

CSE - 326
Information System Design Sessional



AlgoLytic
**Online platform for technical interview
preparation & CS education**

Supervisor:
Dr. Anindya Iqbal

Members:
1805001 - Md. Mehrab Haque
1805003 - Rabib Jahin Ibn Momin
1805009 - MD. Zarzees Uddin Shah
1805015 - Ahmed Mahir Sultan Rumi
1805021 - Abdus Samee
1805024 - Zannatul Naim

Table of Contents

1. What is AlgoLytic?	2
2. Why AlgoLytic?	2
3. Diagrams	4
4. BPMN Diagram	5
5. Mock UI	6
6. Class Diagram	18
7. ERD	32
8. Sequence Diagram	33
9. Collaboration Diagram	40
10. State Diagram	47
11. Live Demo	50

1. What is AlgoLytic?

AlgoLytic is a platform for software engineers to efficiently prepare themselves for technical interviews. It allows the users to work through various problems in computer science and ace their technical coding interviews. They can also engage themselves in learning different topics of computer science by enrolling in courses offered on the platform and honing their theoretical knowledge before attempting the coding problems.

2. Why AlgoLytic?

The main motivation for building AlgoLytic was to ensure a proper place for aspiring software engineers to learn the theoretical concepts of various topics in Computer Science like BFS, DFS, MST, Number Theory, and so on before attempting the coding problems. This way they can not only enable themselves to practice a wide variety of coding problems but also enhance their reasoning behind solving a particular problem which would help them in their technical interviews. The site is enabled with the following features which makes it a standard platform to be used as a technical interview preparation site:

- An interview platform solely dedicated to aspiring software engineers
- Makes the users aware of their strengths and weakness in particular types of problems
- Allows a user to get acquainted with popular problems & courses with the aid of our recommendation system

- A good educational platform for CS students offering CS courses and quizzes
- Most of the problems are free to attempt

AlgoLytic offers various courses which are related to Computer Science to users. They can take those courses, go through the materials provided, and attempt the final quiz. This way they can enhance their knowledge of a particular topic. There is also a type of problem where their coding skillset is put to test. They are made to solve a real-world problem with a problem language of their liking, being divided into multiple categories and three difficulty levels namely easy, medium, and hard. Most of these coding problems and courses are free, while some are premium for which the users have to subscribe with a particular amount.

The core feature of the site is the recommendation system which suggests users based on the problems they solved, their strengths, and weaknesses. There is also a provision for a peer-to-peer recommendation where one user can suggest a problem to one or more users. Moreover, the admin of the site can also add weight to particular problems which would be given more preference while suggesting users of the platform. In order to achieve this, a CronJob will be run after a specific period of time daily to update the recommendations to the users and ensure their proper training by suggesting to them the problems and courses which help them ace their coding interviews.

The site provides a detailed description of a particular user with their statistics on the platform like the number of problems attempted & solved, their attempts at problems of various types along with charts, their problem acceptance rate, and types of problems which are their strengths and weaknesses. This will enlighten a user to get an idea about his/her learning curve and plan accordingly.

Alongside general users and the admin, there are content creators who design the courses and make the coding problems according to the standard.

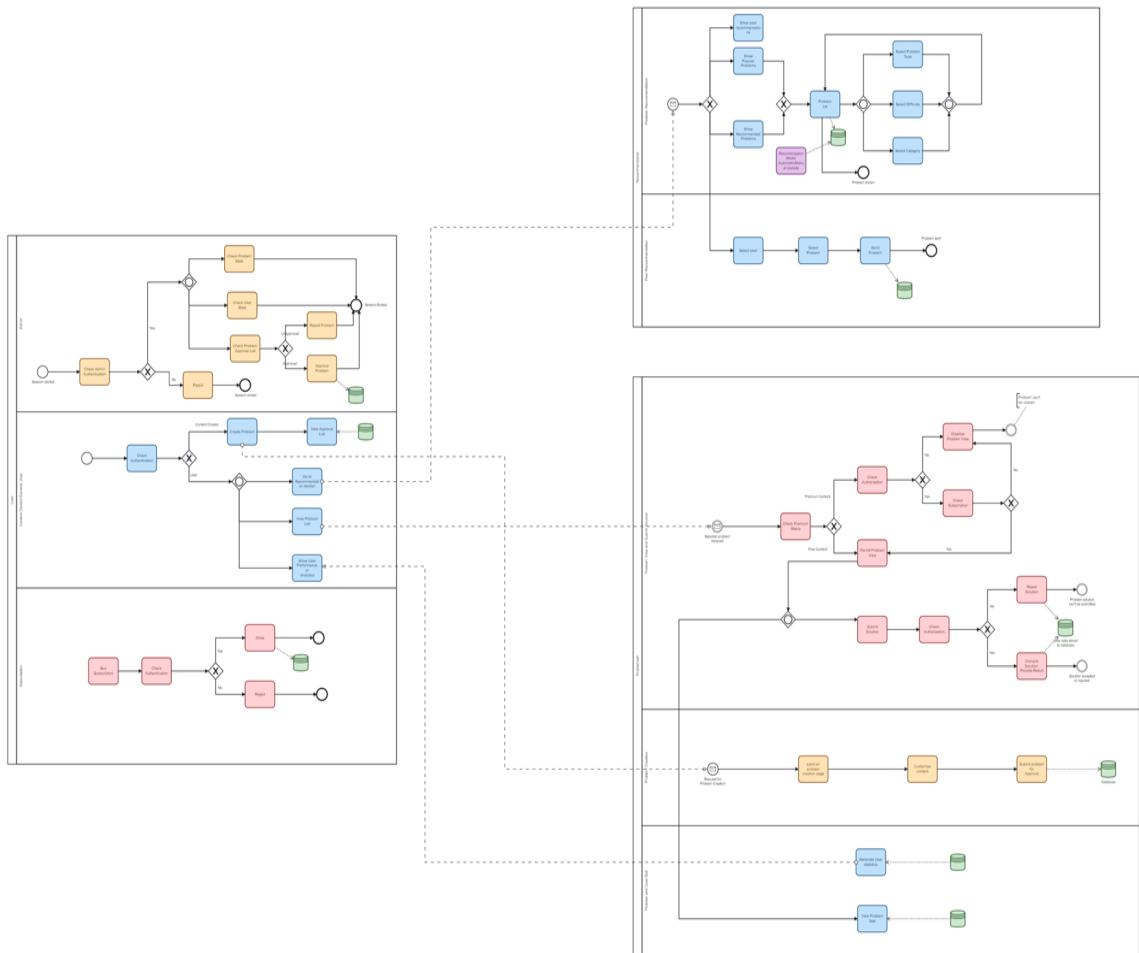
3. Diagrams

The following diagrams were presented:

- BPMN diagram
- Mock UI
- UML Class Diagram
- UML Entity Relationship Diagram
- UML Sequence Diagram
- UML Collaboration Diagram
- UML State Diagram

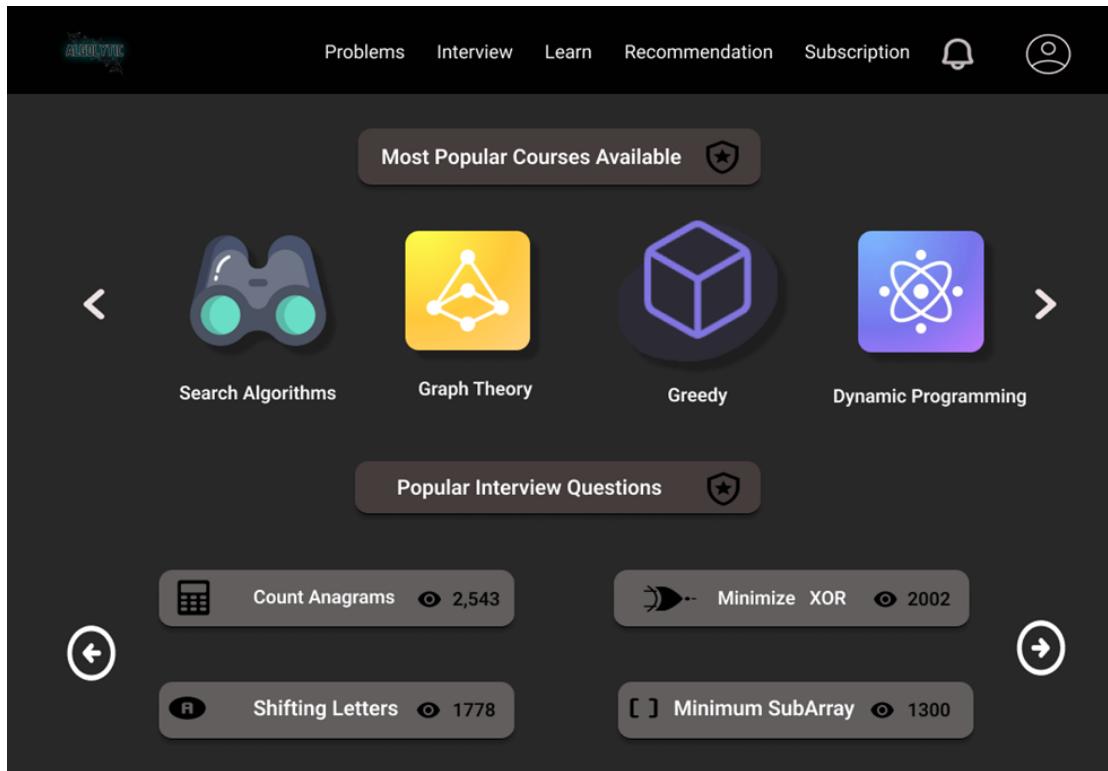
4. BPMN Diagram

The full BPMN diagram has been attached below as a single picture:



5. Mock UI

The Mock UI was made in Figma. All the images of the Mock UI have been presented below:



The screenshot shows the LeetCode dashboard. At the top, there are navigation links: Problems, Interview, Learn, Recommendation, Subscription, a notification bell icon, and a user profile icon. Below the navigation is a summary card with a large number 16 in a circle, followed by counts for Easy (5/1500), Medium (9/800), and Difficult (2/200) problems.

Below the summary card are four dropdown filters: Difficulty, Status, Tags, and Topic, followed by a search bar with the placeholder "Search Problems".

The main area displays a table of recent submissions:

Status	Title	Solution	Acceptance	Difficulty	Topic
✓	Pallindrome Number		80%	Easy	Implementation
✗	Two Sum		38.2%	Medium	Math
✓	Add two integers		44%	Hard	Adhoc
	Remove Element		44%	Easy	Number Theory

At the bottom of the table are navigation arrows: <, 1, 2, 3, ..., >.

This screenshot shows the details for the "Two Sum" problem.

Description: Given an array of integers nums, and an integer target, return indices of the two numbers such that they add up to target.

Discussion: Array Hash table 5min Share

Solution: A Java code snippet for the solution is shown:

```

class Solution {
    public int[] twoSum(int[] nums, int target){
        int[] result = new int[2];
        Map<Integer, Integer> map = new HashMap<>();
        for(int i=0; i<nums.length; i++){
            if(map.containsKey(target - nums[i])){
                result[1] = i;
                result[0] = map.get(target - nums[i]);
                break;
            }
            map.put(nums[i], i);
        }
        return result;
    }
}

```

Submissions: A pie chart indicates the distribution of correctness: Incorrect (grey) and Correct (dark grey).

Statistics: Total submissions: 4638, Users tried: 2677, Users solved: 2586.

Input: [3, 2, 4] Accepted! 1ms

Output: [1, 2]

Explanation: Because nums[0] + nums[1] = 9, we return [0, 1]

Similar Questions:

1. Two sum II - Array is sorted
2. Two sum III - Data Structure design
3. Two sum IV - Input is a BST
4. Count good meals
5. First letter to appear twice

The screenshot shows a dark-themed user interface for Alolytic. At the top, there are navigation links: Problems, Interview, Learn, Recommendation, Subscription, a notification bell icon, and a user profile icon. Below this is a large circular progress bar divided into three segments: Easy (5/1500), Medium (9/800), and Difficult (2/200). To the left of the progress bar is a sidebar with sections for Difficulty (Easy, Medium, Hard), Status (Solved, Attempted), Tags (Tag1, Tag2, Tag3), and Topics (Greedy, Implementation, Number Theory). A search bar at the top right says "Search Problems". Below the sidebar, there are three listed problems: "Two Sum" (Easy, Medium, Hard), "Add two integers" (Easy, Medium, Hard), and "Remove Element" (Easy, Medium, Hard). At the bottom are navigation arrows for the list.

This screenshot shows the "Discussion" tab for a problem. The top navigation bar is identical to the previous one. The discussion area contains a "Discussion Rules" section with three points: 1. Please don't post any solution in this discussion tab, 2. This tab is for asking questions relating to the problem, and 3. Be respectful towards one another. Below this, a user named "yomin" has posted a message: "I got Time Limit Exceeded for O(n^2). Does anyone know if there's a solution for O(n^2)?". To the right, the "Solution" tab is active, displaying Java code for the "twoSum" problem. The code uses a HashMap to store numbers and their indices, iterating through the array to find a pair that sums up to the target value. Below the code, the "Input" is given as [3, 2, 4] and the "Output" is [1, 2]. The status is "Accepted!" with a time of "1ms".

This screenshot shows the LeetCode problem 1. Two Sum page. The top navigation bar includes links for Problems, Interview, Learn, Recommendation, Subscription, a bell icon, and a user profile icon. The main content area has tabs for Description, Discussion, Solution (which is selected), and Submissions.

The Solution tab displays three code snippets:

- C++ optimized solution in O(n)
- Python Simple Solution | O(n)
- Java optimized solution

The Java optimized solution code is:

```
class Solution {
    public int[] twoSum(int[] nums, int target) {
        int[] result = new int[2];
        Map<Integer, Integer> map = new HashMap<>();
        for(int i=0; i<nums.length; i++){
            if(map.containsKey(target - nums[i])){
                result[1] = i;
                result[0] = map.get(target - nums[i]);
                break;
            }
            map.put(nums[i], i);
        }
        return result;
    }
}
```

The Input is [3, 2, 4] and the Output is [1, 2]. The status is Accepted! with a time of 1ms.

This screenshot shows the LeetCode problem 1. Two Sum page after a submission attempt. The top navigation bar is identical to the first screenshot.

The main content area has tabs for Description, Discussion, Solution, and Submissions (which is selected).

The Submissions tab lists three attempts:

- Compilation Error (Java)
- Runtime Error (C++)
- Correct Answer (Java)

The Java code for the correct answer is identical to the one in the first screenshot.

The Input is [3, 2, 4] and the Output is [1, 2]. The status is Accepted! with a time of 1ms.

The screenshot shows the AlgoLytic user profile for a user named Ahmed Rumi. At the top, there is a navigation bar with links for Problems, Interview, Learn, Recommendation, Subscription, a bell icon, and a user profile icon. Below the navigation bar, the user's profile picture and name are displayed. A sidebar on the left contains links for Basic Info, Account, and Notifications. The main content area is a dark box containing sections for Basic Info and Experience, each with several fields and edit buttons.

Basic Info

Name	Ahmed Rumi	Edit
Gender	Male	Edit
Location	Dhaka,Bangladesh	Edit
Birthday		Edit
Summary		Edit

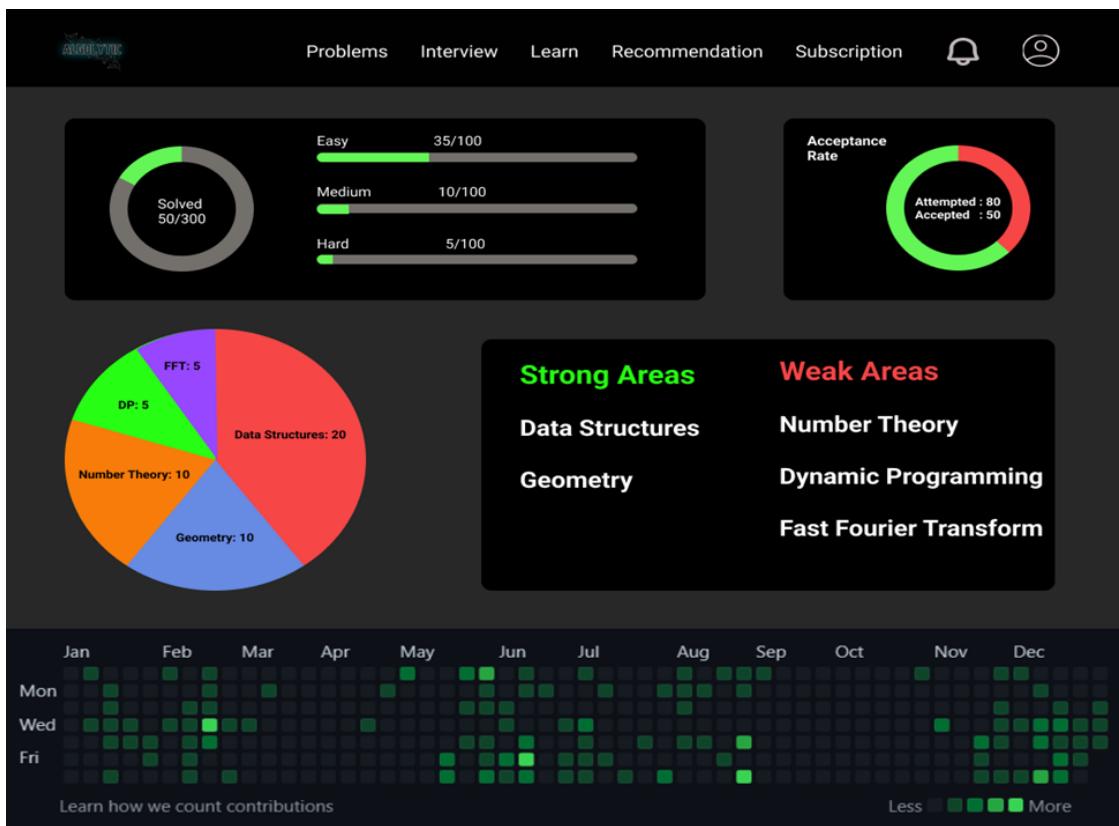
Experience

Work		Edit
Education	BUET	Edit

This screenshot is similar to the one above, showing the profile of Ahmed Rumi. However, it includes a notification sidebar on the right side of the main content area. The notifications are listed as follows:

- Abdus Samee recommended you a problem 5 mins ago
- Abdus Samee recommended you a problem 50 mins ago
- 5 new problems were added 1 day ago

The rest of the interface is identical to the first screenshot, featuring the same navigation bar, sidebar, and main content area.



Peer **Popular** **Personalized**

Reverse Integer

Recommended by Zarzees

Medium

27.3%

[View Problem](#)

Delete Columns to Make Sorted

Recommended by Naim

Easy

74.9%

[View Problem](#)

The screenshot shows the Algوريق website interface. At the top, there is a navigation bar with links: Problems, Interview, Learn, Recommendation (which is highlighted in blue), Subscription, a bell icon, and a user profile icon.

Below the navigation bar, there are three tabs: Peer, Popular (which is highlighted in bold black), and Personalized.

Three algorithmic problems are listed in a grid:

- Minimum Rounds to Complete All Tasks**: Medium difficulty, 62.9% solved. View Problem button.
- Longest Valid Parenthesis**: Hard difficulty, 32.7% solved. View Problem button.
- Climbing Stairs**: Easy difficulty, 30% solved. View Problem button.

The screenshot shows the Algوريق website interface, similar to the one above but with different problem cards.

Three algorithmic problems are listed in a grid:

- Palindrome Number**: Easy difficulty, 53.1% solved. View Problem button.
- Pascal's Triangle II**: Easy difficulty, 60.1% solved. View Problem button.
- Best Time to Buy and Sell Stock II**: Medium difficulty, 63.5% solved. View Problem button.

Courses

- 01** Dynamic Programs
- 02** Greedy Algorithm
- 03** Graph Theory
- 04** Object Oriented
- 05** System Design

Graph Theory > Lectures

4 of 5

What is a bipartite graph ?

A bipartite graph, also called a bigraph, is a set of graph vertices decomposed into two disjoint sets such that no two graph vertices within the same set are adjacent. A bipartite graph is a special case of a k-partite graph with k=2. The illustration above shows some bipartite graphs, with vertices in each graph colored based on to which of the two disjoint sets they belong. Bipartite graphs are equivalent to two-colorable graphs. All acyclic graphs are bipartite. A cyclic graph is bipartite iff all its cycles are of even length (Skiena 1990, p. 213).

DFS

BFS

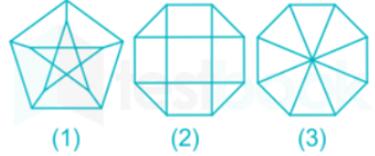
ALGOLYTIC

Problems Interview Learn Recommendation Subscription  

Graph Theory > Lectures

4 of 5

Which of the following graphs are bipartite?



(1) (2) (3)

Only (1) Only (2)
 Both (2) and (3) None of (1), (2), and (3)

SUBMIT

The answer is correct. In the above three graphs, only the second graph is 2-colourable hence the graph is a Bipartite graph.

ALGOLYTIC

Problems Interview Learn Recommendation Subscription  

Get more with Premium

Choose a subscription plan

Basic

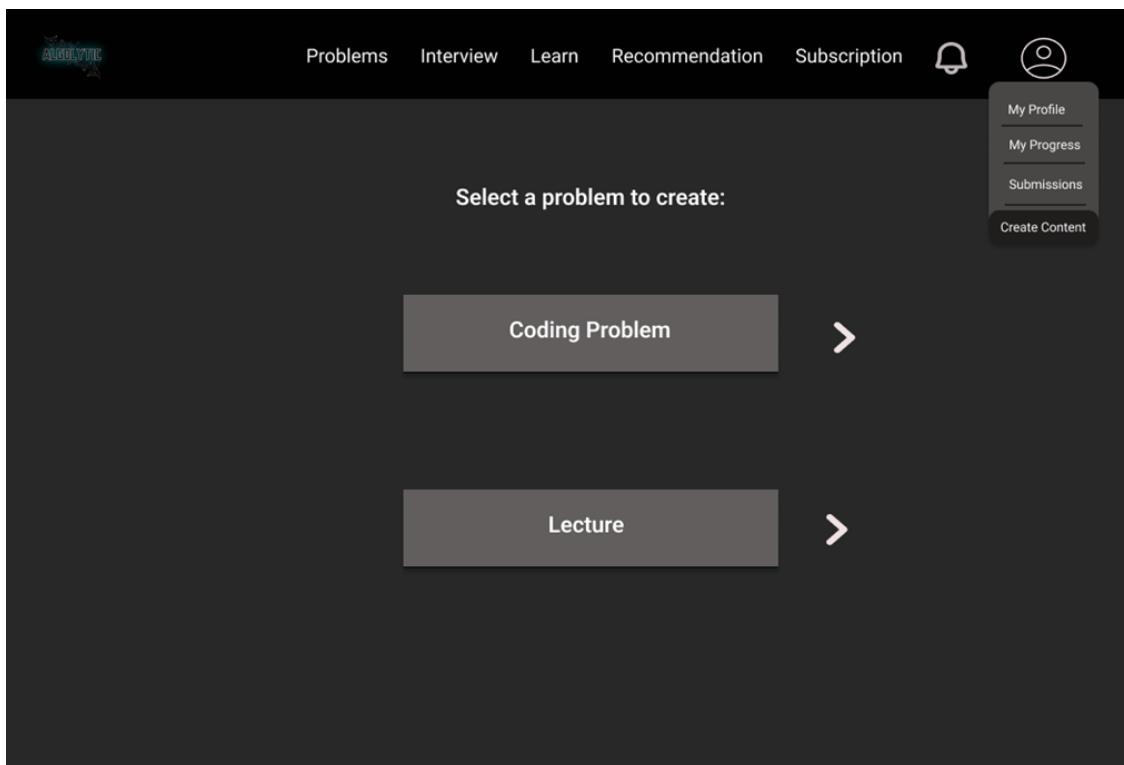
Free

- Basic Problems and Courses
- Premium Problems
- Premium Courses

Premium

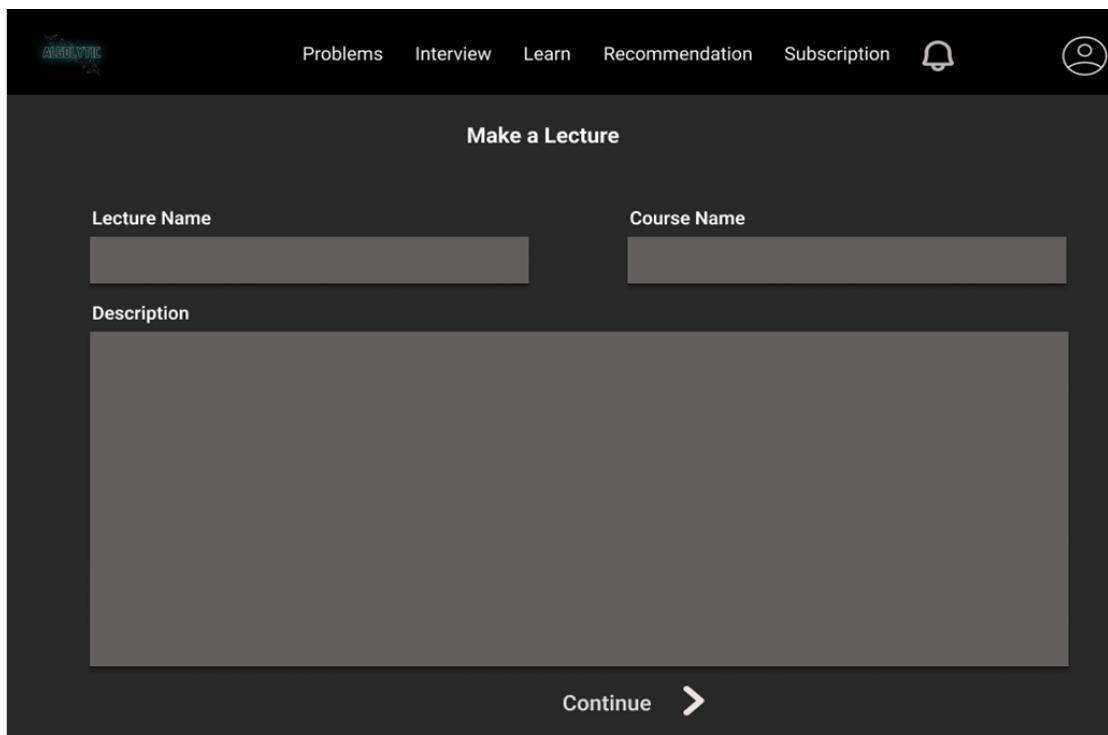
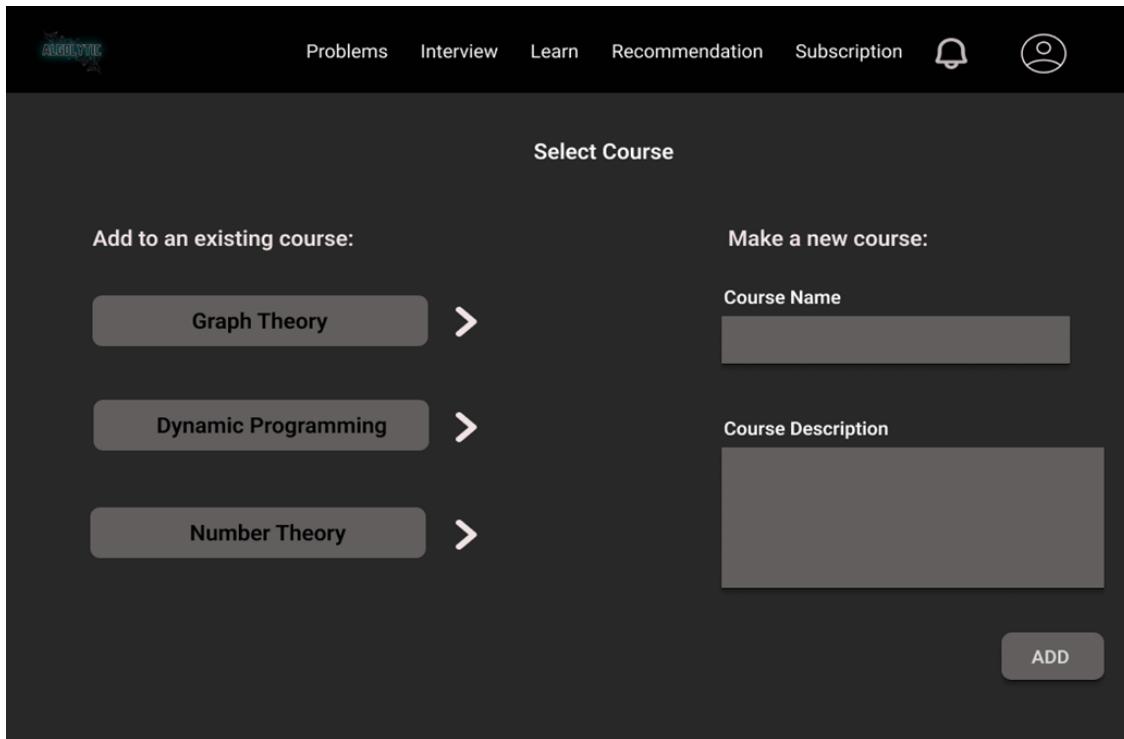
\$10.00

- Basic Problems and Courses
- Premium Problems
- Premium Courses



This screenshot provides a detailed look at the "Make a Coding Problem" form. It includes fields for "Problem Name" (with a dropdown menu for "Topic" showing Greedy, Implementation, and Number Theory), "Description", "Constraints" (with a dropdown menu for "Difficulty" showing Easy, Medium, and Hard), "Test Cases" (with a plus sign and a delete icon), "Solution" (with an "Attach File" button), and "Tags" (with tags for Array and Two Pointers). At the bottom, there is a "SUBMIT" button with a right-pointing arrow.

Topic	Difficulty
Greedy Implementation Number Theory	Easy Medium Hard



What is the complexity of BFS?

$O(n \cdot n)$ $O(n \cdot m)$ $O(2^n)$ $O(n \cdot \log n)$

ADD

1. What is the complexity of DFS?

$O(n \cdot m)$ $O(n \cdot \log n)$ $O(n \cdot m)$ $O(2^n \cdot m)$

ADD MORE SUBMIT

Admin View

Trending

#1 BFS	2000
#2 Dynamic Programming	1645
#3 Flow	1320

Recommendation List Save

BFS	^	v
Dynamic Programming	^	v
Flow	^	v
DFS	^	v

Reverse Integer Medium Live Premium

Minimum Round to Complete all Tasks Medium Live Premium

Check Sum Hard Live Premium

Palindrome Number Easy Live Premium

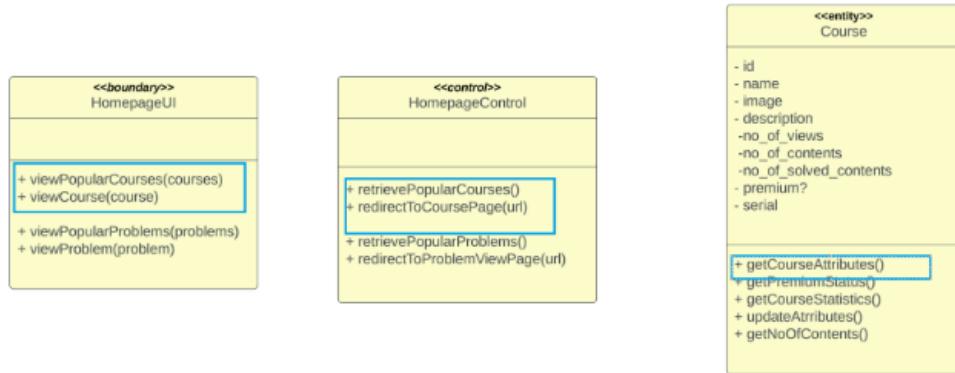
6. Class Diagram

The class diagram is attached below:

- **Homepage**

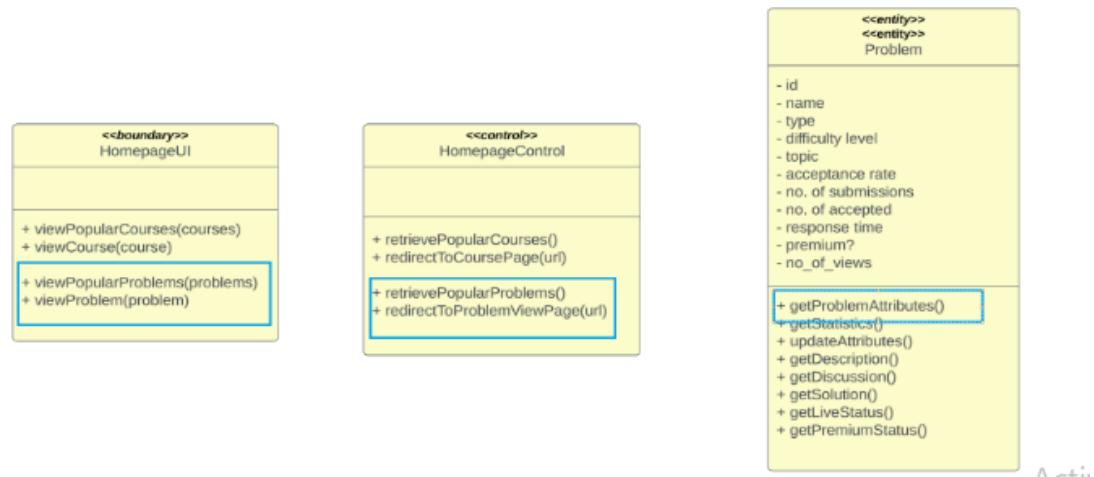
❖ Popular Course Section

Homepage



❖ Popular Problem Section

Homepage

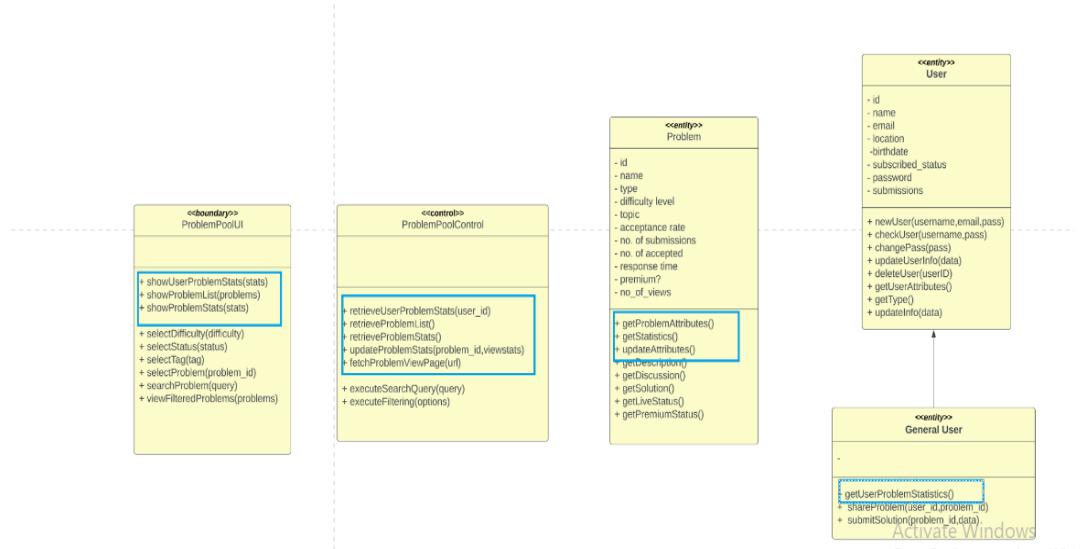


Λ σελίδα

● ProblemPool

❖ Stats & Problem list

User : ProblemPool



❖ Filtering & Problem View Redirection

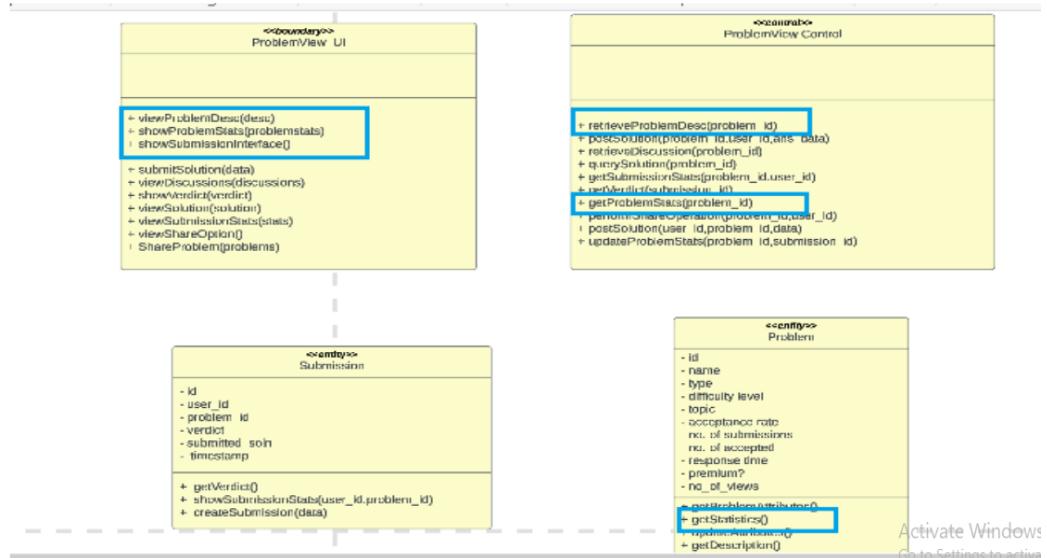
User : ProblemPool



● ProblemView

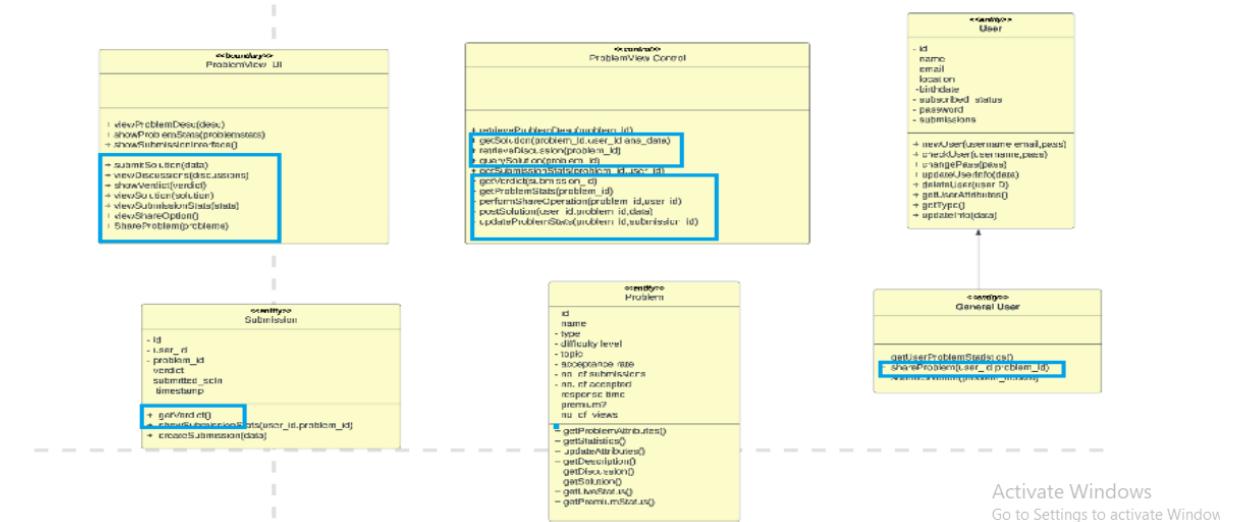
❖ Problem Description & Stats

User:ProblemView



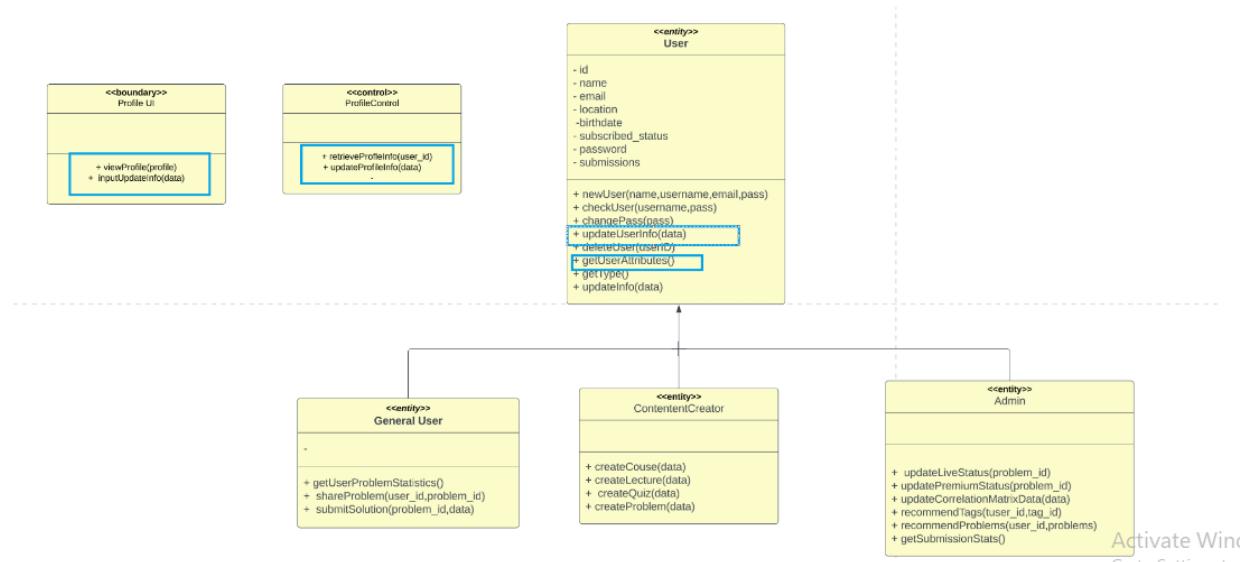
❖ Different Tabs & Solution Submission

User:ProblemView



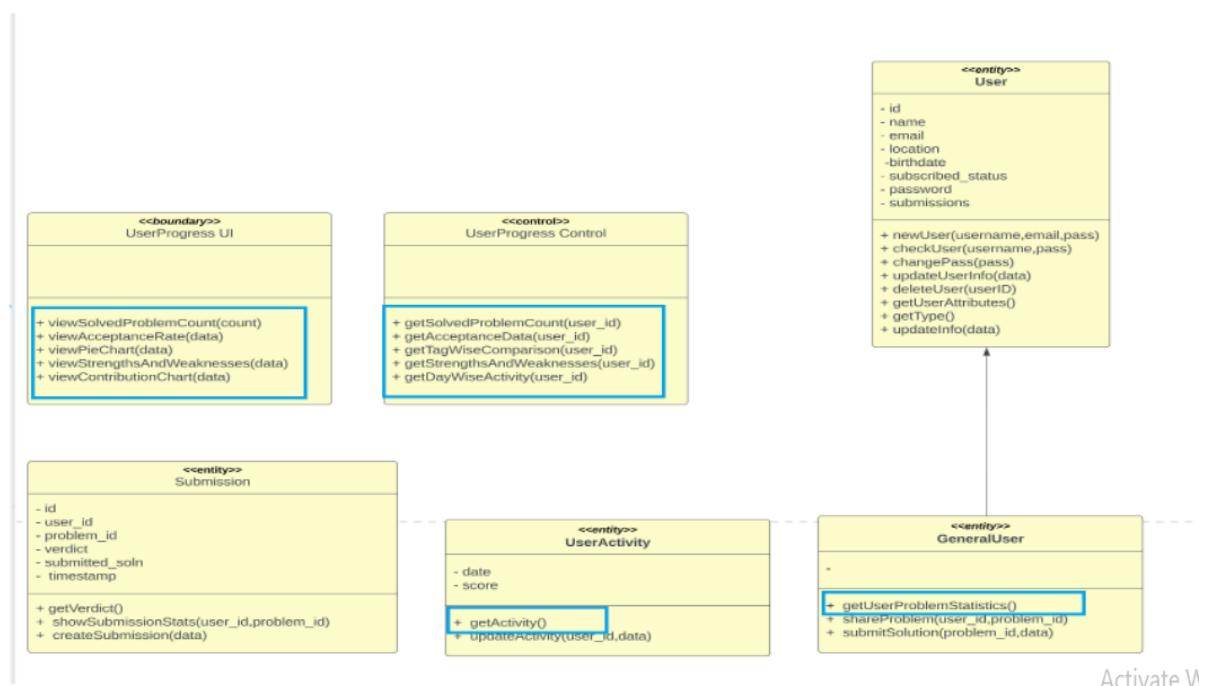
● User Profile

User : UserProfile



● User Progress

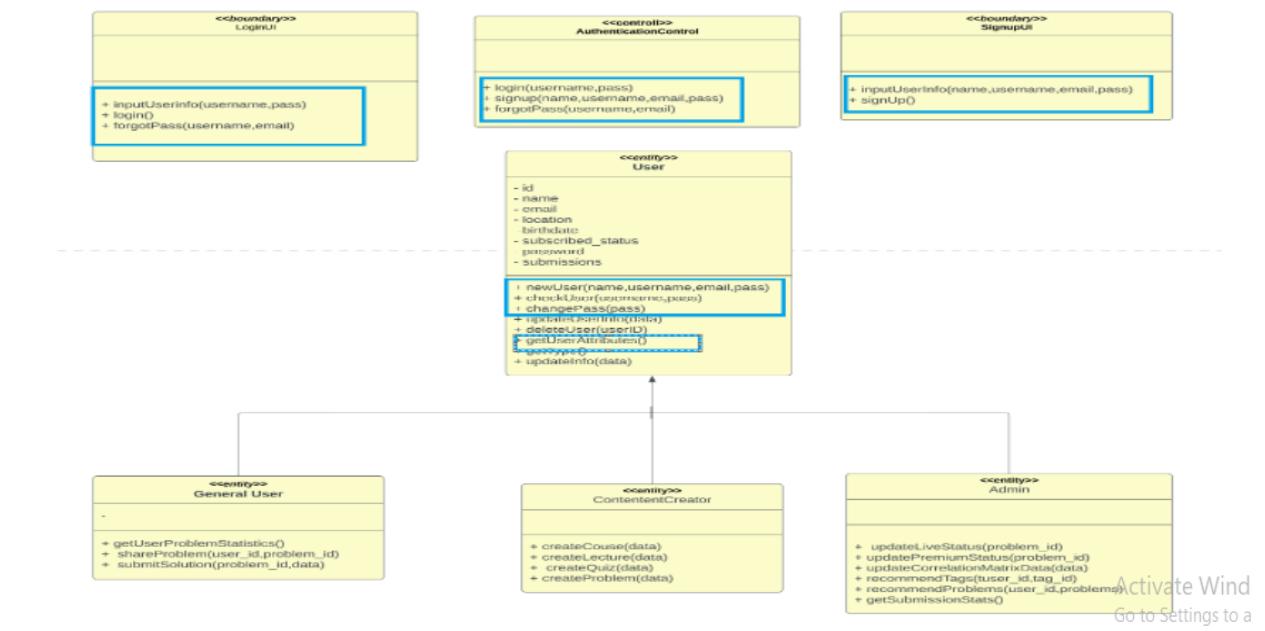
User : Progress



Activate V

• Authentication

User : Authentication

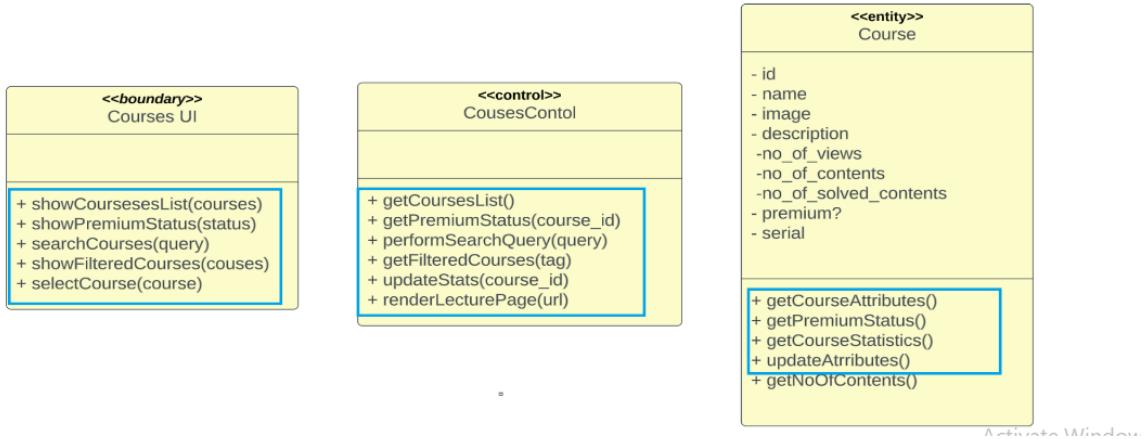


Activate Wind

Go to Settings to a

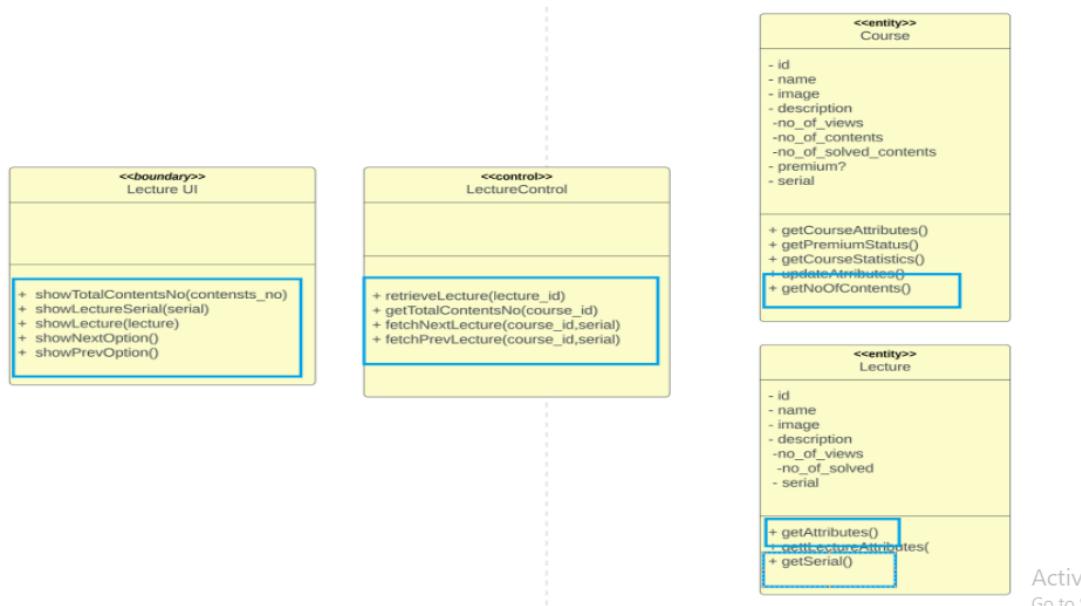
• Course Page

User:CoursePage



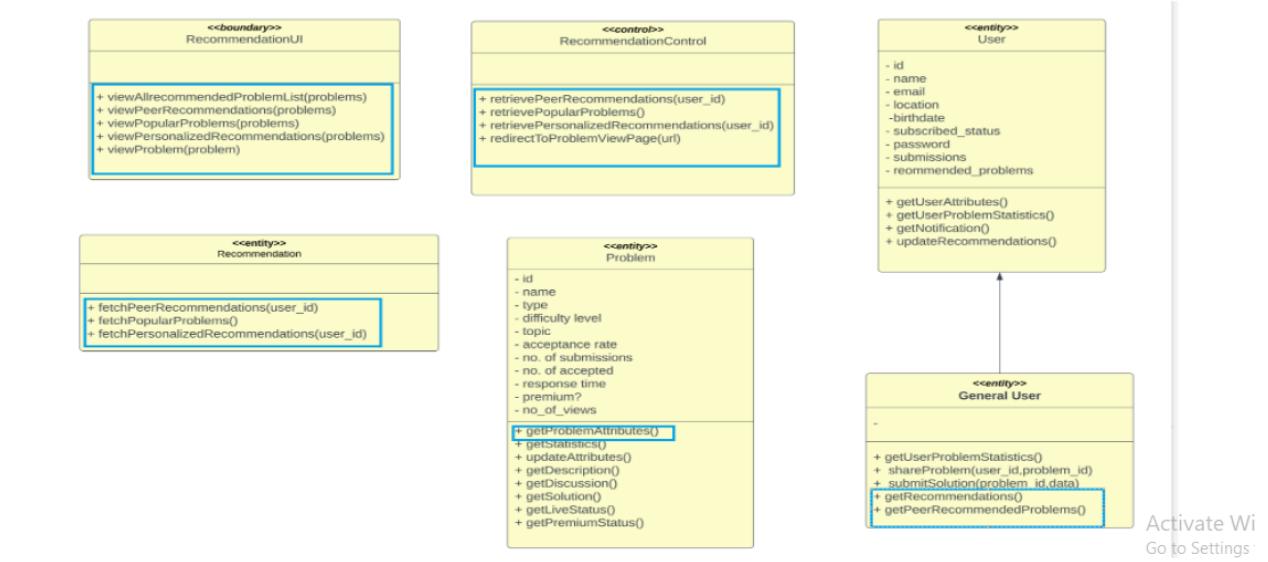
• Lecture Page

User:LecturePage



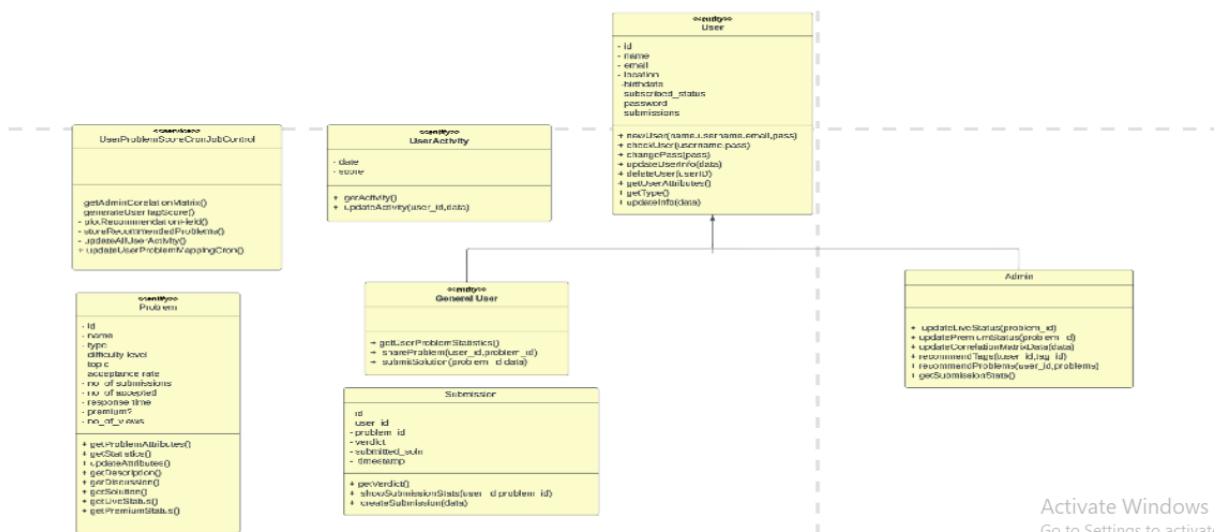
• Recommendation

User: Recommendation



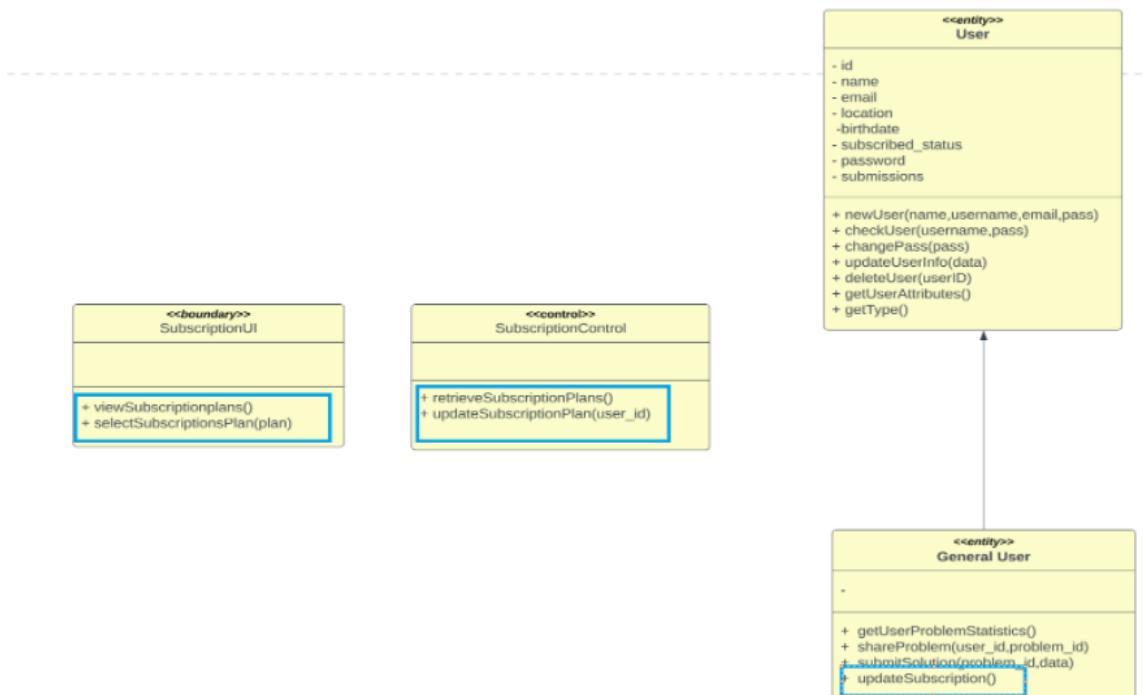
• Cronjob

Service: CronJob



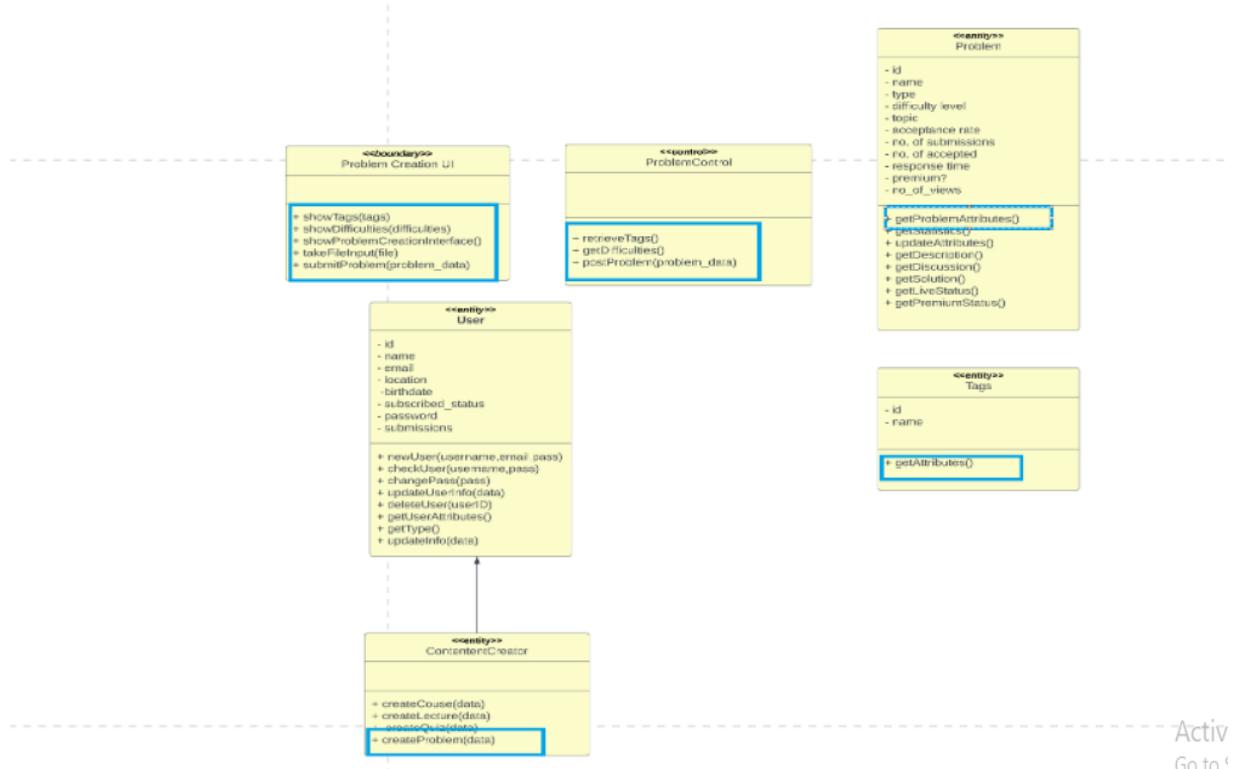
- **Subscription**

User:Subscription



- Content Creation(Problem)

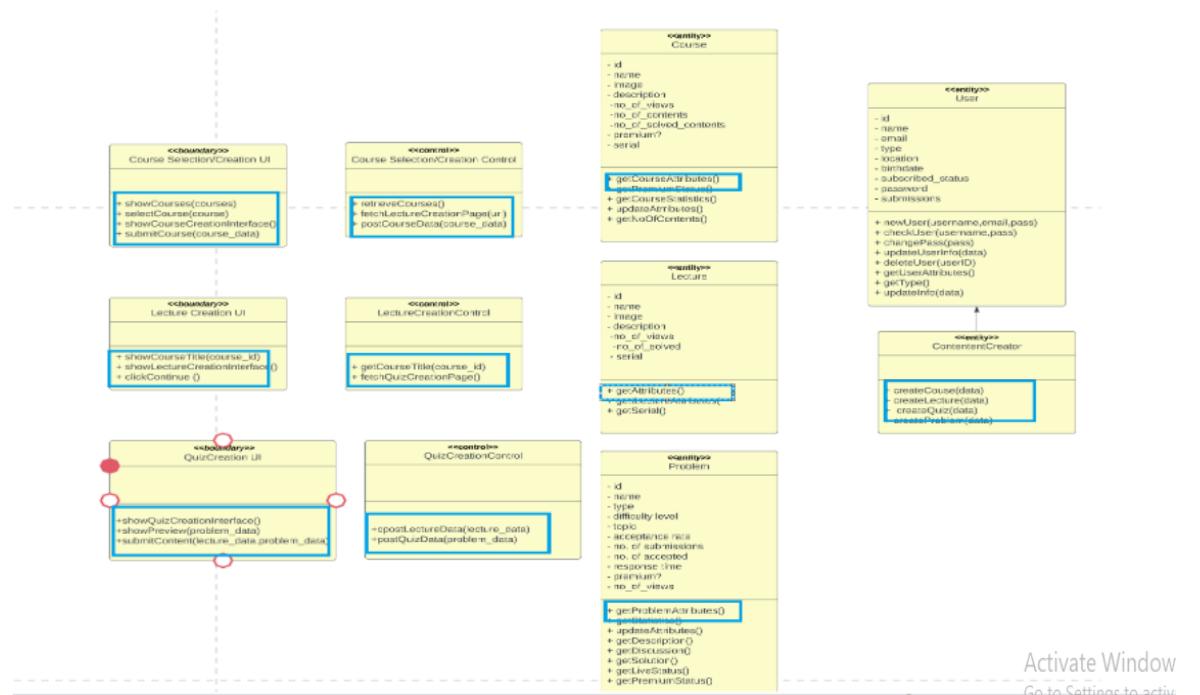
ContentCreator : CreateProblem



Activ
Go to !

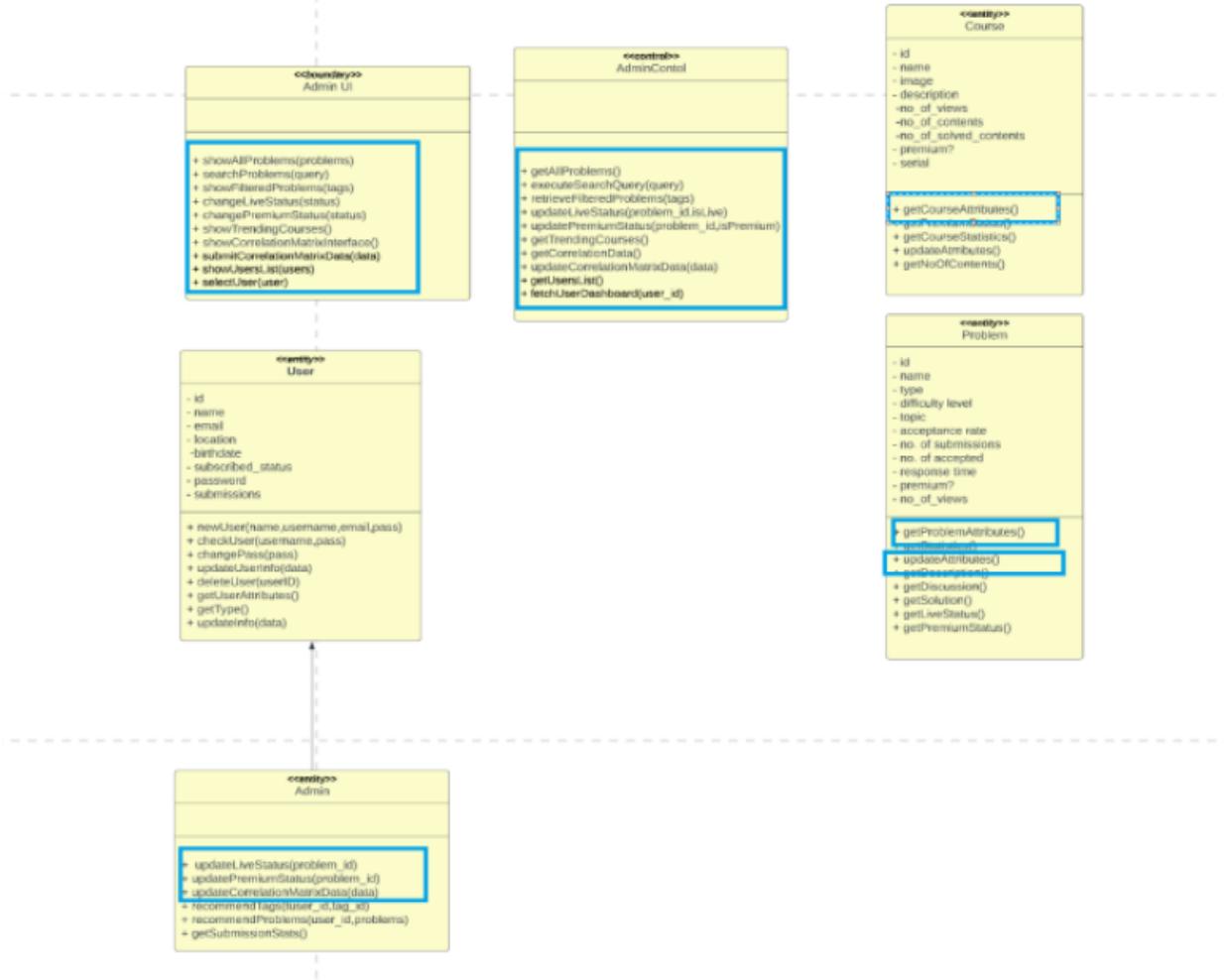
- Content Creation(Lecture)

ContentCreator : CreateLecture



• Admin

Admin



- Admin (User Dashboard)

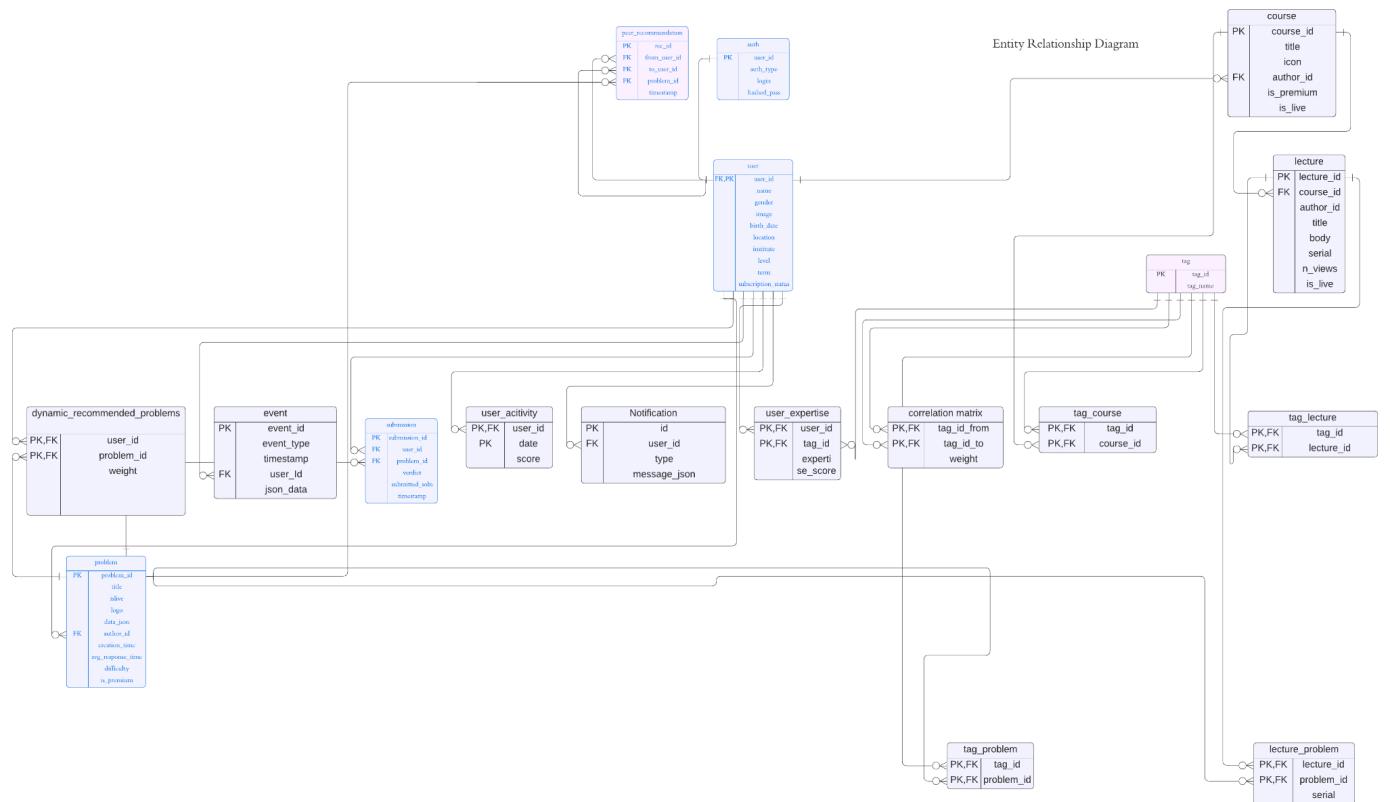
Admin:User Dashboard



Activat

7. ERD

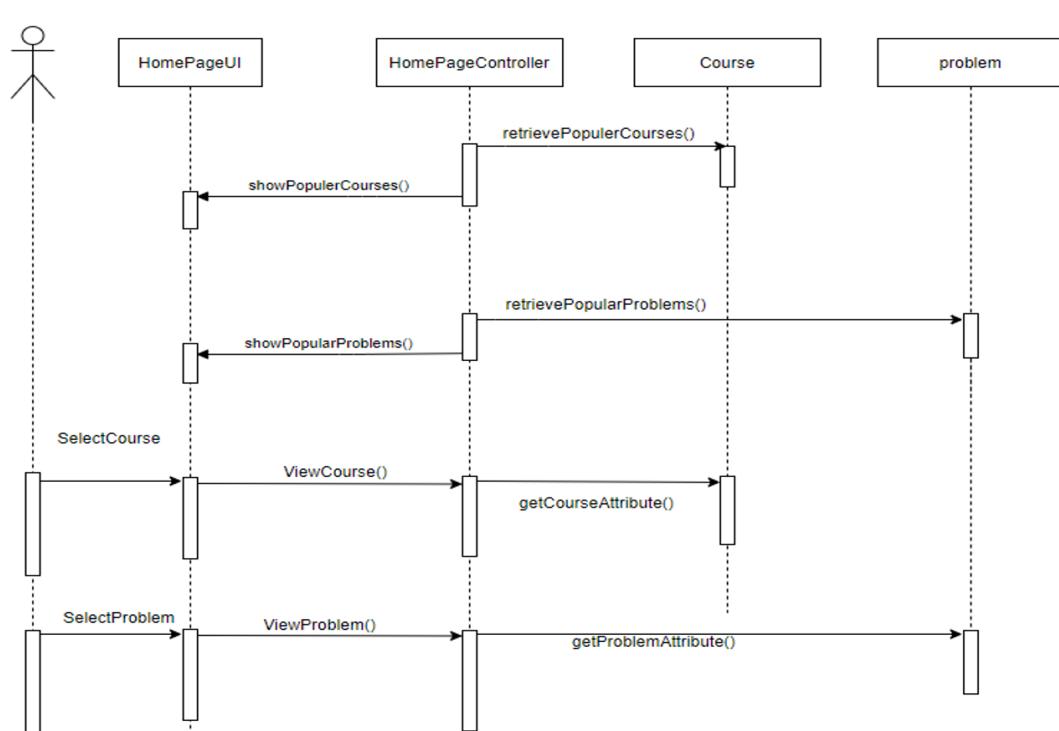
The ERD is presented below:



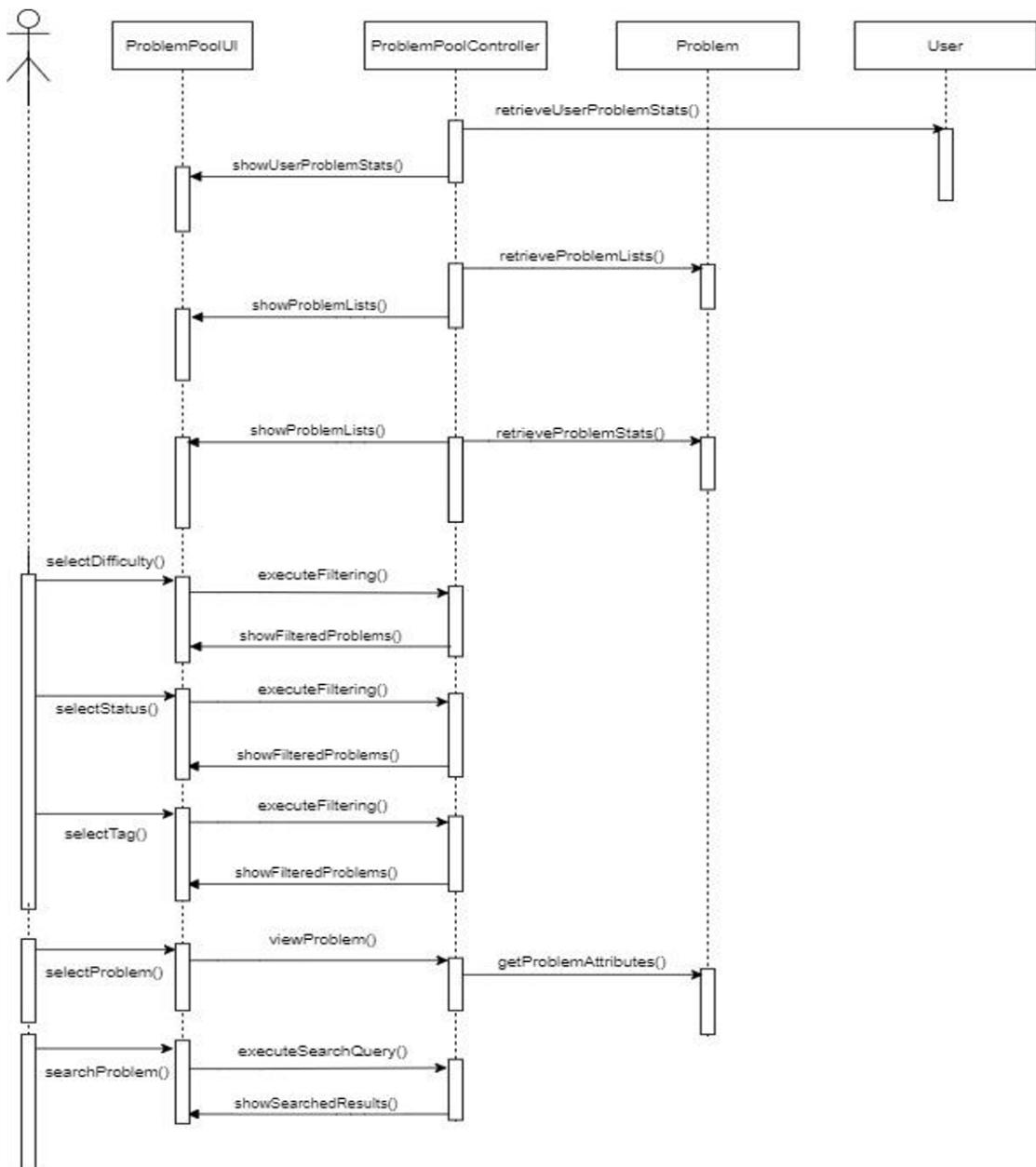
8. Sequence Diagram

The sequence diagram is given below

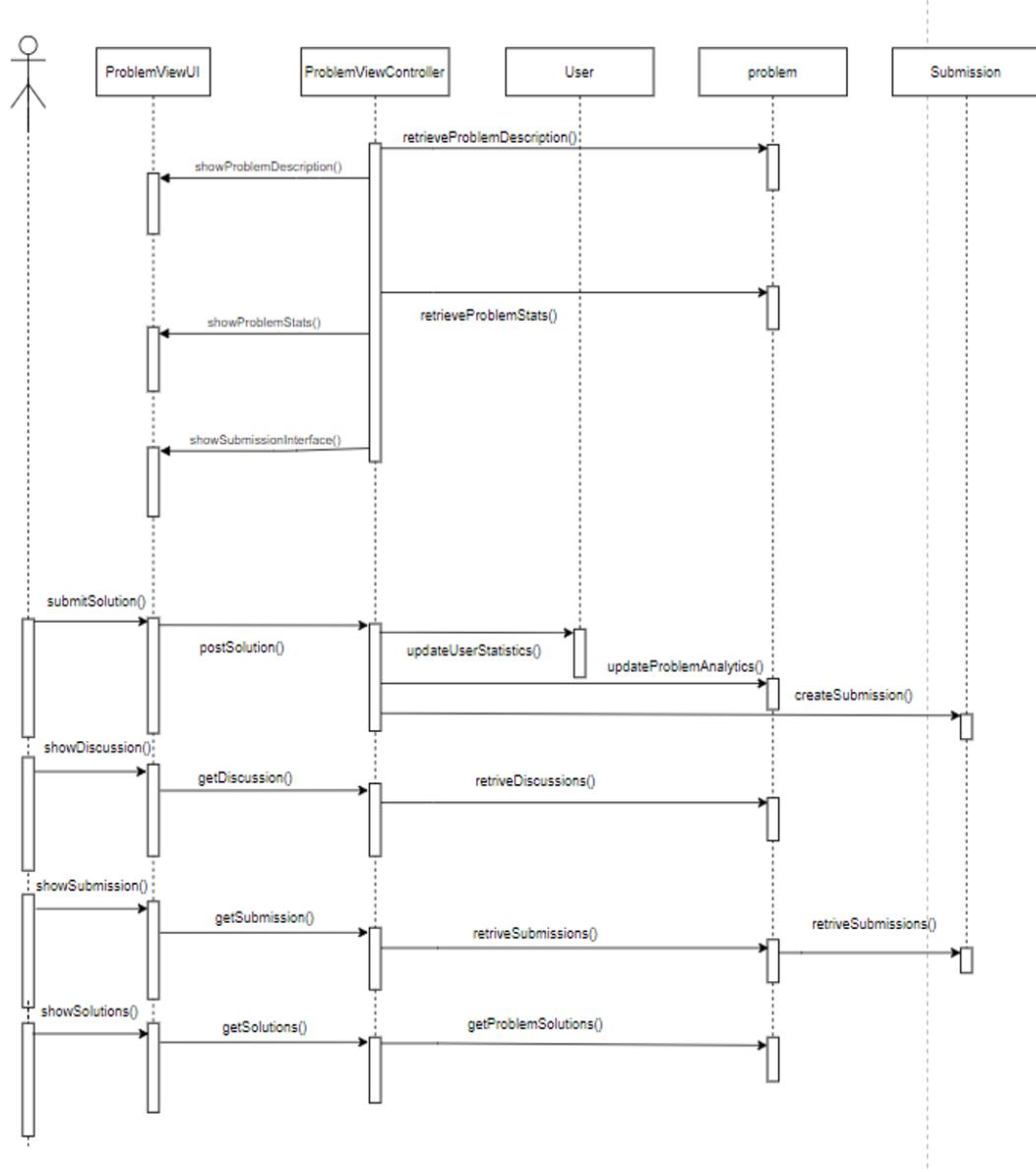
❖ Homepage



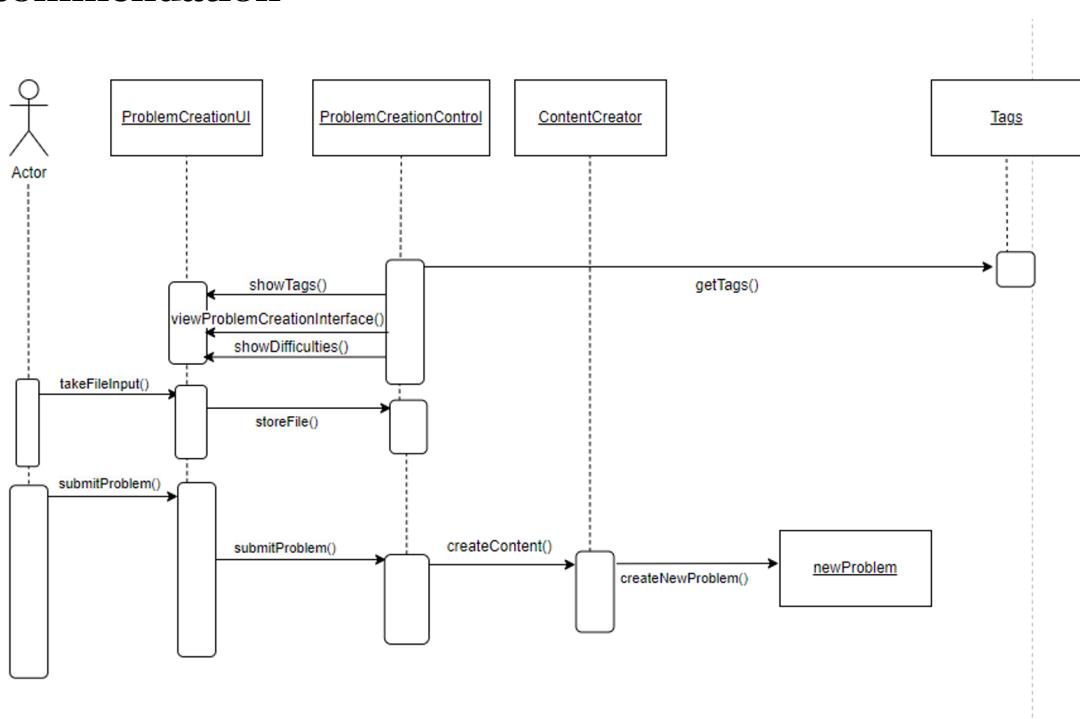
❖ Problem pool



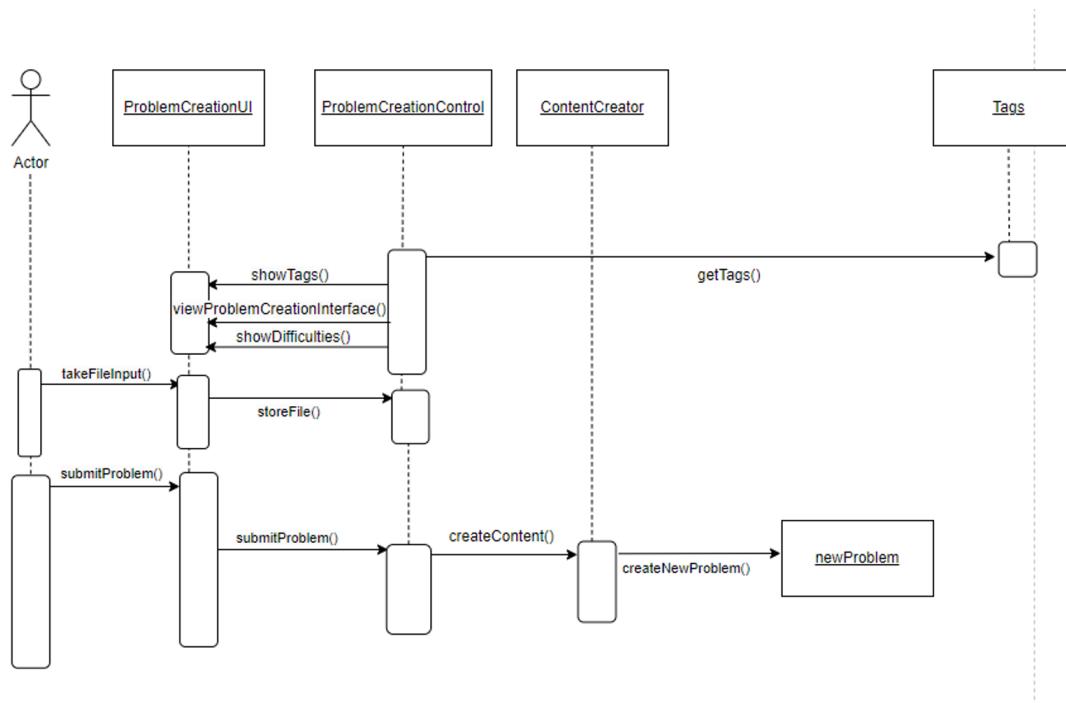
❖ Problem View



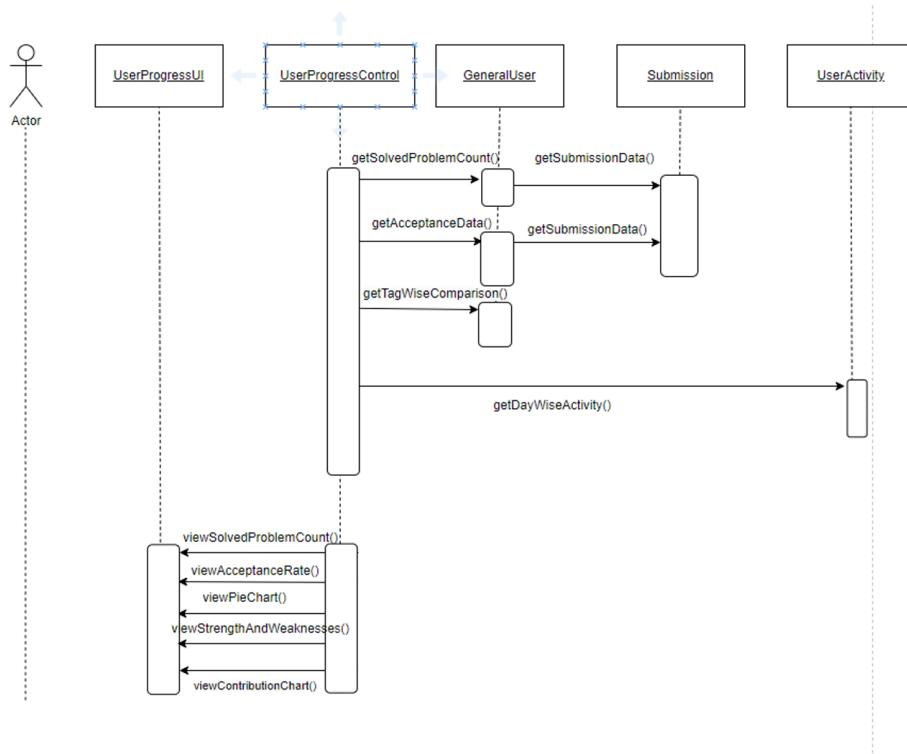
❖ Recommendation



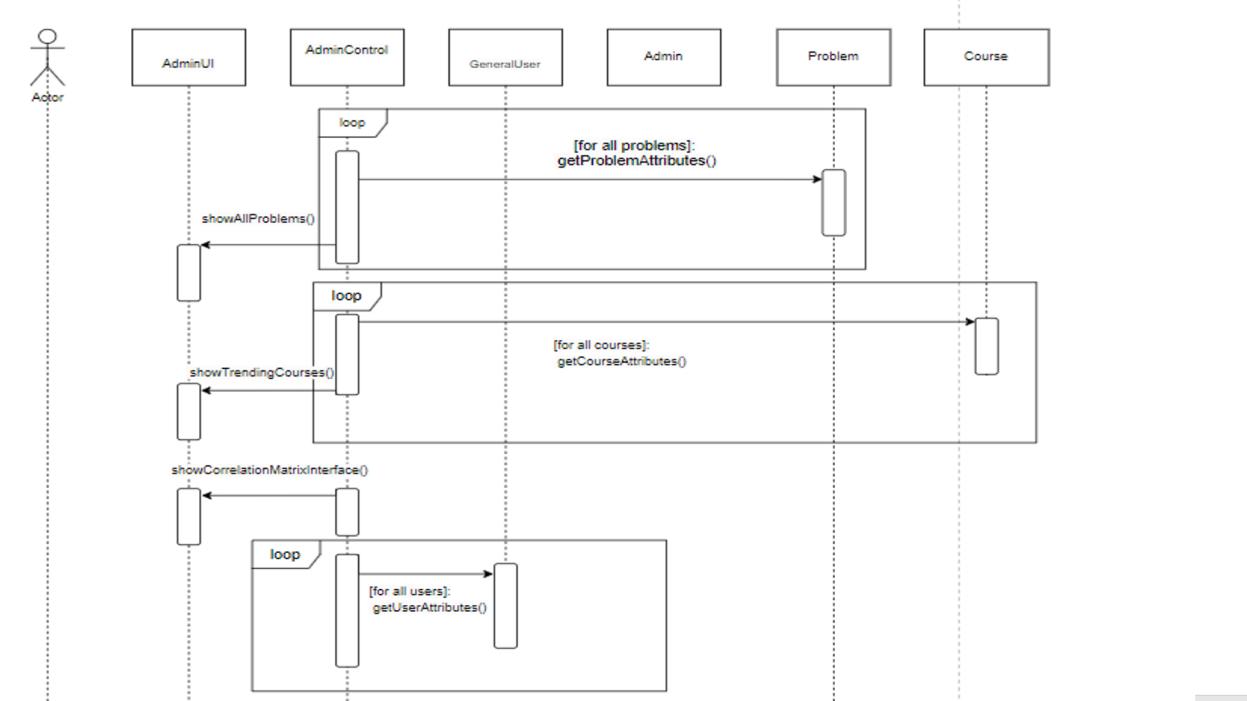
❖ Problem Creation

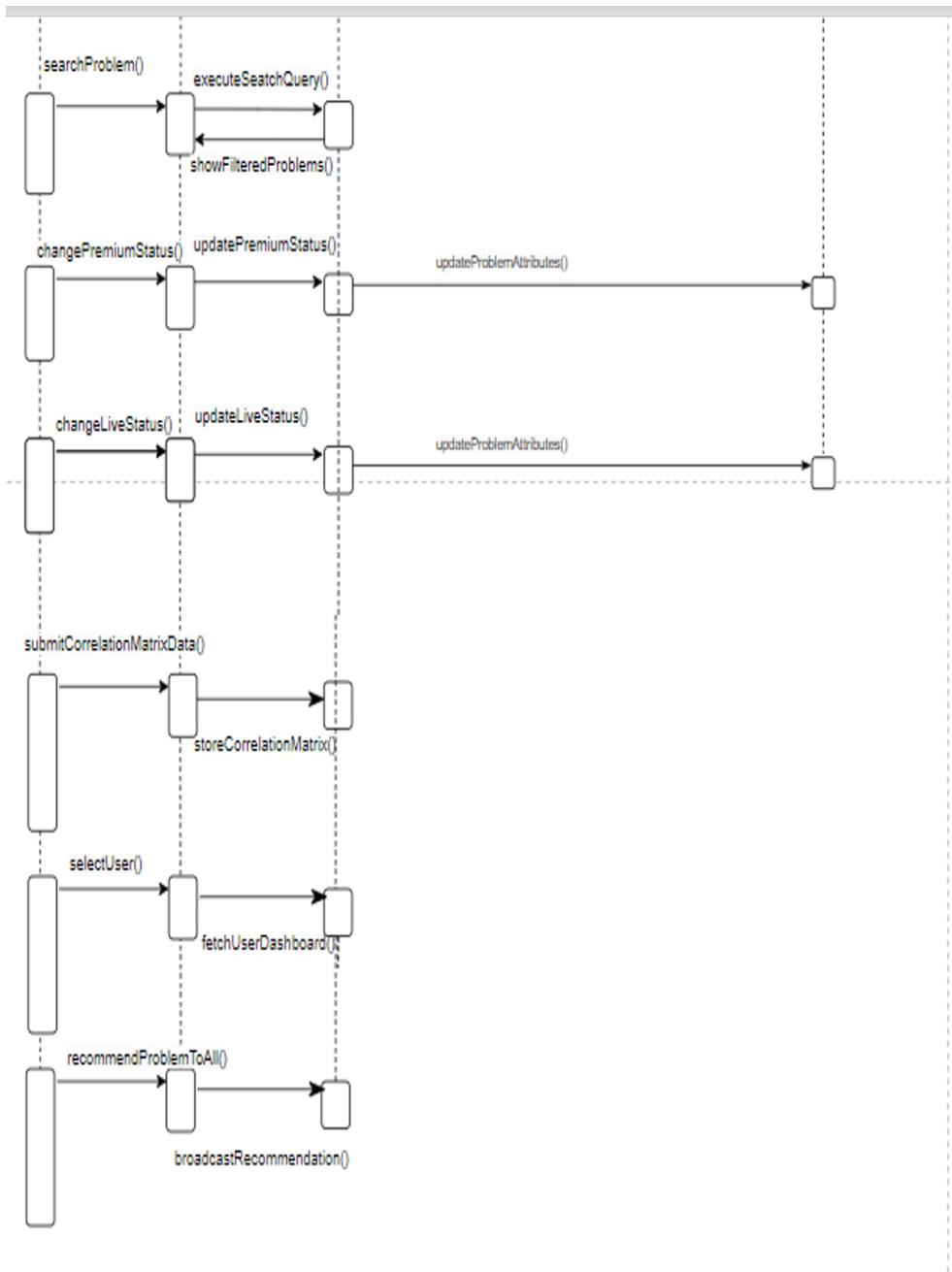


❖ User Progress

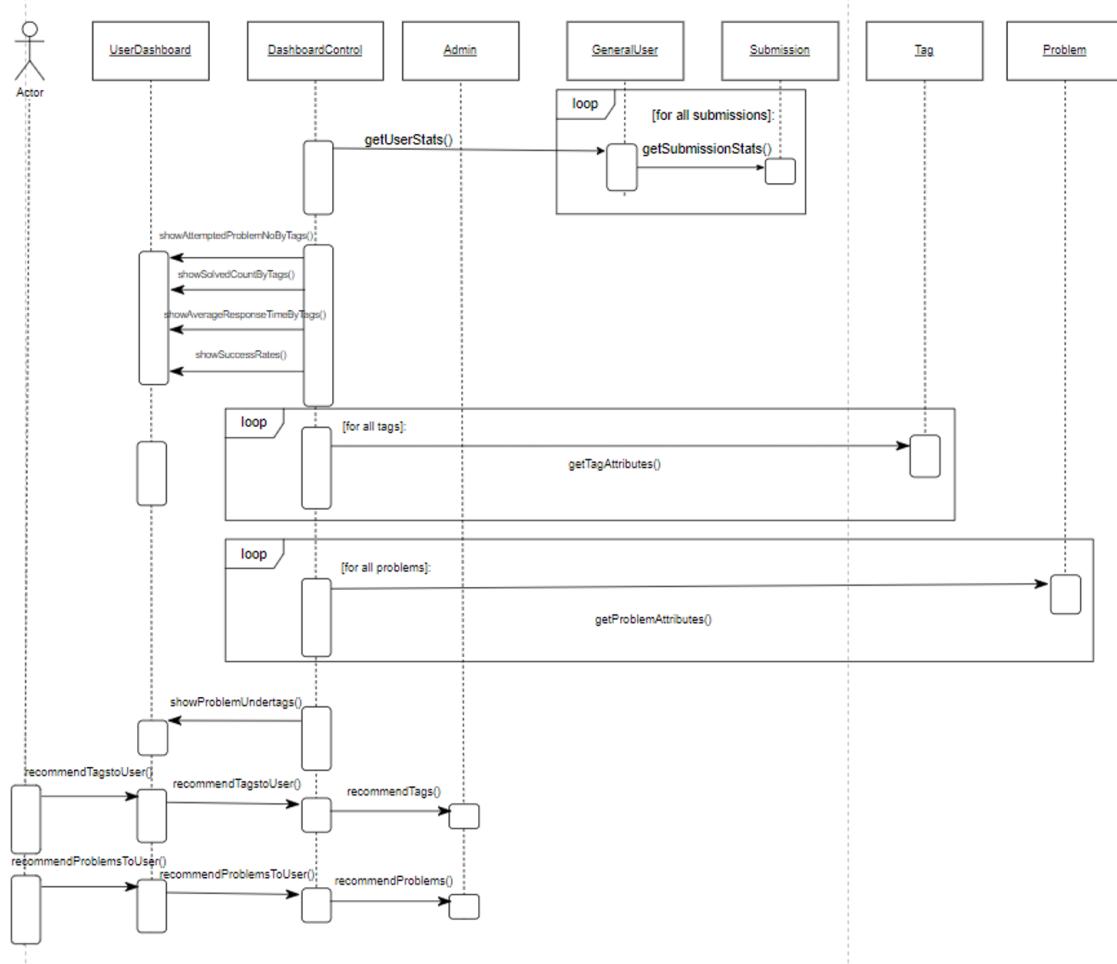


❖ Admin

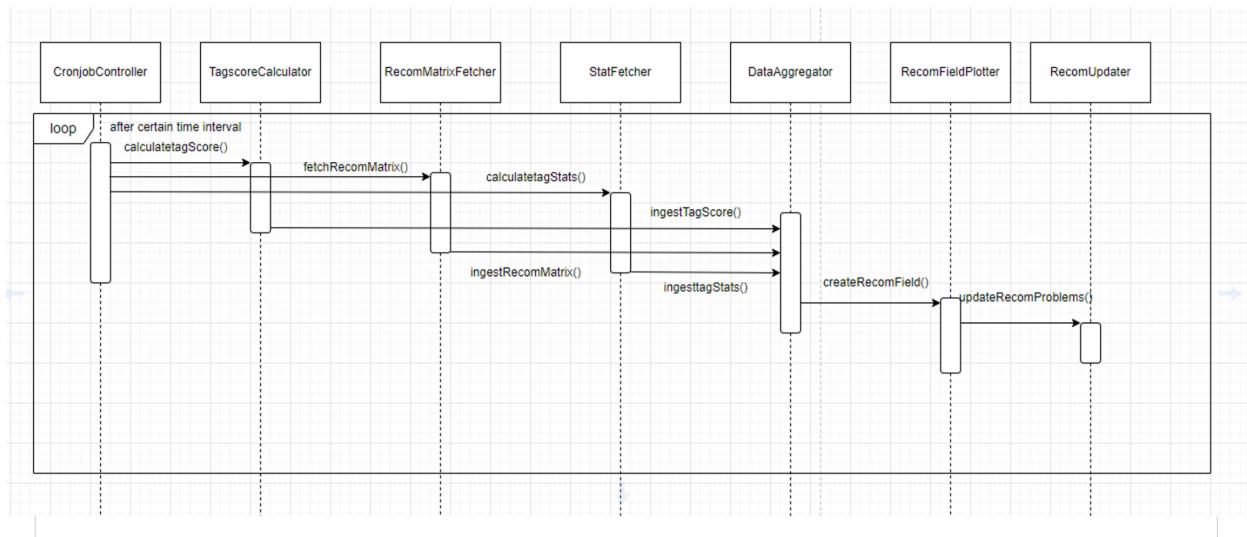




❖ Admin Dashboard



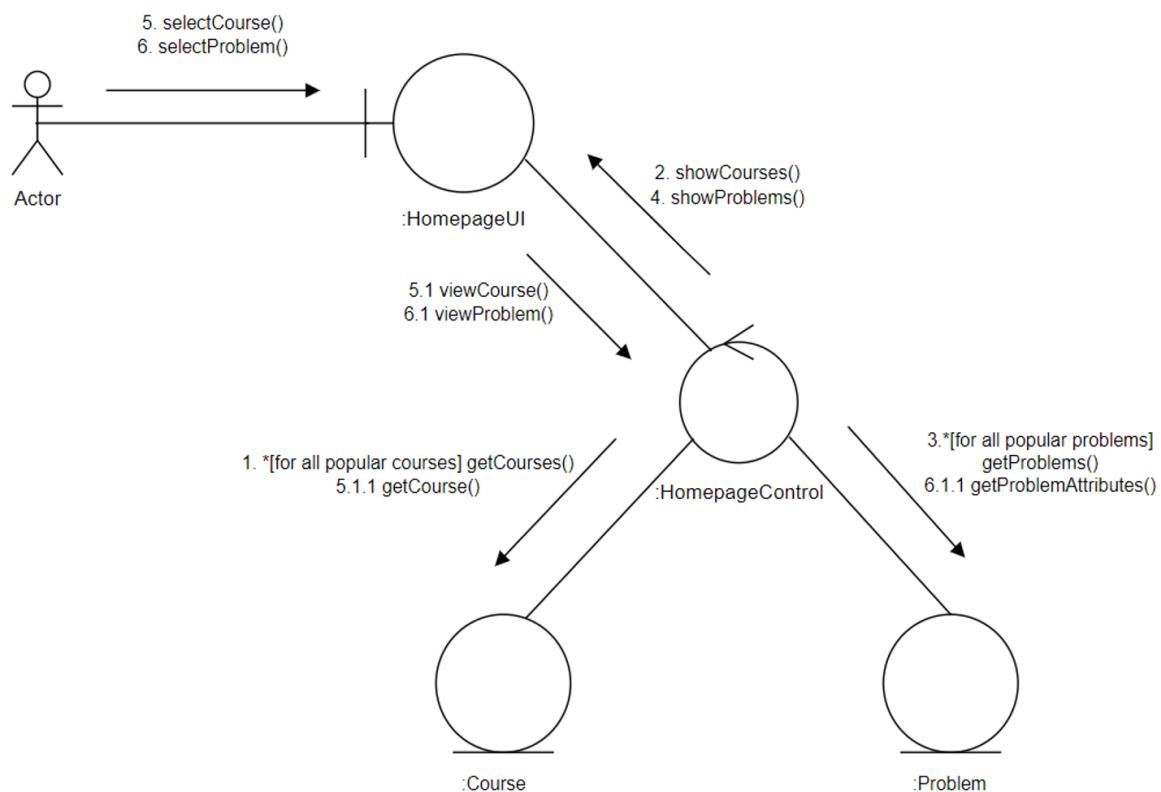
❖ CronJob



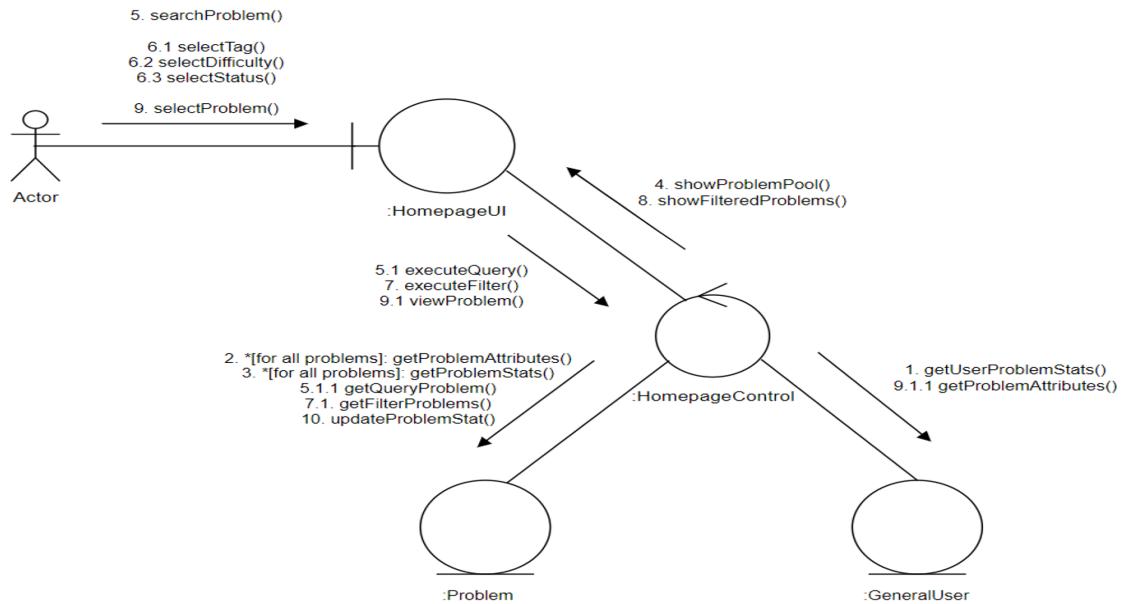
9. Collaboration Diagram

The collaboration diagram is presented below:

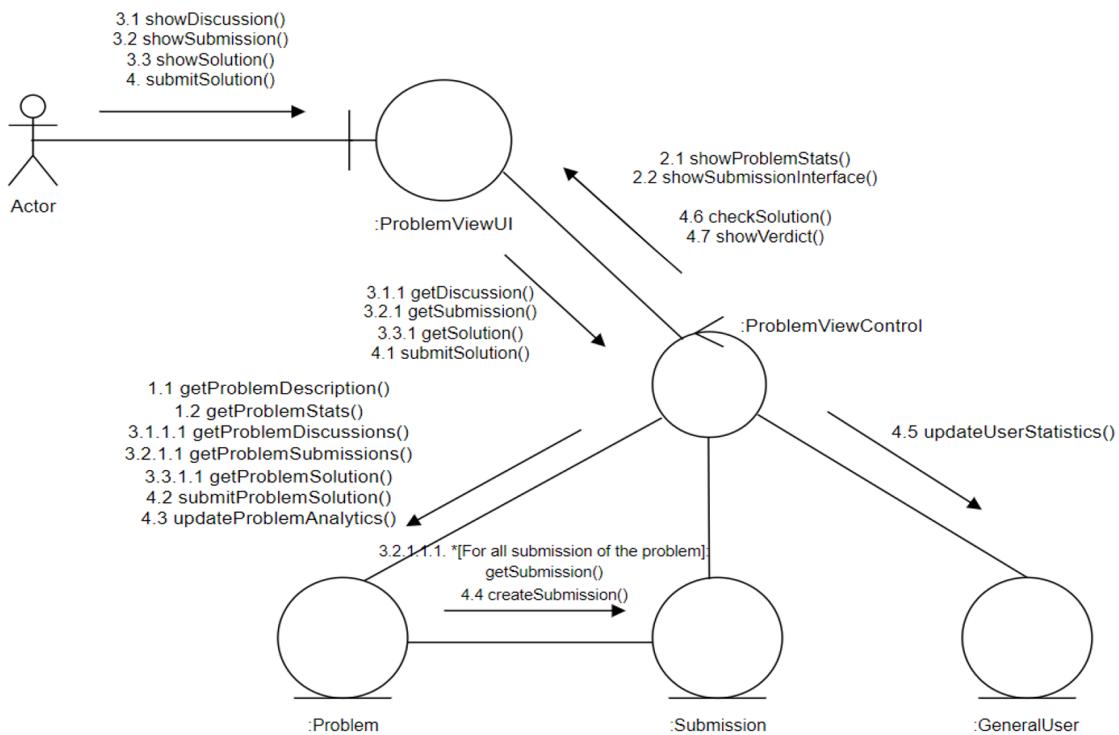
❖ Homepage



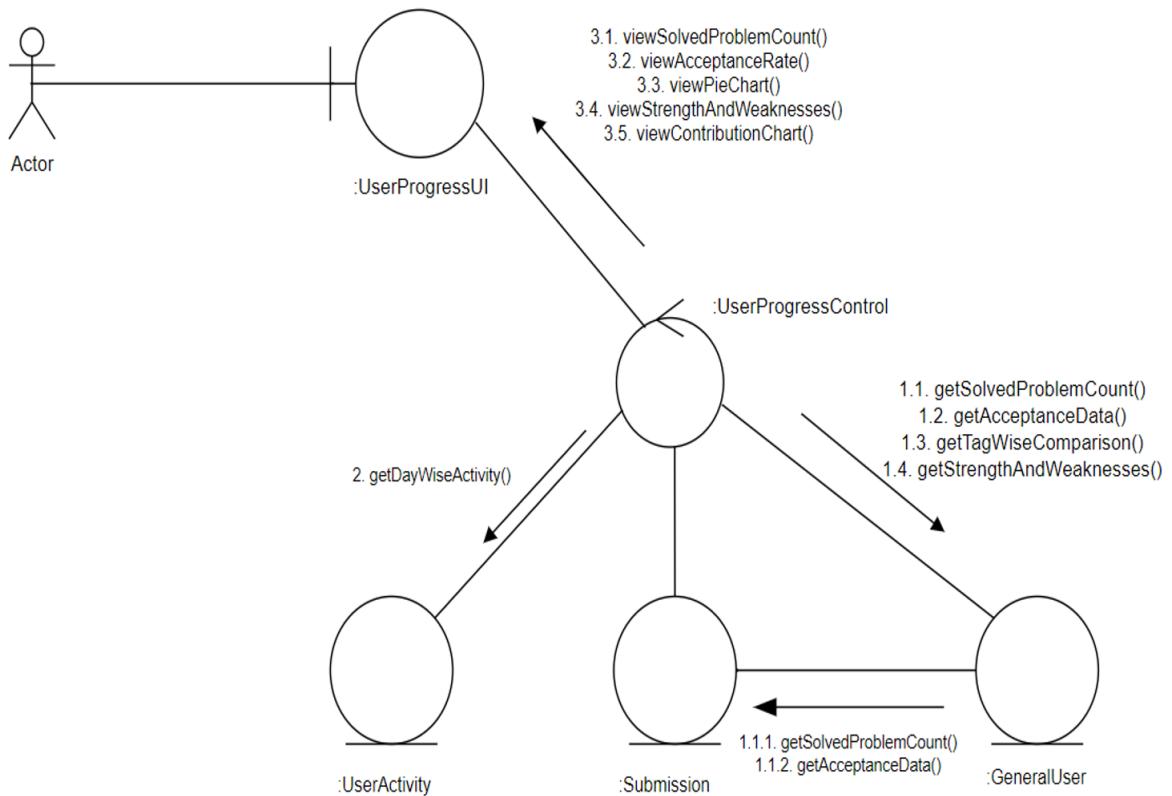
❖ Problempool



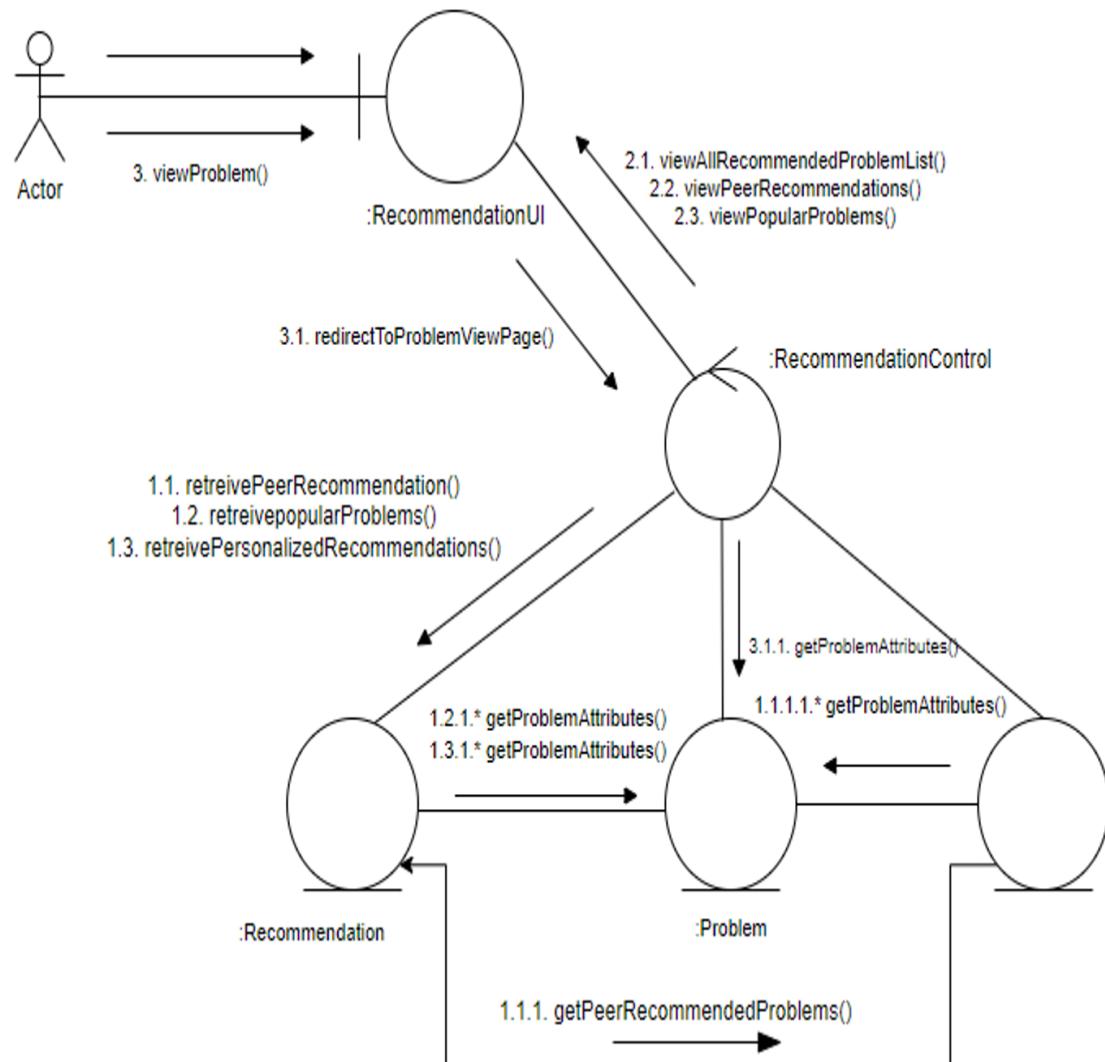
❖ Problem View



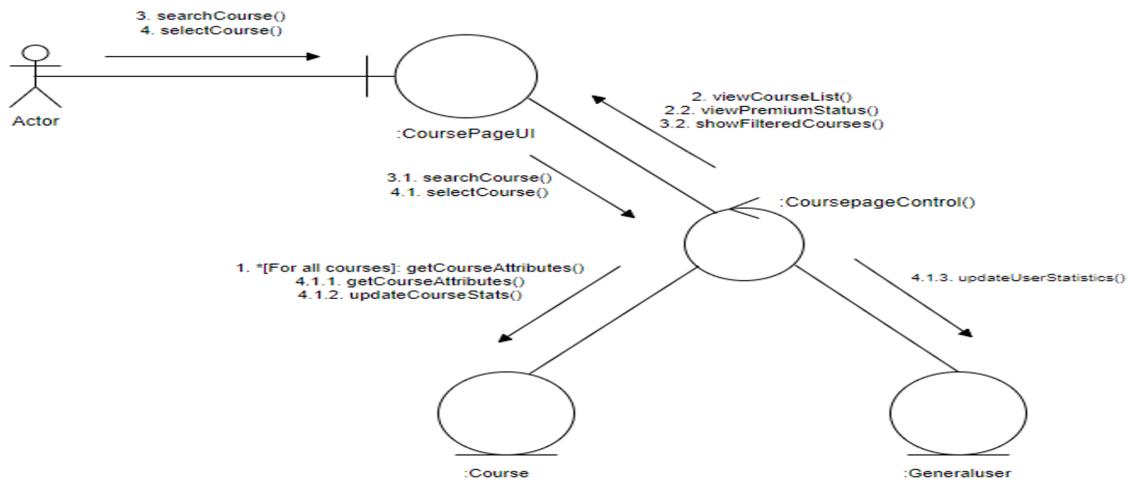
❖ User Progress



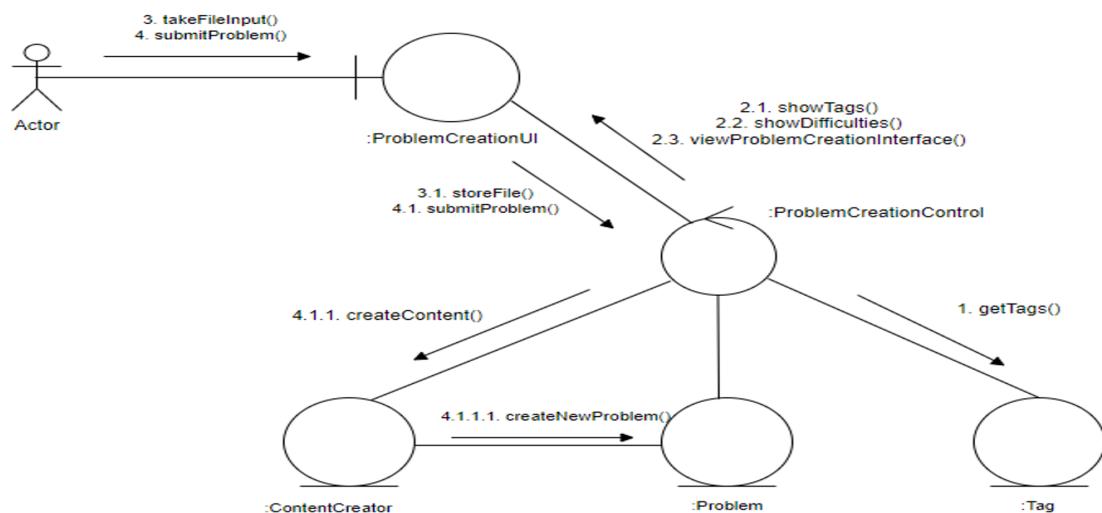
❖ Recommendation



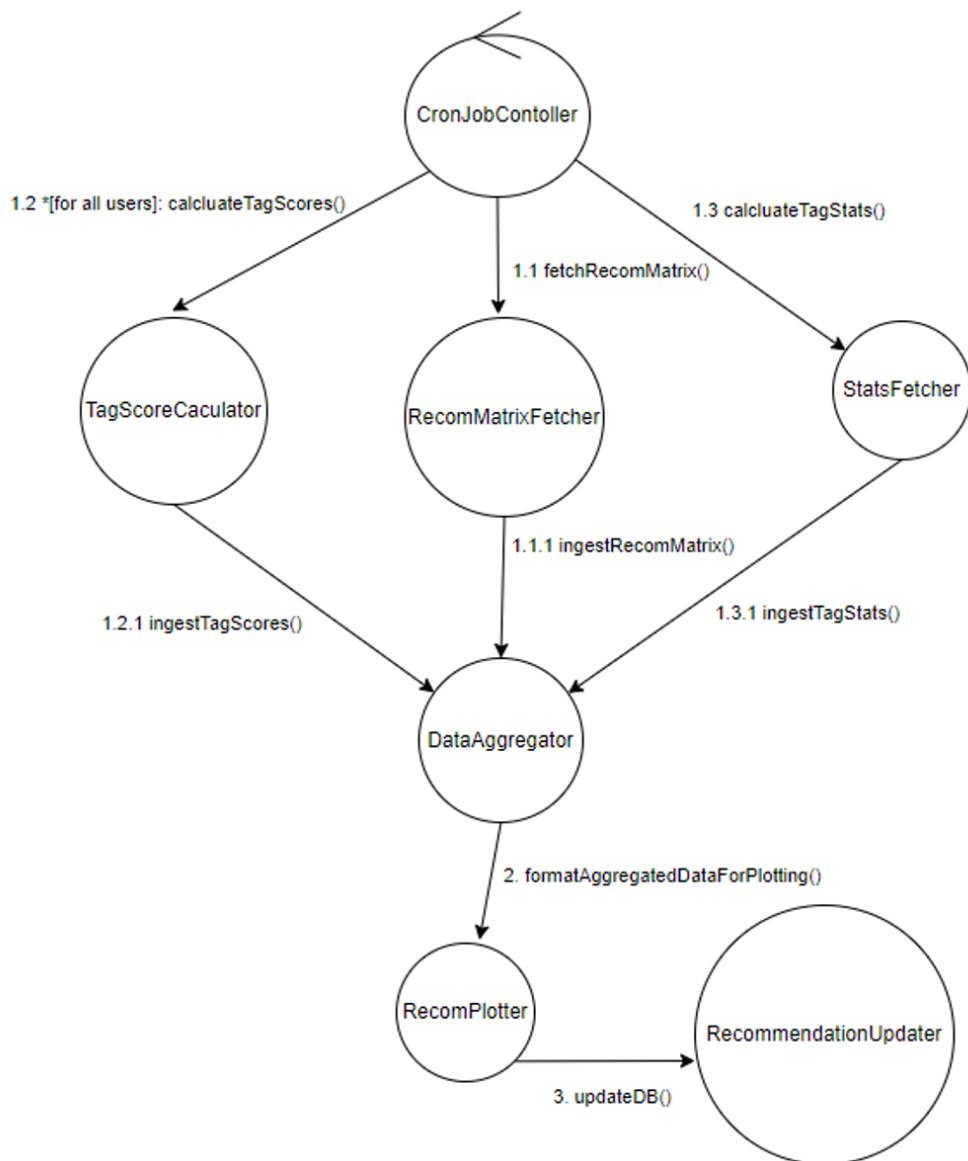
❖ Course Page



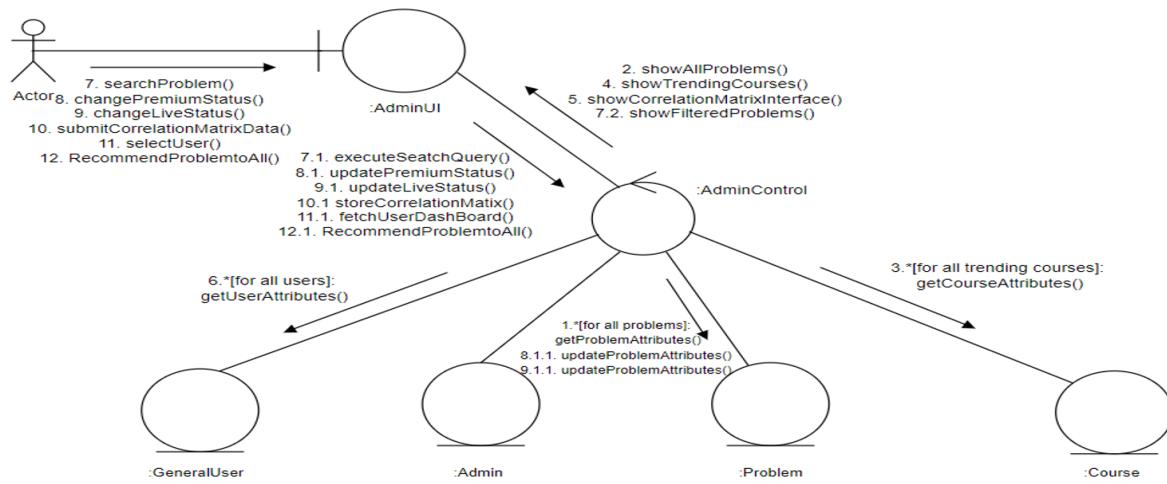
❖ Problem Creation



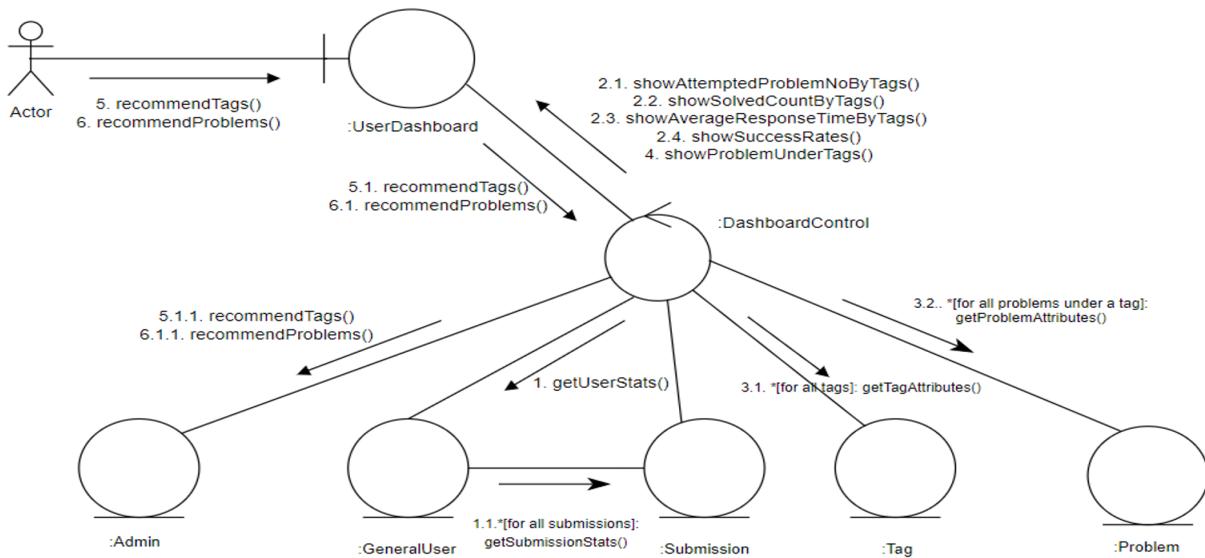
❖ CronJob



❖ Admin



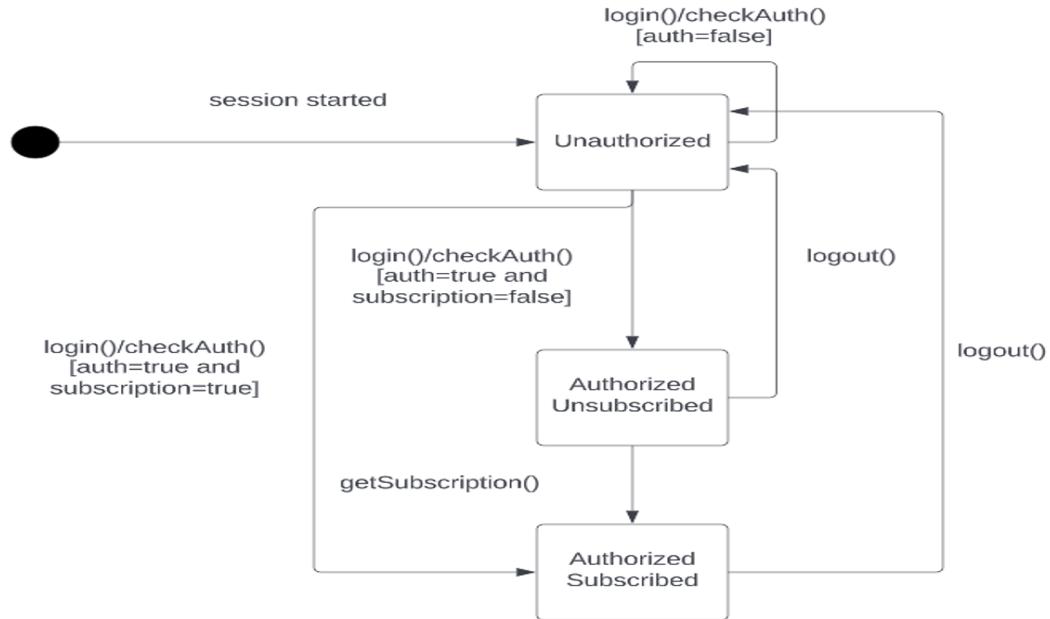
❖ Admin User Dashboard



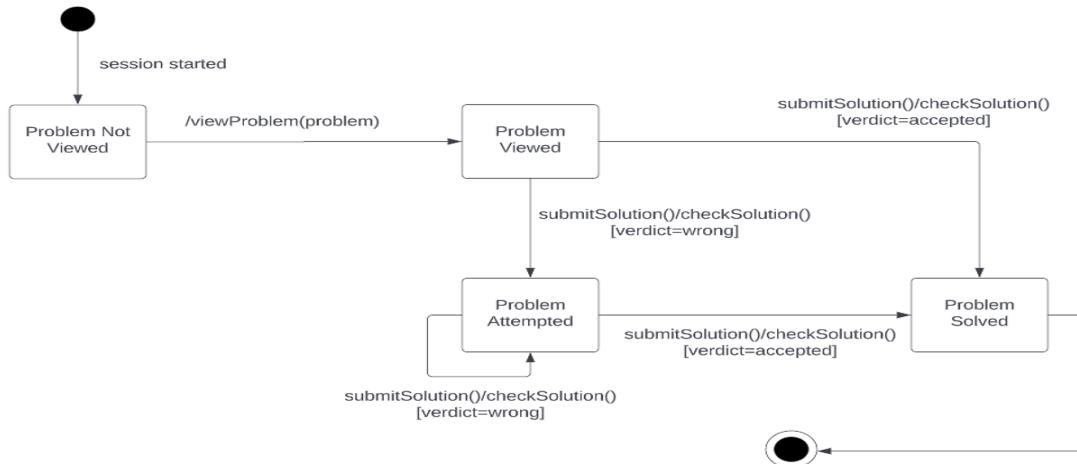
10. State Diagram

The state diagram has been presented below:

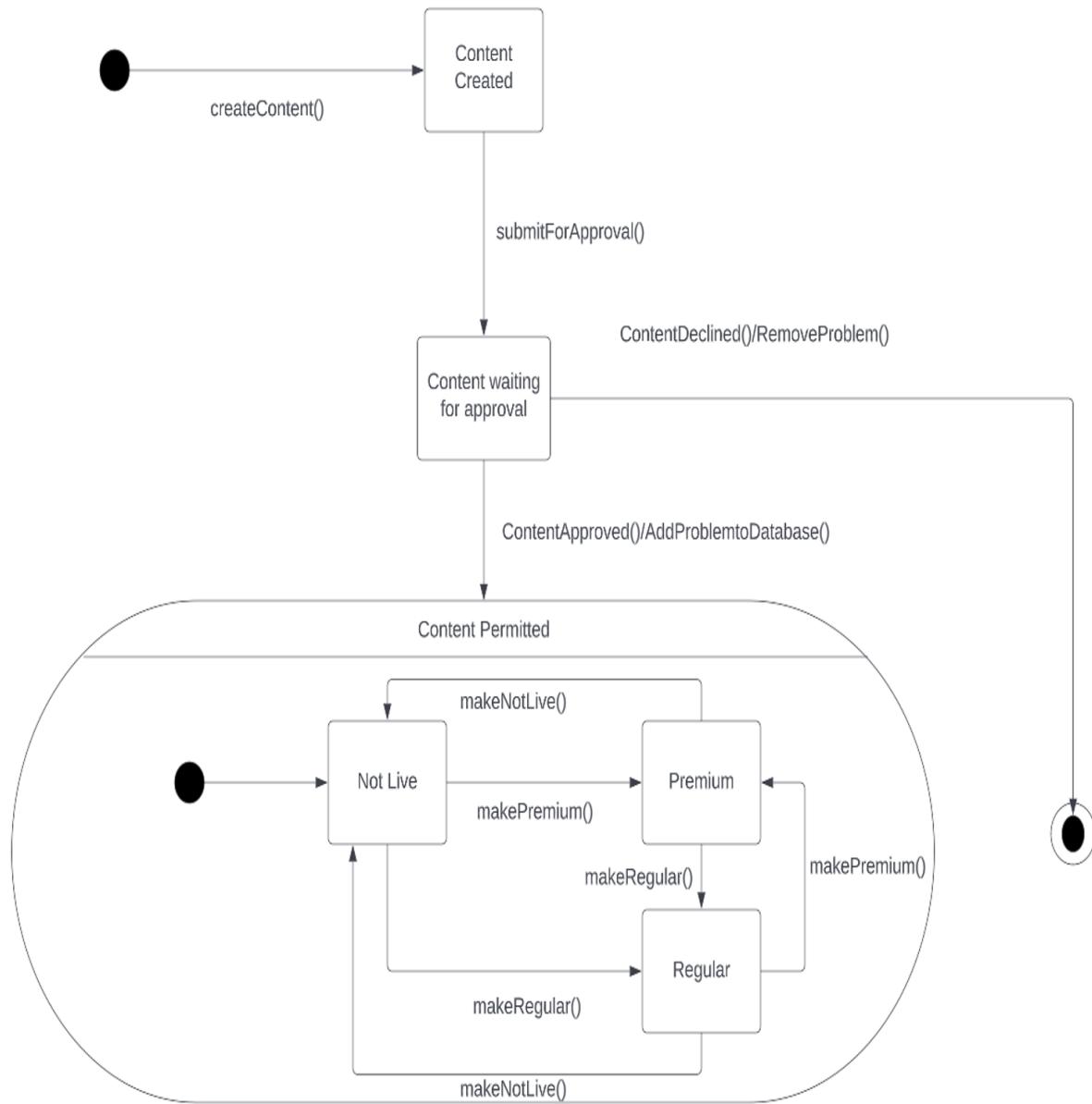
❖ LogIn/SignUp



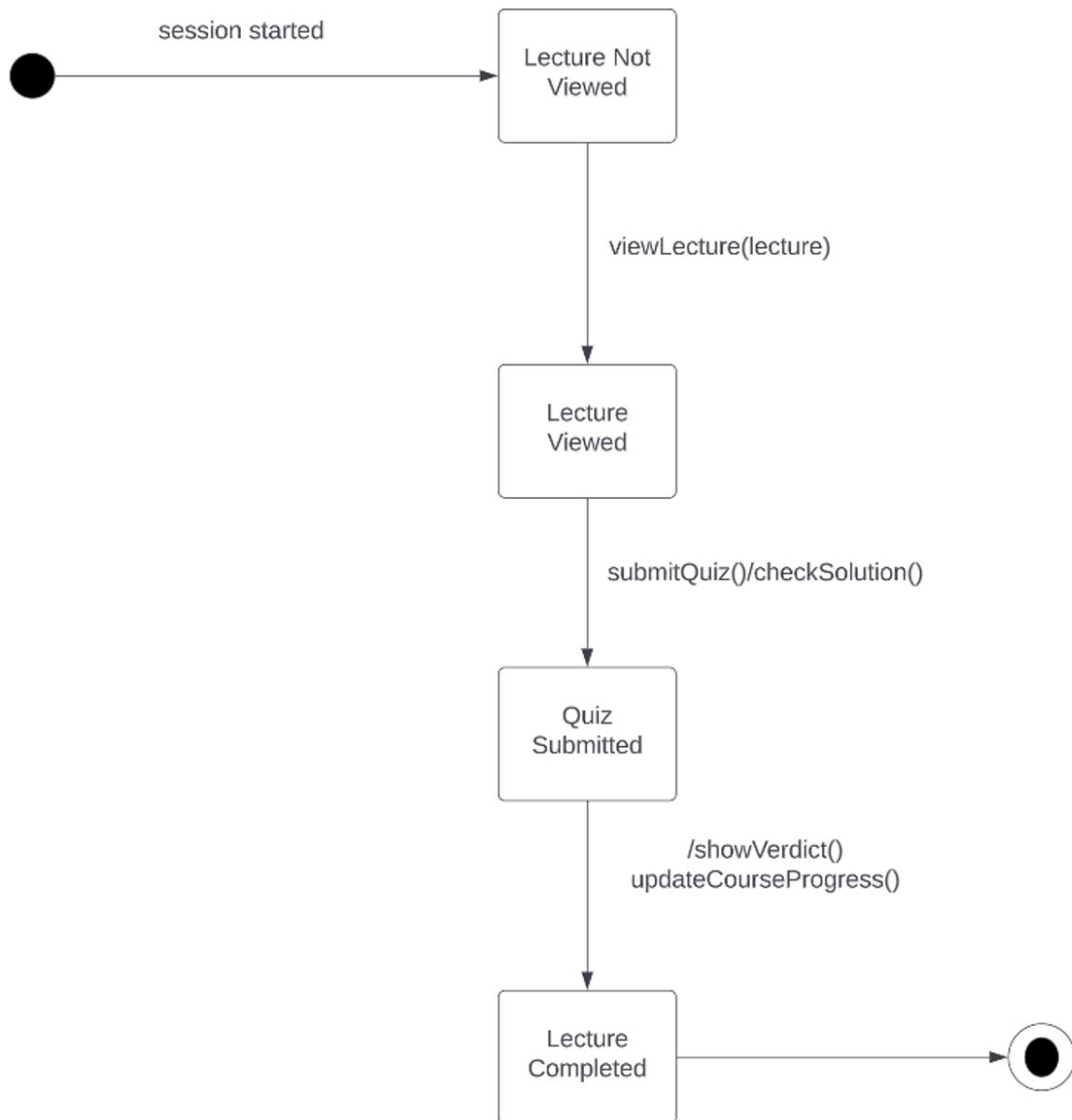
❖ Problem View



❖ Content Moderation



❖ Lecture



11. Live Demo

For this part, we had to demonstrate at least a functioning module of our project. We decided to showcase the following modules:

1. Problem pool
2. User progress
3. Coding problem view and submission
4. Google authentication

The front end has been developed using ReactJS and hosted on Netlify. The backend has been deployed on AWS and the database uses PostgreSQL. The CI/CD pipelining has been done by connecting the GitHub repositories with the hosting sites. The whole development process has been coordinated by using GitHub as the codebase.

Some snapshots of the [live site](#) are provided below:

The landing page of AlgoLytic shows problem statistics and a list of coding problems.

At the top, there is a navigation bar with links for Problems, Learn, Recommendation, and Subscription. A sign-in button for "SAMEE abdussamee16@gmail.com" is also present.

In the center, there is a summary card with the following data:

Difficulty	Easy 0/0
Medium	0/0
Difficult	14/14

Below the summary card, there are four filter buttons: Difficulty, Status, Tag, and Premium, each with a dropdown arrow. To the right is a search bar with a magnifying glass icon.

The main content area displays a table of coding problems:

Status	Title	Acceptance	Difficulty	Topic
-	Twice The Sum	hard	hard	DFS
✓	GCD of 2 numbers	hard	hard	Number Theory

The landing page of AlgoLytic shows problem statistics

The landing page of AlgoLytic shows problem statistics and a list of coding problems.

At the top, there is a navigation bar with links for Problems, Learn, Recommendation, and Subscription. A sign-in button for "SAMEE abdussamee16@gmail.com" is also present.

In the center, there is a summary card with the following data:

Difficulty	Medium 0/0
Difficult	14/14

Below the summary card, there are four filter buttons: Difficulty, Status, Tag, and Premium, each with a dropdown arrow. To the right is a search bar with a magnifying glass icon.

The main content area displays a table of coding problems:

Status	Title	Acceptance	Difficulty	Topic
-	Twice The Sum	hard	hard	DFS
✓	GCD of 2 numbers	hard	hard	Number Theory
-	GCD of 2 numbers	hard	hard	Number Theory
✓	Twice The Sum	hard	hard	Arithmetic
-	GCD of 2 numbers	hard	hard	Number Theory

At the bottom, there are pagination controls: "Rows per page: 5", "1–5 of 14", and arrows for navigating through the pages.

The landing page also displays all the coding problems

Difficulty ▾ Status ▾ Tag ▾ Premium ▾

Search... Q

Status	Title	Acceptance	Difficulty	Topic
-	Twice The Sum	100%	hard	Arithmetic
✓	Twice The Sum	100%	hard	Arithmetic
-	Twice The Sum	100%	hard	Arithmetic
✓	Twice The Sum	100%	hard	Arithmetic
-	Twice The Sum	100%	hard	Arithmetic

The problems can be filtered with the tags, status, difficulty, and premiums

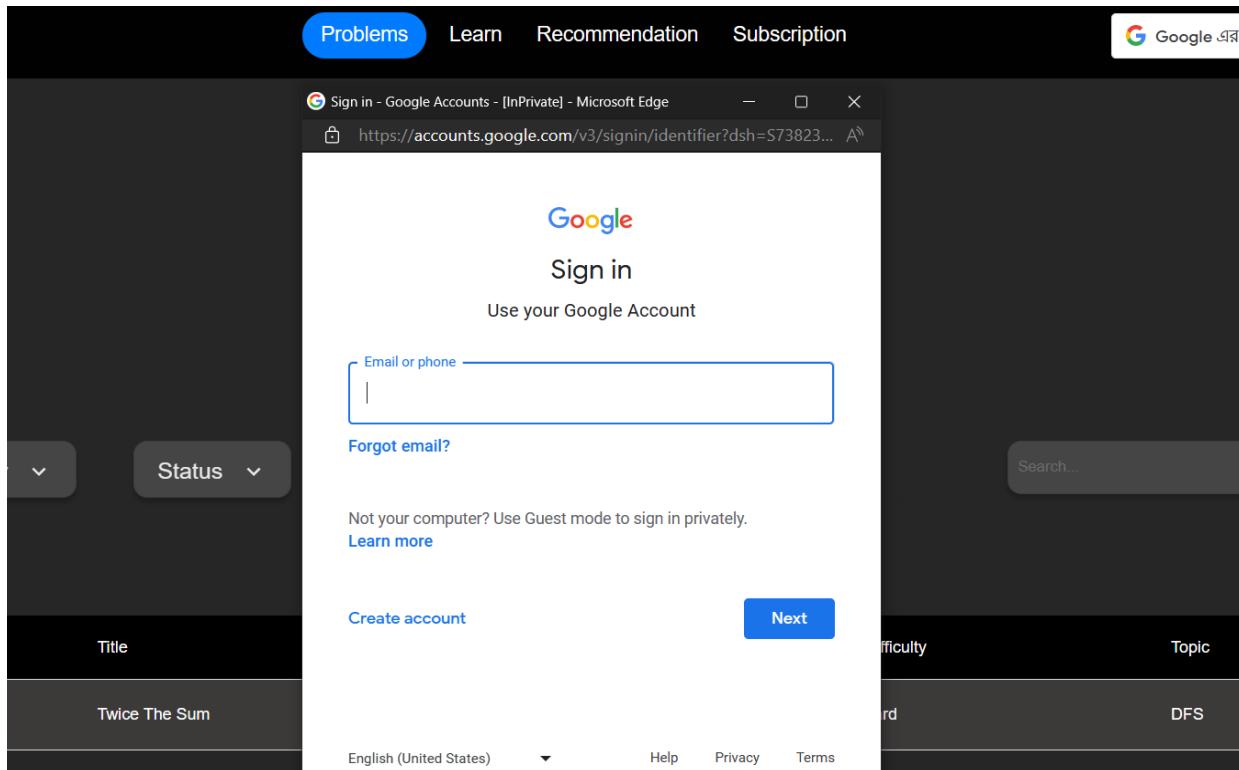
Difficulty ▾ Status ▾ Tag ▾ Premium ▾

Twice the Sum Q

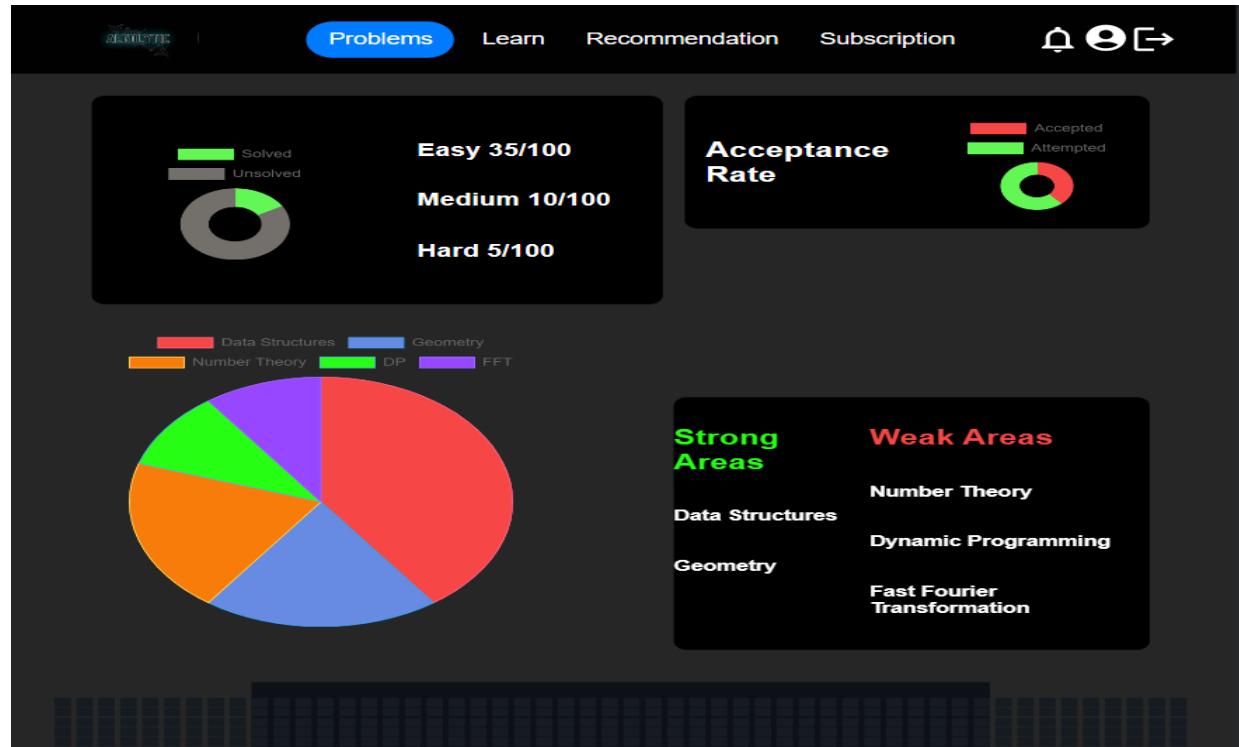
Status	Title	Acceptance	Difficulty	Topic
✓	Twice The Sum	100%	hard	Arithmetic
-	Twice The Sum	100%	hard	Arithmetic
✓	Twice The Sum	100%	hard	Arithmetic

Rows per page: 5 6-8 of 8 | < > |

Problems can also be searched and filtered



[There is a provision for Google authentication](#)



[Progress of a particular user is displayed](#)

The screenshot shows a coding environment with a dark theme. At the top, there are navigation links: Problems (highlighted in blue), Learn, Recommendation, and Subscription. On the right side, there are icons for notifications, user profile, and sharing.

The main area displays a problem titled "Twice The Sum" with a difficulty level of "DPS". Below the title is a description: "Take 4 Numbers as input, your output will be a number that is double the sum of those 4 numbers." A code editor on the right contains the following C++ code:

```
1 #include<iostream>
2 using namespace std;
3
4 int main(){
5     int s = 0;
6     int arr[4];
7
8     for(int i = 0; i < 4; i++) cin >> arr[i];
9
10    for(int i = 0; i < 4; i++) s += arr[i];
11
12    cout << 2*s;
13
14    return 0;
--
```

A "SUBMIT" button is located at the bottom of the code editor. To the right, under "Sample Input", is the text "10 2 22 1". Under "Sample Output", it shows "70" followed by the message "Accepted!!!".

A coding problem is submitted and an accepted verdict is given!

The screenshot shows a coding environment with a dark theme, similar to the first one. At the top, there are navigation links: Problems (highlighted in blue), Learn, Recommendation, and Subscription. On the right side, there are icons for notifications, user profile, and sharing.

The main area displays the same "Twice The Sum" problem and its description. A code editor on the right contains the following C++ code:

```
1 #include<iostream>
2 using namespace std;
3
4 int main(){
5     int s = 0;
6     int arr[4];
7
8     for(int i = 0; i < 4; i++) cin >> arr[i];
9
10    for(int i = 0; i < 4; i++) s += arr[i];
11
12    cout << 2*s + 1;
13
14    return 0;
--
```

A "SUBMIT" button is located at the bottom of the code editor. To the right, under "Sample Input", is the text "10 2 22 1". Under "Sample Output", it shows "70" followed by the message "Rejected!".

A coding problem is submitted and the solution is rejected!

The screenshot shows a user interface for a programming challenge. At the top, there are navigation links: Problems (highlighted in blue), Learn, Recommendation, and Subscription. On the right side, there are icons for notifications, user profile, and account settings.

The main area displays a list of submissions for a specific problem:

Description	Language
Accepted!	C++
Wrong Ans	C++
Accepted!	C++
Wrong Ans	C++
Wrong Ans	C++

On the right side, there is a code editor window containing C++ code:

```
1 #include<iostream>
2 using namespace std;
3
4 int main(){
5     int s = 0;
6     int arr[4];
7
8     for(int i = 0; i < 4; i++) cin >> arr[i];
9
10    for(int i = 0; i < 4; i++) s += arr[i];
11
12    cout << 2*s + 1;
13
14 }
```

Below the code editor is a "SUBMIT" button.

On the far right, there are sections for "Sample Input" and "Sample Output":

Sample Input
10 2 22 1

Sample Output
70

Rejected!

All the submissions of a particular problem by a certain user