

Air University Islamabad

**Software Design Description
(SDS DOCUMENT)**

for

**Machine Learning-Based Prediction of PTSD by Analyzing
Textual Data**

Version 1.0

By

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Supervisor



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Bachelor of Science in Information Technology (2019-2023)

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Supervisor Meeting Log:

	Discussion	Task Assignment	Supervisor Signature
Meeting 01 Date: <u>29-11-2022</u>	Discussion on ERD diagram, procedural vs. object-oriented approach, which model would be best, as well as on how and which model should be implemented on found dataset.	Complete SDD Document, front-end and do some research on Machine Learning Models.	
Meeting 02 Date: <u>01-12-2022</u>	Discussed the diagrams, frontend technologies that we will be using as well as what to do next.	The task was to complete and submit the SDD as on time by improving the given dimensions.	

Application Evaluation History

Comments (by committee) *Include the ones given at SRS time both in doc and presentation	Action Taken
Scope components not addressed.	addressed
1 use case, at least 13 or 30 should be there.	34 use cases now
FRs is less, modules are not properly defined, and NFR needs revision.	34 FR, modules properly defined, NFR revised
Wrong product perspective, don't work on Accuracy.	corrected
Add prescriptions by PTSD Checker, others: option can be given other than 3-5 checkboxes in which doctor can write by himself in Q/A, Patient interaction should be there.	added

Supervised by

Supervisor's Name: Sir Tariq



Signature_____

1. Design Methodology and Software Process Model

The choice of design methodology is an object-oriented approach because our project is based on the concept of objects and the software process model is agile methodology with Kanban approach. Kanban is an agile framework used by software development teams to organize their work flow.

1.1 Design Methodology justification

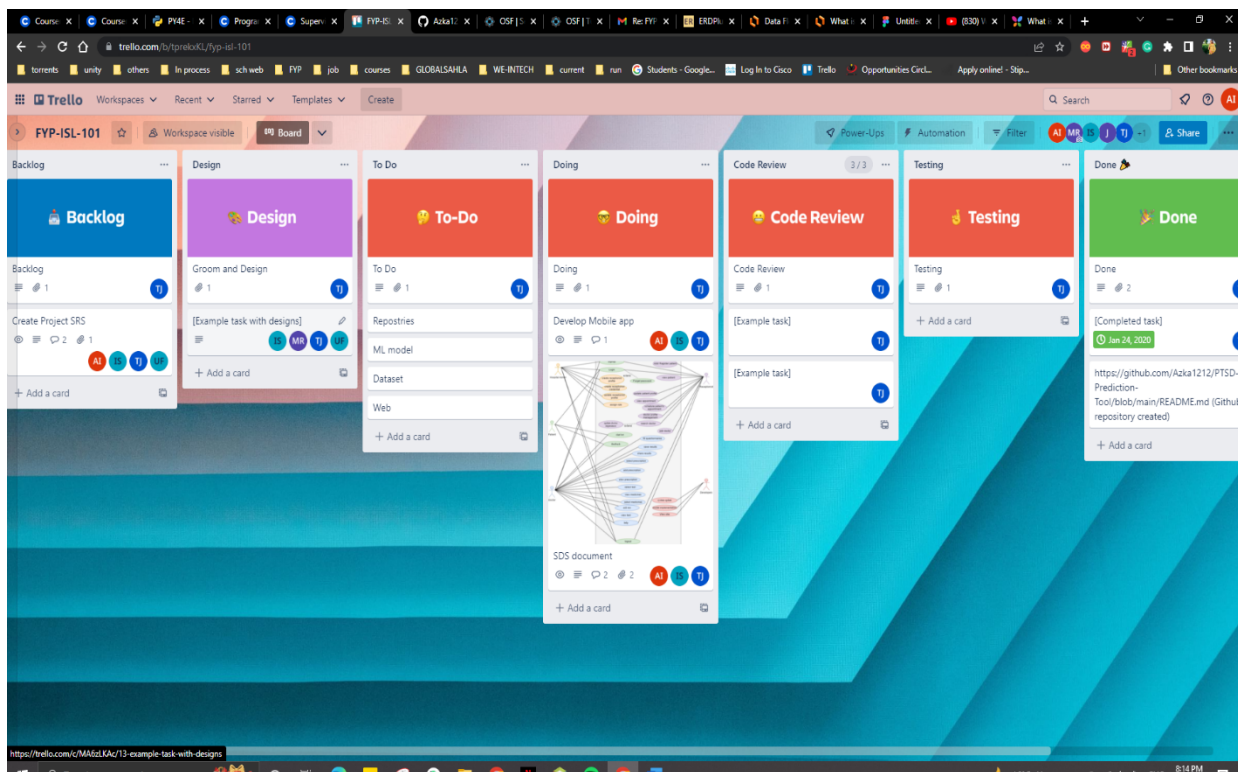
In the PTSD predictor platform, the ML model that we are going to implement will also be considered as an object. Objects will contain data in the form of attributes and code in the form of method. In object-oriented programming, computer programs are designed using the concept of objects that interact with the real world. As of our project will be divided into small parts called objects e.g., PTSD checker, login, signup etc. We are following a bottom-up approach same as object-oriented design. We will have access specifiers like private, public protected in object oriented. Data will be considered as more important than functions. The concept of data abstraction is also included.

Languages that we will use majorly are: Python, web technologies e.g., HTML, CSS, Bootstrap, Flask.

1.2 Software process model justification

We are using agile methodology as a software process model with Kanban approach. Agile mostly is used when the project's requirements are not static and continuous feedback of the client is entertained. Same is the case here, the university does give feedback after every defense and we change things accordingly. Kanban approach is used when the project is long term and there are no specific deadlines. In case of FYP projects the deadlines are announced by the university, there are no specific deadlines and the project is three semesters long. In our software development team with collaboration of 10pearls, we are using virtualizing the entire project with board (Trello) to increase the object transparency and collaboration between members.

Here I have pasted the screenshot of the proof that we are using the Kanban approach.



2. Data Design

Explain how the information domain of your system is transformed into data structures. Describe how the major data or system entities are stored, processed, and organized.

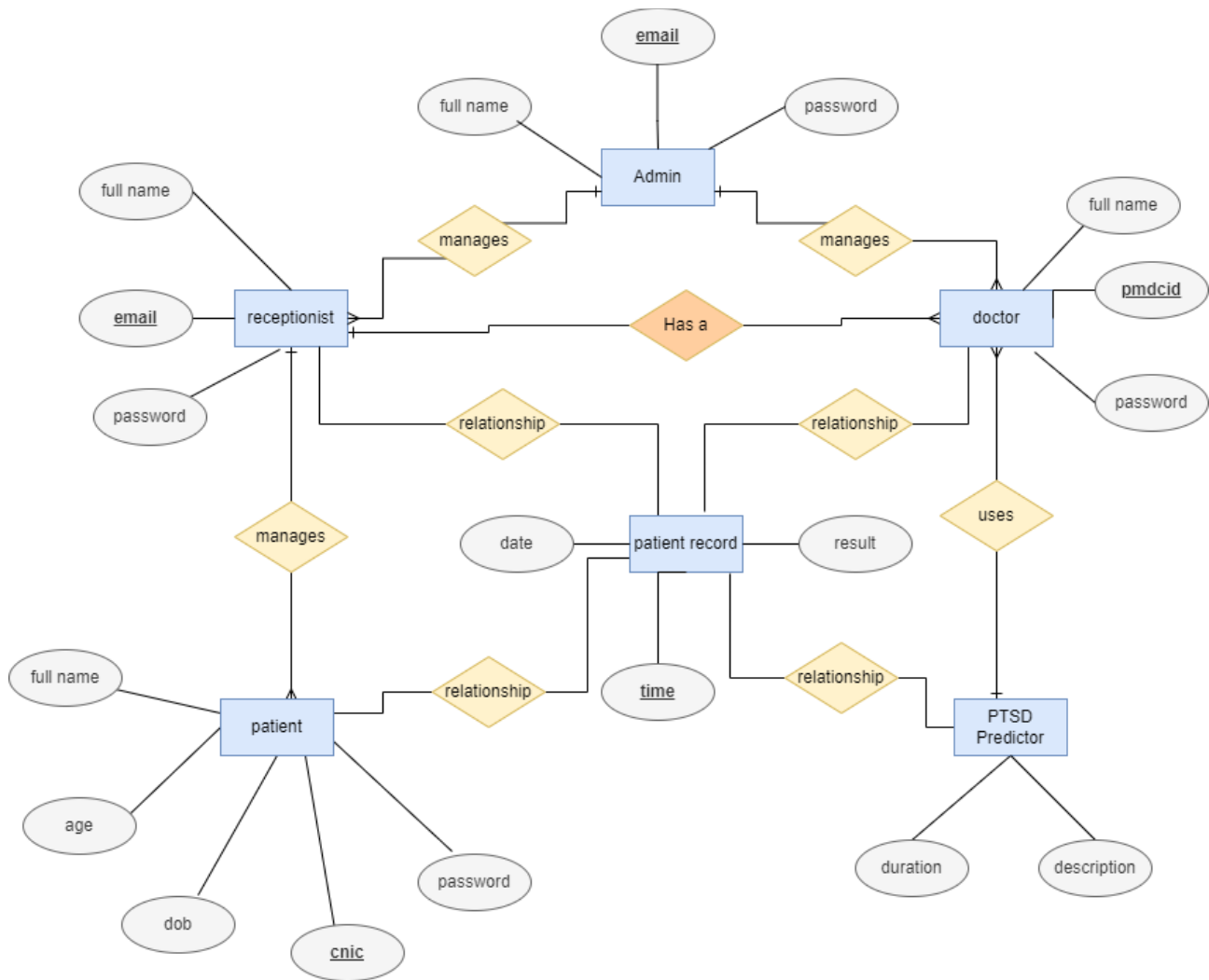
2.1 Data Dictionary

Alphabetically list the system entities or major data along with their types and descriptions (list the entity and its attributes)

Entity	Attribute
Doctor	Email, Password, F-name, PMDC-number
Admin	Name, admin-password, Admin-id
Receptionist	F-name, title, Receipt-no
Patient	CNIC, f-name, l-name, age, Email, Password, Date-of-admission, Date-of-birth
Patient Record	Date, Result, Time
PTSD predictor	Test-id, Duration, Description

2.2 Entity relationship diagram (ERD)

Proper and complete ERD of our FYP.



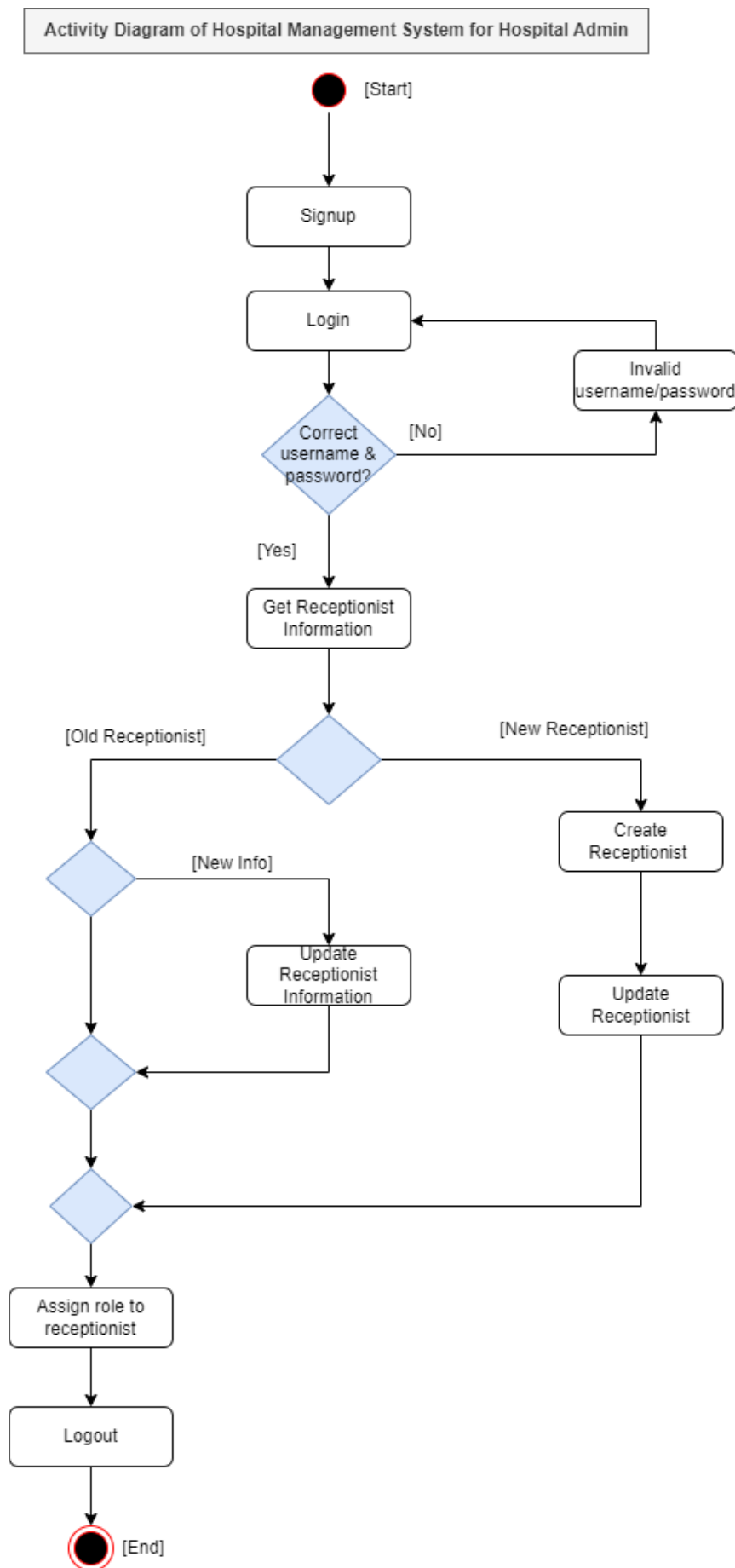
3. Design Models

Create design models as are applicable to your system. Provide detailed descriptions with each of the models that you add. Also ensure visibility of all diagrams. see Appendix.

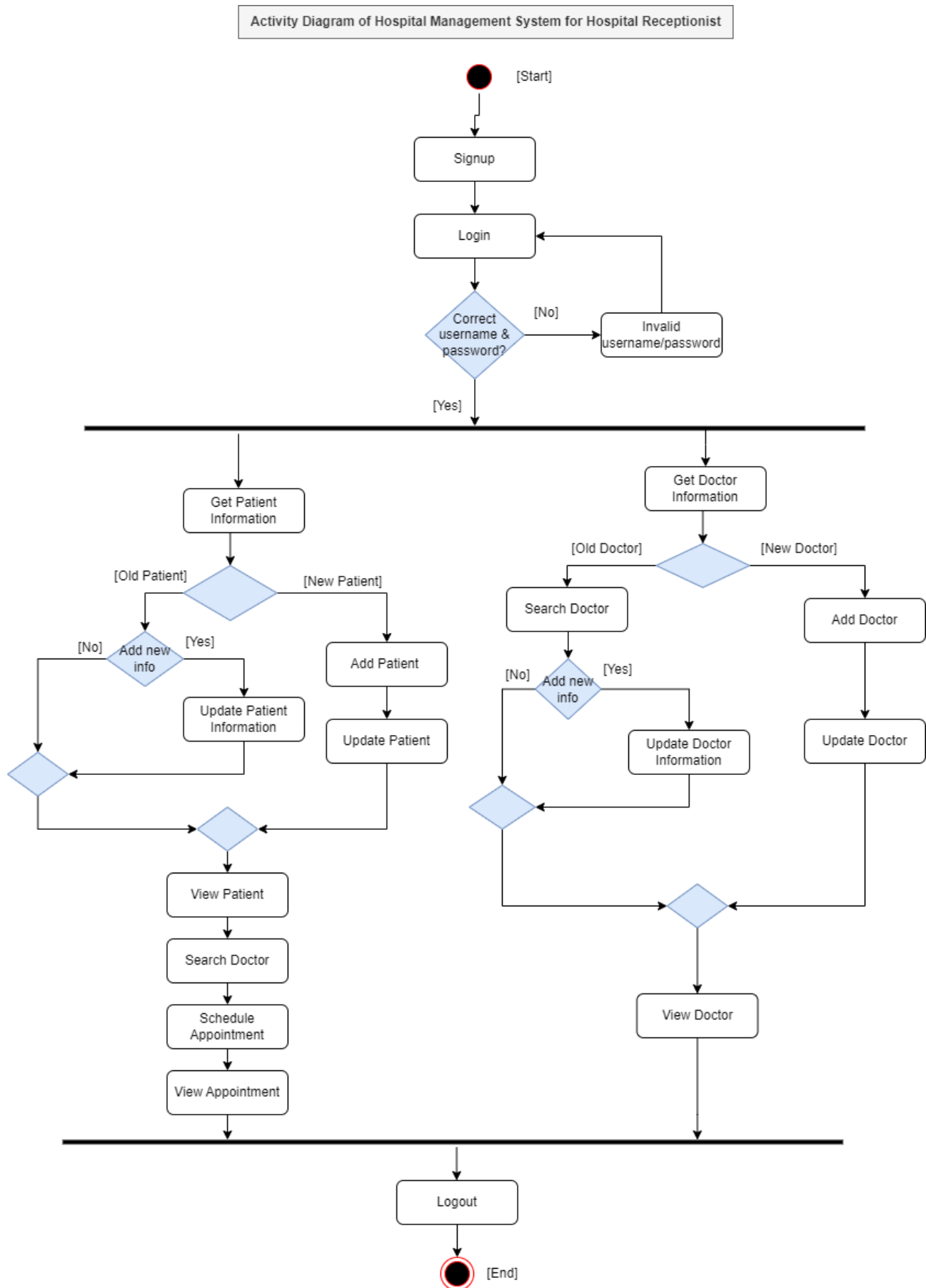
The applicable models for the project using object-oriented development approach may include:

- Activity Diagram [4 Only]

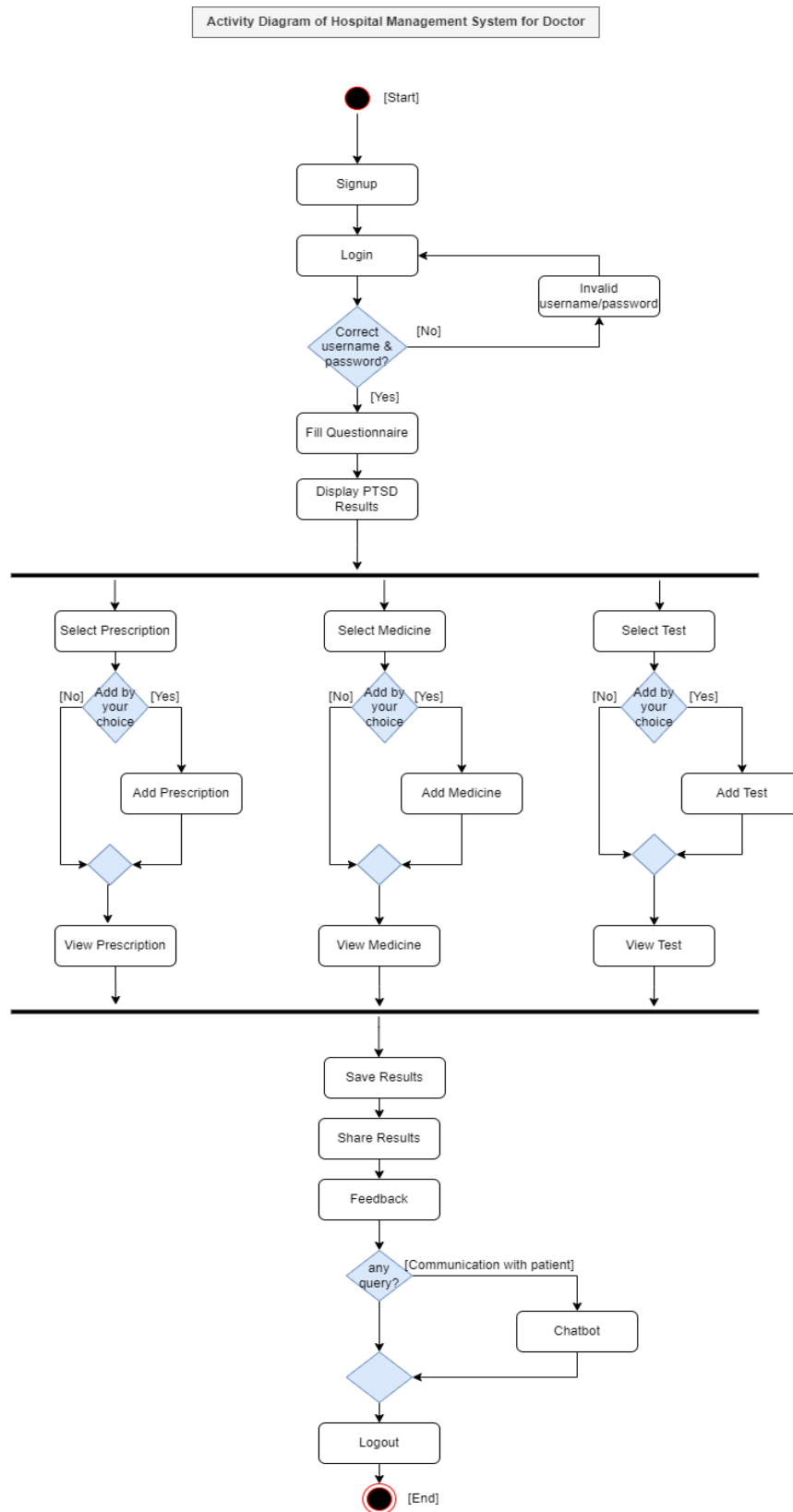
Software Design Description for Machine Learning-Based Prediction of PTSD by Analyzing Textual Data



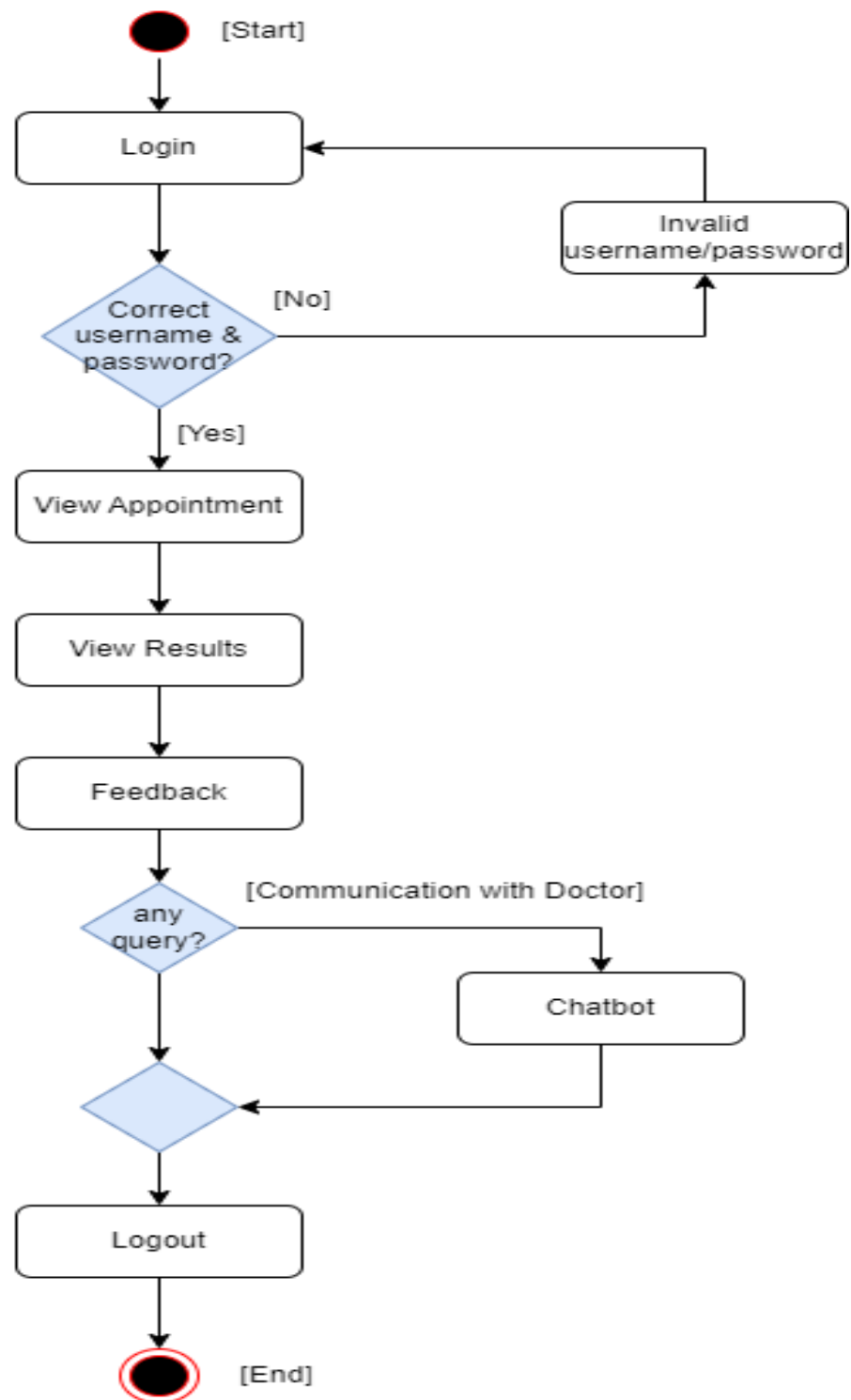
Software Design Description for Machine Learning-Based Prediction of PTSD by Analyzing Textual Data



Software Design Description for Machine Learning-Based Prediction of PTSD by Analyzing Textual Data

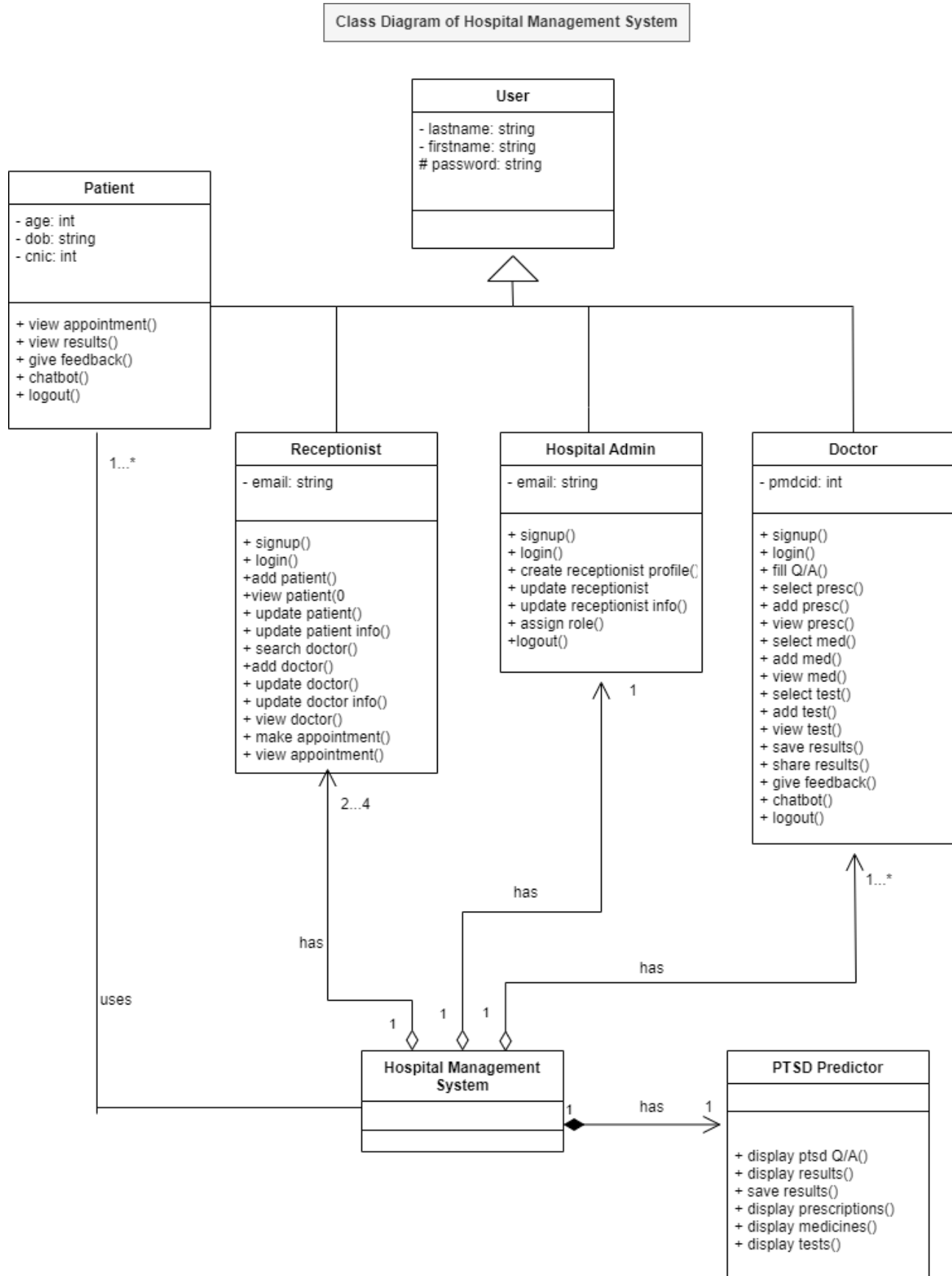


Activity Diagram of Hospital Management System for Patient



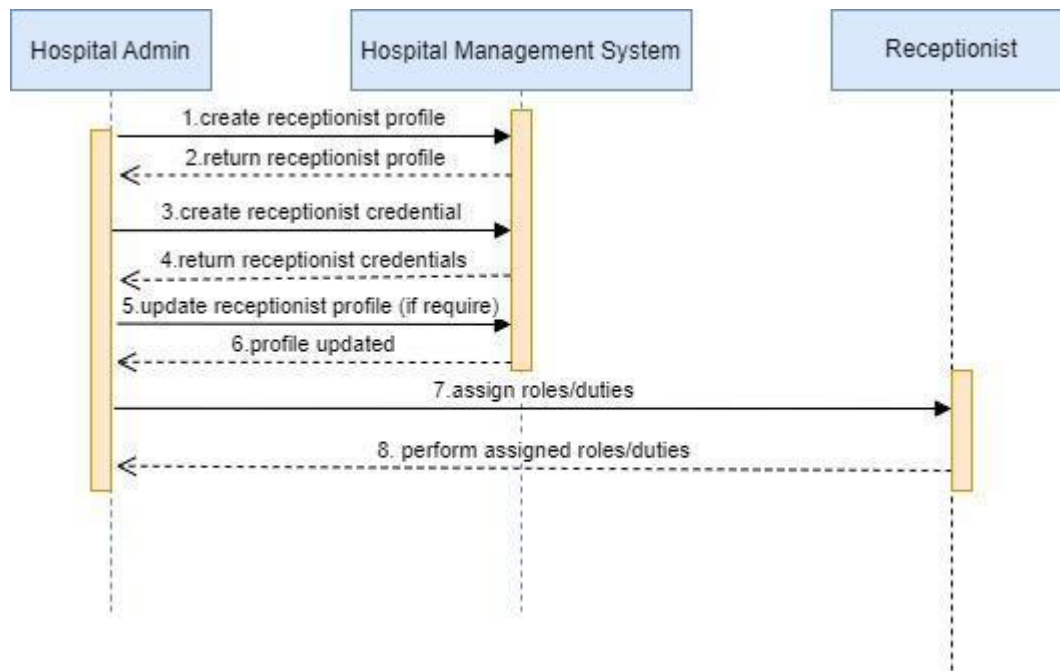
- Class Diagram

Software Design Description for Machine Learning-Based Prediction of PTSD by Analyzing Textual Data

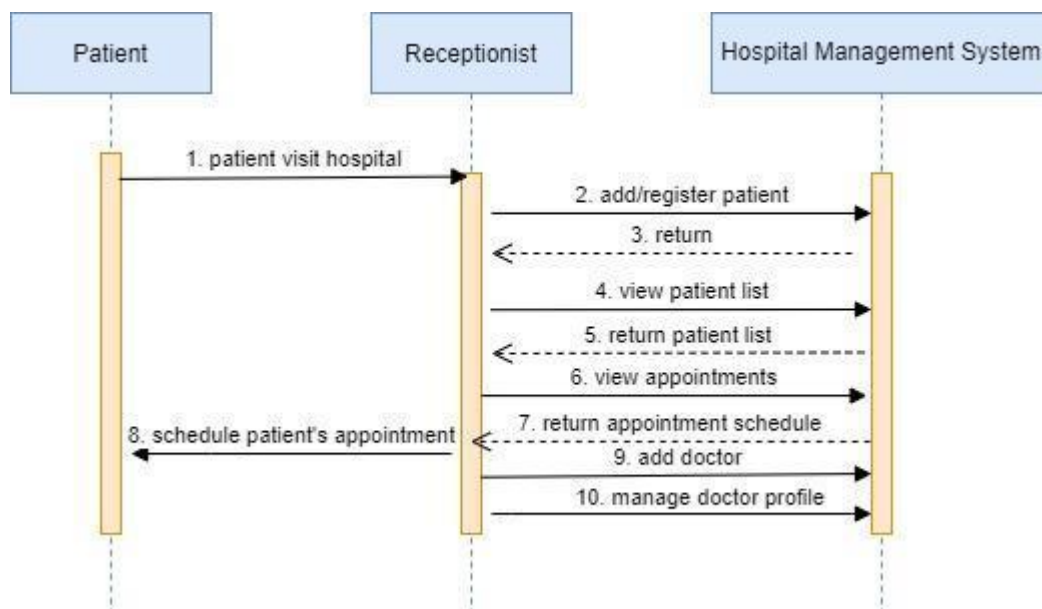


- Sequence Diagram [4 Only]

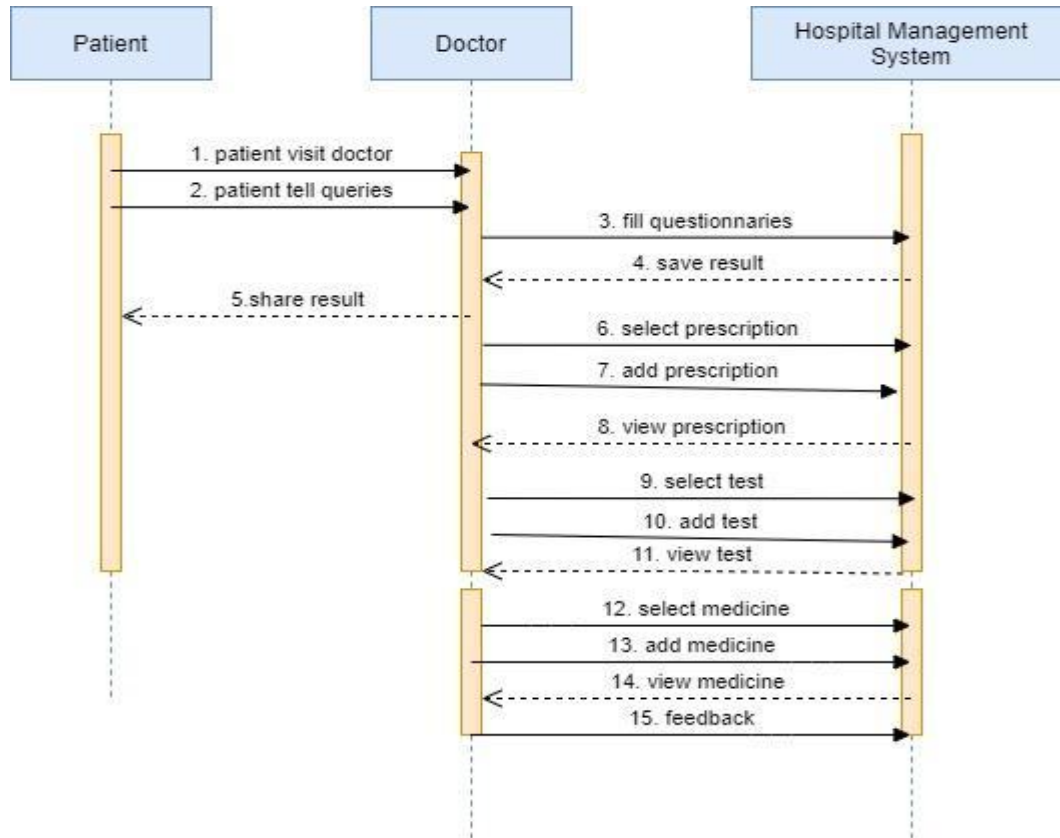
Sequence Diagram for Hospital Admin



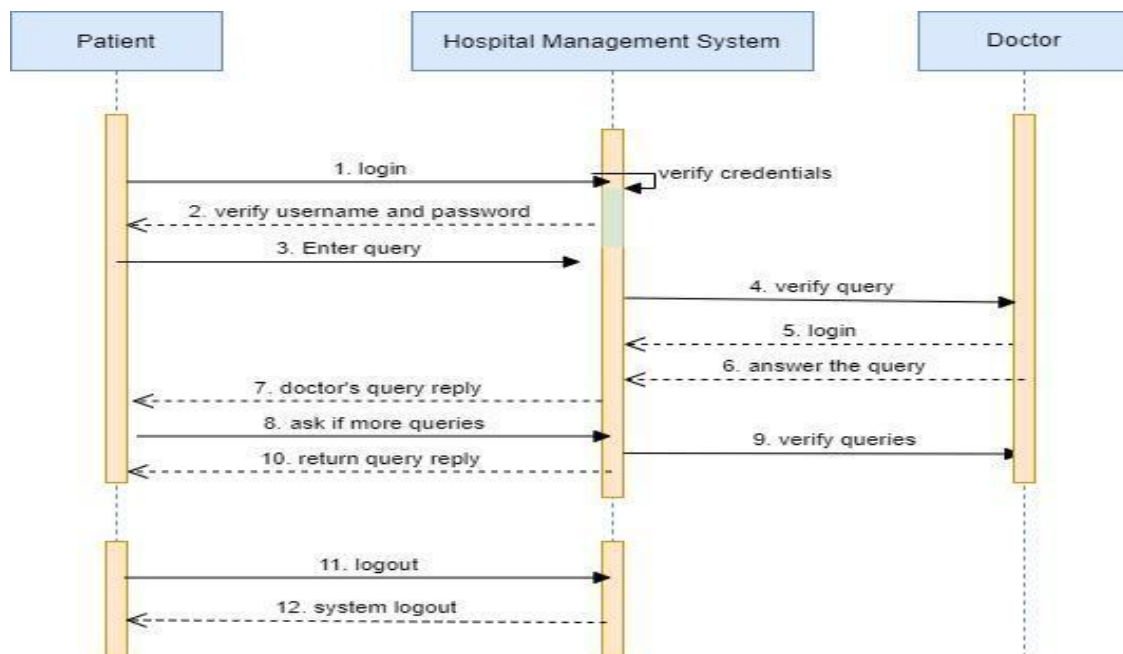
Sequence Diagram for Receptionist



Sequence Diagram for Doctor



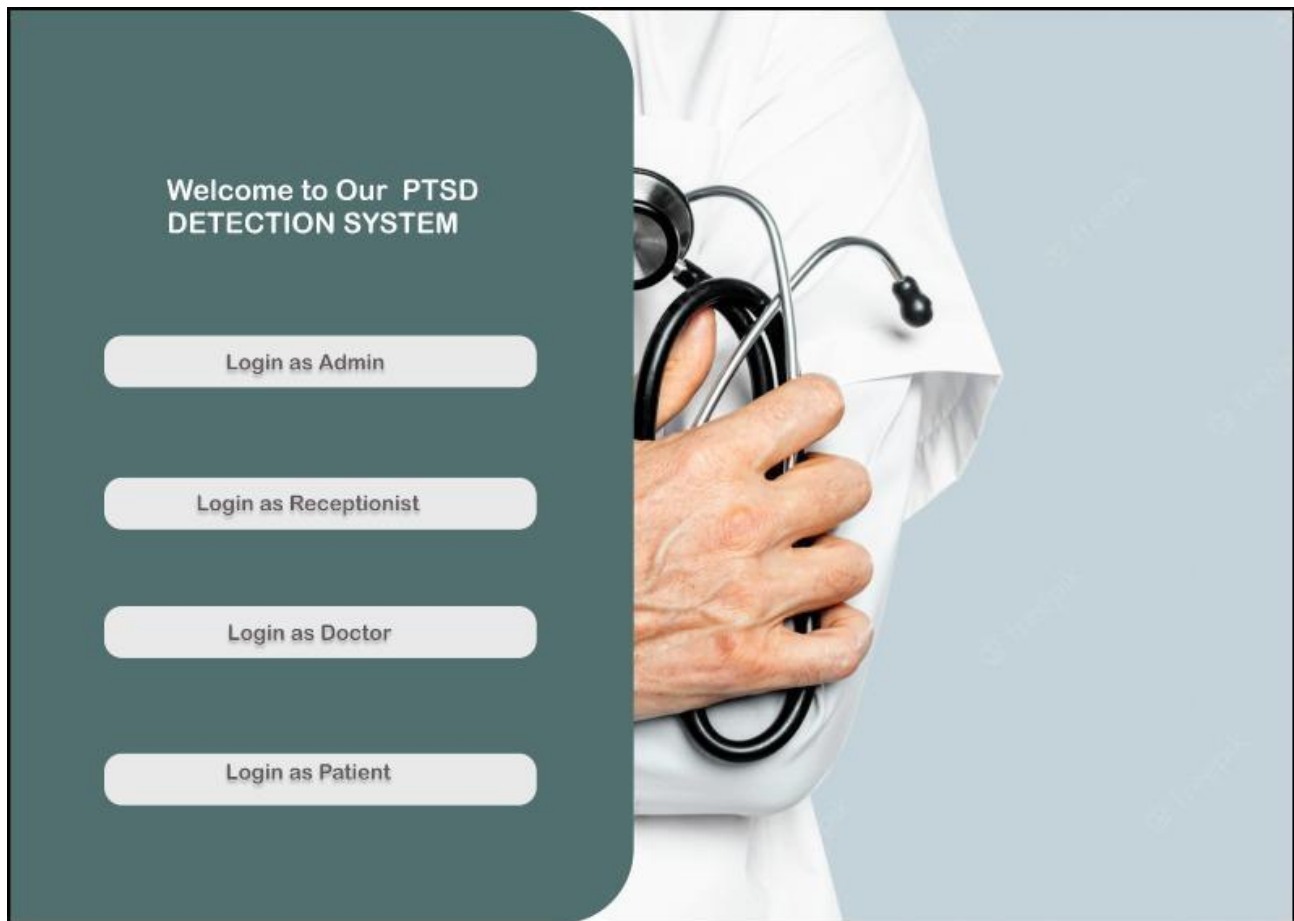
Sequence Diagram for Patient




4. Human Interface Design

Describe the functionality of the system from the user's perspective. Explain how the user will be able to use your system to complete all the expected features and the feedback information that will be displayed for the user. Display screenshots showing the interface from the user's perspective.

Provide all possible UIs (Web application or Android)
Signup page for Admin, Receptionist and Doctor





SIGN UP

Full Name


Email

Password

SIGNUP

Already have an account? [Login](#)

Login page for Admin, Receptionist, Patient and Doctor



LOGIN

Full Name/Email

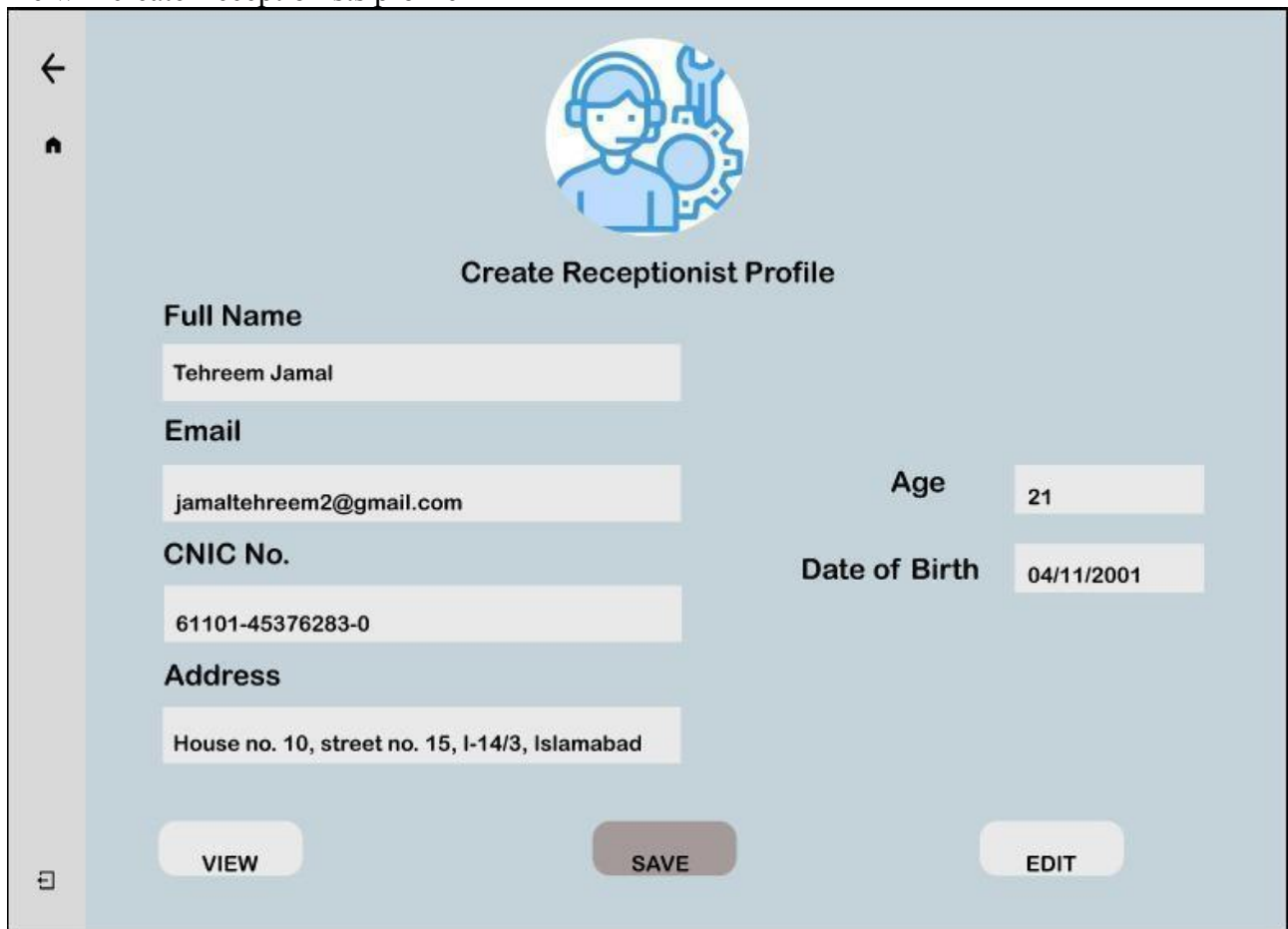
Password



Login


[Forgot Password?](#)

Login as Admin:

He will create Receptionists profile





Create Receptionist Profile

Full Name
Tehreem Jamal


Email
jamaltehreem2@gmail.com

Age
21

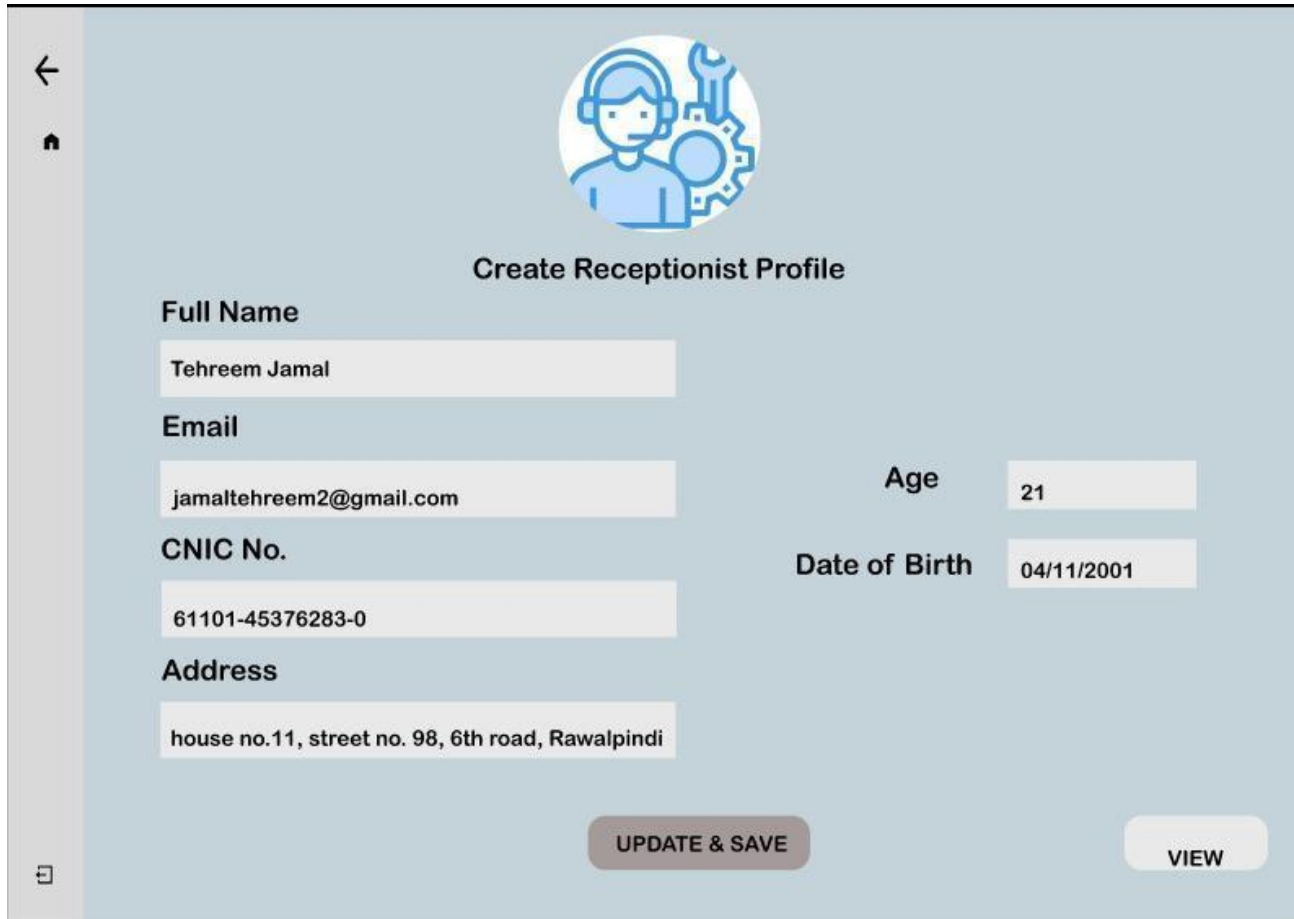
CNIC No.
61101-45376283-0

Date of Birth
04/11/2001

Address
House no. 10, street no. 15, I-14/3, Islamabad

 **VIEW** **SAVE** **EDIT**

He is updating Receptionist's profile



The image shows a user interface for updating a Receptionist's profile. At the top, there is a circular icon of a person wearing a headset and a wrench, with gears in the background. Below the icon, the title "Create Receptionist Profile" is displayed. The form contains several input fields for personal information: Full Name (Tehreem Jamal), Email (jamaltehreem2@gmail.com), Age (21), CNIC No. (61101-45376283-0), Date of Birth (04/11/2001), and Address (house no.11, street no. 98, 6th road, Rawalpindi). At the bottom, there are two buttons: "UPDATE & SAVE" and "VIEW".

Create Receptionist Profile

Full Name
Tehreem Jamal

Email
jamaltehreem2@gmail.com

Age
21

CNIC No.
61101-45376283-0

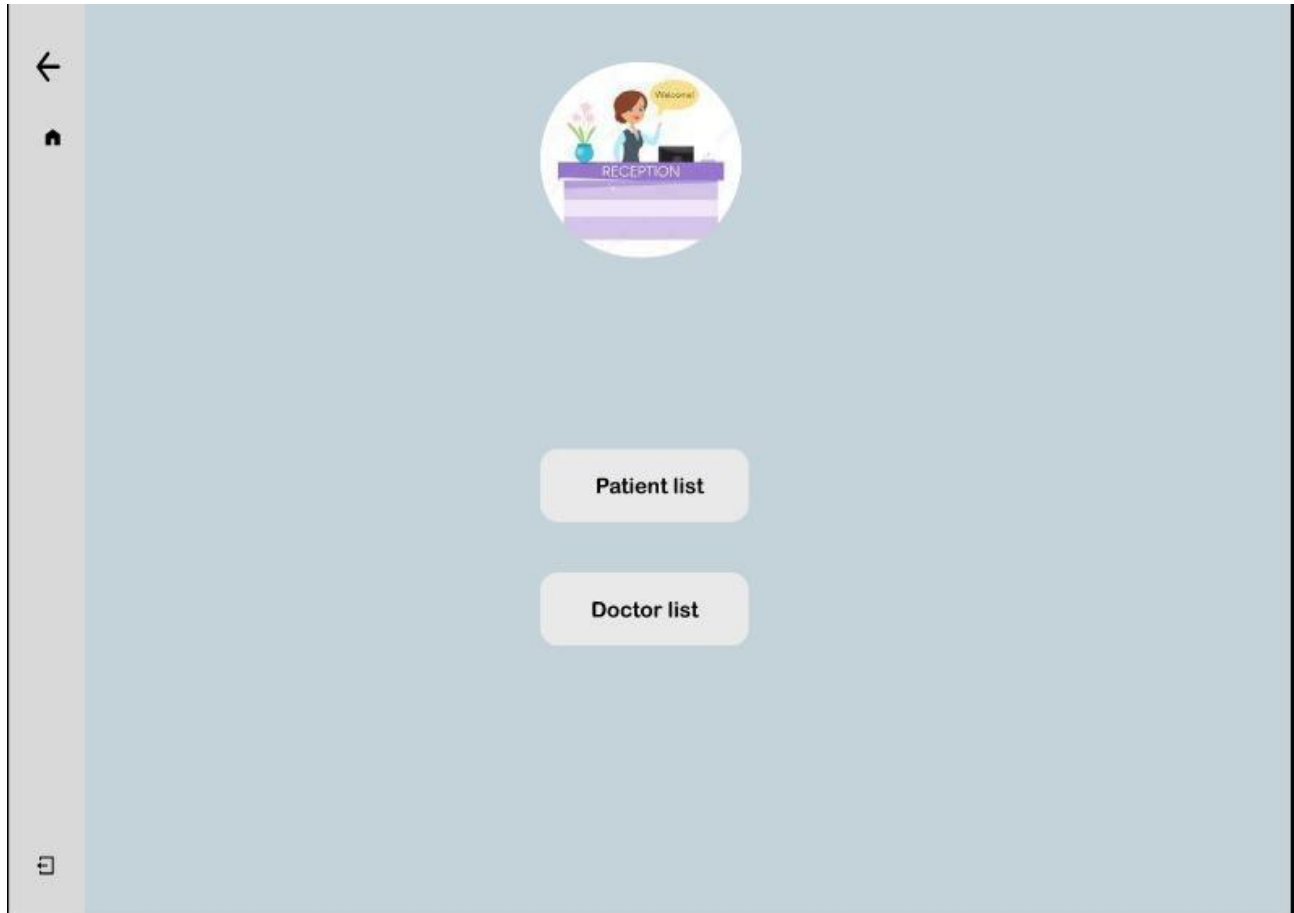
Date of Birth
04/11/2001

Address
house no.11, street no. 98, 6th road, Rawalpindi

UPDATE & SAVE **VIEW**

Login as Receptionist:

He can search Patient and search Doctor.



On clicking Patient List:

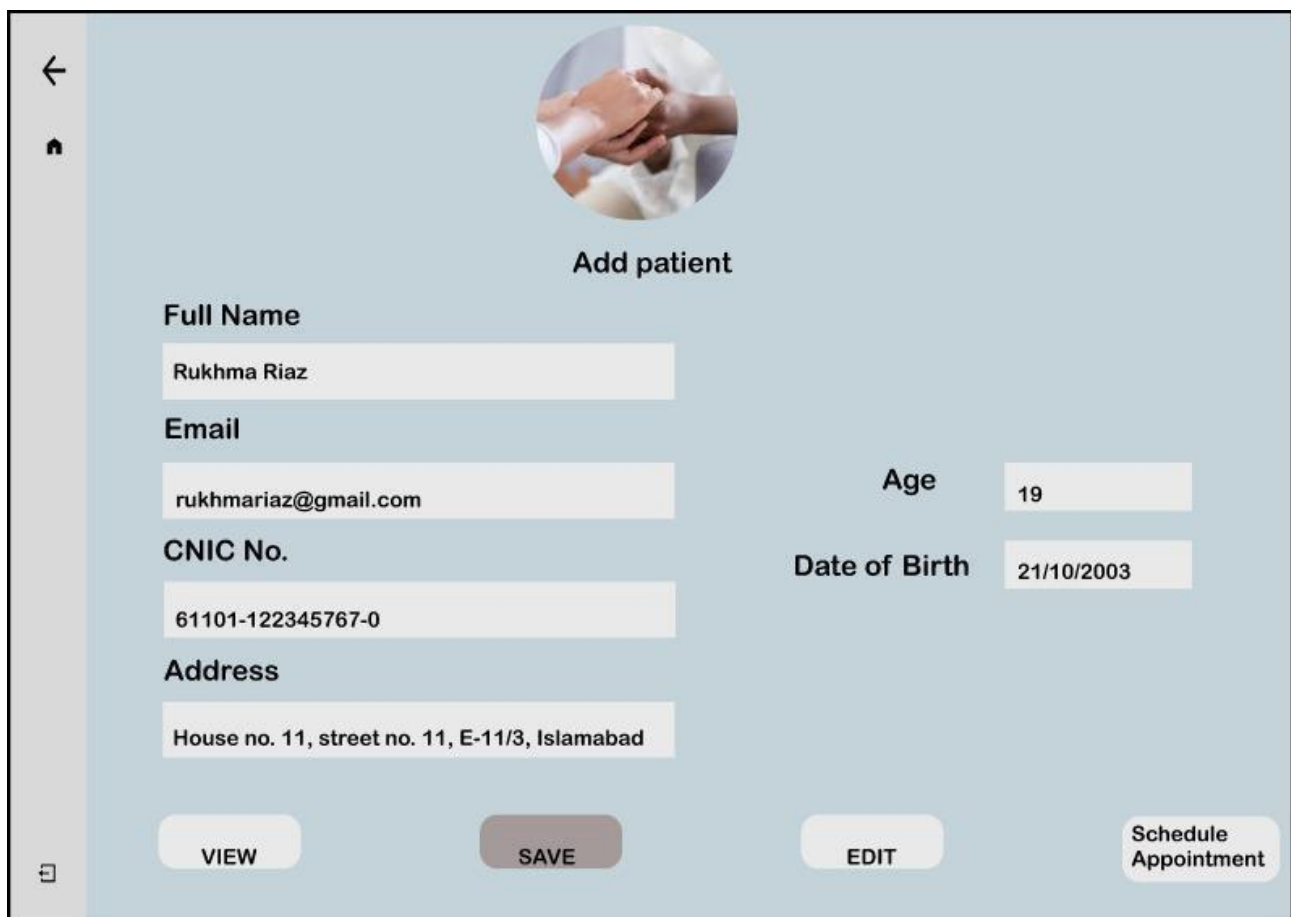
Patients List

write patient name to search

	Patient Name	Age	Date of Birth	CNIC	Email	Address
1	Azka Ikramullah	22	11/12/2000	61101-325 567889-0	azkaikramullah@gmail.com	House no. 456, street no. 76, I-9/3, Islamabad
2						
3						
4						
5						
6						


+ Add patient

On clicking Add patient,



←

⌂



Add patient

Full Name

Rukhma Riaz

Email

rukhmariaz@gmail.com

Age

19

CNIC No.

61101-122345767-0

Date of Birth

21/10/2003

Address

House no. 11, street no. 11, E-11/3, Islamabad

☰

VIEW

SAVE

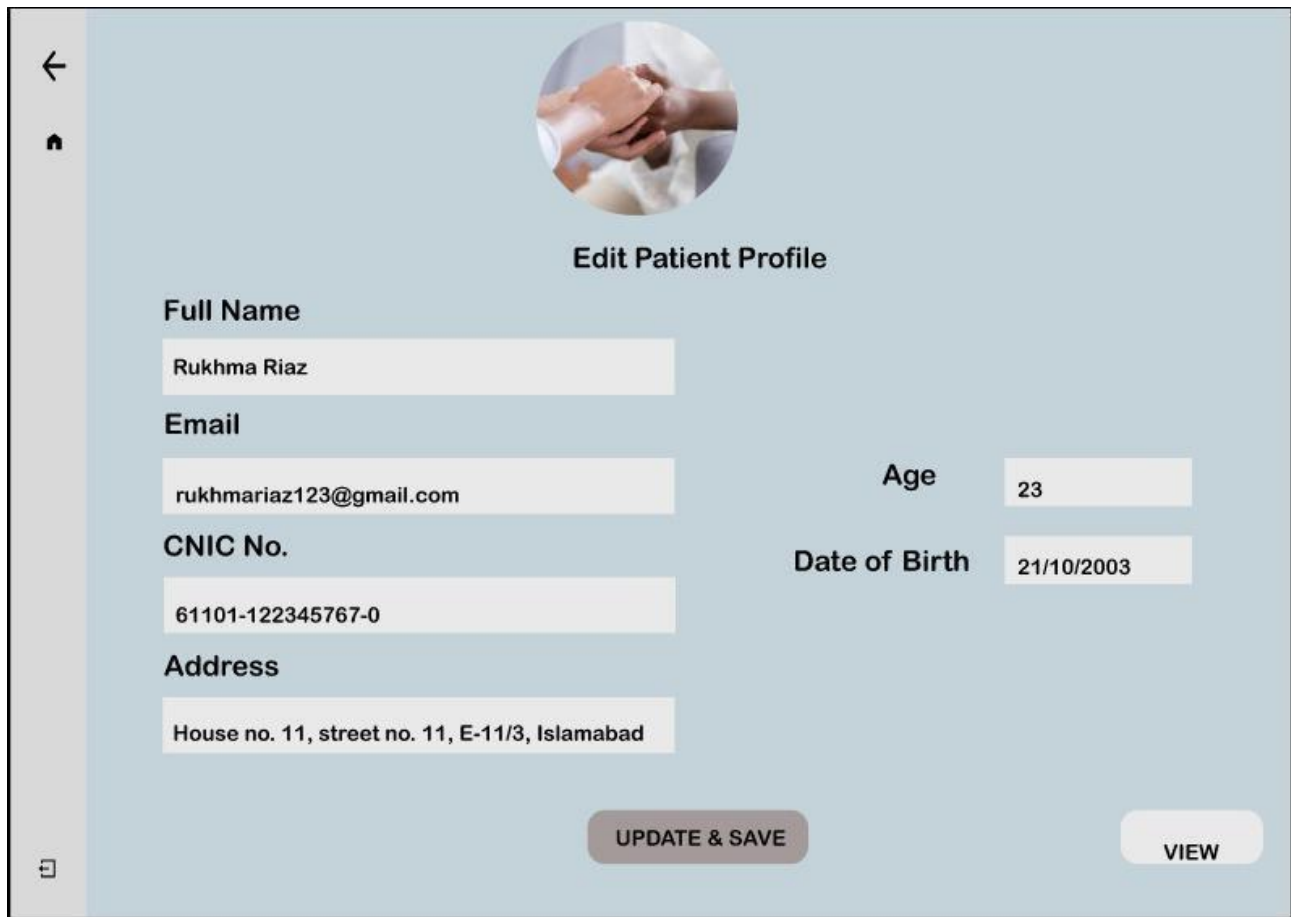
EDIT



Schedule Appointment


On clicking schedule appointment,

The screenshot shows a mobile application interface for scheduling an appointment. It features a light blue background with a grey sidebar on the left containing a back arrow, a home icon, and a plus icon. The main content area is titled 'Schedule appointment' and includes a search bar with the placeholder text 'write patient name to search'. Below the search bar, there are two white rounded rectangular boxes: one labeled 'Last Visits' containing the text 'None', and another labeled 'Day & Time' containing the text '09/12/2022, 12:30 p.m'.

On clicking, Edit button in “Add Patient” form to update the information.





Edit Patient Profile

Full Name
Rukhma Riaz


Email
rukhmariaz123@gmail.com

Age
23

CNIC No.
61101-122345767-0

Date of Birth
21/10/2003

Address
House no. 11, street no. 11, E-11/3, Islamabad

 **UPDATE & SAVE** **VIEW**

Search the Doctor, If not present then, Add Doctor.

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Doctors List

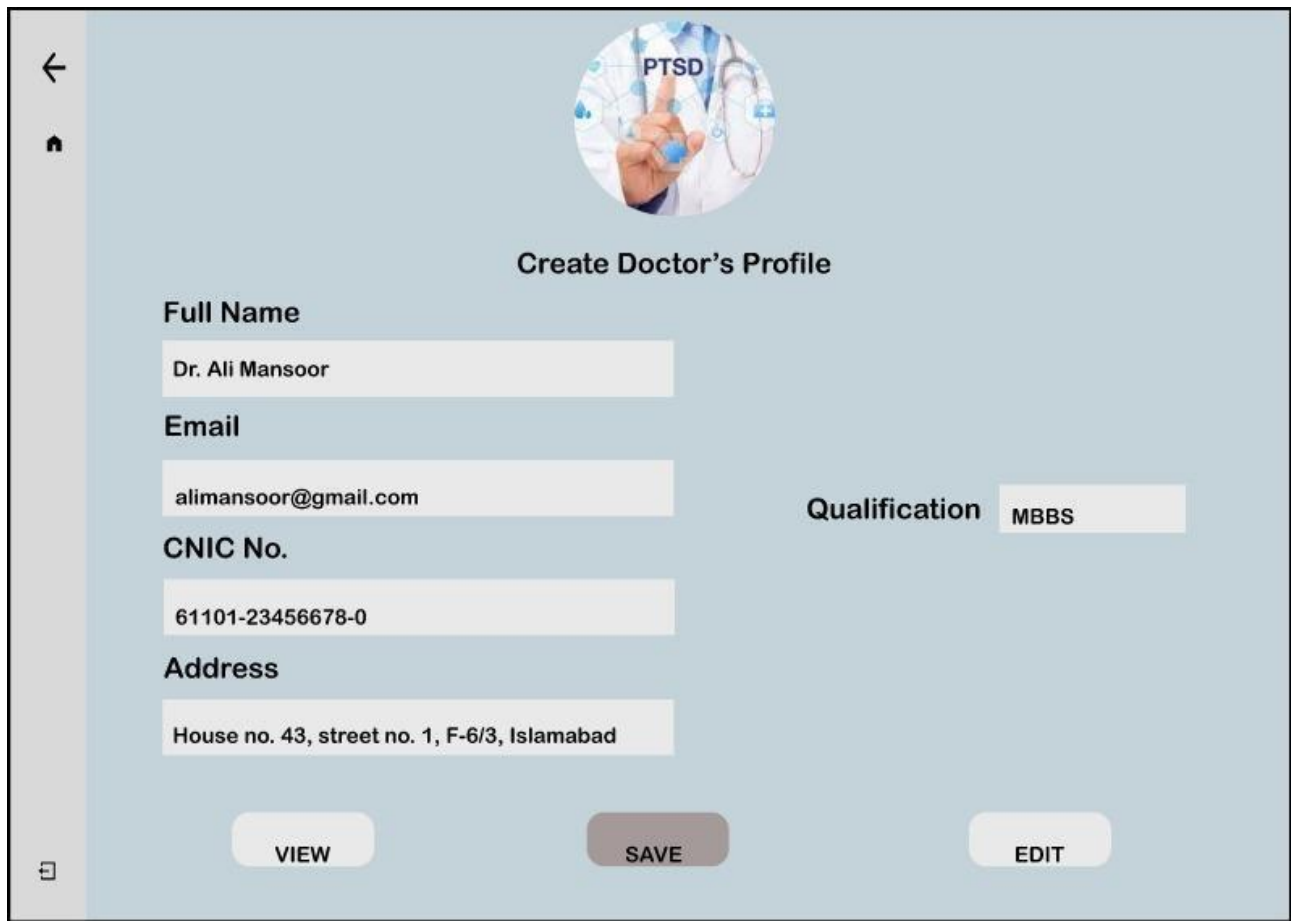
🔍

write Doctor's name to search

	Doctor's Name	CNIC	Email	Qualification	Address
1	Dr. Azhar Mehmood	61101-345689 57-0	azharmehmood@gmail.com	MBBS	House no. 1, street no. 54, G-11, Islamabad
2					
3					
4					
5					
6					


+ Add Doctor

On clicking “Add Doctor” button, form is filled.



←

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Create Doctor's Profile

Full Name

Dr. Ali Mansoor

Email

alimansoor@gmail.com

Qualification

MBBS

CNIC No.

61101-23456678-0




Address

House no. 43, street no. 1, F-6/3, Islamabad

📄

VIEW **SAVE** **EDIT**

On clicking, Edit button, Qualification of a Doctor is updated.



Edit Doctor's Profile

Full Name

Dr. Ali Mansoor

Email

alimansoor@gmail.com

CNIC No.

61101-23456678-0

Address

House no. 43, street no. 1, F-6/3, Islamabad

Qualification

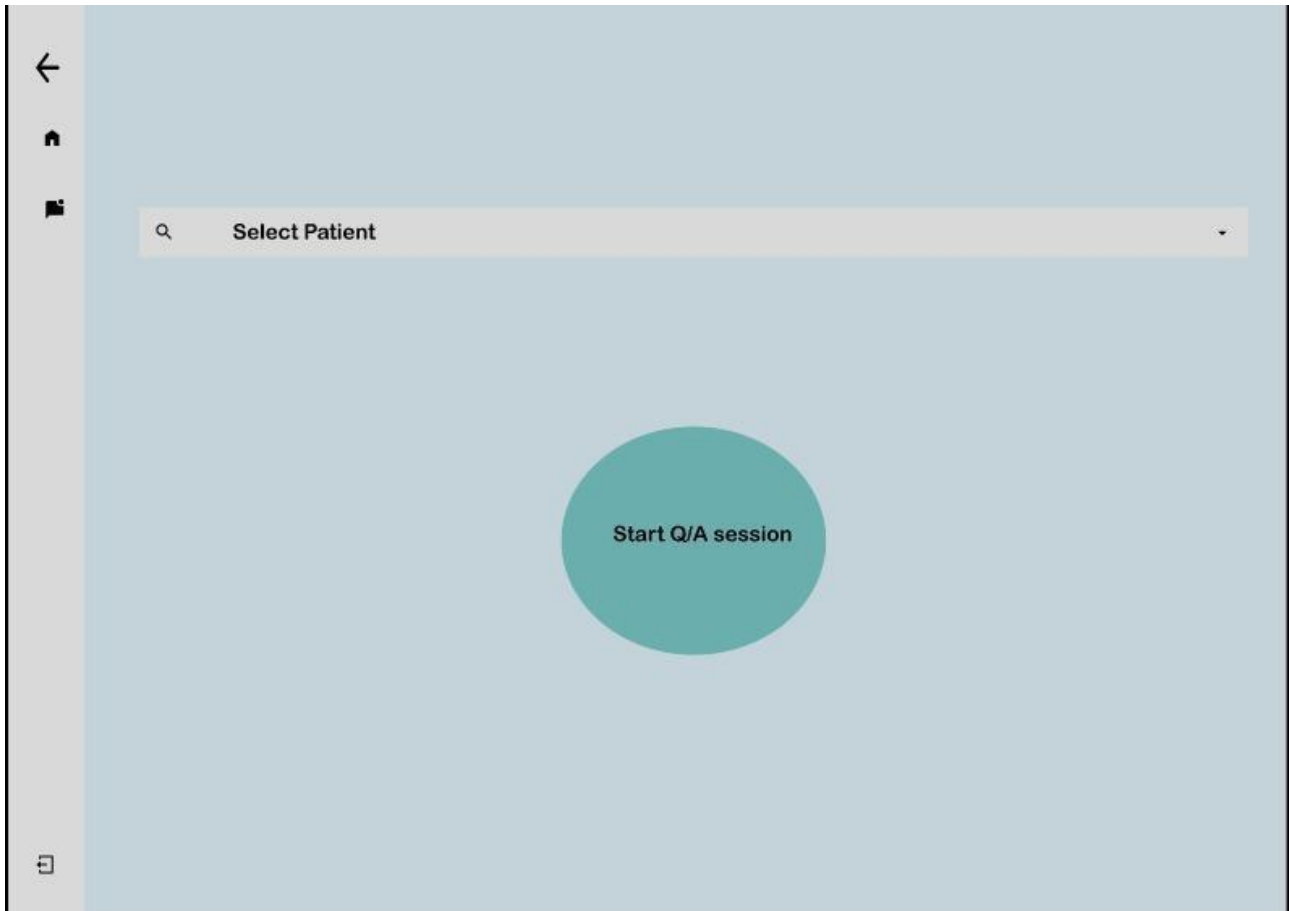
M.D

UPDATE & SAVE

VIEW

Login as Doctor:

Search the name of Patient and Start Question Answer session.



The screenshot shows a mobile application interface for a survey. On the left, there is a vertical sidebar with three icons: a back arrow, a home icon, and a list icon. The main content area has a light blue background. At the top, the text "QUESTION 1" is centered and underlined. Below it, the question "1. had nightmares about the event(s) or thought about the event(s) when you did not want to?" is displayed and underlined. Three response options are presented in light gray rounded rectangles: "Not at all", "Moderately", and "Extremely". A "DONE" button, also in a light gray rounded rectangle, is positioned below these options. At the bottom left of the screen, there is a small icon of a document with a plus sign.

QUESTION 1

1. had nightmares about the event(s) or thought about the event(s) when you did not want to?

Not at all Moderately Extremely

DONE

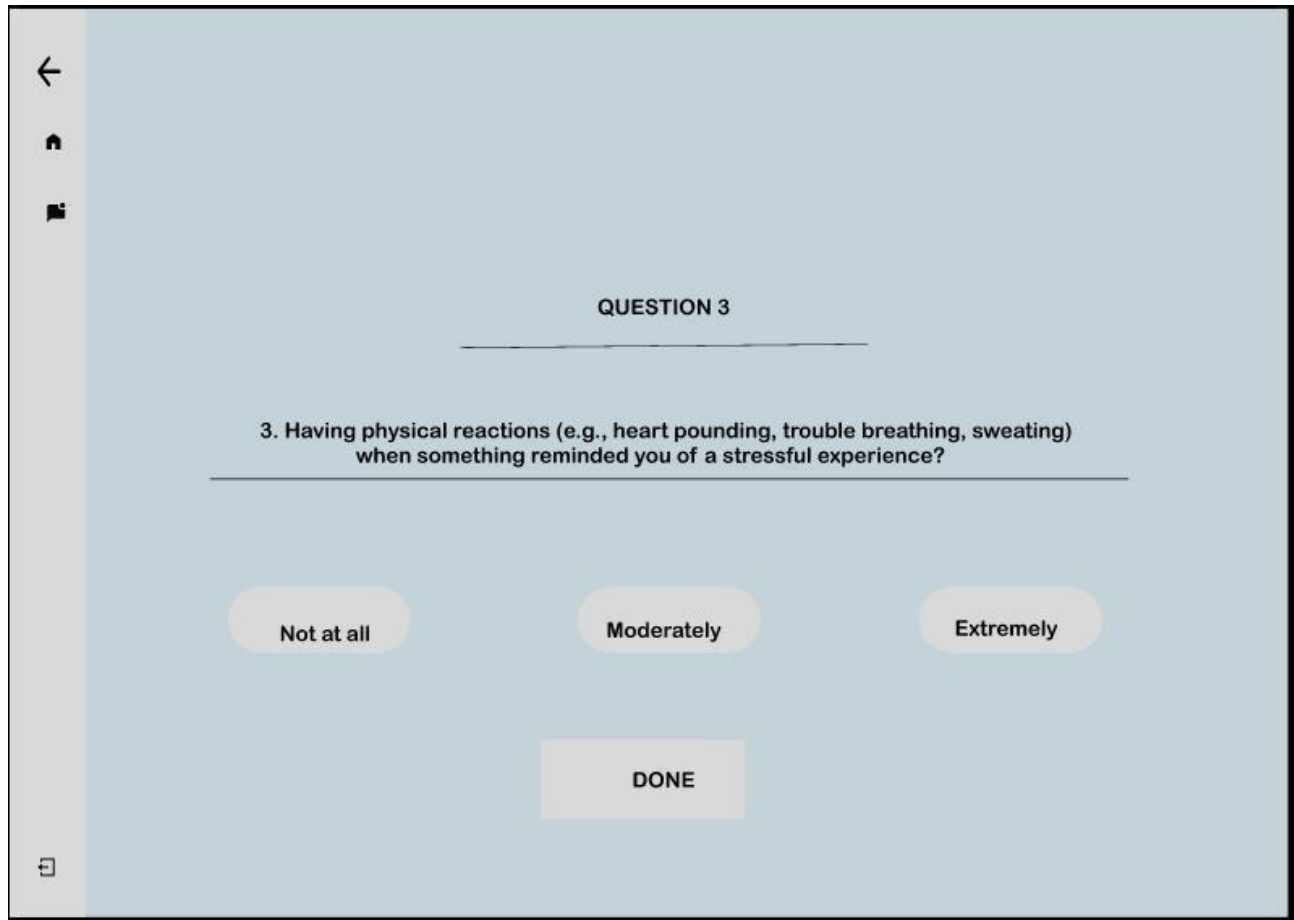
The screenshot shows the next screen of the survey application. The layout is identical to the previous one, with the same sidebar and question format. The question text is "2. Repeated, disturbing memories, thoughts, or images of a stressful experience?". The response options "Not at all", "Moderately", and "Extremely" are again in light gray rounded rectangles, with a "DONE" button below them. The document icon at the bottom left is also present.

QUESTION 2

2. Repeated, disturbing memories, thoughts, or images of a stressful experience?

Not at all Moderately Extremely

DONE



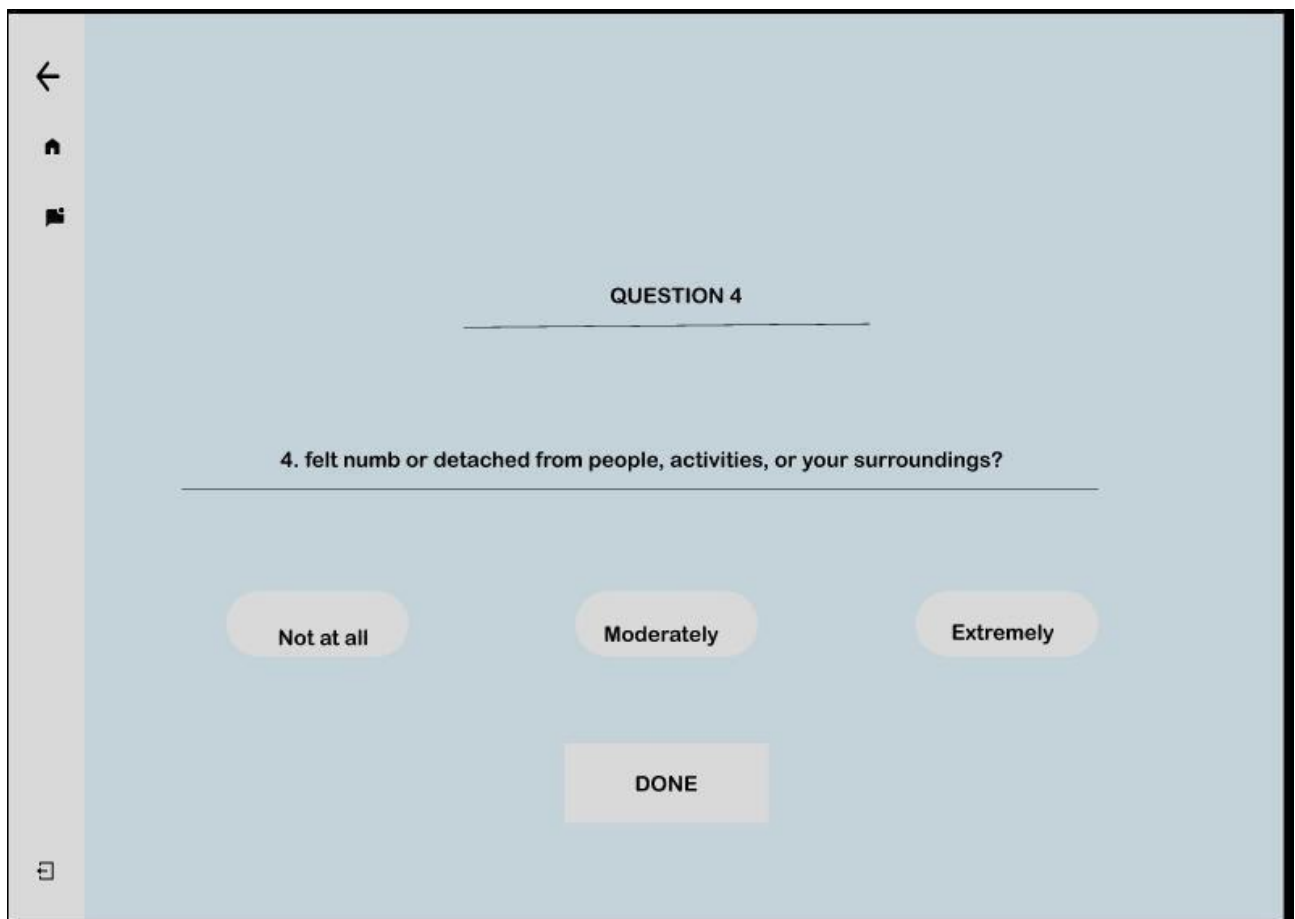
QUESTION 3

3. Having physical reactions (e.g., heart pounding, trouble breathing, sweating) when something reminded you of a stressful experience?

Not at all Moderately Extremely

DONE

Navigation icons: back, home, list, and a small icon at the bottom left.



QUESTION 4

4. felt numb or detached from people, activities, or your surroundings?

Not at all Moderately Extremely

DONE

Navigation icons: back, home, list, and a small icon at the bottom left.

A screenshot of a mobile application interface for a questionnaire. On the left, there is a vertical sidebar with three icons: a back arrow, a home icon, and a document icon. The main area has a light blue background. At the top, the text "QUESTION 5" is centered above a horizontal line. Below this, the question text "5. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?" is centered and underlined. At the bottom, there are three light gray rounded rectangular buttons labeled "Not at all", "Moderately", and "Extremely" arranged horizontally. Below these buttons is a single light gray rectangular button labeled "DONE". A small icon is visible in the bottom left corner of the main area.

QUESTION 5

5. Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?

Not at all Moderately Extremely

DONE

A screenshot of a mobile application interface for a questionnaire, similar to the one above. The sidebar on the left contains the same three icons. The main area has a light blue background. At the top, the text "QUESTION 6" is centered above a horizontal line. Below this, the question text "6. Having strong negative feelings such as fear, horror, anger, guilt, or shame?" is centered and underlined. At the bottom, there are three light gray rounded rectangular buttons labeled "Not at all", "Moderately", and "Extremely" arranged horizontally. Below these buttons is a single light gray rectangular button labeled "DONE". A small icon is visible in the bottom left corner of the main area.

QUESTION 6

6. Having strong negative feelings such as fear, horror, anger, guilt, or shame?

Not at all Moderately Extremely

DONE

This is a mobile application interface for a questionnaire. It features a light blue background and a vertical sidebar on the left with three icons: a back arrow, a home icon, and a document icon. The main content area is titled "QUESTION 7" and contains the question "7. Loss of interest in activities that you used to enjoy?". Below the question, there are three rounded rectangular buttons labeled "Not at all", "Moderately", and "Extremely". At the bottom center, there is a rectangular button labeled "DONE".

QUESTION 7

7. Loss of interest in activities that you used to enjoy?

Not at all Moderately Extremely

DONE

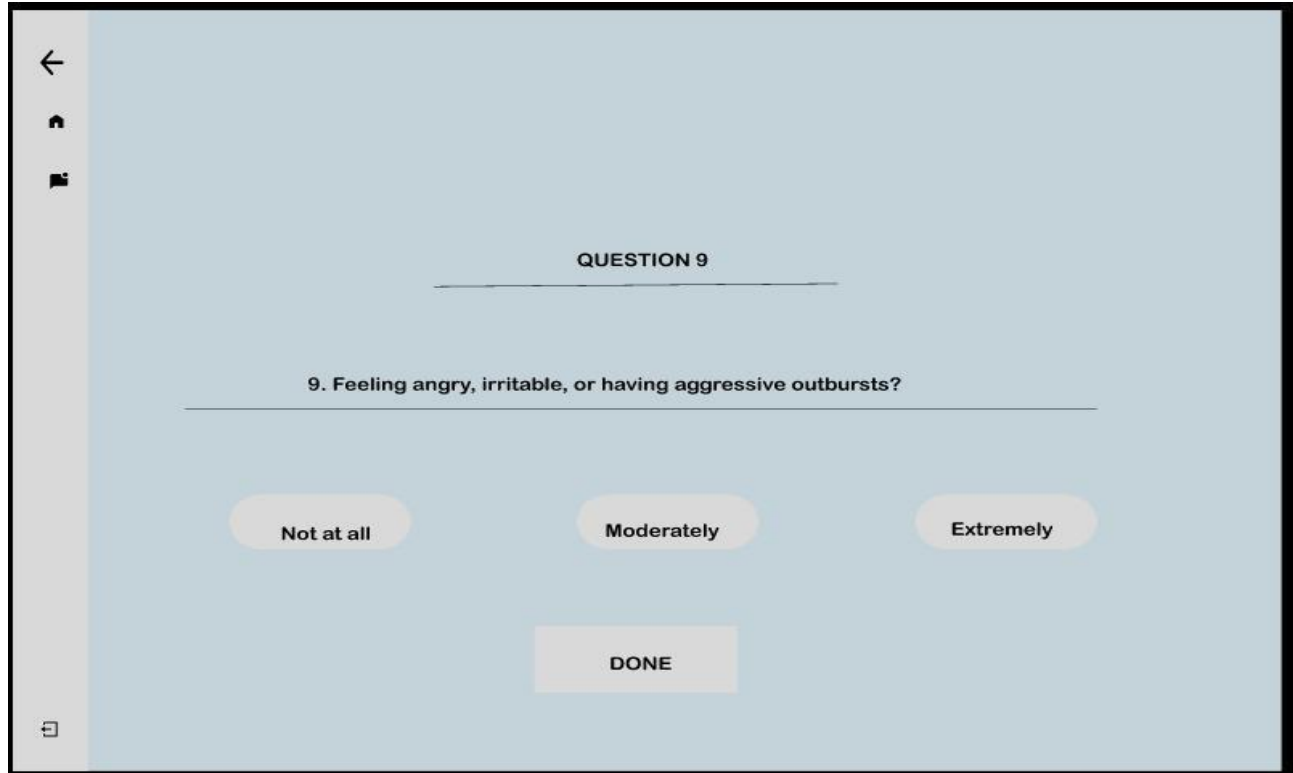
This is a mobile application interface for a questionnaire, similar to the one above. It features a light blue background and a vertical sidebar on the left with three icons: a back arrow, a home icon, and a document icon. The main content area is titled "QUESTION 8" and contains the question "8. Trouble experiencing positive feelings (for example, being unable to have loving feelings for those close to you)?". Below the question, there are three rounded rectangular buttons labeled "Not at all", "Moderately", and "Extremely". At the bottom center, there is a rectangular button labeled "DONE".

QUESTION 8

8. Trouble experiencing positive feelings (for example, being unable to have loving feelings for those close to you)?

Not at all Moderately Extremely

DONE



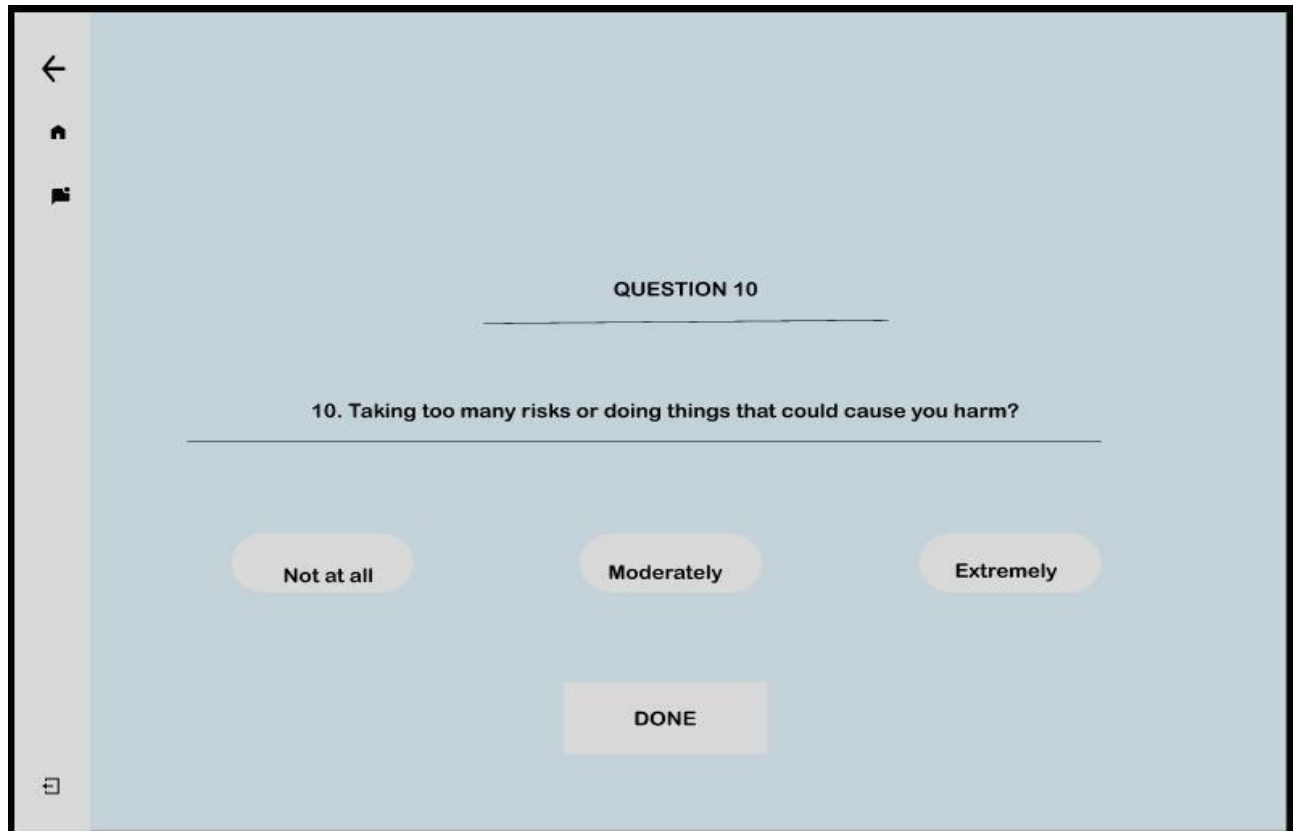
QUESTION 9

9. Feeling angry, irritable, or having aggressive outbursts?

Not at all Moderately Extremely

DONE

This is a mobile app interface for a questionnaire. It features a light blue background and a grey sidebar on the left with navigation icons: a back arrow, a home icon, and a list icon. The main content area displays 'QUESTION 9' at the top, followed by a horizontal line. Below the line is the question text '9. Feeling angry, irritable, or having aggressive outbursts?'. Another horizontal line follows. At the bottom, there are three rounded rectangular buttons labeled 'Not at all', 'Moderately', and 'Extremely'. Below these buttons is a rectangular button labeled 'DONE'. A small icon is visible in the bottom left corner of the main area.



QUESTION 10

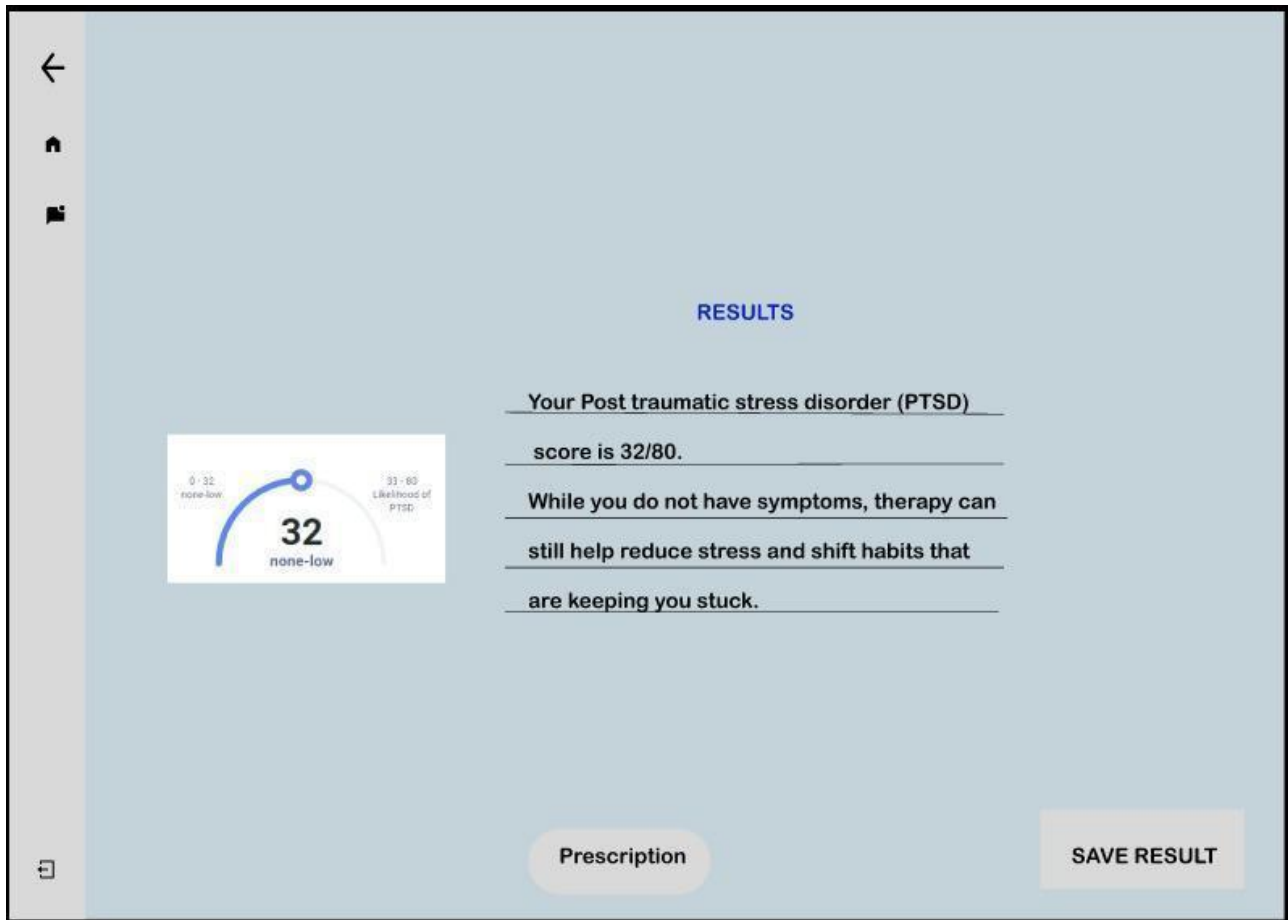
10. Taking too many risks or doing things that could cause you harm?

Not at all Moderately Extremely

DONE

This is a mobile app interface for a questionnaire, similar to the one above. It features a light blue background and a grey sidebar on the left with navigation icons: a back arrow, a home icon, and a list icon. The main content area displays 'QUESTION 10' at the top, followed by a horizontal line. Below the line is the question text '10. Taking too many risks or doing things that could cause you harm?'. Another horizontal line follows. At the bottom, there are three rounded rectangular buttons labeled 'Not at all', 'Moderately', and 'Extremely'. Below these buttons is a rectangular button labeled 'DONE'. A small icon is visible in the bottom left corner of the main area.

Results shown through ML model implementation in the backend.



Select Prescriptions in which advice, medicines and tests are included

←

Prescriptions

☒ Talk Therapy

☒ Workout

☐ Exposure Therapy

☐ Cognitive Therapy

☐ Sertraline (Zoloft)

☐ Fluoxetine (Prozac)

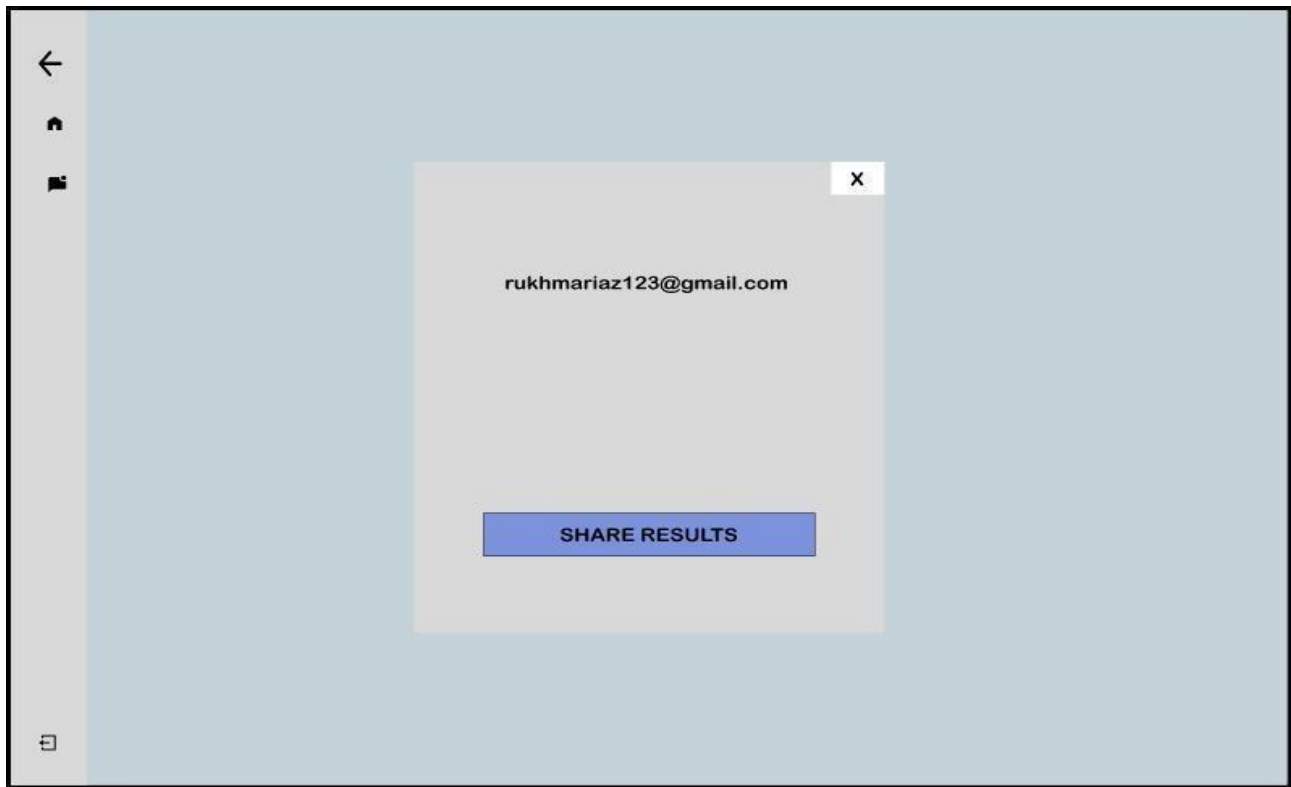
☐ Prazosin

Other:

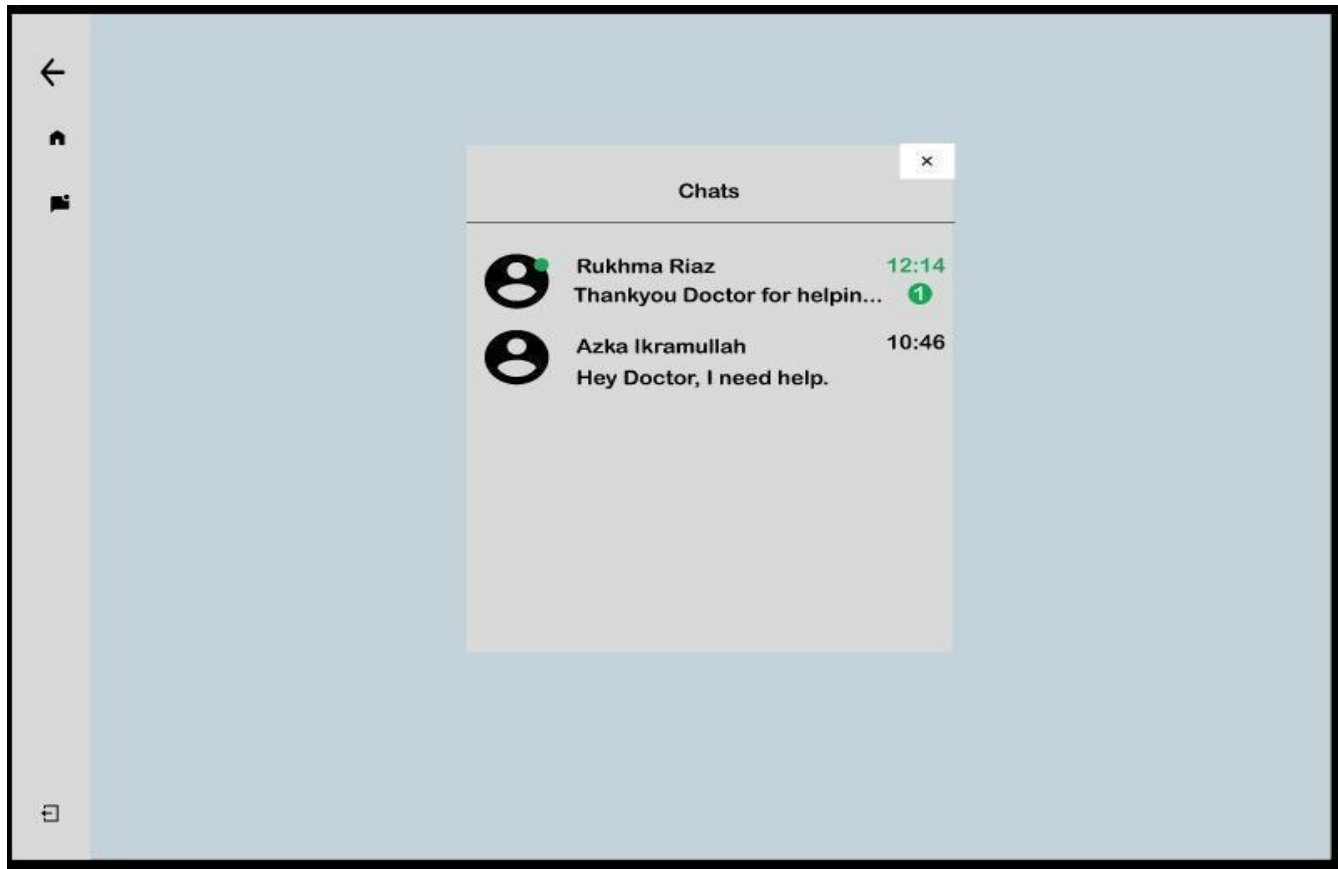
Preview

SAVE

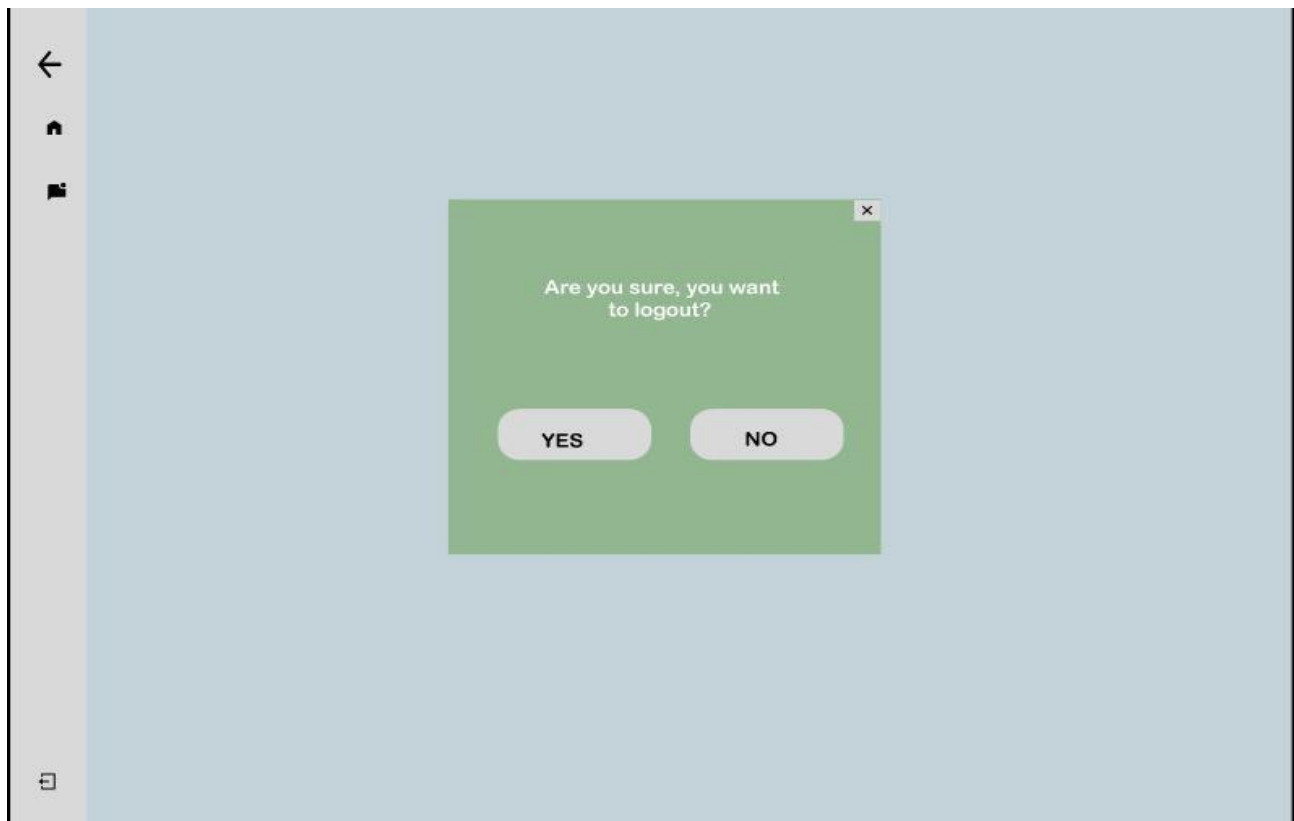
Results of the patient is shared with him/her via email.



If patient is facing any issue, he/she can text the Doctor via Chatbot.



Logout option for all Admin, Receptionist, Doctor and Patient.



Appendix:

Actual frontend:

[Home](#) [Doctor](#) [Receptionist](#) [Patient](#) [Logout](#) [Admin](#) [Sign Up](#)



WELCOME

TO OUR PTSD DETECTION SYSTEM

Software Design Description for Machine Learning-Based Prediction of PTSD by Analyzing Textual Data

Home Logout Login Sign Up

Sign Up

Email Address

First Name

Password

Password (Confirm)

Submit

SQLite X

SQL ▾ < 1 / 1 > 1 - 1 of 1

id	email	password	first_name
1	azka@mail.com	sha256\$jobawI4gDCH4ba1G\$072f00e69c6c09437135e9f3b109e6d0993ad0c7ef0f9d4a166e87d52160c52d	Azka Ikramullah

[Home](#) [Doctor](#) [Receptionist](#) [Patient](#) [Logout](#) [Admin](#) [Sign Up](#)



Admin Login

Email Address

Password

Login

[Home](#) [Doctor](#) [Receptionist](#) [Patient](#) [Logout](#) [Admin](#) [Sign Up](#)



Receptionist Login

Email Address

Password

Login



Doctor Login

PMDC ID

Password

Password (Confirm)

Submit



Patient Login

CNIC

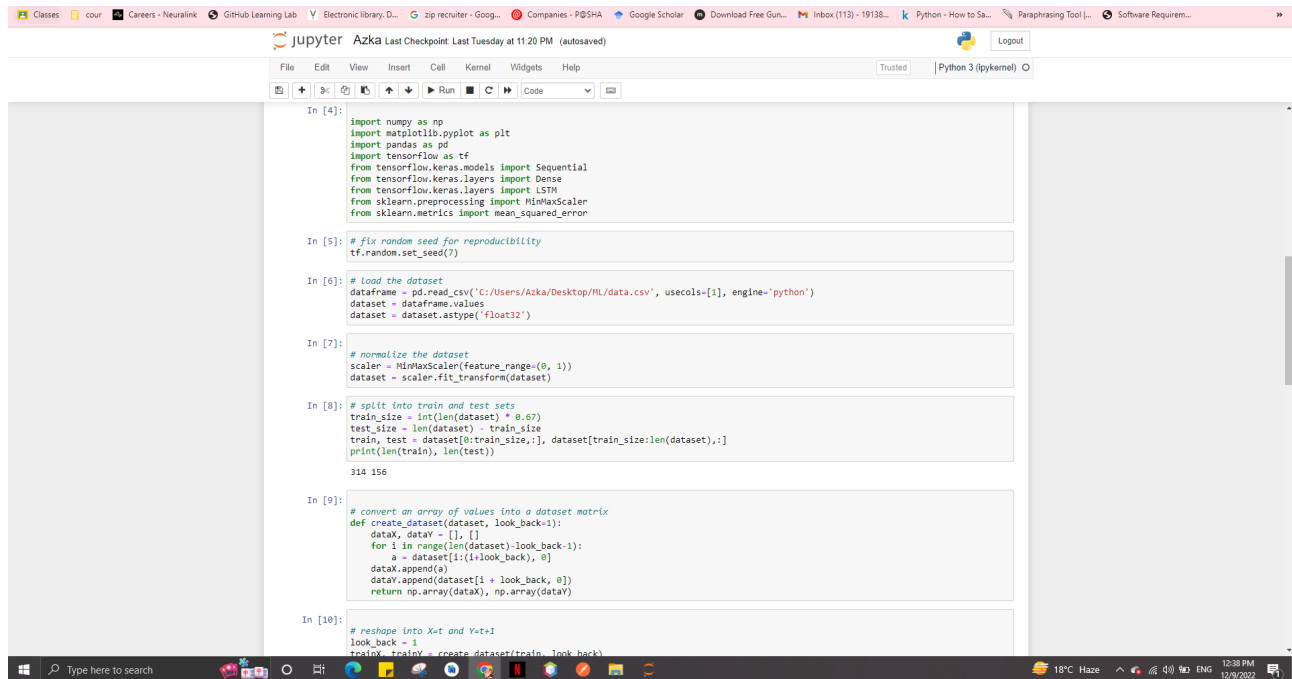
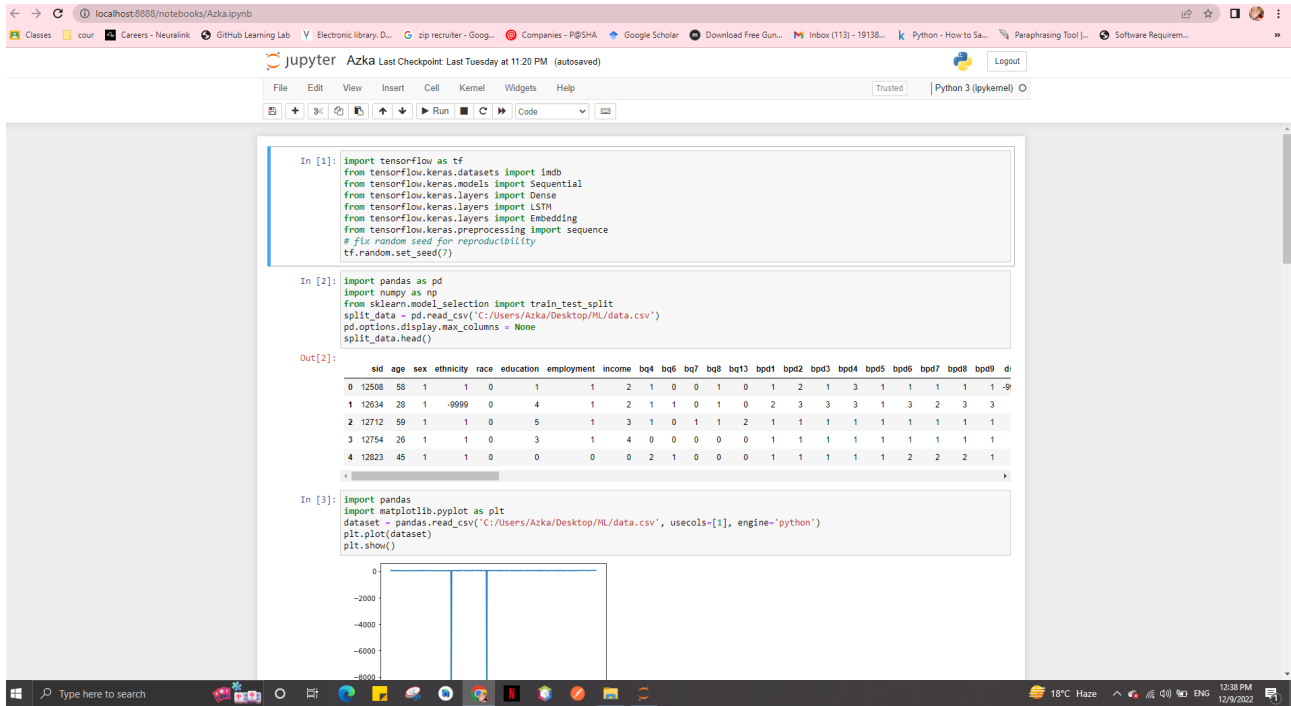
Email Address

Password

Login

Software Design Description for Machine Learning-Based Prediction of PTSD by Analyzing Textual Data

Machine Learning Model Implementation:



Software Design Description for Machine Learning-Based Prediction of PTSD by Analyzing Textual Data

```
localhost8888/notebooks/Azka.ipynb
Classes cour Careers - Neuralink GitHub Learning Lab Electronic library D... zip recruiter - Goog... Companies - P@SHA Google Scholar Download Free Gun... Inbox (113) - 19138... Python - How to Sa... Paraphrasing Tool... Software Requirem...

jupyter Azka Last Checkpoint: Last Tuesday at 11:20 PM (autosaved)
File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (pykernel)

# reshape into X-t and Y-t+1
look_back = 1
trainX, trainY = create_dataset(train, look_back)
testX, testY = create_dataset(test, look_back)

In [11]:
# reshape input to be [samples, time steps, features]
trainX = np.reshape(trainX, (trainX.shape[0], 1, trainX.shape[1]))
testX = np.reshape(testX, (testX.shape[0], 1, testX.shape[1]))

In [12]:
# create and fit the LSTM network
model = Sequential()
model.add(LSTM(4, input_shape=(1, look_back)))
model.add(Dense(1))
model.compile(loss='mean_squared_error', optimizer='adam')
model.fit(trainX, trainY, epochs=100, batch_size=1, verbose=2)

Epoch 1/100
1/1 - 4s - loss: 0.9744 - 4s/epoch - 4s/step
Epoch 2/100
1/1 - 0s - loss: 0.9709 - 19ms/epoch - 19ms/step
Epoch 3/100
1/1 - 0s - loss: 0.9674 - 3ms/epoch - 3ms/step
Epoch 4/100
1/1 - 0s - loss: 0.9639 - 5ms/epoch - 5ms/step
Epoch 5/100
1/1 - 0s - loss: 0.9605 - 0s/epoch - 0s/step
Epoch 6/100
1/1 - 0s - loss: 0.9570 - 5ms/epoch - 5ms/step
Epoch 7/100
1/1 - 0s - loss: 0.9536 - 6ms/epoch - 6ms/step
Epoch 8/100
1/1 - 0s - loss: 0.9502 - 6ms/epoch - 6ms/step
Epoch 9/100
1/1 - 0s - loss: 0.9467 - 4ms/epoch - 4ms/step
Epoch 10/100

In [13]:
# make predictions
trainPredict = model.predict(trainX)
testPredict = model.predict(testX)
# invert predictions
trainY = scaler.inverse_transform(trainPredict)
trainY = scaler.inverse_transform(trainY)
testY = scaler.inverse_transform(testPredict)
testY = scaler.inverse_transform(testY)
# calculate root mean squared error
trainScore = np.sqrt(mean_squared_error(trainY[0], trainPredict[:,0]))
```

```
localhost8888/notebooks/Azka.ipynb
Classes cour Careers - Neuralink GitHub Learning Lab Electronic library D... zip recruiter - Goog... Companies - P@SHA Google Scholar Download Free Gun... Inbox (113) - 19138... Python - How to Sa... Paraphrasing Tool... Software Requirem...

jupyter Azka Last Checkpoint: Last Tuesday at 11:20 PM (autosaved)
File Edit View Insert Cell Kernel Widgets Help Trusted Python 3 (pykernel)

Epoch 100/100
1/1 - 0s - loss: 0.6438 - 7ms/epoch - 7ms/step
Out[12]: <keras.callbacks.History at 0x247eb597c10>

In [13]:
# make predictions
trainPredict = model.predict(trainX)
testPredict = model.predict(testX)
# invert predictions
trainY = scaler.inverse_transform(trainPredict)
trainY = scaler.inverse_transform(trainY)
testY = scaler.inverse_transform(testPredict)
testY = scaler.inverse_transform(testY)
# calculate root mean squared error
trainScore = np.sqrt(mean_squared_error(trainY[0], trainPredict[:,0]))
print('Train Score: %.2f RMSE' % (trainScore))
testScore = np.sqrt(mean_squared_error(testY[0], testPredict[:,0]))
print('Test Score: %.2f RMSE' % (testScore))

1/1 [=====] - 1s 1s/step
1/1 [=====] - 0s 42ms/step
Train Score: 8852.89 RMSE
Test Score: 8849.00 RMSE

In [14]:
# shift train predictions for plotting
trainPredictPlot = np.empty_like(dataset)
trainPredictPlot[:, :] = np.nan
trainPredictPlot[look_back:len(trainPredict)+look_back, :] = trainPredict
# shift test predictions for plotting
testPredictPlot = np.empty_like(dataset)
testPredictPlot[:, :] = np.nan
testPredictPlot[len(trainPredict)+(look_back*2)+1:len(dataset)-1, :] = testPredict
# plot baseline and predictions
plt.plot(scaler.inverse_transform(dataset))
plt.plot(trainPredictPlot)
plt.plot(testPredictPlot)
plt.show()
```