is one of the services provided by Google. Google Classrooms help to communicate between faculties and students, teachers can share Assignments, Classwork, even teachers can conduct an online test by providing marks as a result. The best part is everything goes paperless which makes this app so useful. These days, faculties and students are looking for how to use Google Classroom. This module is fully integrated with google classroom and allows faculties and students with following features:

- Google Classroom module can be used by the users if Eklavya Platform is being used to store notes and to raise query among users.
- This module will assist users to create classrooms and create assignments and announcements.
- This classroom then can be used by the users to share important documents among participants and also to raise query or discussion topics.
- Some custom features on top of google classroom such as creating hierarchical structure for subjects and topics.

4. API

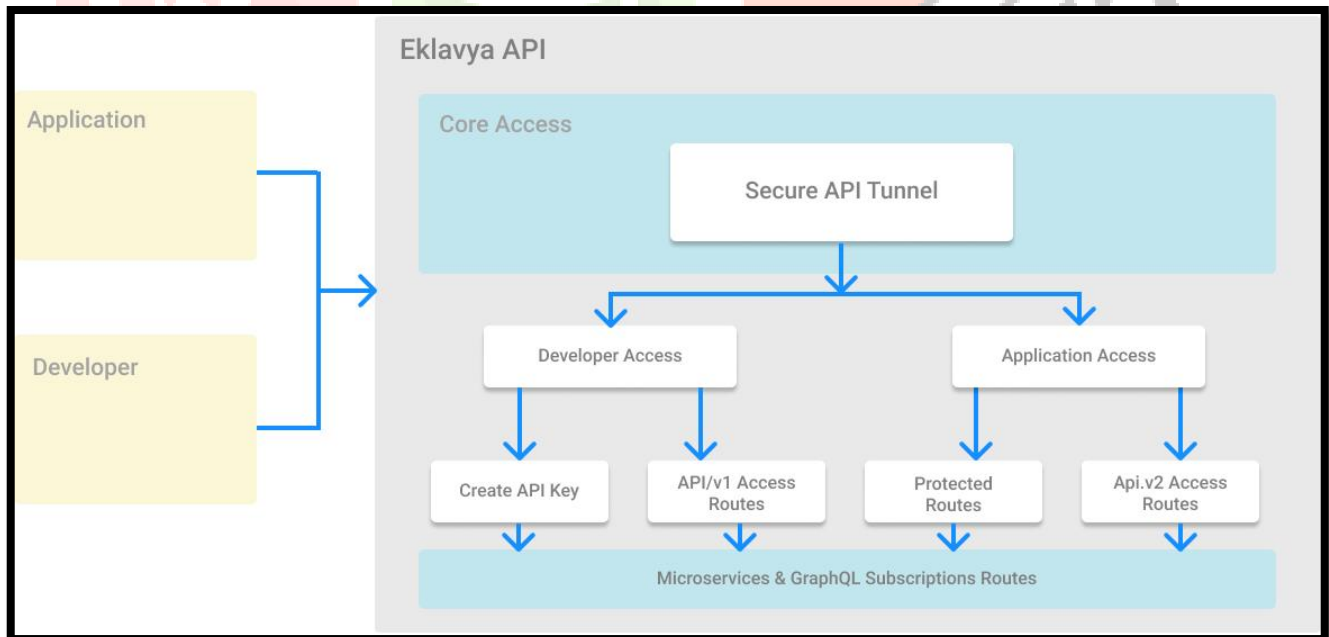


Fig. 5. API modular diagram

Application Programming Interface (API) are usually data sources from where the client i.e., Application consumes public as well as private data or information stored onto a datastore or database. We provide our services data through a custom secured API, which other developers can also use to integrate our service into their web application or any service they are willing to provide. The developer willing to use our API needs to first generate an API Key, which is basically an encoded string that helps us to validate the incoming request and also to monitor / limit requests made per minute. All of our modules are divided into

microservices made on top of an Express Server and a GraphQL Wrapper, so it is up to Developer to use either our Express REST API or GraphQL based Query API.

III. RESULTS

3.1 Faculty Flow:

The faculties first need to go through our authentication module, where they have the option to either register/login with email and password or with their existing Google account. Then they are prompted to complete their profile with academic and personal details. Once complete they are redirected to a dashboard, where they can create a quiz using either of the options like scraping, OCR or prediction or they can start from scratch. Once the quiz form is populated, they move forward to schedule the quiz for a set of students or a class. During an ongoing quiz they have an option to view live student statistics where they basically can proctor any students and later download reports for any past quizzes.

3.2 Student Flow

The students also need to go through the same authentication procedure and then profile completion process. Once the students are navigated to their dashboard, they can attempt a quiz scheduled by concerned faculties. While attempting the quiz, they are in a proctored environment where their face is monitored if they are looking left or right, tabs are monitored if they try to switch and the entire quiz is in full screen, if a student's tries to do any the above activity they are considered as penalties and after certain threshold the quiz gets automatically terminated.

IV. IMPLEMENTATION DETAILS

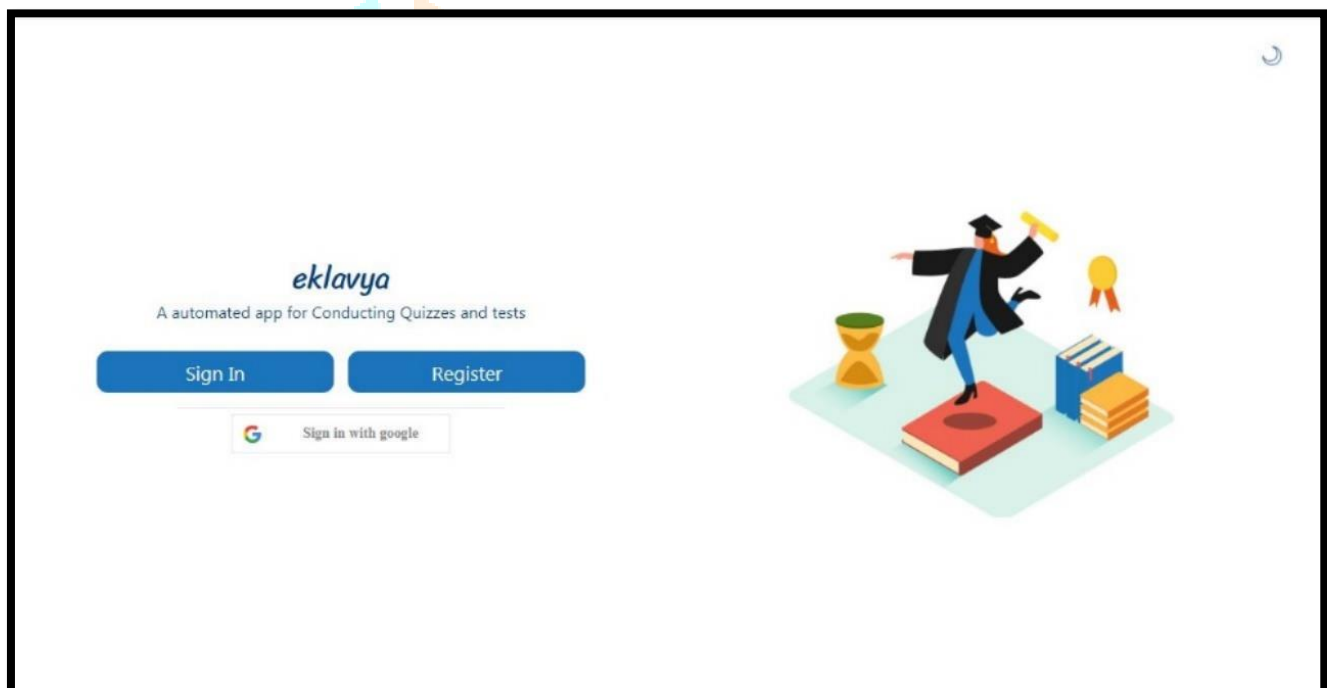


Fig. 6. Landing Page

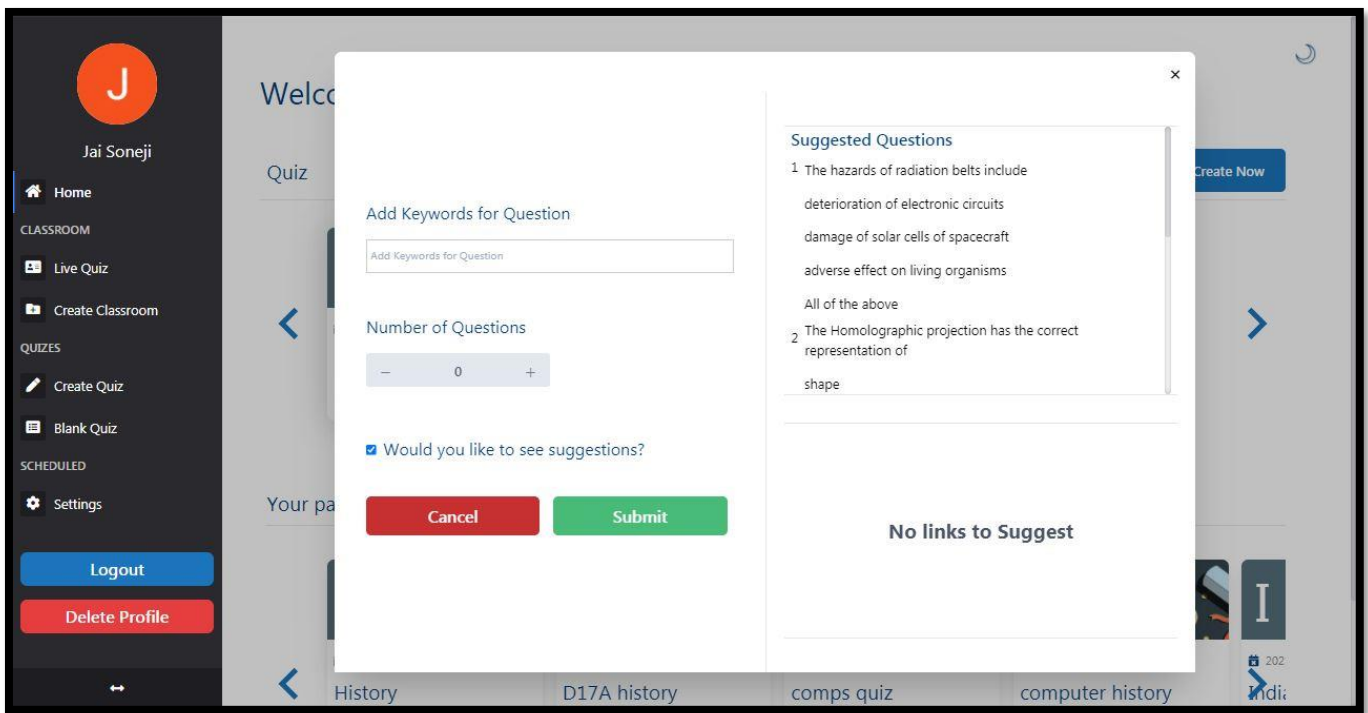


Fig. 7. Suggested questions appearing for creating quiz from scratch

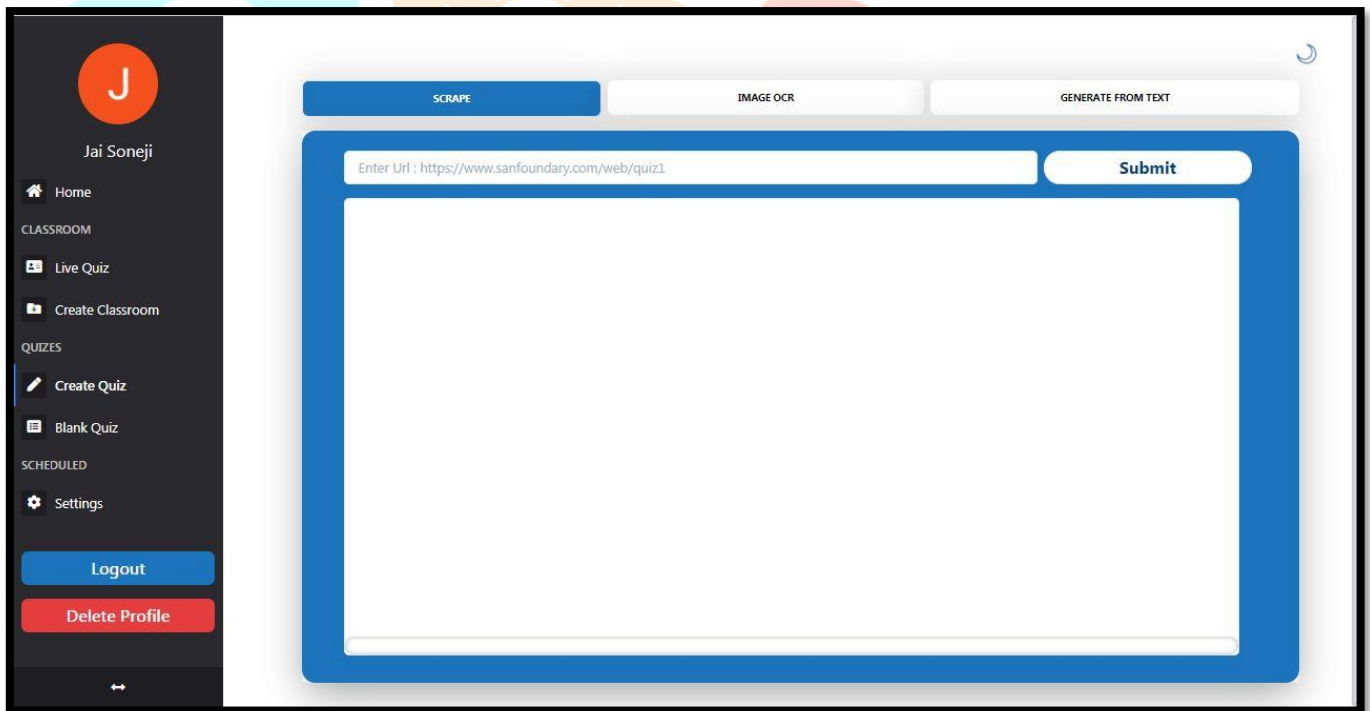


Fig. 8. Create Quiz

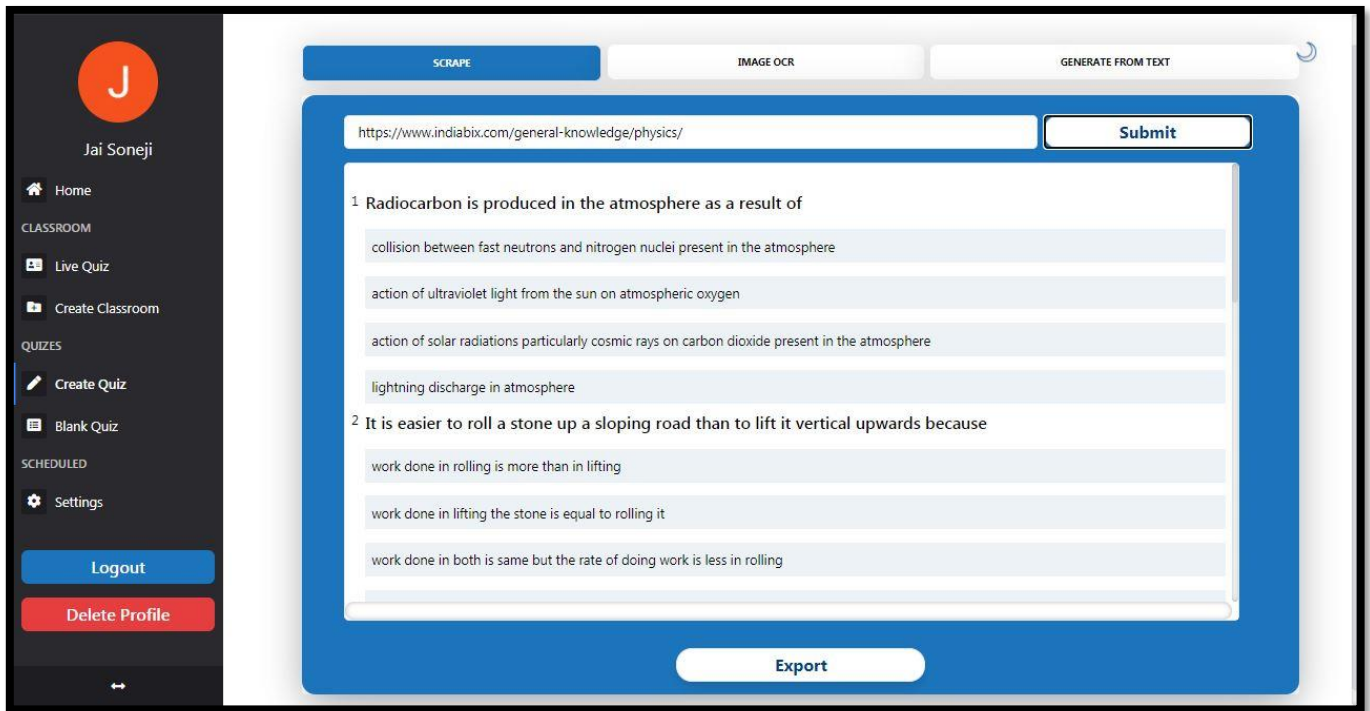


Fig. 9. Scrape Question

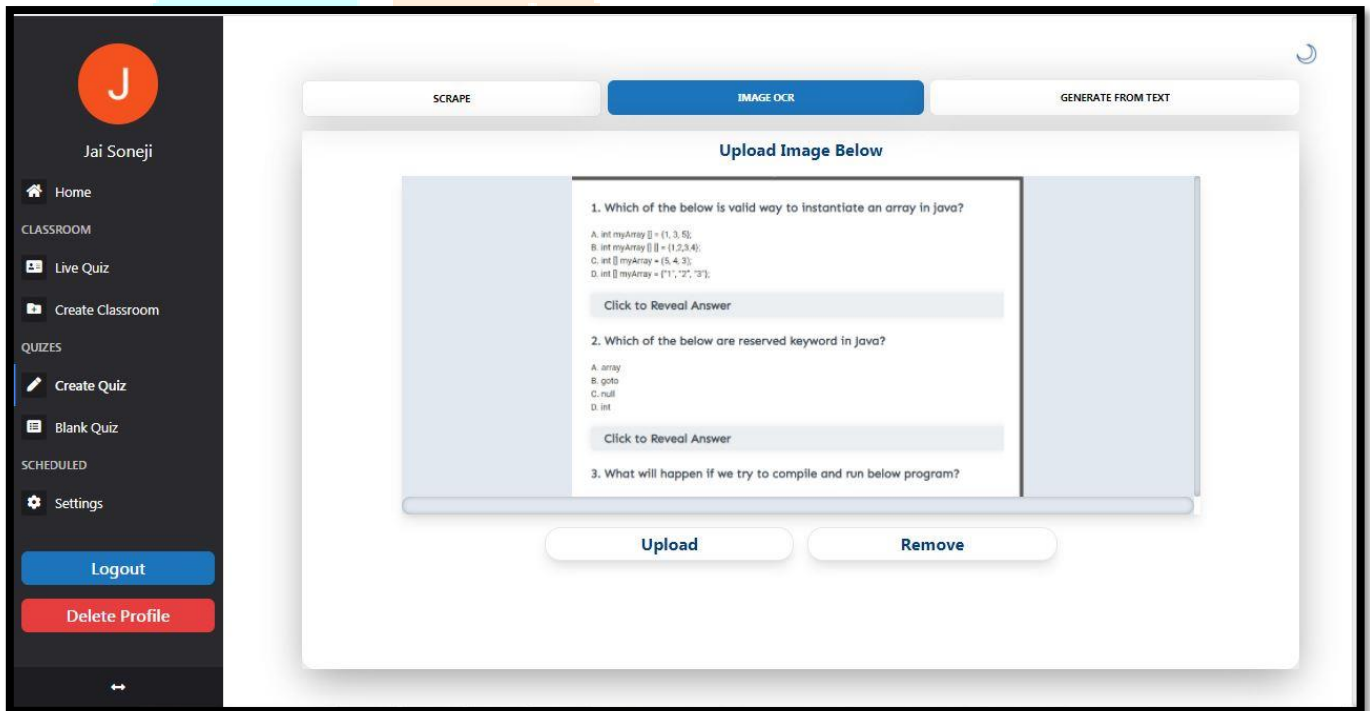


Fig. 10. Image OCR uploading image

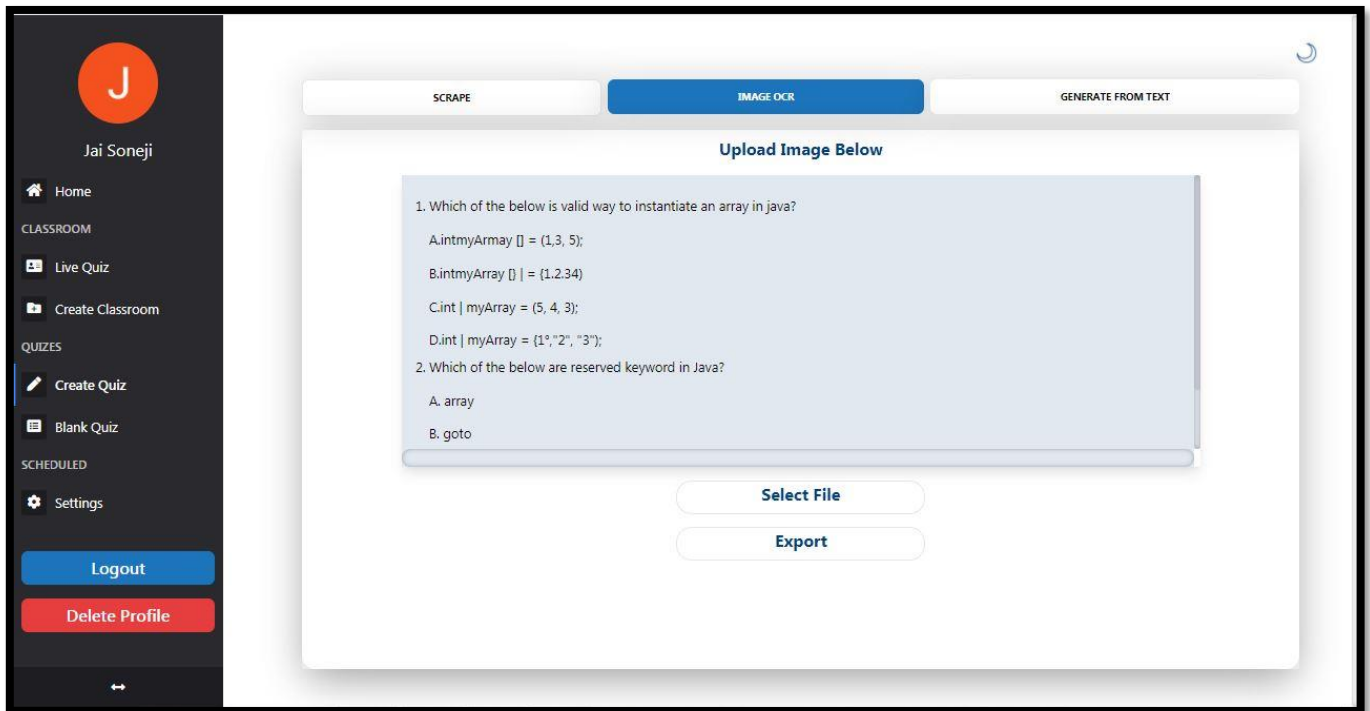


Fig. 11. Image OCR question extracted

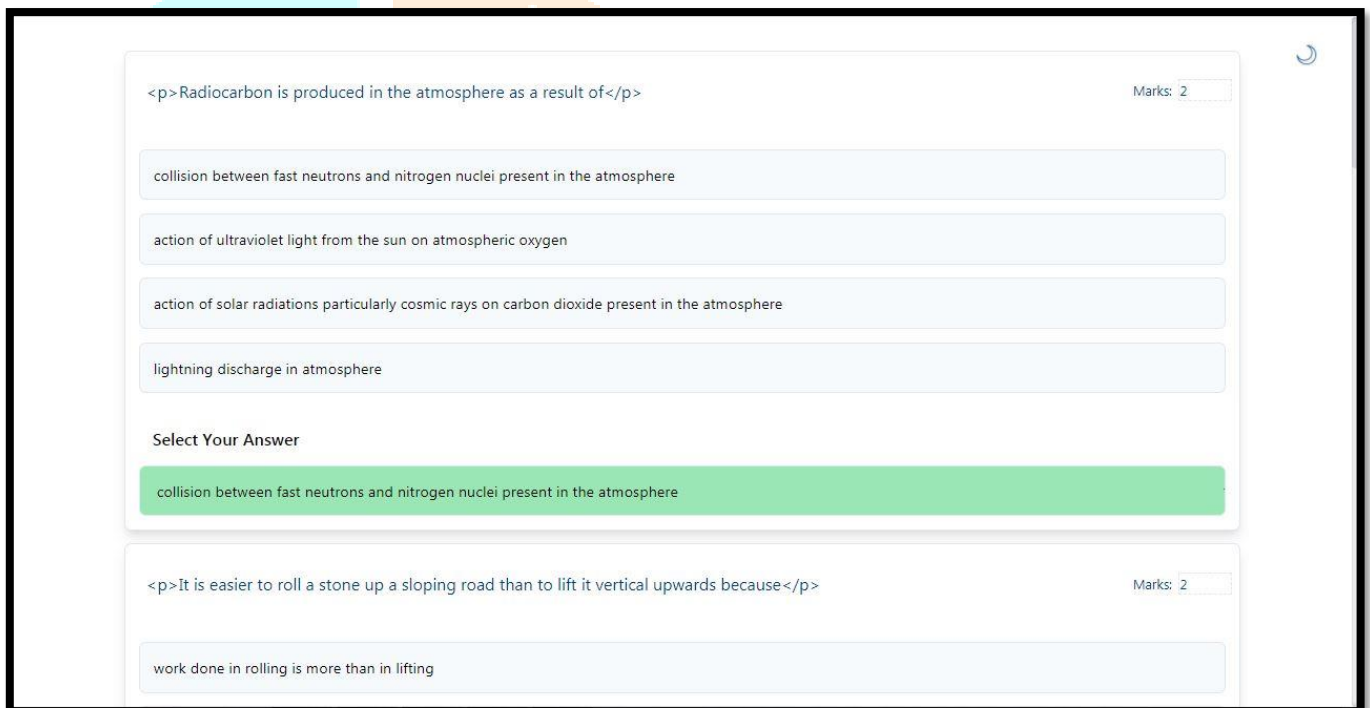


Fig. 12. Editing quiz form

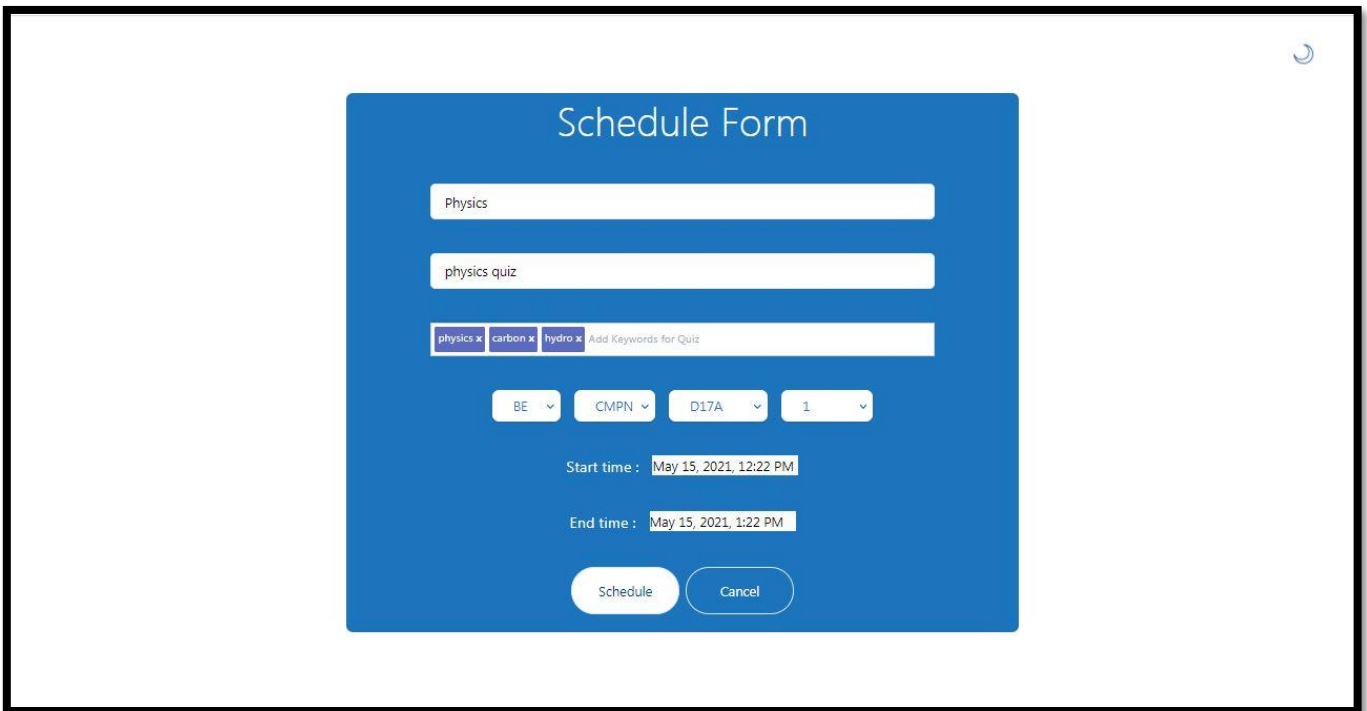


Fig. 13. Schedule quiz form

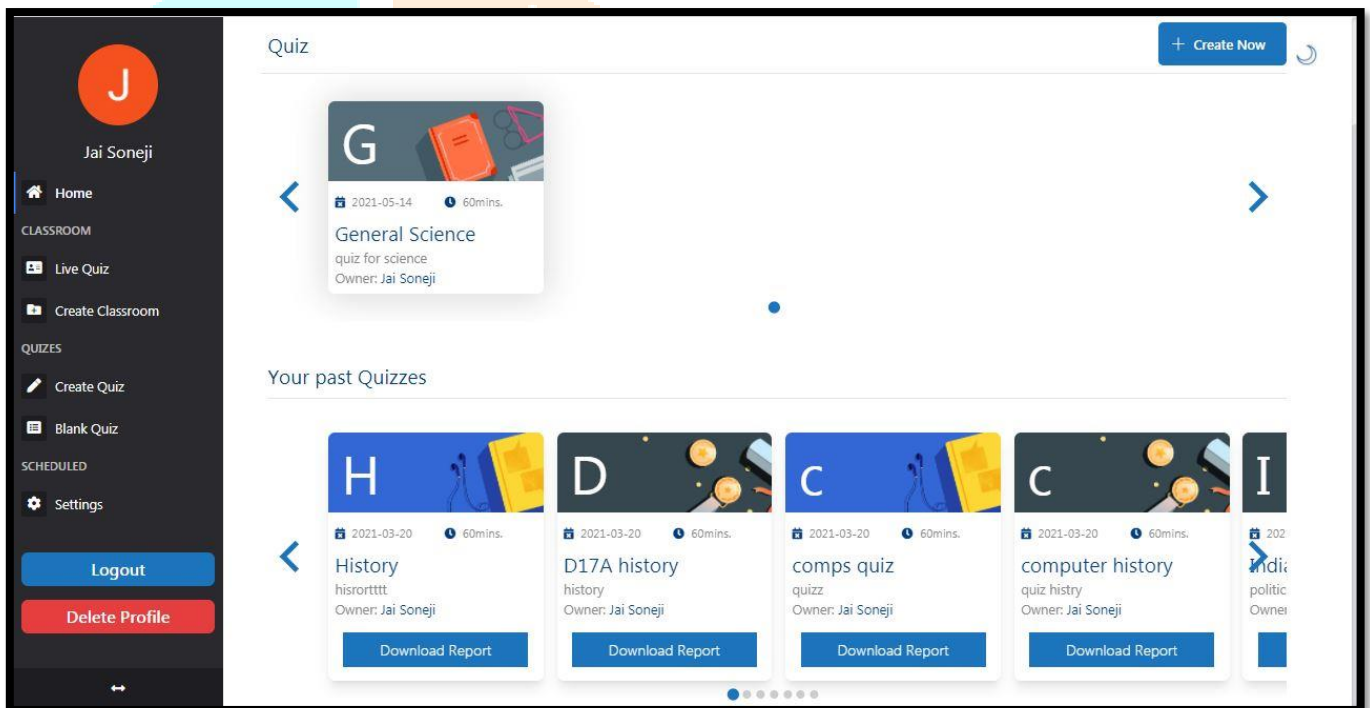


Fig. 14. Scheduled quiz listed in quiz tab

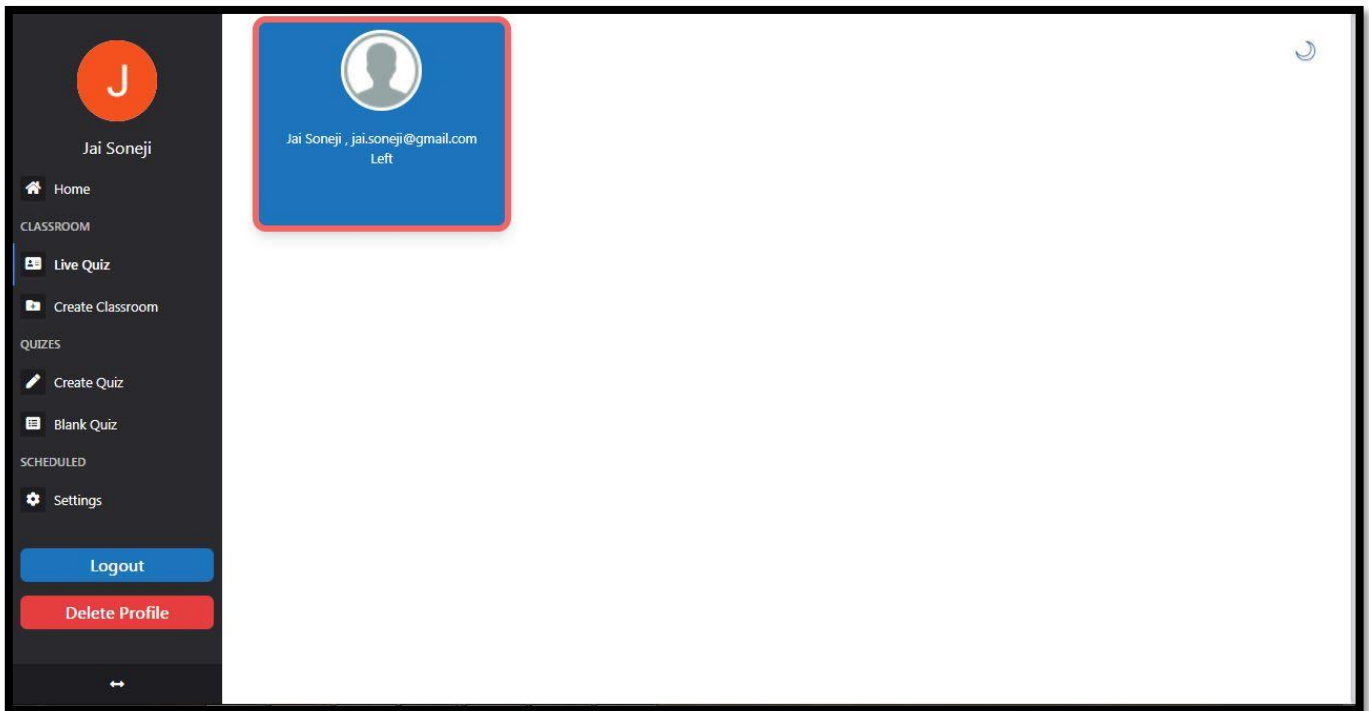


Fig. 15. Live proctoring while live exams

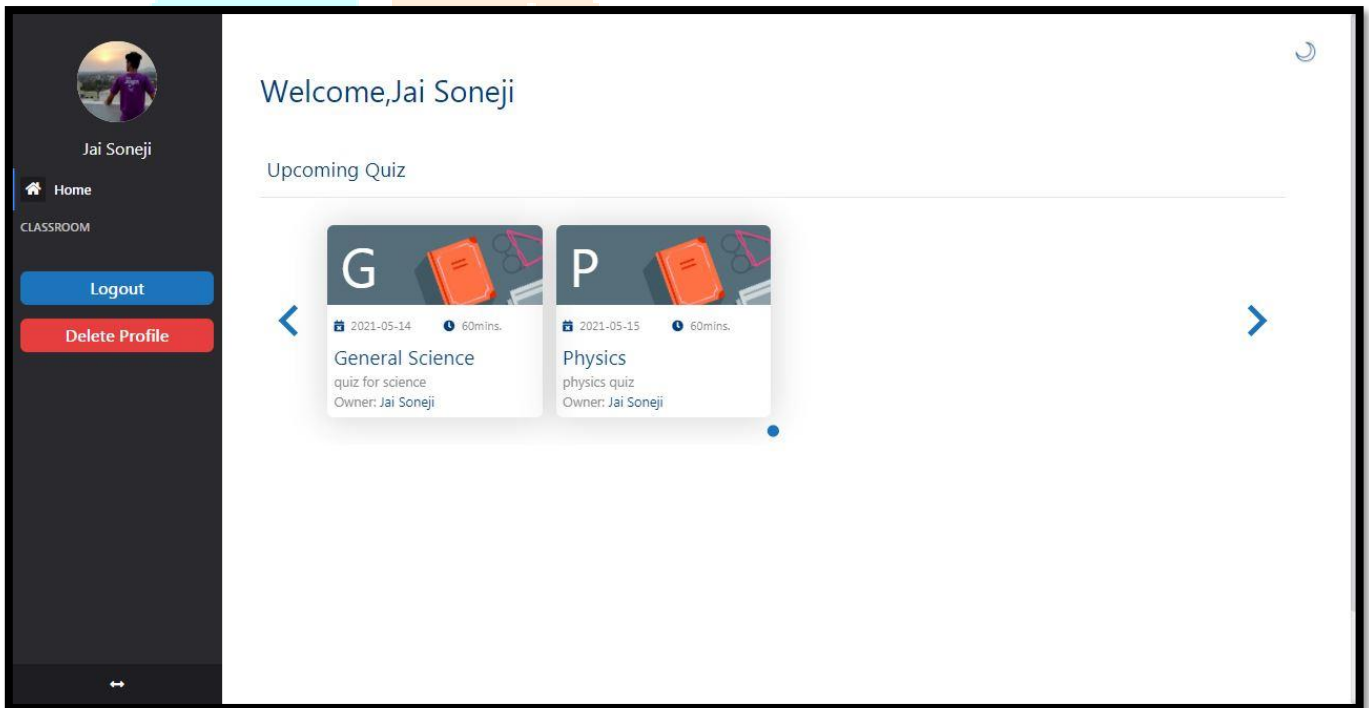


Fig. 16. Students Dashboard

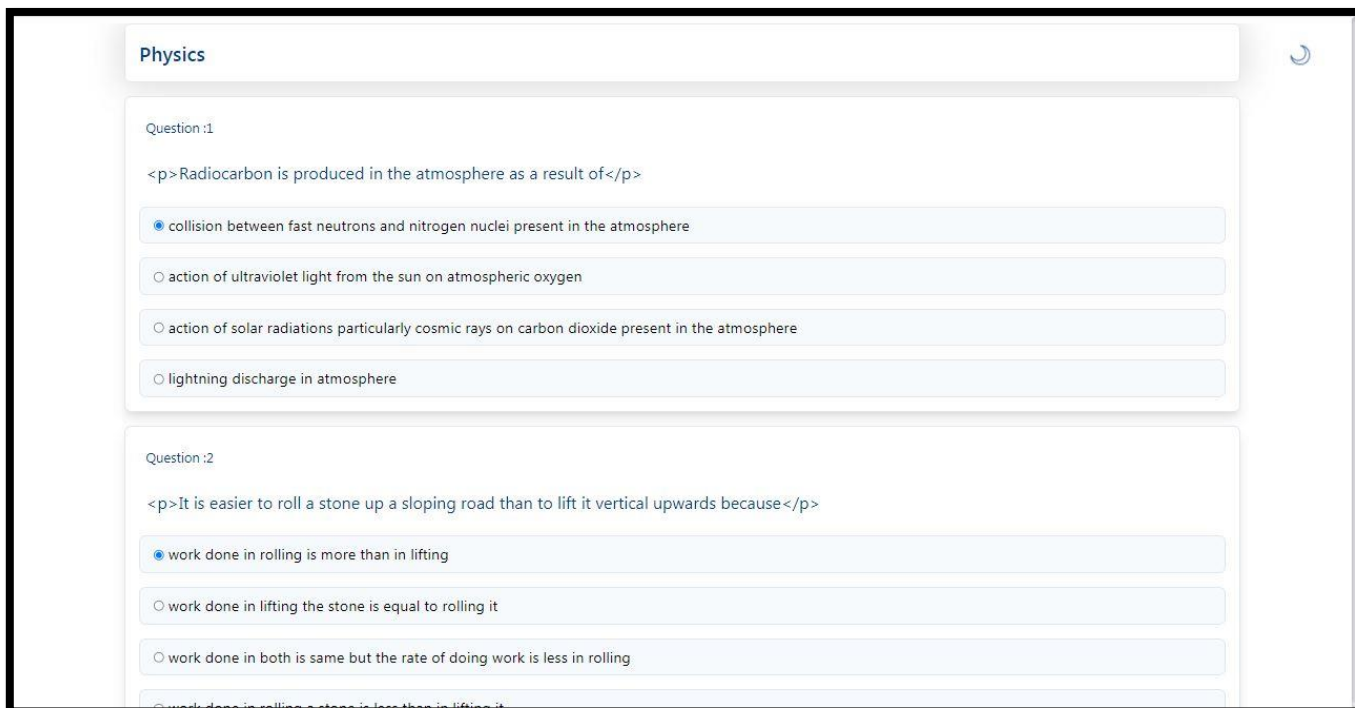


Fig. 17. Students attempting quiz

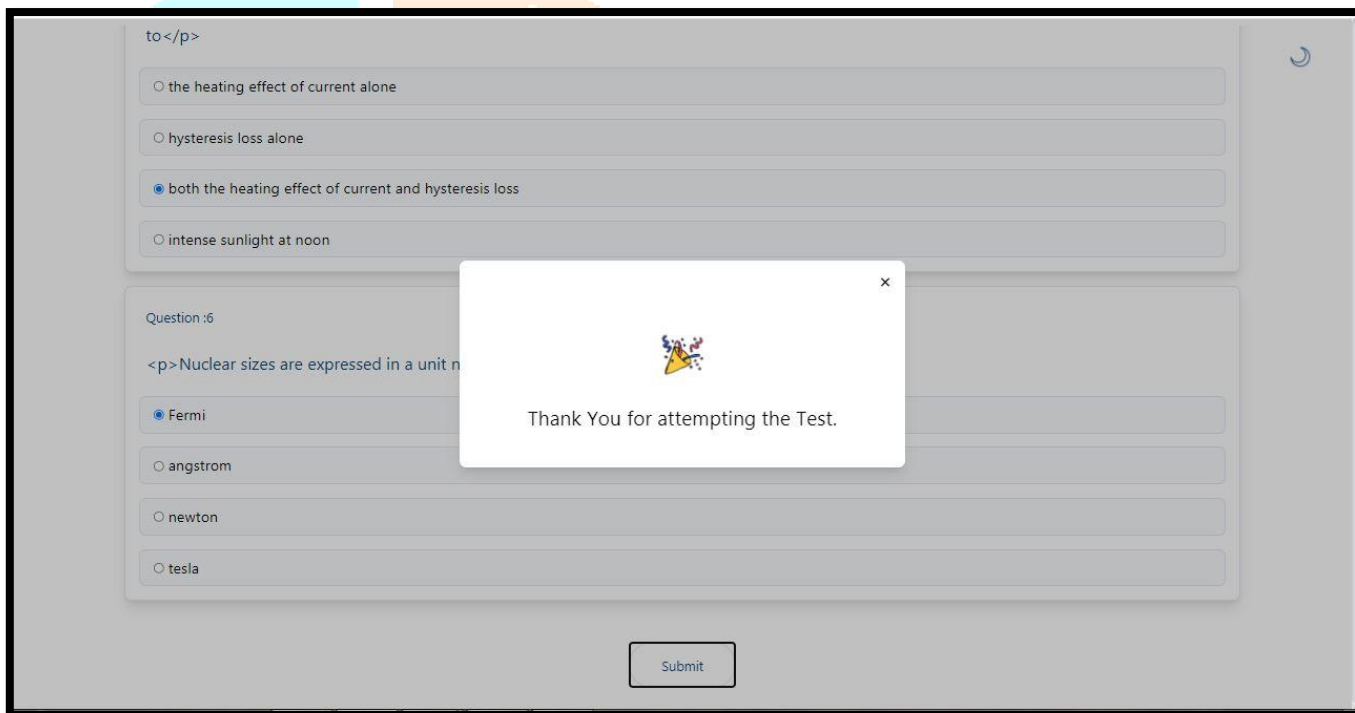


Fig. 18. Student submitting the quiz

V. LIMITATIONS

Some of the limitations of our system are:

- Some of the Modules in our system are process intensive, hence they require a high computing power like the question generation module has lots of processing before predicting questions that cannot be executed on commodity hardware's.
- Face Monitoring Module has just 2-way face recognition for now i.e., Left or Right.
- Scraping Module is limited to some websites for now, this is because we are using REGEX to scrape the website and every website has a different structure which is not feasible to define regex for every structure found on the web.

VI. CONCLUSION

In our system the users i.e., faculties are able to automate the process of creating a quiz or test forms having various options to choose from. Having to proctor students live while attempting the quiz or for any reason faculties not present on the day of exam, they can download result and proctoring reports. While students are proctored in session using various methods like face monitoring which is continuously monitoring their movements and also the tabs, they switch considering this as an offence and terminating the quiz immediately. The proposed system discusses the progressive web application, as we know nowadays more and more no of

exams and quizzes are being conducted online. All the services being used are available in different platforms, some or another has one of the services absent, there is no unified platform for colleges and schools. Eklavya will enable schools and colleges to conduct any online examinations quickly by using different options available like MCQ generation model; in a secure environment. The system will ensure that it is being conducted in protected mode to reduce the chances of any malpractice and alternatively provide developers with out-of-the box API service.

VII. FUTURE SCOPE

In the future we plan to integrate our system with Google classroom that will add more features that will ease many activities like submitting or creating assignments, announcements, and student's overall reports. Implementing a provision for making a dedicated quiz module for coding. This will allow faculties to create competitive coding tests very easily. The repository feature can be scaled to include quizzes of various subjects in different fields. Push notifications can be added for Progressive Web App to provide faculties and students with better user experience and reminders for upcoming quiz or assignments.

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