



# UNIVERSITI TEKNOLOGI MALAYSIA

PRESENTATION SLIDE

FINAL YEAR PROJECT –  
TREE EXPLORER AUGMENTED REALITY  
(AR) APPLICATION

GOH YITIAN A20EC0038

presentation link:

<https://www.youtube.com/watch?v=kxmMglutmjA>

demo link: <https://www.youtube.com/watch?v=k350vRXT8pM>

*Innovating Solutions*



UTM JOHOR BAHRU

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## PROBLEM BACKGROUND

- Deforestation is a global environmental issue with numerous consequences such as climate change, loss of biodiversity, and soil erosion.
- Lack of understanding of the importance of trees is one of the main causes of deforestation.
- Cities are becoming more urbanized and developed, so planting trees to improve air quality and reduce urban heat islands is becoming increasingly important.
- Without addressing this problem, the negative effect of deforestation will continue to impact our planet.

# OBJECTIVES



## OBJECTIVE 1

To elicit the requirements from subject matter experts.

## OBJECTIVE 2

To design the augmented reality application for tree explorer.

## OBJECTIVE 3

To develop the application for tree explorer.

## OBJECTIVE 4

To conduct functional testing of the application.

# PROJECT SCOPE

- (a) Provide 3 different printed tree images, display the 3D tree model and enable the user to interact with the 3D tree model.
- (b) Provide gamification to attract the kids.
- (c) Subject matter expert will involve survey forms for several lecturers.
- (d) Target users are children and their parents.
- (e) The Scan AR function in the application only supports Android versions 13 and above.

# LITERATURE REVIEW



**01** AR LANDSCAPER



**02** QUIVER



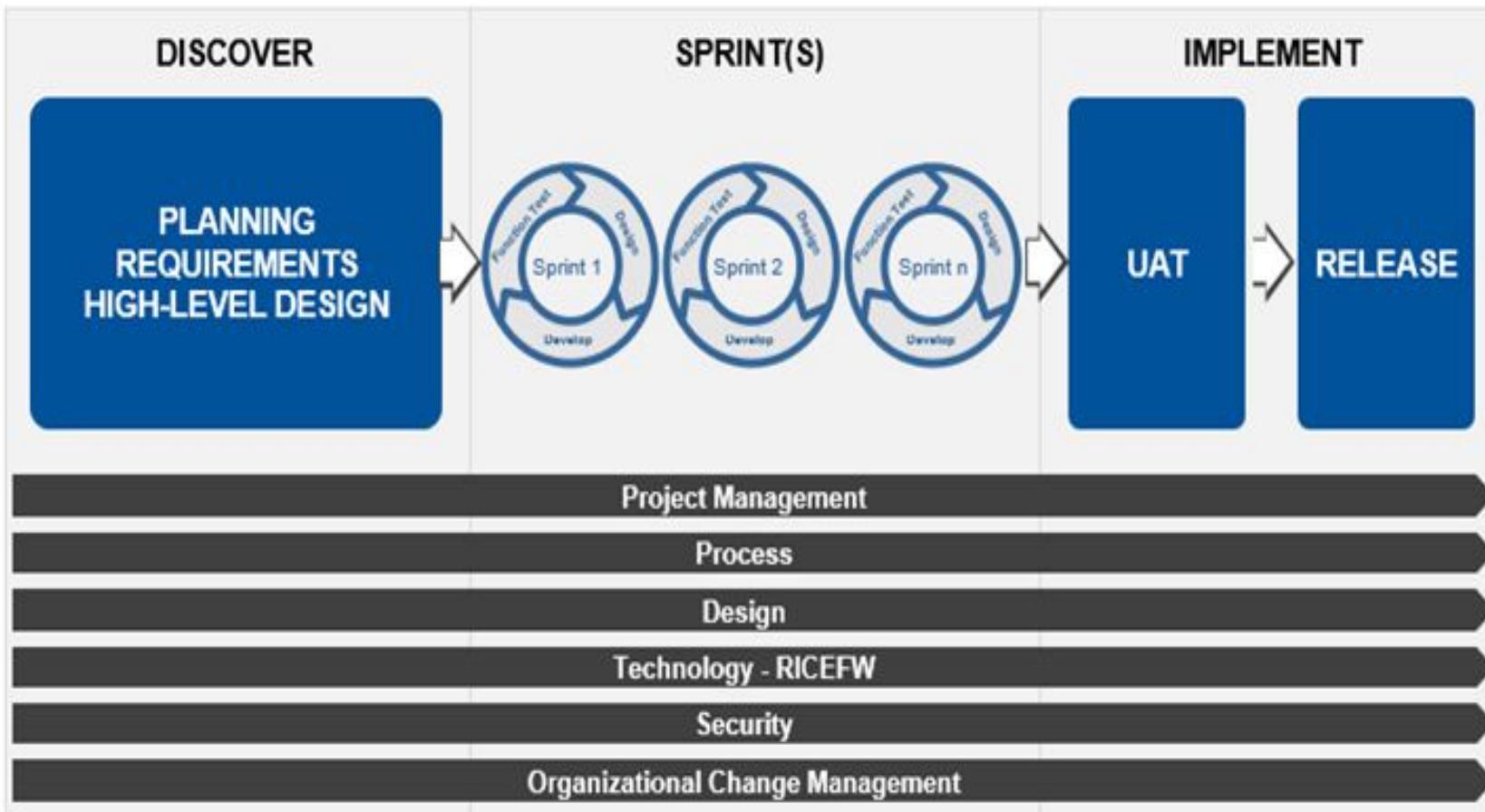
**03** TREE Explorer  
AUGMENTED REALITY  
(AR) APPLICATION

# COMPARISON OF SIMILAR SYSTEM

Features	AR Landscaper	Quiver	Tree Explorer AR App
Platform	Android & iOS	Android & iOS	Android
Target User	Normal user	Kids	Kids
AR technology	Markerless	Marker-based	Marker-based
Object Recognition	No	Yes	Yes
Interactivity	Yes	Yes	Yes
Gamification	No	No	Yes

# PROJECT METHODOLOGY

## HYBRID AGILE METHODOLOGY

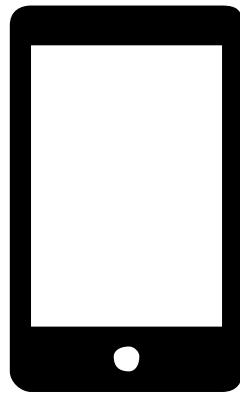




# SOFTWARE REQUIREMENTS



# HARDWARE REQUIREMENTS

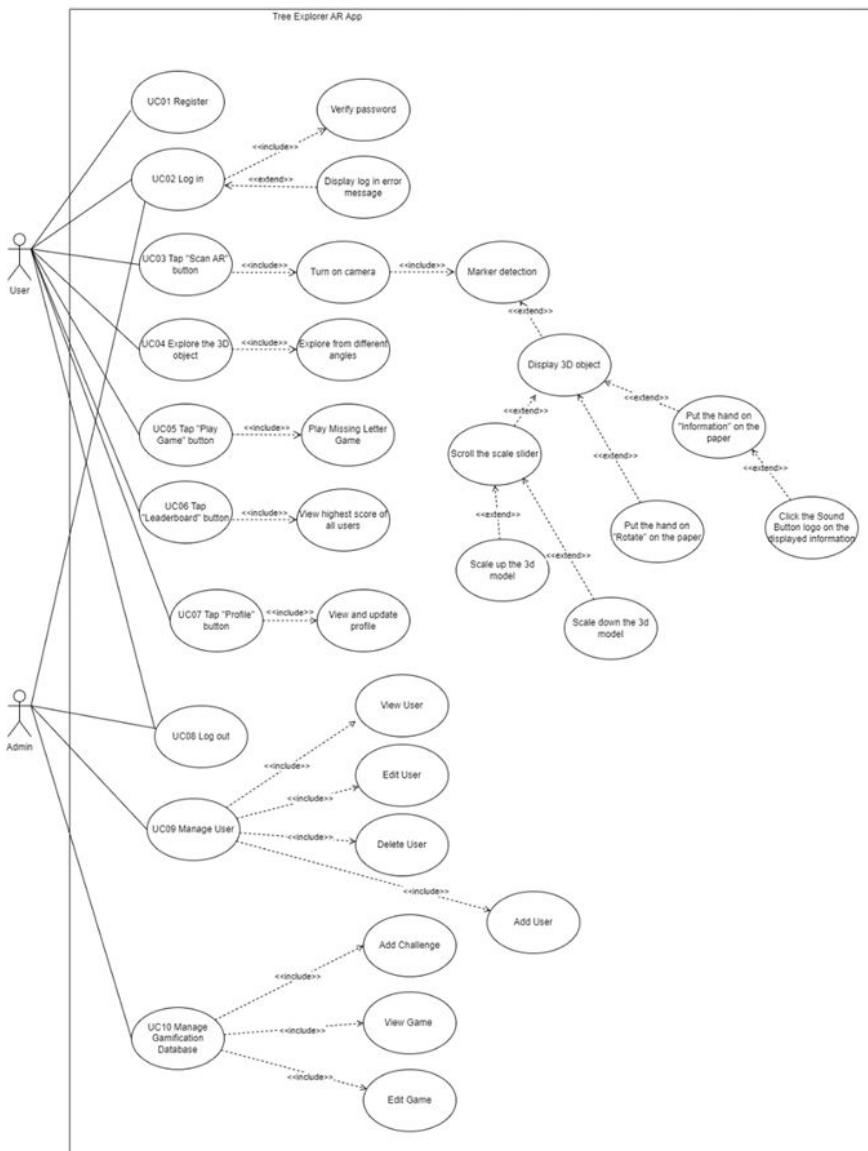


Testing



Development  
and  
Documentation

# FUNCTIONAL REQUIREMENTS



Use Case	Use Case Name	Description
UC01	Register	User can register using email and password to the system.
UC02	Log in	Existing user and admin can login to the system using email and password.
UC03	Tap “Scan AR” button	User can use the camera to scan the printed tree image and the system will display a 3D tree model based on the target image.
UC04	Explore 3D object	User can explore the 3D model to view it from different angles by moving the printed image, engage with the virtual button “information” by putting the hand on it, click the sound button on the screen to read out the text of information, engage with the virtual button “rotate” by putting the hand on it, the 3d model will rotate in 360 degrees, and lastly, scale up and down the size of 3D tree model by scrolling the slider.
UC05	Tap “Play Game” button	User can play the missing letter game by selecting the challenge. Once enter the game, the timer will start. The timer will start from 0 seconds and increase by the time. If the user selects the answer correctly within 10 seconds, the user will get 30 scores, within 20 seconds will get 20 scores, within 30 seconds will get 10 scores, within 40 seconds will get 5 scores, within 50 seconds will get 2 scores, exceed 50 seconds will only get 1 score. The user can repeat the game to get a better score.
UC06	Tap “Leaderboard” button	User can view the cumulative score and the rank of all users.
UC07	Tap “Profile” button	User can view and update profile, including profile picture, email, username, phone number, birthdate and gender.
UC08	Log out	User and admin can log out from the app.
UC09	Manage user	Admin can view, create, update and delete user from the system.
UC10	Manage game database	Admin can view, create, and update the database of missing letter game.

# NON-FUNCTIONAL REQUIREMENTS

- Usability: 95% of the users shall be able to perform tasks in the system without the need for training before completing them
- Performance: User interface (UI) evaluation. Assess the intuitiveness and ease of use of the application's menus, controls, and navigation within the virtual environment.
- Portability: The system shall be able to function on any Android mobile device with version 13.0 and above.
- Availability: The system shall be able to perform tasks 23 hours a day with maintenance time not exceeding 1 hour when needed.
- Security: The system shall provide data encryption and security rules to protect the user's data.

# REQUIREMENT PHASE-QUESTIONNAIRE

May I know Dr. name? (If feel free to say, no pressure)

2 responses

Dr alif ridzuan

NA

## Play Game Section

1. Select Challenge page

4 responses

Ok

Try to use colorful and striking colors to enhance visual appeal and user engagement

ok.

Not clear the image, should give hints

2. Play missing letter game page

4 responses

Ok

My suggestion is to make this layout more intuitive, making it easy for users of all ages to participate

ok.

ok

3. Answer correctly pop up dialog

4 responses

Ok

My suggestion is to add on animation, sound to make it more attractive and do use bold color.

ok.

ok

# REQUIREMENT PHASE-QUESTIONNAIRE

## 4. Answer wrongly

4 responses

Ok

My suggestion is to add on animation, sound to make it more attractive and do use bold color.

ok.

ok

## 5. View leaderboard

4 responses

Ok

Use contrasting colors for text and background to enhance readability, especially for important details like player names and scores. Next, try to make sure the leaderboard is responsive and looks good on all devices, including smartphones and tablets.

ok.

ok

## 6. Update profile page

4 responses

Ok

My suggestion is to add on button/function edit/upload profile image.

ok. make sure have input validation.

ok

# REQUIREMENT PHASE-QUESTIONNAIRE

1. Scan printed mangrove tree image, the slider below is use to scale the size of tree model

3 responses

Ok

ok.

ok

2. When "information" virtual button on the paper is press, the information of the tree will be displayed. User can click the sound button on the bottom right of the information and the system will read out the information text.

4 responses

Maybe can change font. And also change from all uppercase fonts to sentence font for easier reading of information

Do change the font selection, do use sentence case. It is hard to read with this type of font and style.

ok.

ok

3. Another AR model

3 responses

Ok

ok.

ok

Other suggestion

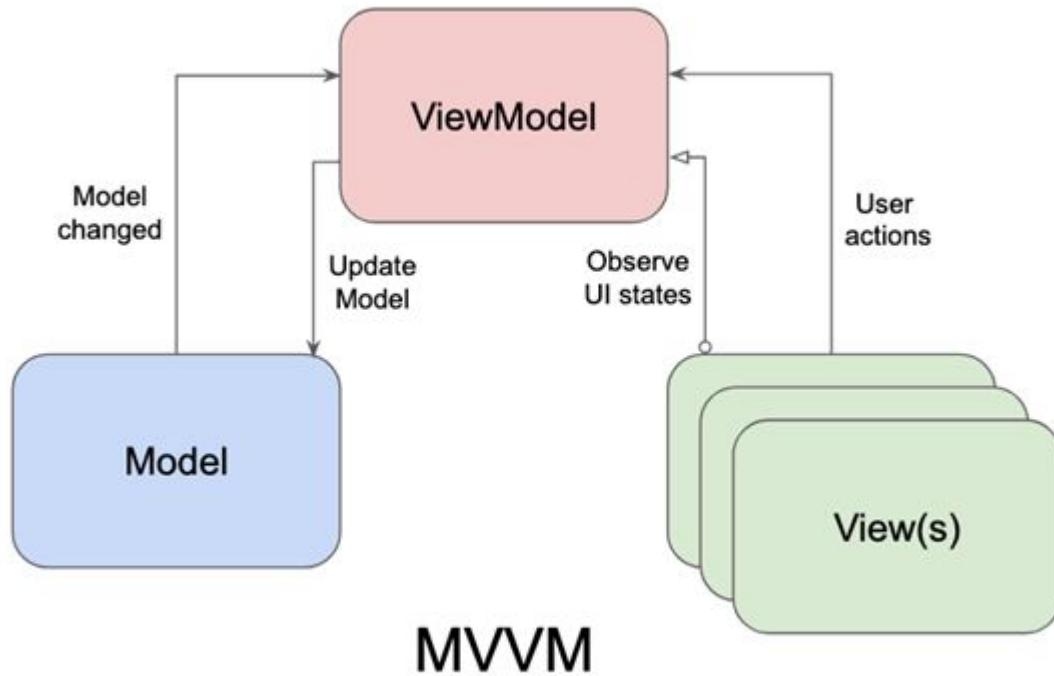
2 responses

ok.

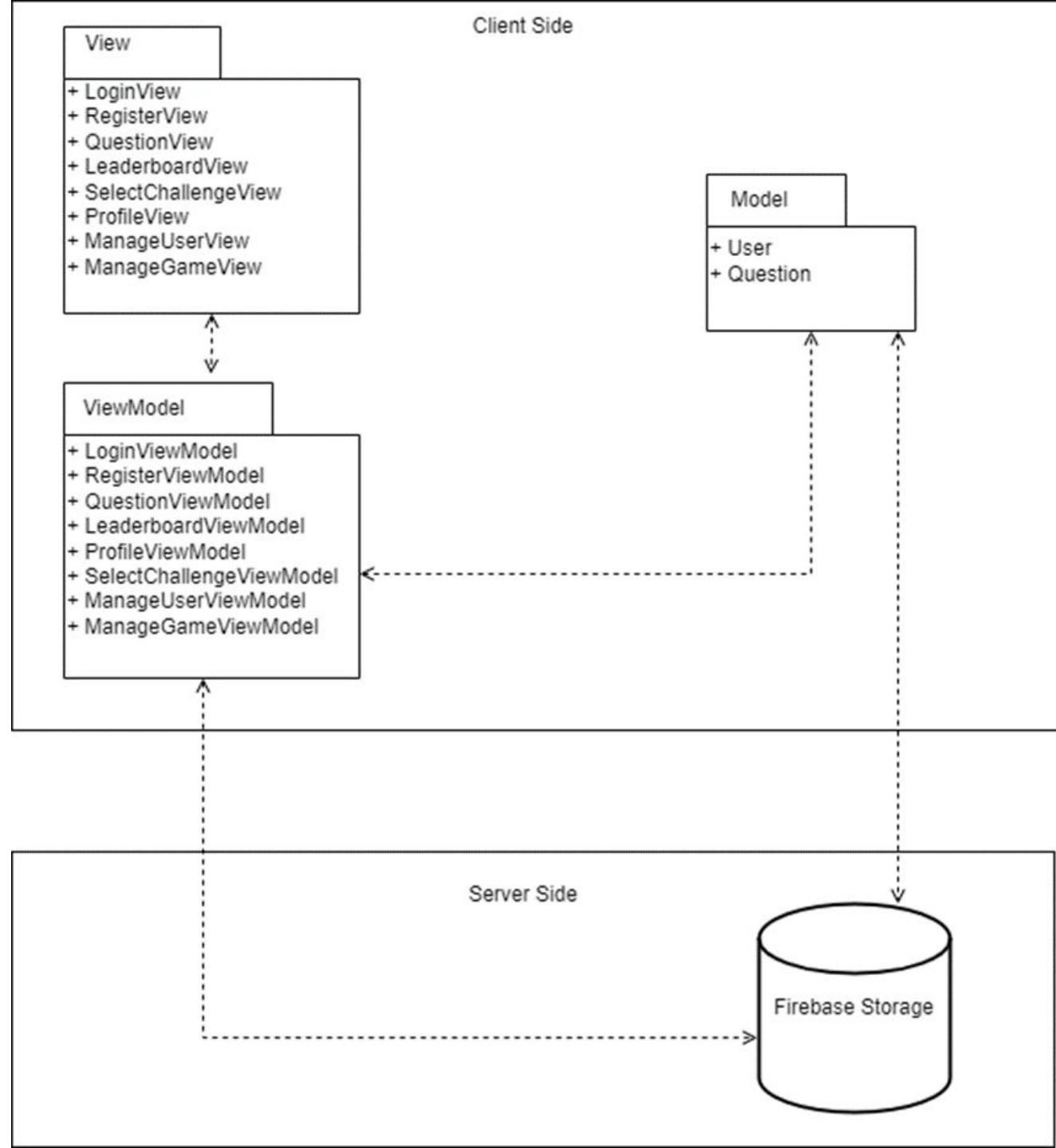
NA

Thank you very much for your time.

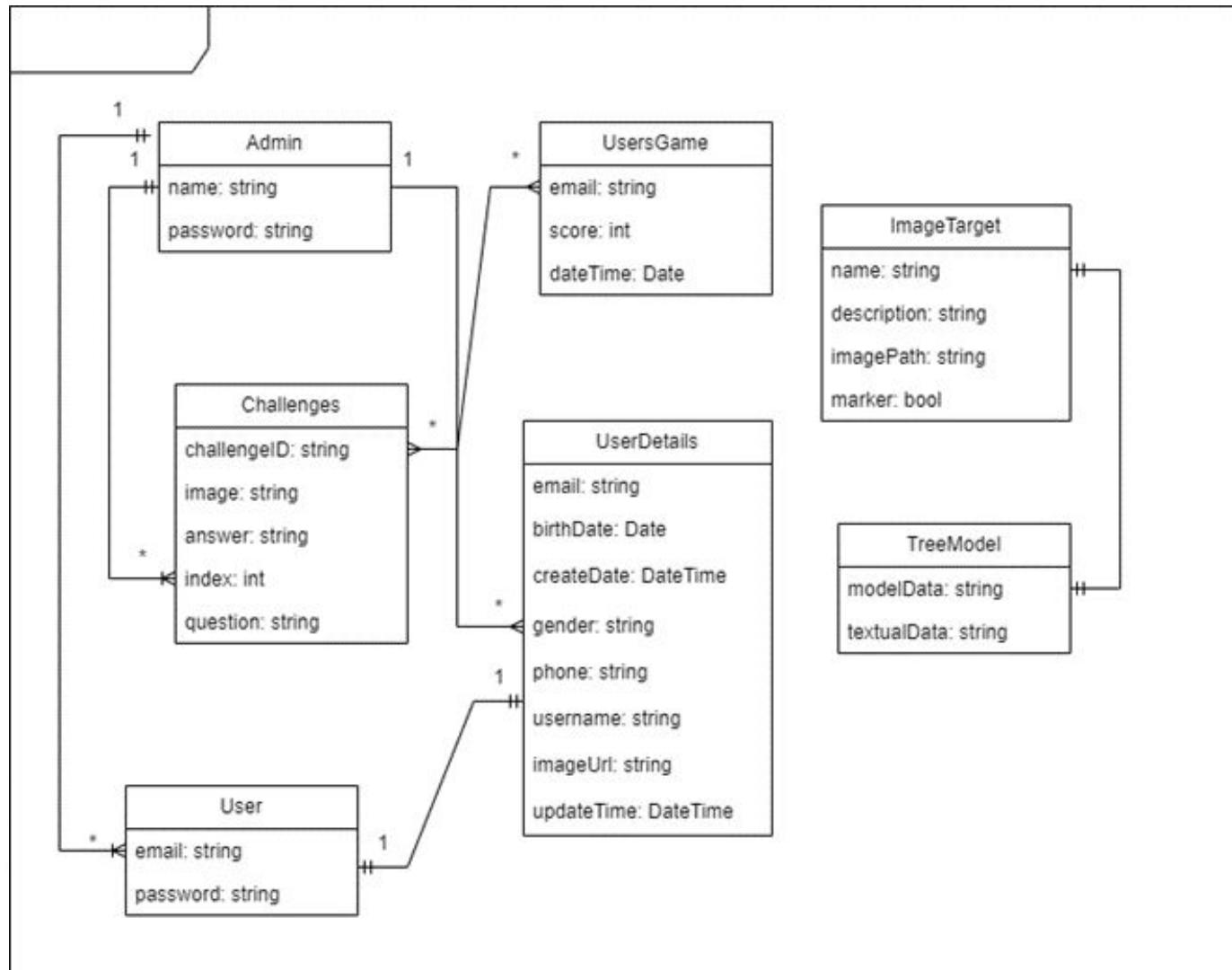
# SYSTEM ARCHITECTURE DESIGN



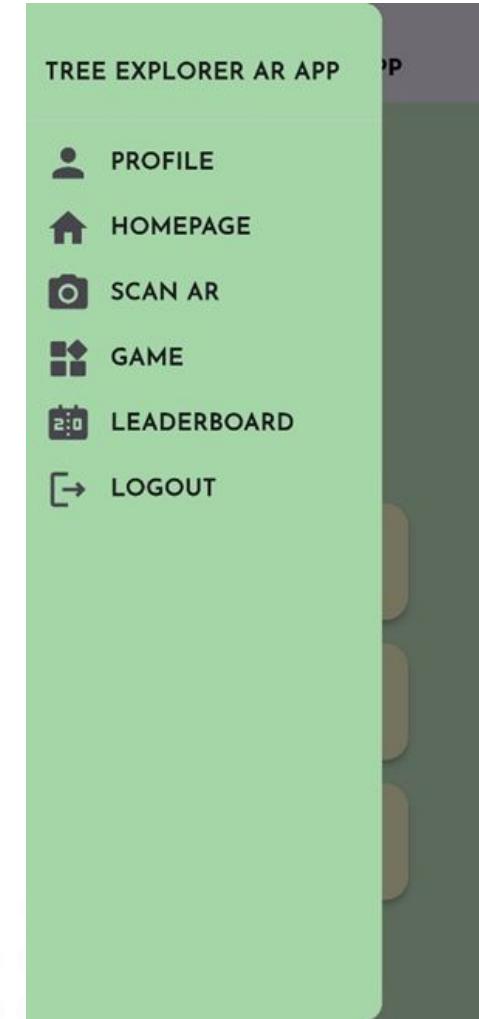
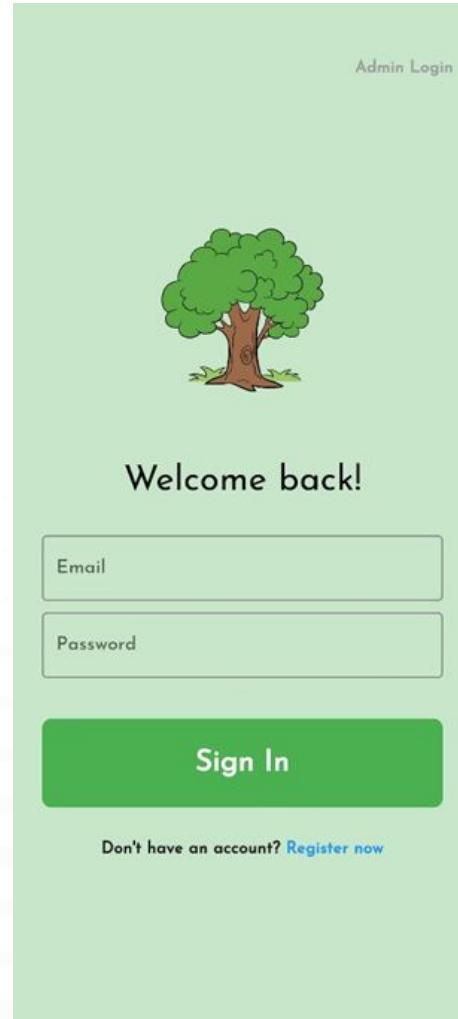
- The Model layer handles data information retrieved by the ViewModel from the Firebase database services.
- The View layer is responsible for displaying information to the user, managing how data appears on the user interface, and controlling interactions between the displayed information and the user.
- The ViewModel layer transforms information from the Model layer and transfers it to the View layer to make it visible to the user.



# DATABASE DESIGN



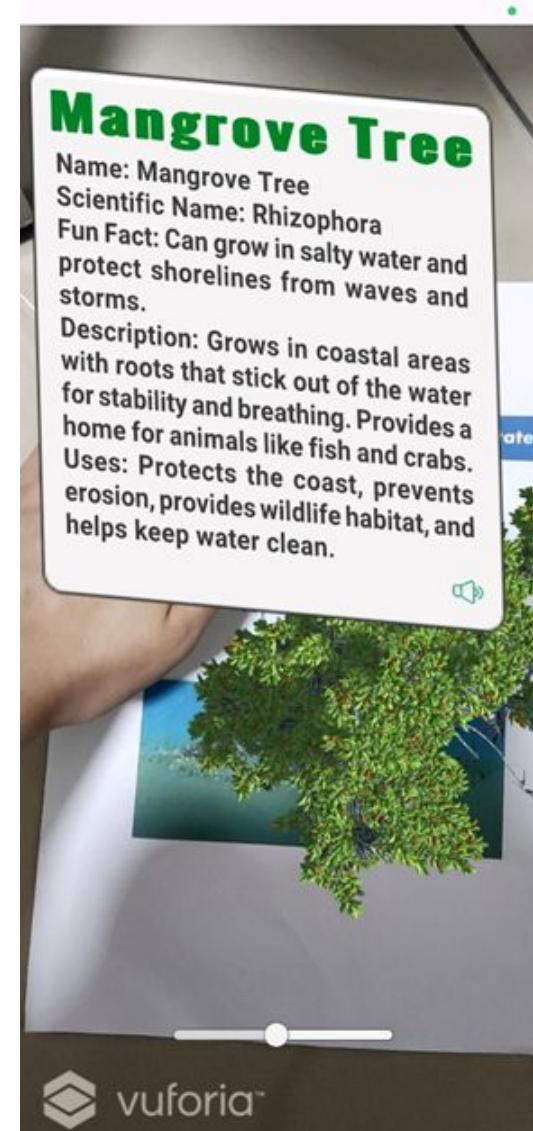
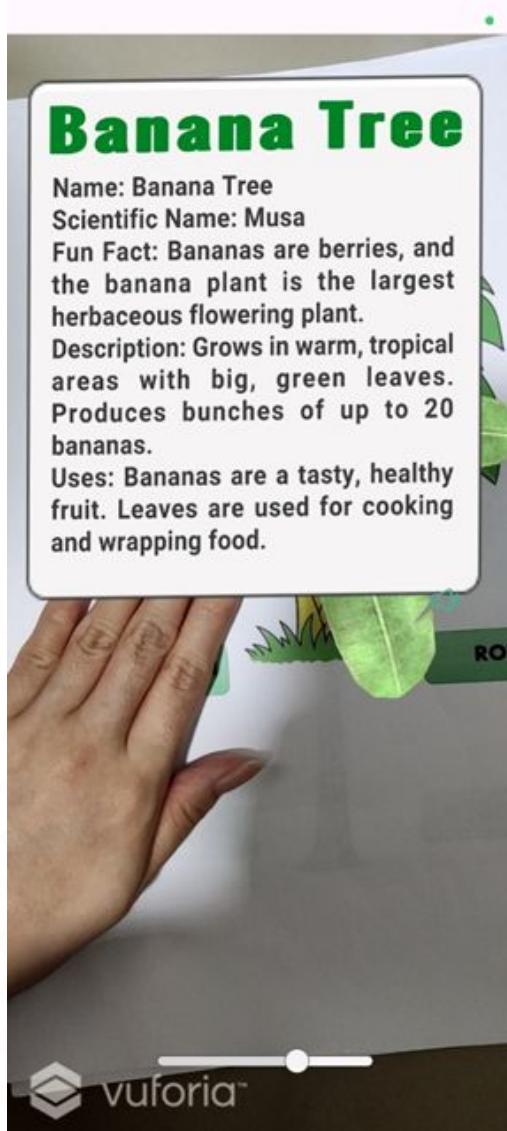
# INTERFACE DESIGN (USER)



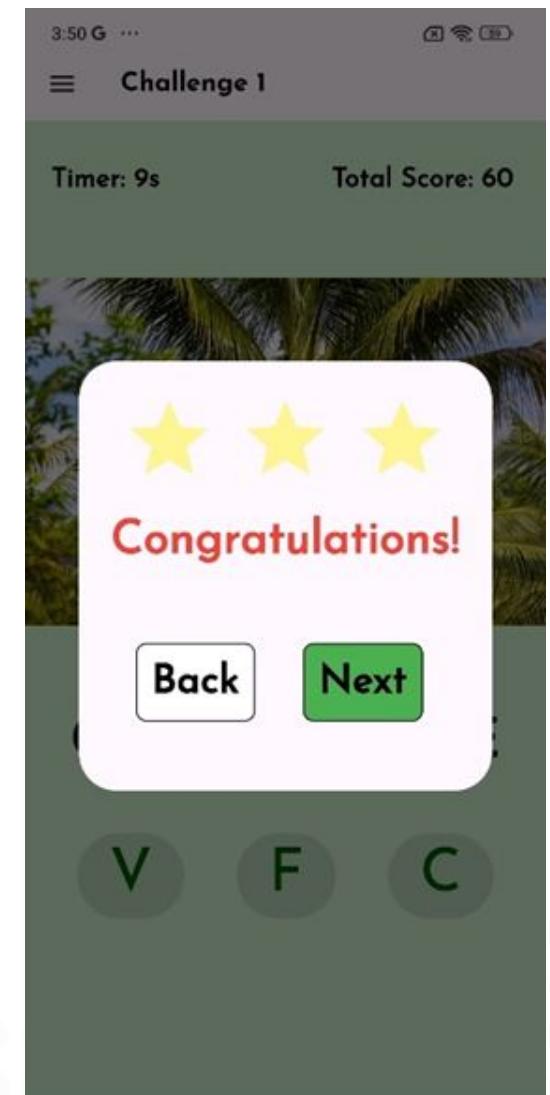
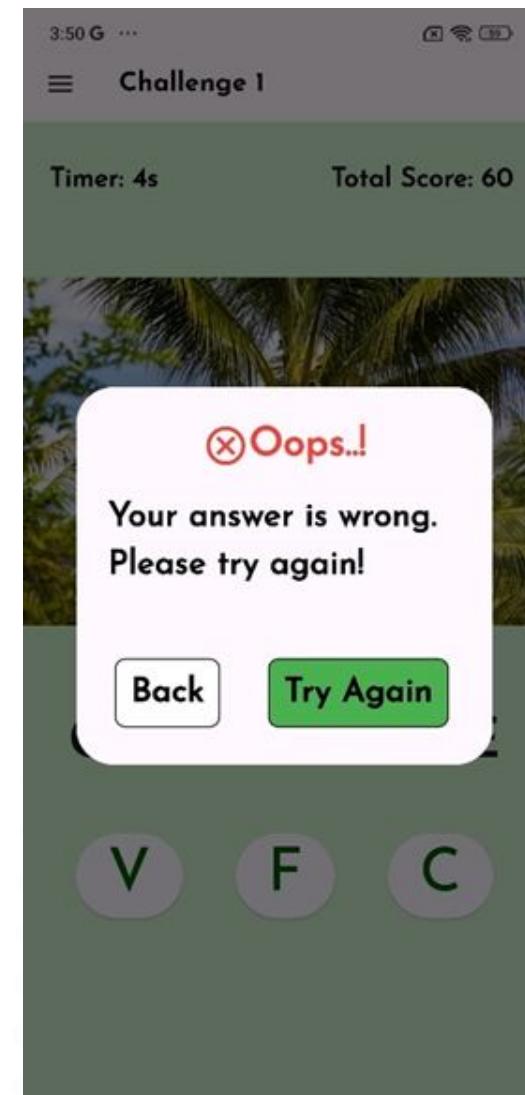
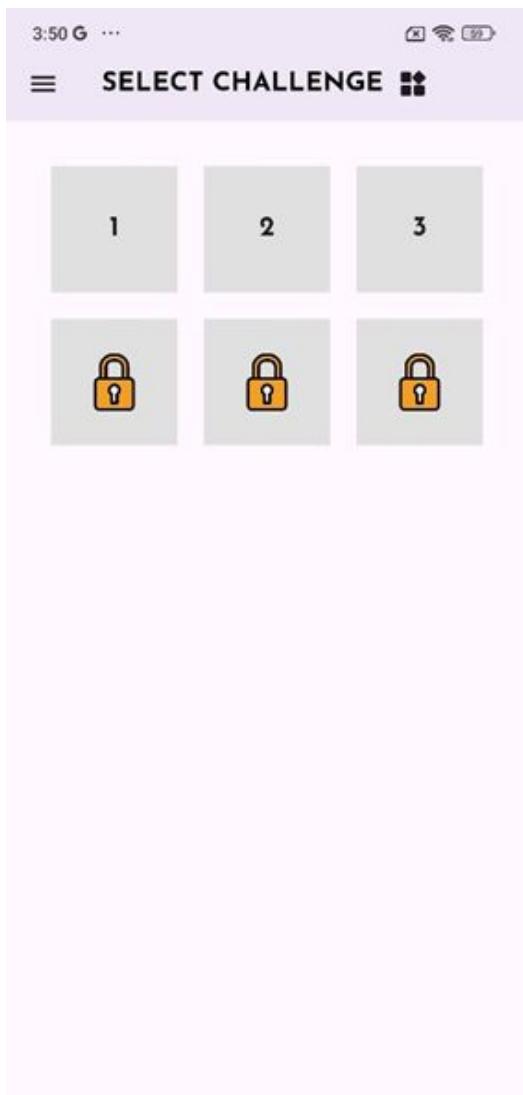
# INTERFACE DESIGN (USER)



# INTERFACE DESIGN (USER)



# INTERFACE DESIGN (USER)



# INTERFACE DESIGN (USER)

3:49 G ...

≡ PROFILE 

Upload profile image



Email

yitian@gmail.com

Username

yitian

Phone Number

 +60 11-2369 5080

Birth Date

2024-06-29

Gender

Female

Update Profile

...

3:49 G ...

≡ PROFILE 

Email

yitian@gmail.com

Username

yitian

Phone Number

 +60 11-2369 5080

Birth Date

2024-06-29

Gender

Female

Update Profile

...

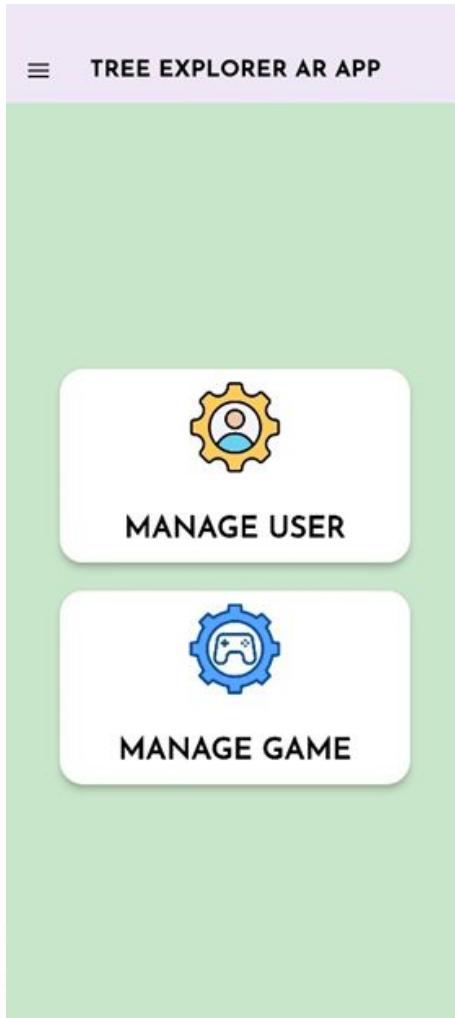
3:50 G ...

≡ LEADERBOARD 

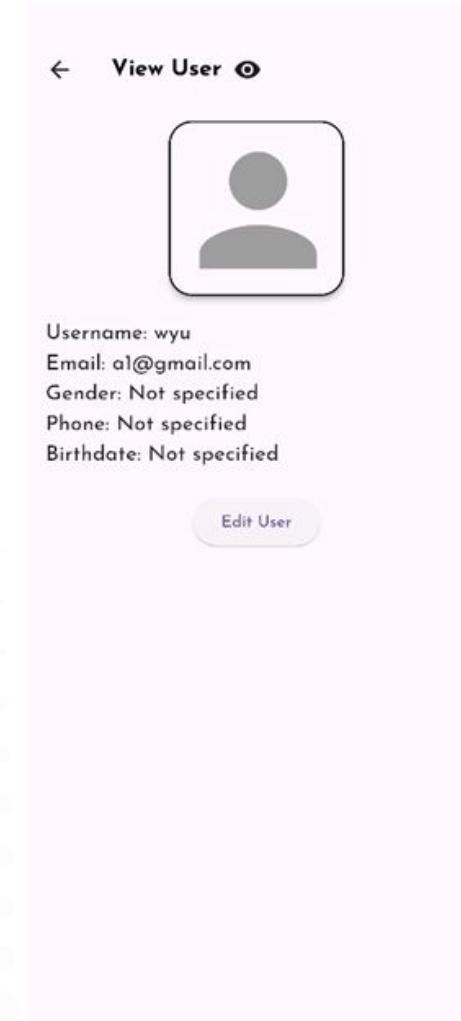
Rank	User	Total Score
1	abc	150
2	t*****2@gmail.com	150
3	Cy	150
4	qq	61
5	abab	60
6	qq@gmail.co m.my	60
7	yitian	60
8	wyu	30
9	eee	20
10	eq	0
11	f*****a@gmail.com	0
12	f*****2@gmail.com	0
13	Tan Yi Beng	0
7	yitian	60

...

# INTERFACE DESIGN (ADMIN)



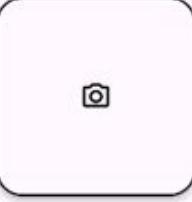
Manage User			
al@gmail.com			
ab@gmail.com			
abc@gmail.com			
eee@test.com			
eqq@gmail.com			
felicia@gmail.com			
felicic0712@gmail.com			
qq@gmail.com			
qq@gmail.com.my			
test4@gmail.com			
test5@gmail.com			
tester1@gmail.com			
tester2@gmail.com			
tester3@gmail.com			



# INTERFACE DESIGN (ADMIN)

← EDIT USER PROFILE 

Update user's profile image



Email

Username

Phone Number

 +60

Birth Date

Gender

← Manage User +

a1@gmail.com	 
ab@gmail.com	 
abc@gmail.com	 
eee@test.com	 
eqq@gmail.com	 
feli	 
qqq@gmail.com	 
test4@gmail.com	 
test5@gmail.com	 
tester1@gmail.com	 
tester2@gmail.com	 
tester3@gmail.com	 

 Disable User

Are you sure you want to disable this user?

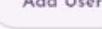
 

← Add User

Username

Email

Password



# INTERFACE DESIGN (ADMIN)

← Manage Games +

coconut tree	
palm tree	
papaya tree	
mangrove tree	
hibiscus	
Apple	

← View Game ✎



Question: papaya tree  
ANSWER: Y  
Index hided: 5

Edit Game

≡ Edit Game ✎

Upload the game image



Question

papaya tree

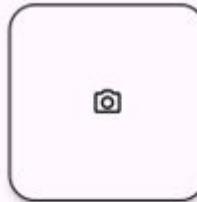
Index of the letter to be hidden (1, 2, 3, ...)

5

Update Game

≡ Add Challenge

Upload the quiz image



Word

Enter Question

Index of the letter to be hide (1, 2, 3, ...)

Enter the index of the letter to be h...

Add

# Test Case Design

Test Case ID:	TC01	Test Case Description:	Register an user in Tree Explorer Augmented Reality (A)
Created By:	Goh Yitian	Reviewed By:	

#	Prerequisites
1	App installed in device
2	Have stable network connection
3	Using Android phone

#	Test Data
1	email = yitian@gmail.com
2	password = test123
3	confirm password = test123

## Test Case Steps

Steps	Details	Expected Result	Actual Result	Pass/Fail
1	Open app	The App is launch successfully	The App is launch successfully	Pass
2	Click on Register button	Redirect to register page	Redirect to register page	Pass
3	Enter email	Email is entered	Email is entered	Pass
4	Enter password	Password is entered	Password is entered	Pass
5	Enter confirm password	Confirm password is entered	Confirm password is entered	Pass
6	Click on Register button	Show register successfully message and redirect to login page	Show register successfully message and redirect to login page	Pass

#	Test Data
1	email = yitian@gmail.com
2	password = test123
3	confirm password = test321

## Test Case Steps (with incorrect confirm password)

Steps	Details	Expected Result	Actual Result	Pass/Fail
1	Open app	The App is launch successfully	The App is launch successfully	Pass
2	Click on Register button	Redirect to register page	Redirect to register page	Pass
3	Enter email	Email is entered	Email is entered	Pass
4	Enter password	Password is entered	Password is entered	Pass
5	Enter incorrect confirm password	Confirm password is entered	Confirm password is entered	Pass
6	Click on Register button	Show confirm password is incorrect message.	Show alert dialog with message "Passwords do not match. Please confirm your password."	Pass

#	Test Data
1	email = yitian@gmail.com
2	password = test123
3	confirm password = test123

## Test Case Steps (with used email)

Steps	Details	Expected Result	Actual Result	Pass/Fail
1	Open app	The App is launch successfully	The App is launch successfully	Pass
2	Click on Register button	Redirect to register page	Redirect to register page	Pass
3	Enter used email	Email is entered	Email is entered	Pass
4	Enter password	Password is entered	Password is entered	Pass
5	Enter confirm password	Confirm password is entered	Confirm password is entered	Pass
6	Click on Register button	Show email is invalid message and prompt user to enter again.	Show alert dialog with message "The email address is already in use."	Pass

#	Test Data
1	email = yitian@com
2	password = test123
3	confirm password = test123

## Test Case Steps (with invalid email format)

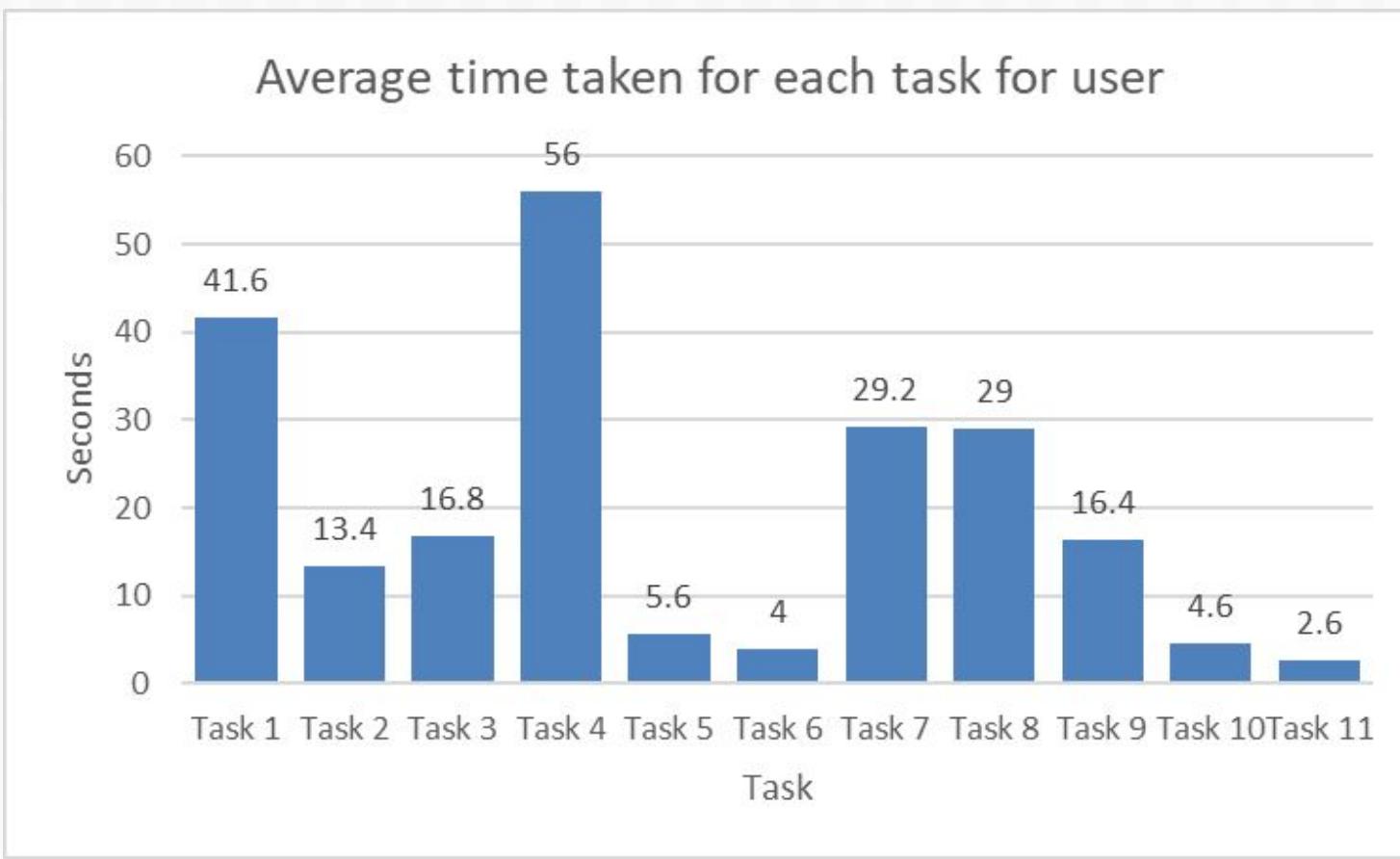
Steps	Details	Expected Result	Actual Result	Pass/Fail
1	Open app	The App is launch successfully	The App is launch successfully	Pass
2	Click on Register button	Redirect to register page	Redirect to register page	Pass
3	Enter invalid email format	Email is entered	Email is entered	Pass
4	Enter password	Password is entered	Password is entered	Pass
5	Enter confirm password	Confirm password is entered	Confirm password is entered	Pass
6	Click on Register button	Show email is invalid message and prompt user to enter again.	Show alert dialog with message "Invalid email address. Please enter a valid email."	Pass

# User Acceptance Testing (UAT)

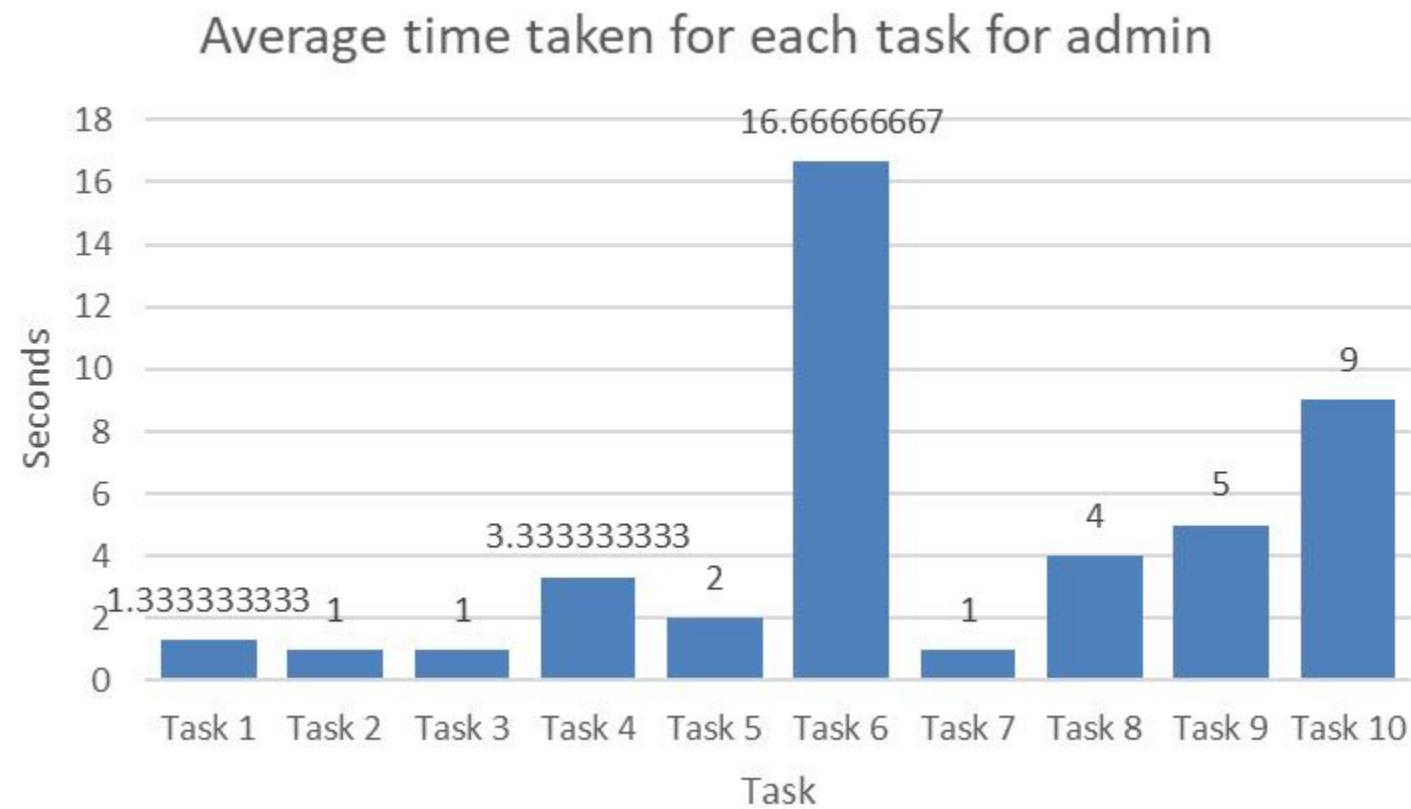
Task	Description	Time taken (seconds)
1	Register account with valid email and password	
2	Login to Tree Explorer AR App	
3	Scan the image target in “Scan AR” page and move the image to view the tree model from different angles	
4	While scanning the image, put the hand at “Information” virtual button and click the sound button on the screen to play the speech of text	
5	While scanning the image, put the hand at “Rotate” virtual button and observe the tree rotation	
6	Scroll the slider bar below to scale up and scale down the tree model	
7	Change the image target and scan again	
8	Update user’s profile at profile page	
9	Select challenge and play the missing letter game by selecting the option	
10	View the leaderboard	
11	Logout from the system	

Task	Description	Time taken (seconds)
1	Login to Tree Explorer AR App as admin	
2	Click manage user to see all active users in the database	
3	Click the view icon to view the user details	
4	Click the edit icon and update user details	
5	Click the bin icon to disable user’s account	
6	Click the plus icon and add user using username, email and password	
7	Click manage game to see all challenges in the database	
8	Click the eye icon to view the game details	
9	Click the pen icon and update game details	
10	Click the plus icon and add new challenge with image, words and index to be hide	
11	Log out from the system	

# User Acceptance Testing (UAT)



# User Acceptance Testing (UAT)



# System Reviews

Rating				
Totally disagree	Disagree	Neutral	Agree	Totally agree
1	2	3	4	5

Review	Description	Rating				
		1	2	3	4	5
1	It is easy and convenient to use the application	1	2	3	4	5
2	It is easy to remember on how to use the application	1	2	3	4	5
3	The application behaves in a way that I can understand	1	2	3	4	5
4	I am comfortable with the user interface design of the application	1	2	3	4	5
5	The functionalities in the application are sufficient for its intended use	1	2	3	4	5
6	The application is suitable for the children	1	2	3	4	5
7	The application run smoothly	1	2	3	4	5
8	The application does not stop or crash unexpectedly	1	2	3	4	5
9	It is easy to restart the application if it stops	1	2	3	4	5

# Project Limitations and Recommendations

## Limitations:

- Did not provide increased difficulties over the challenges
- Scan AR function only support phone with Android version 13 and above
- No background music or sound effect for the missing letter game
- No reset password function

## Recommendation:

- Provide increased difficulties on the increased level of missing letter game.
- Provide more language on display the information of tree.
- Add the background music and sound effect for the missing letter game.
- Provide reset password function so the user can reset the password when forgot.

# CONCLUSION

## ADVANTAGES



Provide augmented reality experience to the user



Help the user familiar with types of tree in Malaysia



Learning through game

## DISADVANTAGES



Only support Android version 13 and above



AR experience only through printed image target, do not provide markerless planting experience



# THANK YOU

PRESENTED BY GOH YITIAN



[utm.my](http://utm.my)



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[utmofficial](https://www.instagram.com/utmofficial)

Kerana Tuhan untuk Manusia