

EduAssist: An Interactive Way of Learning

Submitted BY

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This Report Presented in Partial Fulfillment of the Requirements for
The Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This Project titled “**Eduassist-An Interactive Way of Learning**”, submitted by **Mustahid Hasan**, ID No: **183-15-11813** to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 12 September 2022.

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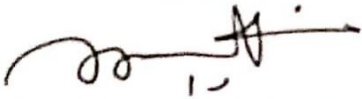
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DECLARATION

I hereby declare that this Project Report has been done by us under the supervision of **Dr. Md. Tarek Habib, Assistant Professor, Department of CSE**, Daffodil International University. I also declare that neither this thesis nor any part of this Project Report has been submitted elsewhere for award of any degree or diploma.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In Bangladesh students are getting introduced to online education day by day. The digitalization of society is causing a massive impact in our education sector. When covid struck our country our education system was about to collapse. But due to having proper connectivity all over the country, the online education system saved our day. With the help of online platforms we could continue our education system with less interruption. As a result our day to day education did not get shut down during this pandemic period. But after that pandemic period, the effect of online education remains in our system which is definitely good for the students as well as teachers. But there was a problem in that system which was proper evaluation through online examinations. Also the teachers used to face great difficulty to create multiple questions for each student manually. This was a great challenge for the teachers to prevent the students from cheating during online examinations. Students used to search the results from the internet and write it down in their answer script. Which is harmful for them and other students as well. That's why I developed a system named EduAssist. It's an interactive way of learning and evaluating. This system has several features such as an automated online education platform by using the Natural Language Processing Algorithm(NLP). Here the work pressure of the teachers will decrease by Automatic Assignment generator, Automatic Test generator with Automatic result publication. Also, The students will get proper support from a chatbot whenever they want. Last but not least the parents will get a platform to track the progress of their Son/Daughter from anywhere. This system uses Artificial intelligence to create questions for online examinations and evaluate them. So that the teachers can save their time. Also it has a cheating controlling system that minimizes the probability of cheating during online examinations

1.2 Motivation

My motivation for creating this project was,

1. Providing an interactive way of learning to the students whose parents are at work.
2. Breaking the barrier of just taking examinations and turning it into a good learning outcome.
3. Making online education more reliable with automation .

4. Making it easier for teachers and parents to observe students' progress reports .
5. Reduce the extra work pressure for the teachers during the online teaching time period .
6. During some imperative time this system can be used to continue normal education .
7. During the normal time period this system can be used.

1.3 Objectives

My objective for the project was to build a web application that will have proper login and registration with proper security. There will be an Artificial Intelligence for generating questions based on the given context and a result evaluation system. Also there is a system that minimizes the probability of cheating during online examinations and a chatbot for student support at any time.

1.4 Expected Outcome

The expected outcome of this project would be such as,

1. Automatic Assignment/Test generator based on sufficient data & trained Model(Convolutional Neural Network).
2. Instantly Generating The results of participants .
3. Supportive chatbot for students .
4. “No switching tab”, “Fixed fullscreen”, “Tracking mouse pointer” during the examination .
5. Automatic test save if any interruption occurs.
6. A dashboard for both students and teachers for proper performance justification.
7. CSRF security for preventing any attack 8. Functional Admin Panel for proper observation

1.5 Project Management and Finance

1.5.1 Project Team

1. Developer: 1 Person
2. System Analyst: 1 Person

3. Content Writer: 1 Person
4. Graphic Designer: 1 Person

1.5.2 Project Cost

1. Salary: 20000 TK per month
2. Domain Hosting: 10000 TK per year
3. Utilities: 2000 TK per month
4. Cloud Subscription: 5000 Tk per month

CHAPTER 2

BACKGROUND

2.1 Preliminaries/Terminologies

This project is a combination of Both research and development. Here the used Terminologies are cooperative to each other and work accordingly. These are,

1. Google collab for data pre-processing, creating models, loading every required library.
2. Docker for creating an Image container of the generated model As API.
3. Postman for testing the API.
4. Text-to-Text Transfer Transformer model for text prediction.
5. Visual studio code as code Editor.
6. Xampp for local server.
7. Chatbot(Botfather): To create a support chatbot for students.
8. mousemove(handler): For Tracking Mouse Pointer.
9. Visibility API(JavaScript): To detect tab switching.
10. FullScreen API(JavaScript): To set fullscreen.
11. T5-question generation API

2.2 Related Works

All over the country online education is spreading so widely. Also in Bangladesh online education is at a good position. Some related works like our projects are,

1. In the USA & Canada, automatic admin tasks have been an important aspect.
2. Making an appointment, completing the immigration automation is everywhere.
3. The US Federal administrative supports are now done by automatic admin software.
4. In Canada, banks use automatic admin software to monitor several tasks.
5. In Bangladesh, the Automatic Immigration system is playing an important role.
6. After this covid situation Automation in education has been an important aspect to accrue.

7. Taking the attendance, shortlisting students, grading, registering courses, etc tasks are now being done by an automatic system.
8. 10 Minute School, Mukthopath are making online education so easy in bangladesh.



**10 MINUTE
SCHOOL**

Figure 2.2.1: Related Works 10 Minute School



Figure 2.2.2 : Related Works Mukhtopath

2.3 Comparative Analysis

Online education sites are now a common instinct in the digital world. They have several features like creating courses, online sessions, Examination portal, result publication, rank challenge. But in every aspect of this software the teacher always has to worry about creating the questions all by themselves and taking the online examinations. It is really hard for the teacher to conduct with all the students every time through any chat system.

Therefore I introduce this system that will create the question automatically based on the given context by the teachers. Also it will check the result and several cheating detection systems during the online examinations. Another feature of this software is conducting with students with an automatic chatbot. This chatbot can be integrated with any social media chat system.

2.4 Scope of the Problem

This software is basically a web based software that has several security features during login and data monitoring. This software is also using an Artificial intelligence model in the background to create questions automatically. This automation process needs proper connectivity with servers for a brakeless operation. Such operation is very much important for this software to run without any interruption. Any interruption in the network connectivity can cause operation loss. Moreover this software is light weight and its complexity is less.

2.5 Challenges

1. Ensuring the proper question and answer during test/assignment generation.
2. Providing the exact support that the student wants from chatbot.
3. Ensuring trained dataset for making Automatic Test/Assignment with reliable accuracy.
4. Ensuring a relative result dataset to the assignment/test.
5. Controlling a huge set of users.
6. Preventing unauthorized users.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

This software is an educational purpose software. This requires a B2B or B2C business model. This requires both government and businessman collaborations for a successful

market deployment. Such software can be managed by a group of people that needs proper direction and documentation. Again the consumers are basically the students and their parents. They will basically use it like all other software on the web. But for deploying this and maintaining this software there should be a team that will maintain several things such as, Proper connectivity, brakeless operations, maintenance. The business benefits are,

1. This project is based on Natural Language Processing. Thus Automation will cut a lot of costs. Such as Delivering manual tests or assignment papers at students home, Delivery cost , Manpower cost
2. Teachers' productivity will be increased
3. School office productivity will be increased as well.
4. Automation in work will minimize paper use.
5. Online communication will make it easier to solve student problems as soon as possible.

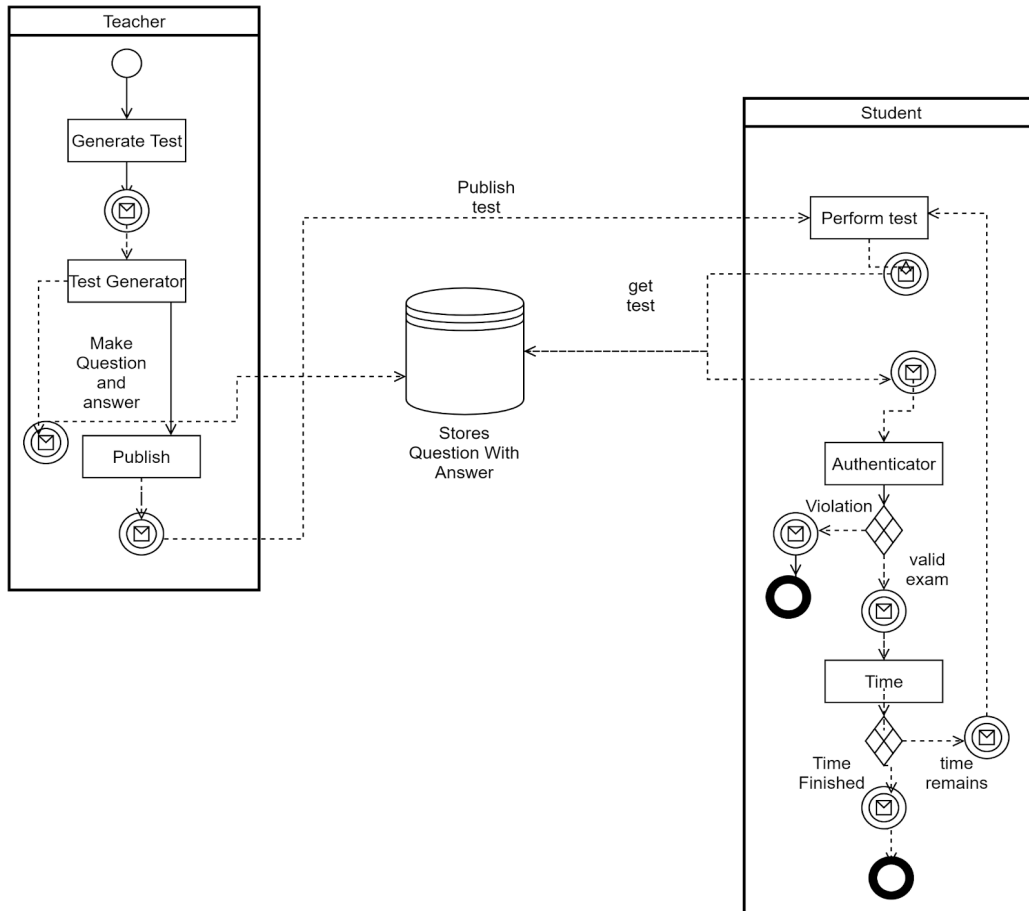


Figure 3.1.1: Business process modeling notation

3.2 Requirement Collection and Analysis

The required options for this software are set by the problem that was raised for introducing this software. The problem was to make an automated system that will minimize the teachers workload and help the students and teachers. Therefore the required options for this software are also the same that need to be there. The Application has a separate user based login that returns a different portal based interface. (table)

Table 3.2.1: Requirement Collection and Analysis

No	User	Action
1	Admin	<ol style="list-style-type: none"> 1. Admin can login with specific credentials 2. Admin can see the teacher and student list 3. Admin can delete, update users list 4. Admin can monitor user activity
2	Teacher	<ol style="list-style-type: none"> 1. Teacher can register with proper credentials 2. Teacher can login with valid credentials 3. Teacher can generate questions 4. Teacher can add questions for test 5. Teacher can monitor the test 6. Teacher can see the test result 7. Teacher can see the test attempts and cheating attempts
3	Student	<ol style="list-style-type: none"> 1. Student can register 2. Student can login with valid credentials 3. Student can Perform test 4. Student can see the final result after test 5. Student can use the chatbot system

3.3 Use Case Modeling and Description

The users of this software are teachers and students as actors. Another one is the admin that will have the admin portal which is django default admin portal for monitoring everything. The teacher will have a specific task to do as well as the students. Teachers will have several features such as Watching Student list, Questions generation portal, Result Portal

And students will have some operations such as giving exams, watching results and using the chatbot. The operation goes as per the user id.



Figure 3.3.1: Use Case Diagram

3.4 Logical Data Model

The Artificial Intelligence model is saved as a docker image that is trained with the t5-question generation model. This model accuracy is more than 92% and the test cases worked properly. This model is saved into the docker image which is running in the linux server and with port 80 it is connected with the web application. This application is

sending requests as json and getting output as json format. Which is then shown in the web application.

```
df_train.head()
```

	context	answer	question
77649	During the Cretaceous, the late Paleozoic-early Mesozoic supercontinent of Pangaea completed its breakup into present day continents, although their positions were substantially different at the time. As the Atlantic Ocean widened, the convergent-margin orogenies that had begun during the Jurassic continued in the North American Cordillera, as the Nevadan orogeny was followed by the Sevier and Laramide orogenies. Though Gondwana was still intact in the beginning of the Cretaceous, Gondwana itself broke up as South America, Antarctica and Australia rifted away from Africa (though India and Madagascar remained attached to each other); thus, the South Atlantic and Indian Oceans were newly formed. Such active rifting lifted great undersea mountain chains along the welts, raising eustatic sea levels worldwide.	Pangaea	The current continents were formerly known as what continent?
9187	In parliamentary systems, governments are generally required to have the confidence of the lower house of parliament (though a small minority of parliaments, by giving a right to block supply to upper houses, in effect make the cabinet responsible to both houses, though in reality upper houses, even when they have the power, rarely exercise it). Where they lose a vote of confidence, have a motion of no confidence passed against them, or where they lose supply, most constitutional systems require either:	lower house of parliament	Most parliamentary governments need to have the support of what governmental body?

```
df_validation.head()
```

	context	answer	question
2218	Luther's disappearance during his return trip back to Wittenberg was planned. Frederick III had him intercepted on his way home in the forest near Wittenberg by masked horsemen who were made to appear as armed highwaymen. They escorted Luther to the security of the Wartburg Castle at Eisenach. During his stay at Wartburg, which he referred to as "my Patmos", Luther translated the New Testament from Greek into German and poured out doctrinal and polemical writings. These included a renewed attack on Archbishop Albrecht of Mainz, whom he shamed into halting the sale of indulgences in his episcopates, and a "Refutation of the Argument of Latomus," in which he expounded the principle of justification to Jacobus Latomus, an orthodox theologian from Louvain.	Luther's disappearance	What was planned for Luther by Frederick III after the meeting?
3149	The French Protestant Church of London was established by Royal Charter in 1550. It is now located at Soho Square. Huguenot refugees flocked to Shoreditch, London. They established a major weaving industry in and around Spitalfields (see Petticoat Lane and the Tenterground) in East London. In Wandsworth, their gardening skills benefited the Battersea market gardens. The Old Truman Brewery, then known as the Black Eagle Brewery, was founded in 1724. The flight of Huguenot refugees from Tours, France drew off most of the workers of its great silk mills which they had built.[citation needed] Some of these immigrants moved to Norwich, which had accommodated an earlier settlement of Walloon weavers. The French added to the existing immigrant population, then comprising about a third of the population of the city.	Soho Square	What is the present-day location of this church?

Figure 3.4.1: Train and validation dataset

3.5 Design Requirement

This software requires designing materials such as

1. User login
2. User registrations
3. User profile
4. Teacher portal
 - a. Student list
 - b. Questions generation portal
 - c. Result Portal

5. Student Portal
 - a. Test portal
 - b. Exam portal
6. Cheating detection system
7. Chatbot system

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-end Design

Table 4.1.1: Front-end Design

No	User	Views
1	Admin	<ol style="list-style-type: none">1. Login2. Dashboard3. User4. Questions5. Tests6. Answers
2	Teacher	<ol style="list-style-type: none">1. Register2. Login3. Dashboard4. Student List5. Student Result6. Generate MCQ Type Question7. Generate Fill in the blank Type questions
3	Student	<ol style="list-style-type: none">1. Register2. Login3. Dashboard4. Perform Test5. See result6. Use automatic chatbot

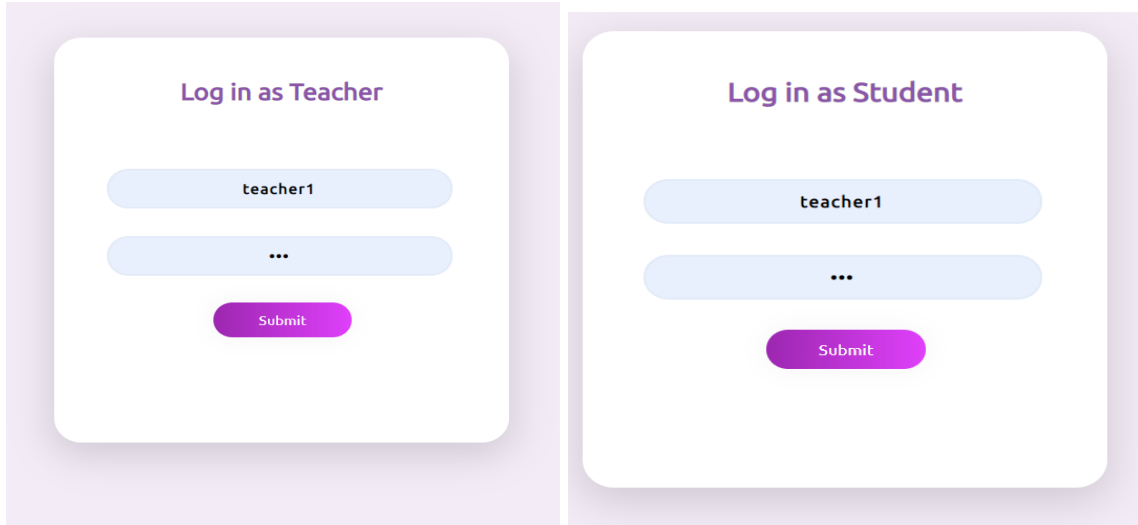


Figure 4.1.1, 4.1.2: Login student teacher

Login view has the login form for user where they can input the username and password and with valid credentials it will send the user to the specific dashboard

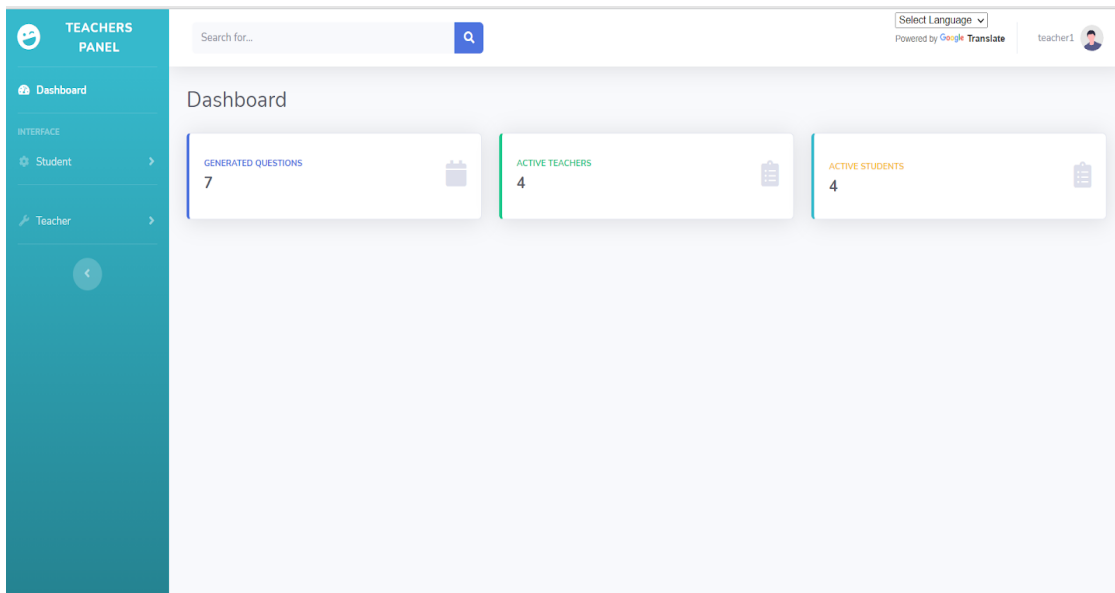


Figure 4.1.3: Teacher Dashboard

This teacher dashboard has a question number active users list. Also it will show the student portal that has a student list and student test result options. In the teacher option there are two options to create questions; these are MCQ and fill in the blank.

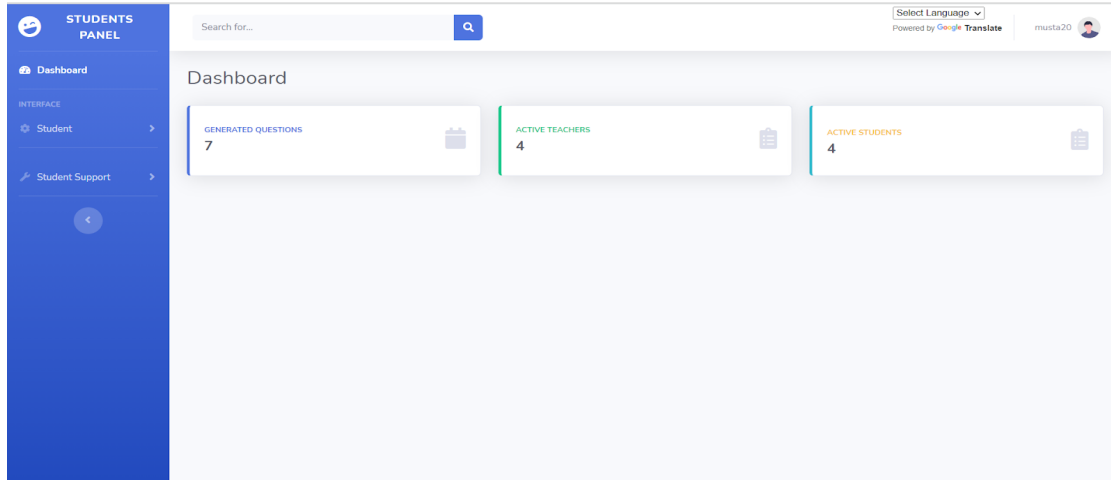


Figure 4.1.4: Student Dashboard

In this student dashboard the active user list is also shown. Here in the student option the student will see the active test which will go to full display view while performing and if students change the tab it will detect the change as cheating.

Generate Multiple Choice Question

Enter the context of the question

Enter the keyword

Submit

Figure 4.1.5: Generate Multiple Choice Question

What was Albert Einstein's profession?

Option:

Bibliotist

PHYSICIST

Biologist

Cognitive Scientist

Chemist

What sport does Iftekhar play?

Option:

Boxing

Wrestling

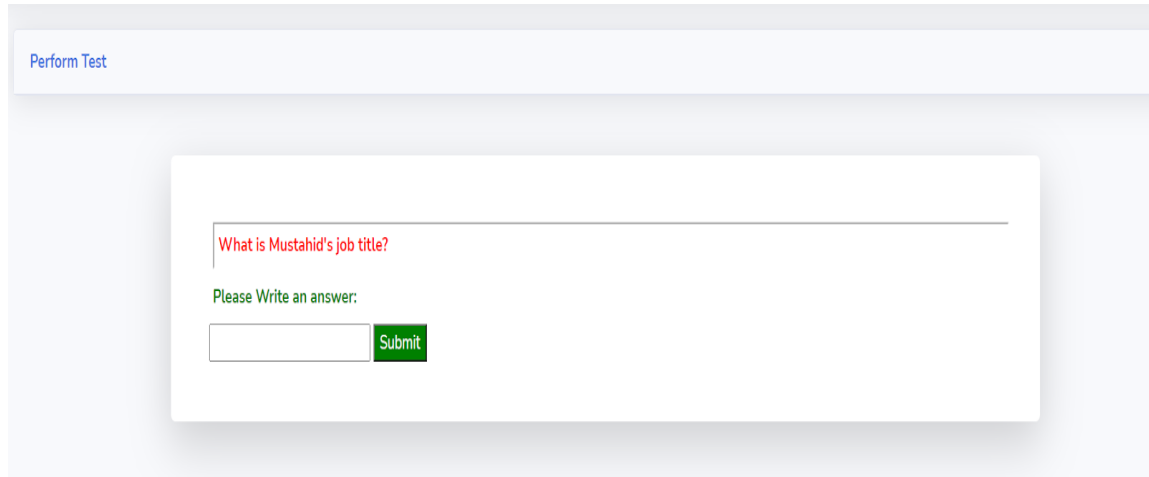
Ice Hockey

football

None Of the Above

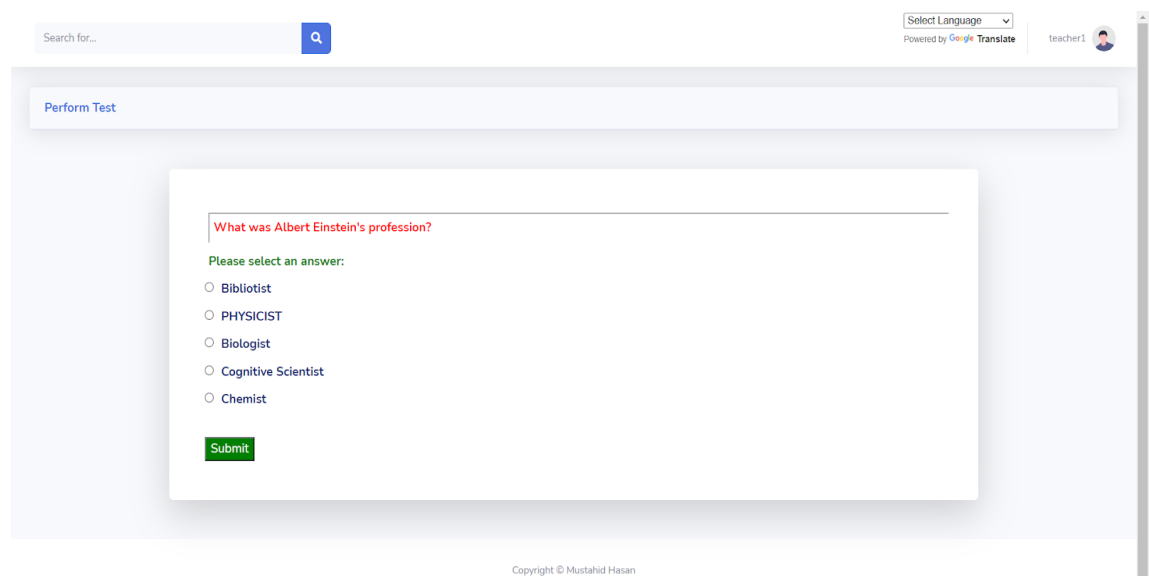
Figure 4.1.6: Multiple Choice Question Output

The active or generated questions are like this both MCQ and Fill in the blank type questions are like that as given in the figure.



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Figure 4.1.7: Generate Fill in the blank Question



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Figure 4.1.8 :Fill in the blank Question output

Mark ↑↓	Tab Change Detected ↑↓
1	0 Times
0	2 Times
1	0 Times
1	0 Times
0	2 Times
0	0 Times
Mark	Tab Change Detected

Figure 4.1.9: Tab change detection list

These result views show the actual result of the test that the student performed. The Students can also see the right answers

User	Question	Right Answer	Attempted Answer	Mark	Tab Change Detected
musta	What sport does Mustahid like to play?	football	football	1	0 Times
musta	What sport does Mustahid like to play?	football	Ice Hockey	0	2 Times

Figure 4.1.10: Test result list

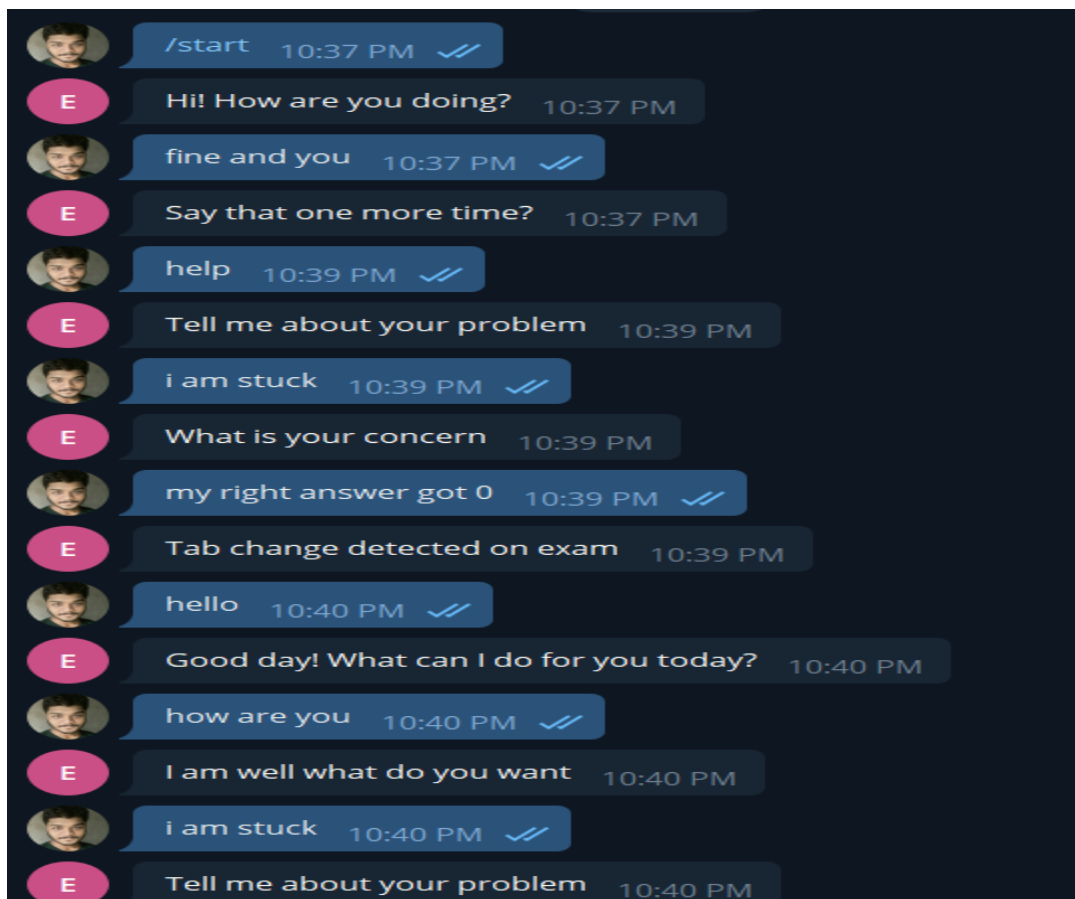


Figure 4.1.11: Chatbot conversation

This chatbot can help the student to cooperate. This bot is ready to answer whenever the student will be stuck into some problem.

ব্যবহারকারী	প্রশ্ন	সঠিক উত্তর	উত্তর দেওয়ার চেষ্টা করা হয়েছে	মার্ক	ট্যাগ পরিবর্তন সনাক্ত করা হয়েছে
কালো	মুস্তাহিদ কোন খেলা খেলাতে পছন্দ করে?	ফুটবল	ফুটবল	৫	0 বার
কালো	মুস্তাহিদ কোন খেলা খেলাতে পছন্দ করে?	ফুটবল	আইস হকি	0	2 বার

Figure 4.1.12: Formatted Language

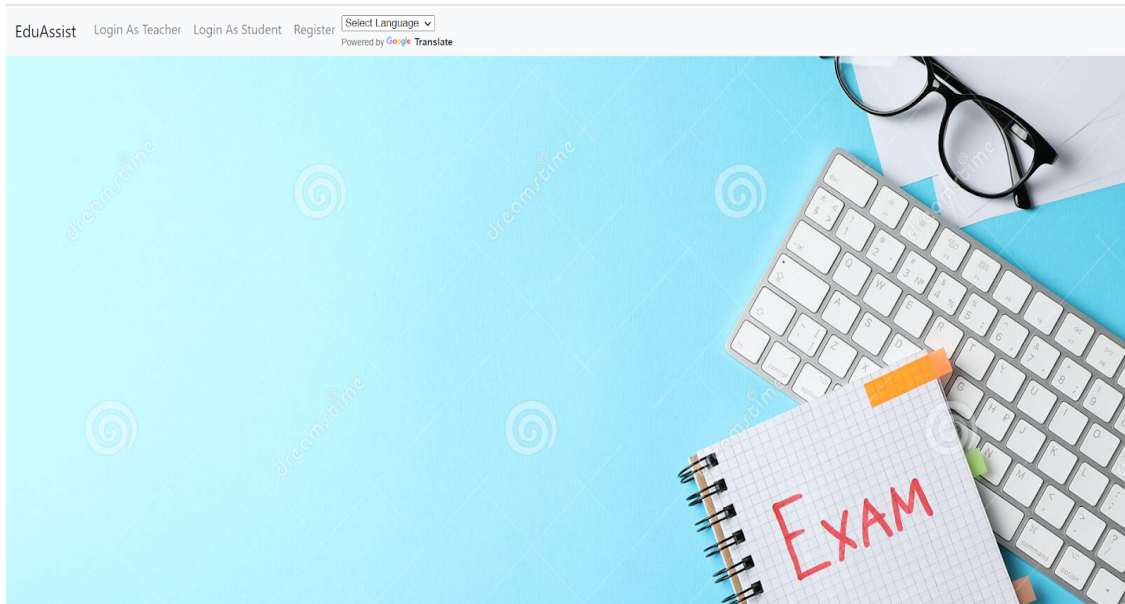


Figure 4.1.13 : Home Page

4.2 Back-end Design

Table 4.2.1 : Back-end Design

No	User	Action
1	Admin	<ol style="list-style-type: none">1. Can Authenticate all users2. Can group the users3. Can Delete, update users4. Can Monitor actions
2	Teacher	<ol style="list-style-type: none">1. Can register and login2. Can send context request for generating questions3. Can monitor test result
3	Student	<ol style="list-style-type: none">1. Can register and login2. Can perform test3. Can observe result4. Can use the chatbot

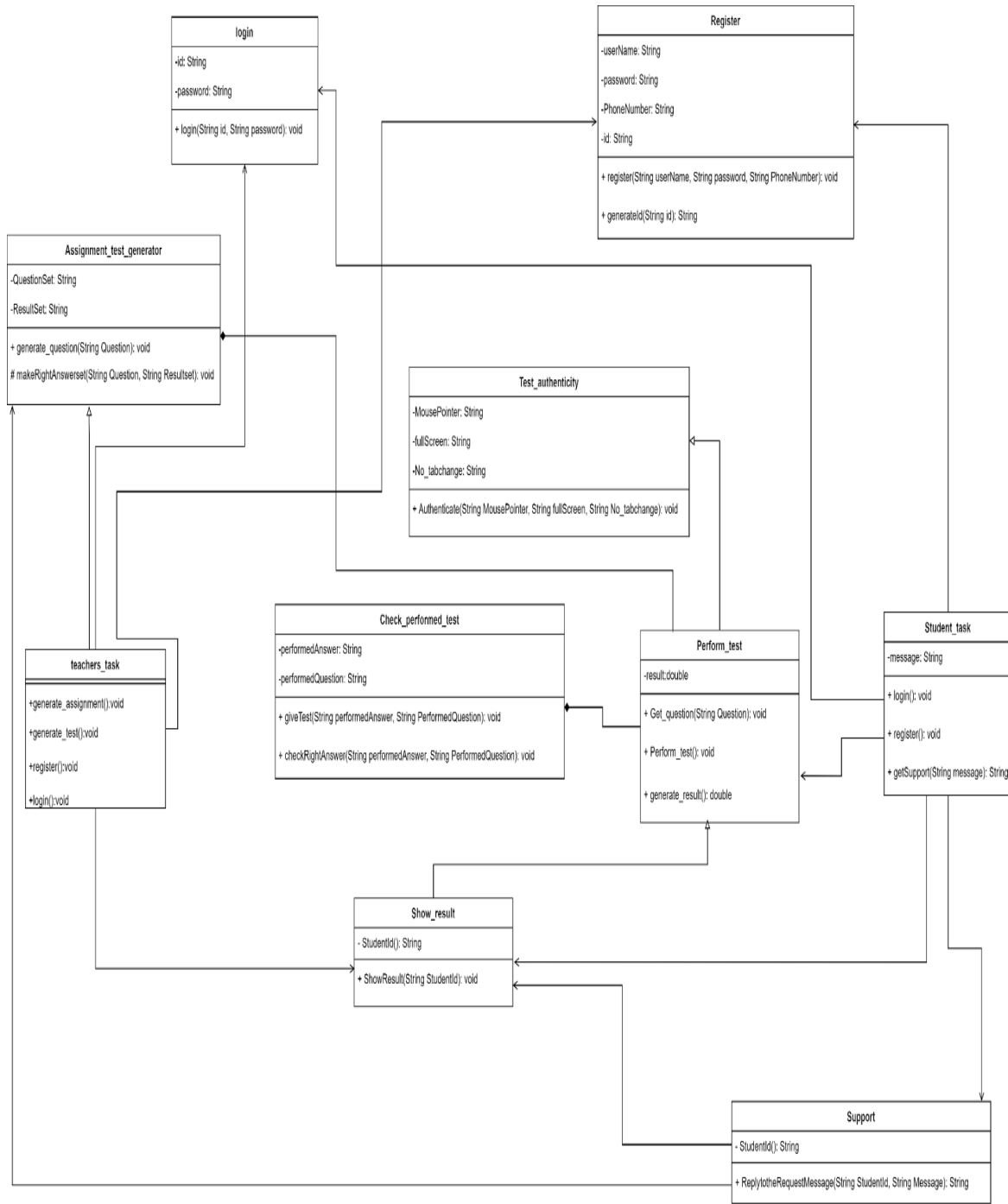


Figure 4.2.1: Class Diagram

4.3 Implementation Requirements

1. Google Collab: For managing and training model
2. Docker : For storing the AI model and operating it into a separate server
3. Github : For managing the software version
4. Postman : For testing and validation
5. Chatbot botfather: For a chat system
6. Visual Studio Code: For coding
7. Windows : As OS
8. Linux server (Any): As Server

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of Database

Here in the implemented database it shows that the admin has all the access as a root user. The teachers and students are also users but with limitations. The generated questions are also saved after generating from the AI model. This AI model is saved and served from a linux server. Here docker is performing its own operation as helper. Two types of questions are here, MCQ and Fill in the blank.

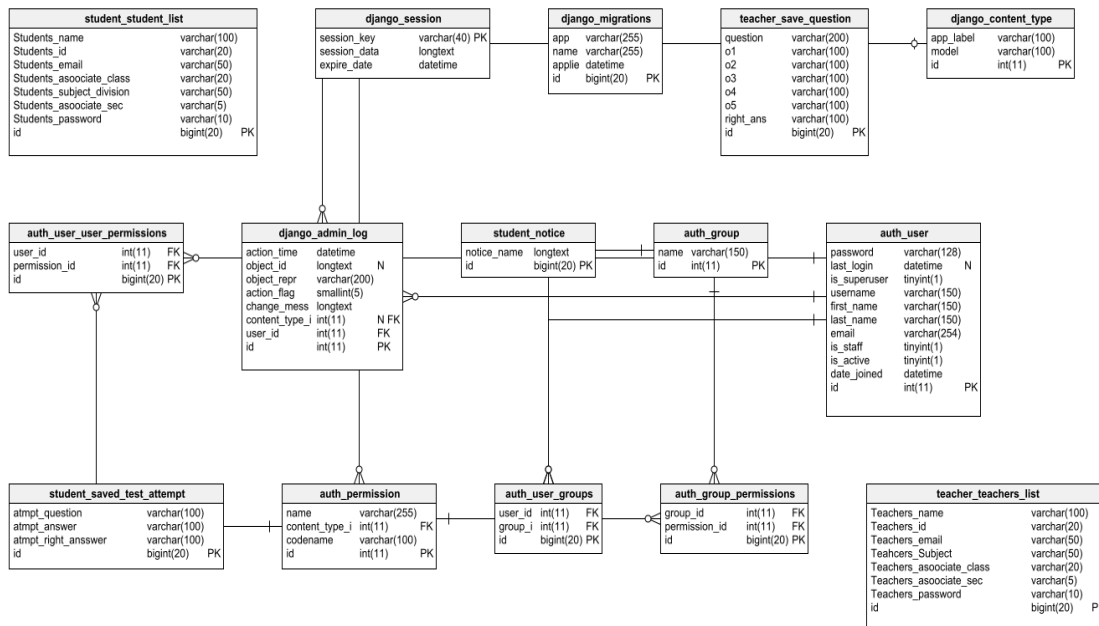


Figure 5.1.1: ER Diagram

5.2 Implementation of Front-end Design

In this section of web application the user will login as a teacher and operate the options from the dashboard. There the teacher will find the option to make questions. These questions will be added as a test question for the students to perform.

Also for the students after login the students will be able to enter the dashboard and there they will find an option to perform the test. After a successful test they will be able to validate from the result section where the right answers and cheating attempts will be given.

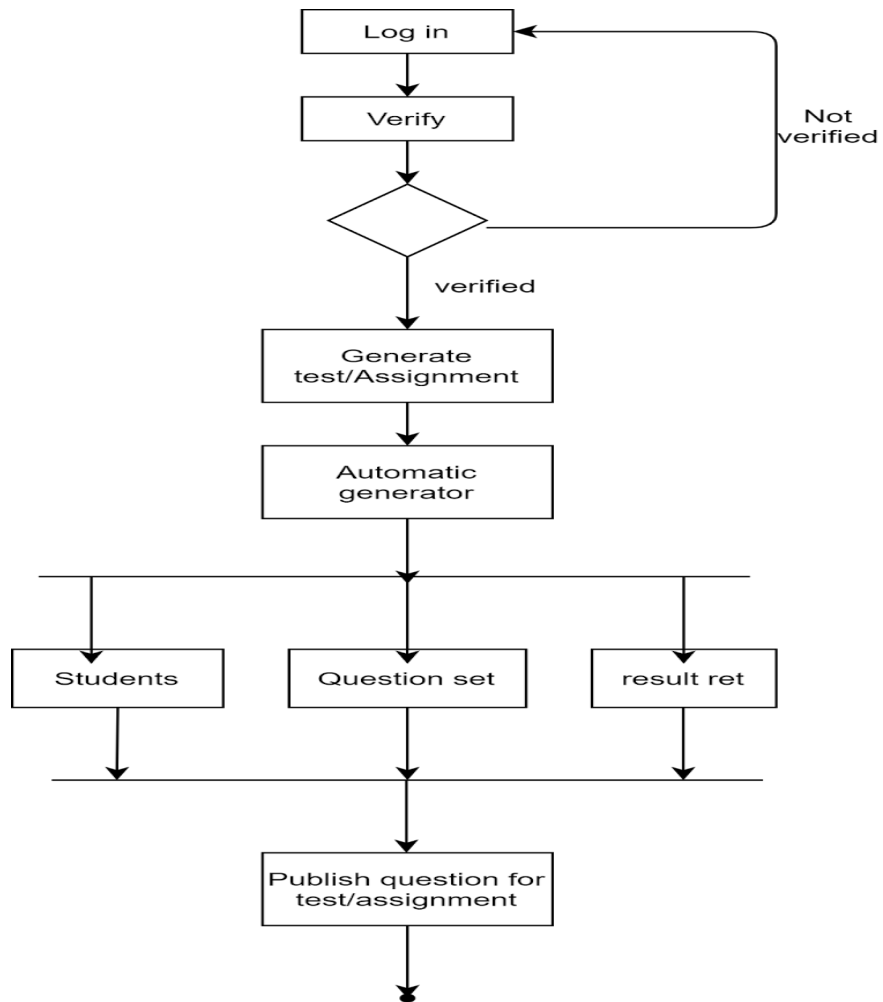


Figure 5.2.1: Teacher activity Diagram

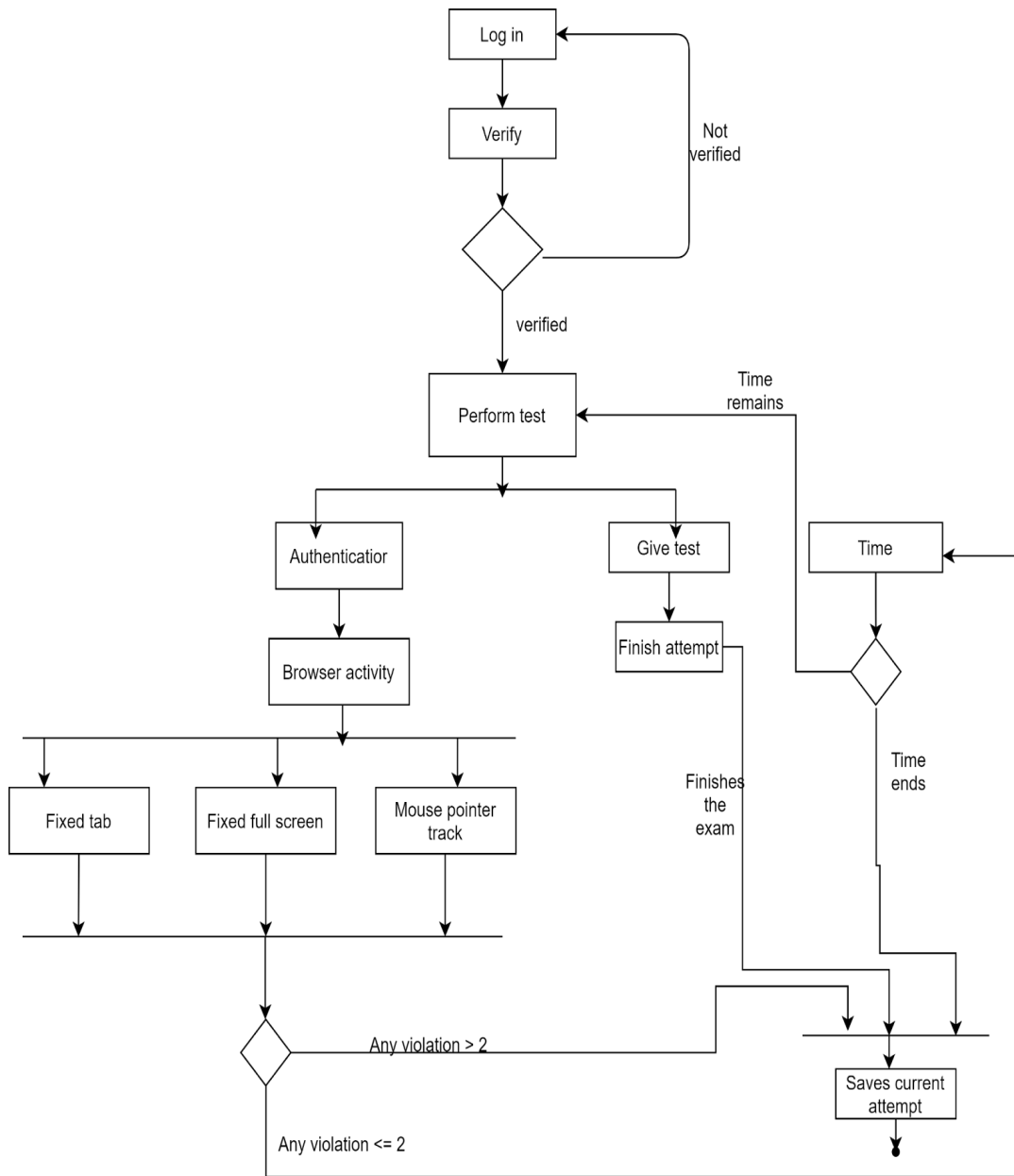


Figure 5.2.2: Student activity Diagram

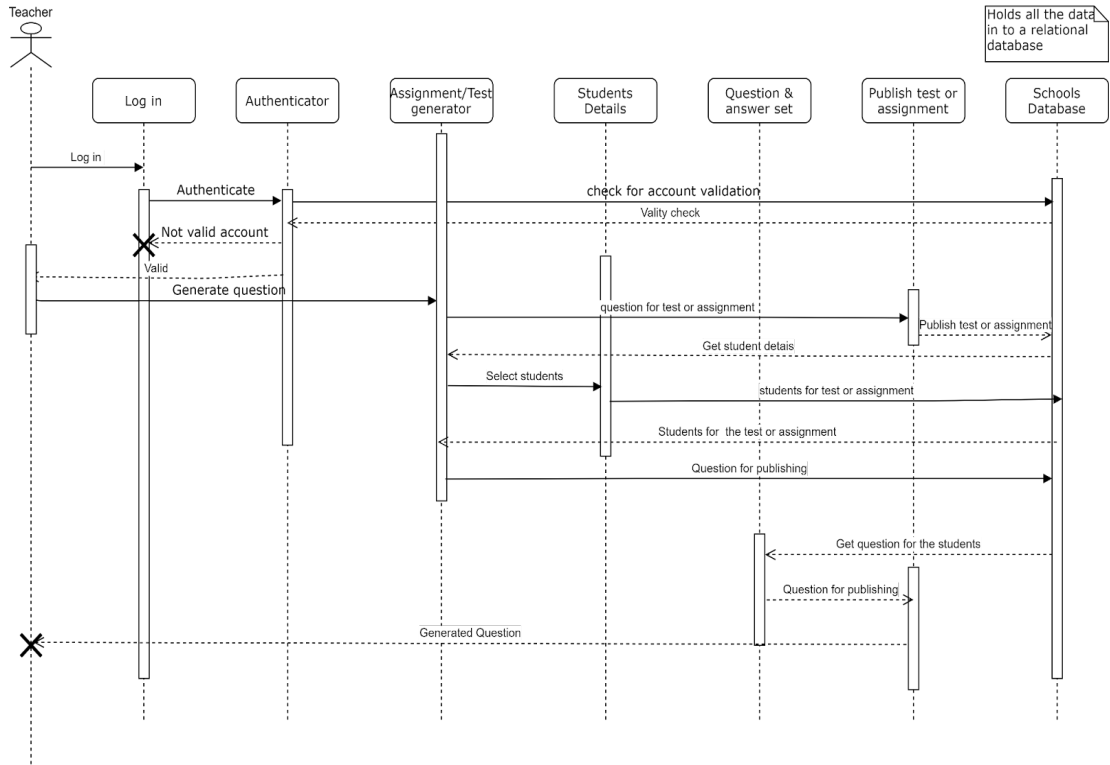


Figure 5.2.3: Teacher Sequence Diagram

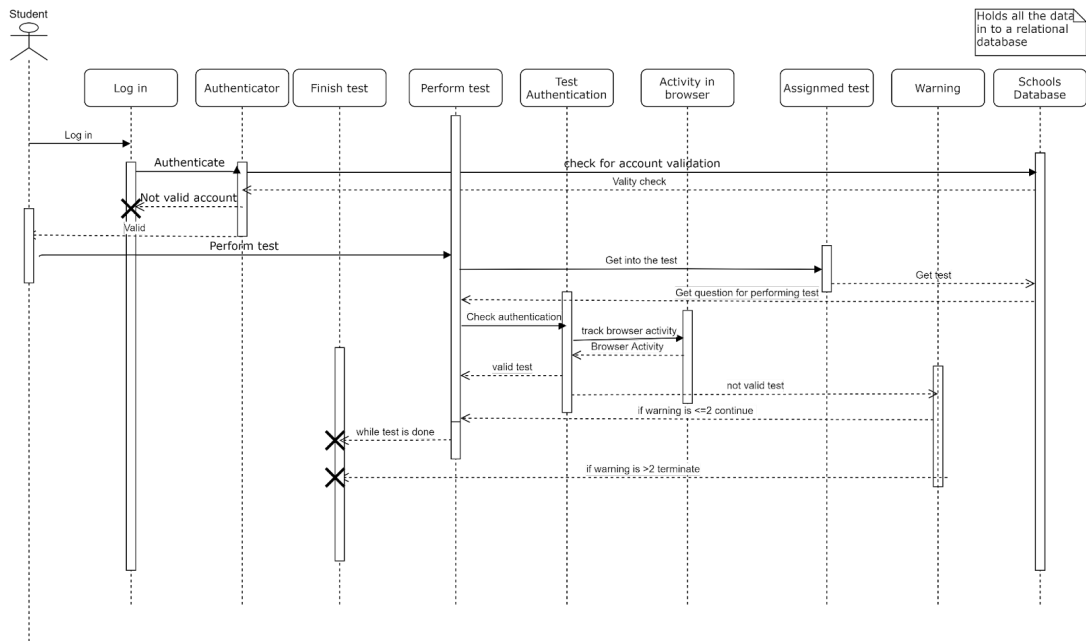


Figure 5.2.4: Student Sequence Diagram

Whenever the application runs all validation and security measures run for a successful and secure application operation. These operations are unique to all users. That means all of these operations will run for every user.

5.3 Testing Implementation

When the software was ready to test It's been tested the Artificial Model first that gave a good accuracy. Such accuracy was good enough to provide a good outcome. Then when both application and Artificial Model was integrated with each other then the actual operation, control testing took place which gave a good output. Finally it was ready to deploy.

Table 5.3.1 : Test report

No	Test case	Test Input	Expected Outcome	Obtained Outcome	Pass/Fail	Tested On
1	Valid email, username, password	Successfully registered	Successfully registered	Successfully registered	Pass	01-08-2022
2	Login via web	Successfully Logged In	Successfully Logged In	Successfully Logged In	Pass	01-08-2022
3	Password	Valid password	Valid password	Valid password	Pass	01-08-2022
4	Generate questions	Valid context	Successfully generated question	Successfully generated question	Pass	01-08-2022
5	Perform Test	Saves the attempted result	Successful	Successful	Pass	01-08-2022
6	Result check	Detect correct answer	Successful	Successful	Pass	01-08-2022

7	Chatbot	Gives auto reply	Successful	Successful	Pass	01-08-2022
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5.4 Software Implementation Methodology

For developing this project | separated the whole concept into Three main sections such as

1. The Model training.
2. The Bridge between NLP model & web App(API)
3. Web Application

1. The Model training:

- a. At first, we selected a compatible dataset for the project in order to predict text from the given context. That is, squad_t5_train.csv, squad_t5_val.csv.
- b. Now the dataset needed to be preprocessed. For that reason, I used Pandas, NumPy, and sci-learn.
- c. Then the base version of the T5 training and validation dataset has been imported. d. After that, I loaded the Text-to-Text Transfer Transformer on my GPU.
- d. After successful training, The model was then saved into the derive.
- e. For doing the tasks described above I used Google Colab. The runtime was GPU.

2. The Bridge between NLP model & web App(API):

- a. Now as we have the Models for predicting the text we need to implement them into my web application. For that reason I used Docker.

- b. The models are then converted into a docker image container with its all necessary components
- c. Then I used Postman for getting the JSON request and after a successful test used the same request in my project.

3. Web Application:

- a. After getting the API I developed a complete Web Application with Python, Django, HTML5, CSS3, Bootstrap, JavaScript, SQL(for database queries)
- b. Now after completing the template I focused on the question generations question generation was divided into Two-part such as
 - i. Getting the predicted question and answer from the given context:
 - 1. For a successful prediction from the given context, I used the prepared API.
 - 2. For running the API locally I used Linux WSL2.
 - 3. When from my HTML the context and the keyword are sent to the API it processes the request with the T5 model stored in it and returns a question with the right answer.
 - ii. Getting the Wrong answer(For MCQ):
 - 1. Now when we have the question and right answer what we need is the Wrong answers which are related to the right answer and the context
 - 2. For that, I used Wordnet which returns a list of deflectors based on the context and right answer as the keyword.
 - 3. Afterwards, this whole process of questions and answers are returned to the template as a python dictionary and formatted like MCQ.
- c. After completing the above operation I saved the generated question in the database
- d. Then From the student end, the students can perform the test with the question that has been generated right now.
- e. When the students are finished with the test it saves into the database as the attempts.
- f. Also, the system checks whether the attempt is right or not with a string comparison of the right answer and attempted answer.
- g. Then a mark is generated for the current attempt and shown in a table.

h. Also, there is a Student table consisting of student lists in the class.

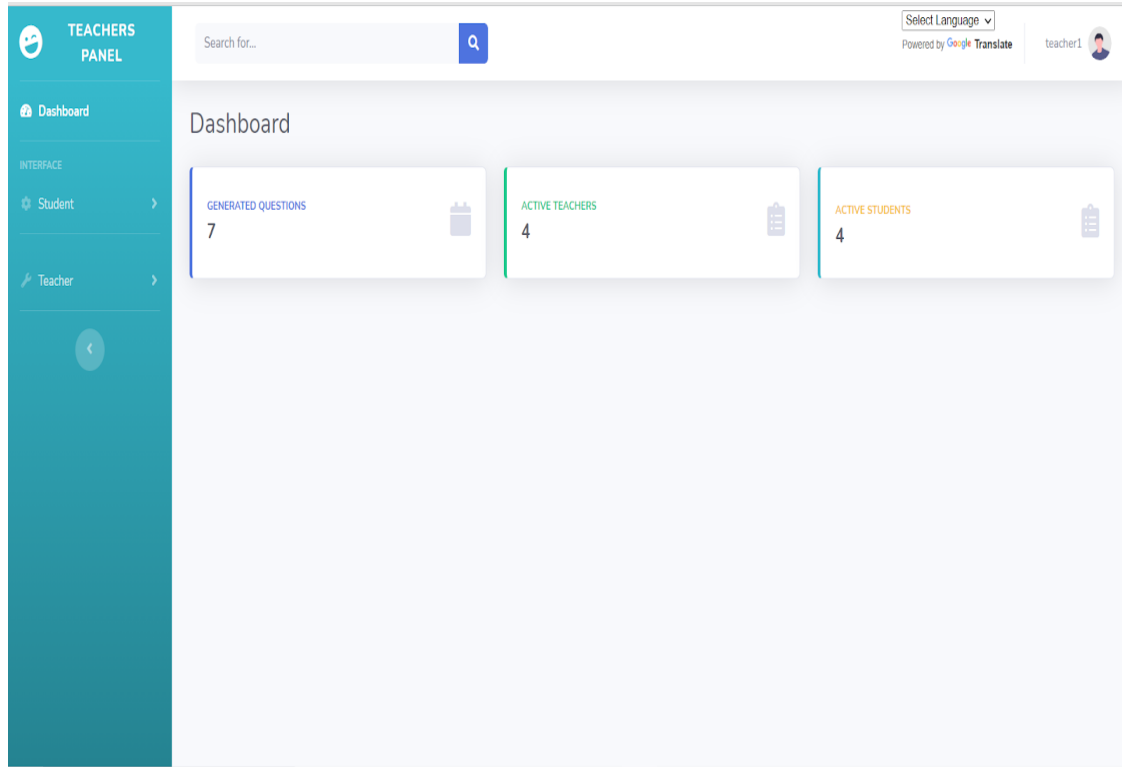


Figure 5.2.5: Teacher Portal

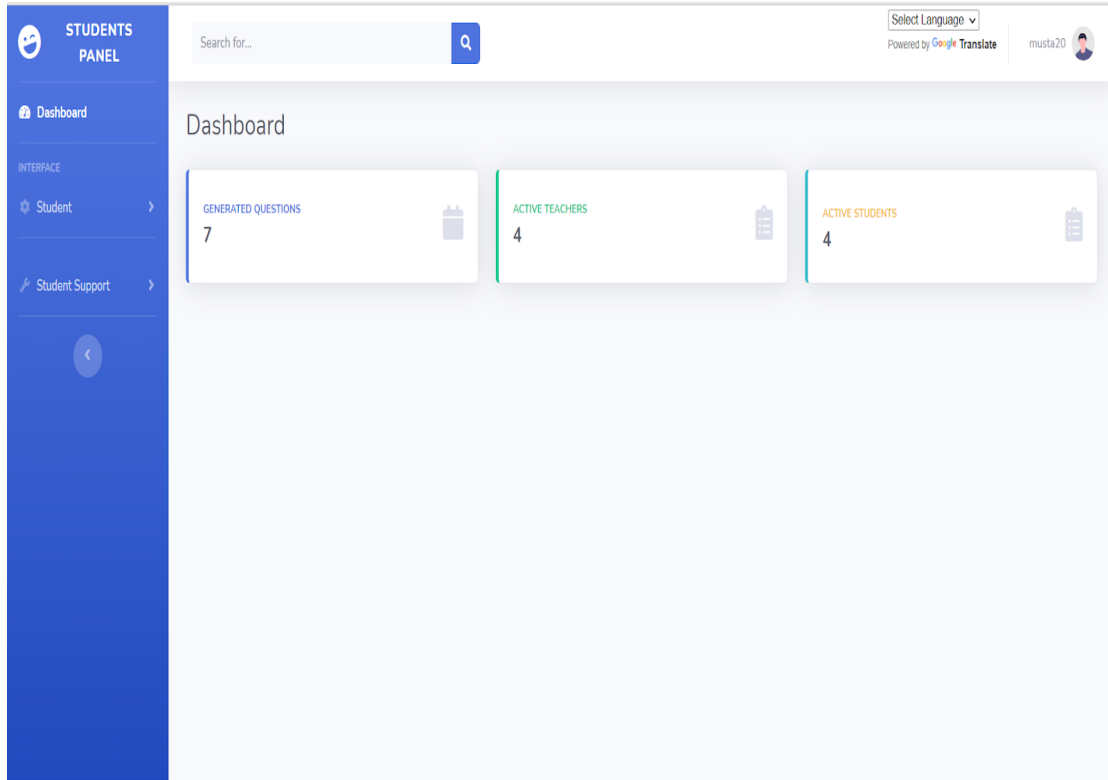


Figure 5.2.6: Student Portal

CHAPTER 6

IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

6.1 Impact on Society

Education is the backbone of any society all over the world. This is the century of modern technology. Technology is spreading all over the sectors in our day to day life. Thus the education system can not be neglected. This software will help the students and teachers collaborate and improve the current education system for a better future.

6.2 Impact on Environment

Usage of paper in the education system is a vital element. Without paper we can not think of an education system. This software will decrease the use of paper during examination. As paper is made of trees, this software will decrease the amount of deforestation. As a result our nature will have a clean environment.

6.3 Ethical Aspects

Education teaches us the Ethics. But in online examinations students perform unethical actions to get good grades. However they get a good grade but it sets a negative impact on their mind. Therefore this software will decrease the possibility of unethical actions during online examinations. Hence students' ethics will be restored gradually.

6.4 Sustainability Plan

For mutual sustainability our approach would be Cost Leadership Strategy. Where Production cost reduction: 68% and Profit margin Increases: 73%.

FC, VC, TC and Rev

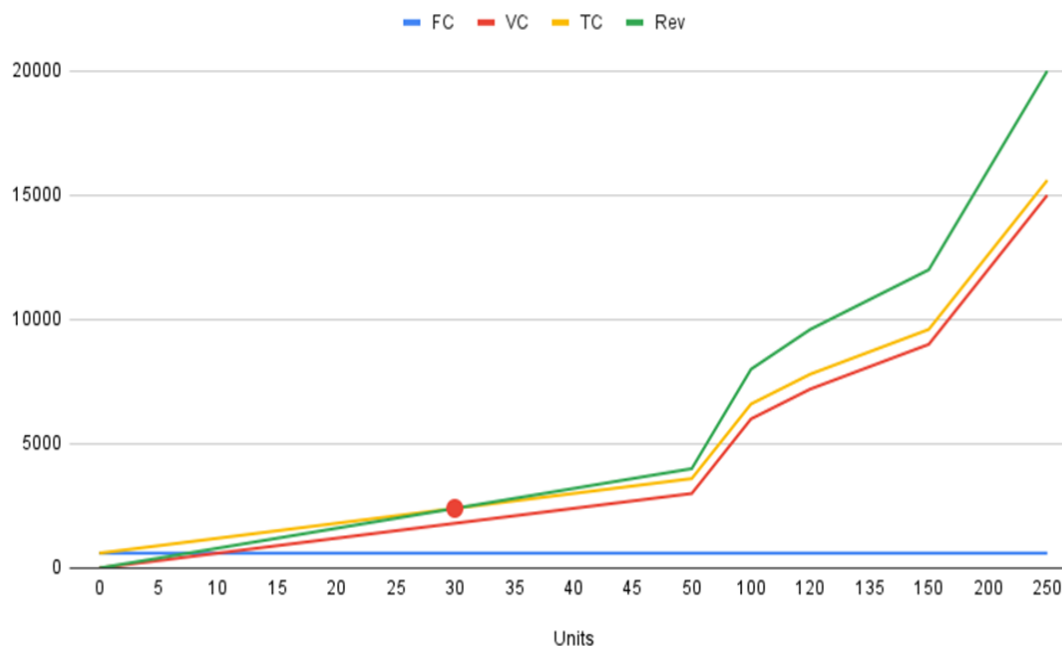


Figure 6.4.1: Revenue Projection

Fixed Cost: 600\$, Variable Cost: 60\$, Selling Price: 80\$, Break-Even Point: 30

Strength

1. Accurate Question
2. Actual Context
3. Accurate Distractors
4. Correct Answer Detect
5. Cheating Detection
6. Fast process

Weakness

1. Language barrier
2. Free Cloud Version

Opportunities

1. Automation in education
2. Option to add new Languages
3. Rising demand towards online education
- 4.

Threat

1. Moderate capital investment



Figure 6.4.2: Software development cycle

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 Discussion and Conclusion

Online education is increasing day by day in our country. Online education is definitely the key to the digital education system in this world. Now the world has no boundary in sharing thoughts, views and everything. Then why should the education system step backward in digitization. There are several online portals that share contents through online education. Also some manage to take examinations. But this software will merge the proper evaluation system with the current online education system. Which will definitely add a positive value with our education.

7.2 Scope for Further Developments

This software will have a positive impact on Quality Online education, Enrich the online examination Quality, Reduces manual management for online examination. Therefore further development will be a great opportunity for the future generation. With cloud integration and several model upgrades this software will reach its own peak.

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