Software Requirement Specification Document for Complete blood count mobile application

Mohamed Moataz, Kareem Ehab(Team leader), Ahmed gamal, Youssif Assem

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Table 1: Document version history

Version	Date	Reason for Change
1.0	7-Oct-2021	Initial version for SRS

Github: https://github.com/YoussifAssem/Complete-Blood-Count.git

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Abstract

The complete blood count (CBC) with differential is one of the most essential common laboratory tests performed today to know the problems we suffer from before it expands. If we don't address the problem early on, the human body is one of the most vulnerable to a number of disorders. We want to make a smartphone application that can read the results of a complete blood count (CBC). Furthermore, the application will inform the user whether there is a possibility that the CBC contains corona or not. Otherwise, the application will advise the user on the most specific specialized area of expertise for the user. An enhanced understanding of this laboratory test is essential to providing quality care.[1]

1 Introduction

1.1 Purpose of this document

The aim of this document is to provide a full description of Complete blood count(CBC) mobile application. The usage of blood analytics is required due to the nature of the subject. Therefore It will outline the system's objectives and characteristics, as well as the system's interfaces. It will also cover what the system will preform, the constraints under which It will operate, and, most importantly, how the system will react to external stimulation.

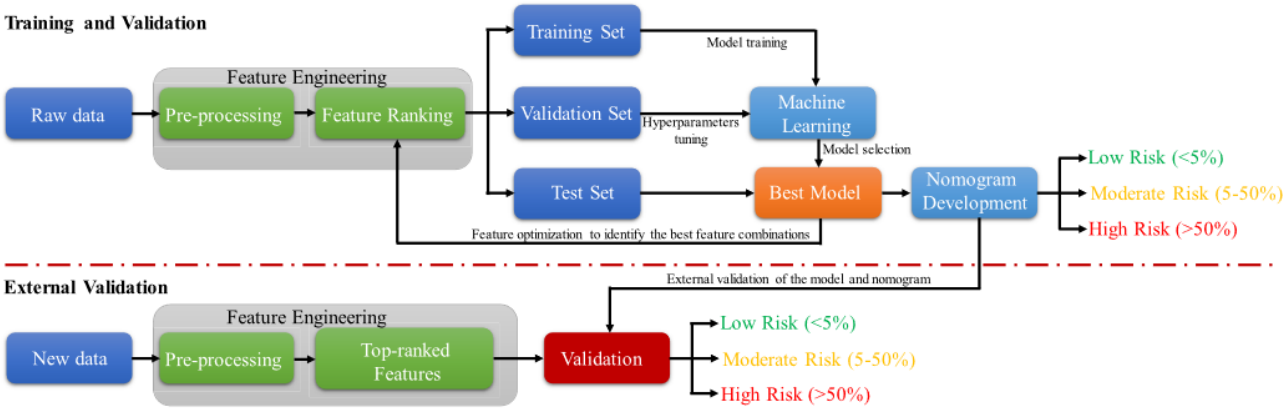
1.2 Scope of this document

This Software Requirements Specification is to create a fully functional mobile application for displaying blood analytics results and indicate which area of expertise the user should consult. This shall target users like patients with minimal experience in reading blood analytics (determining whether the patient has corona virus or not)

2 Similar Systems

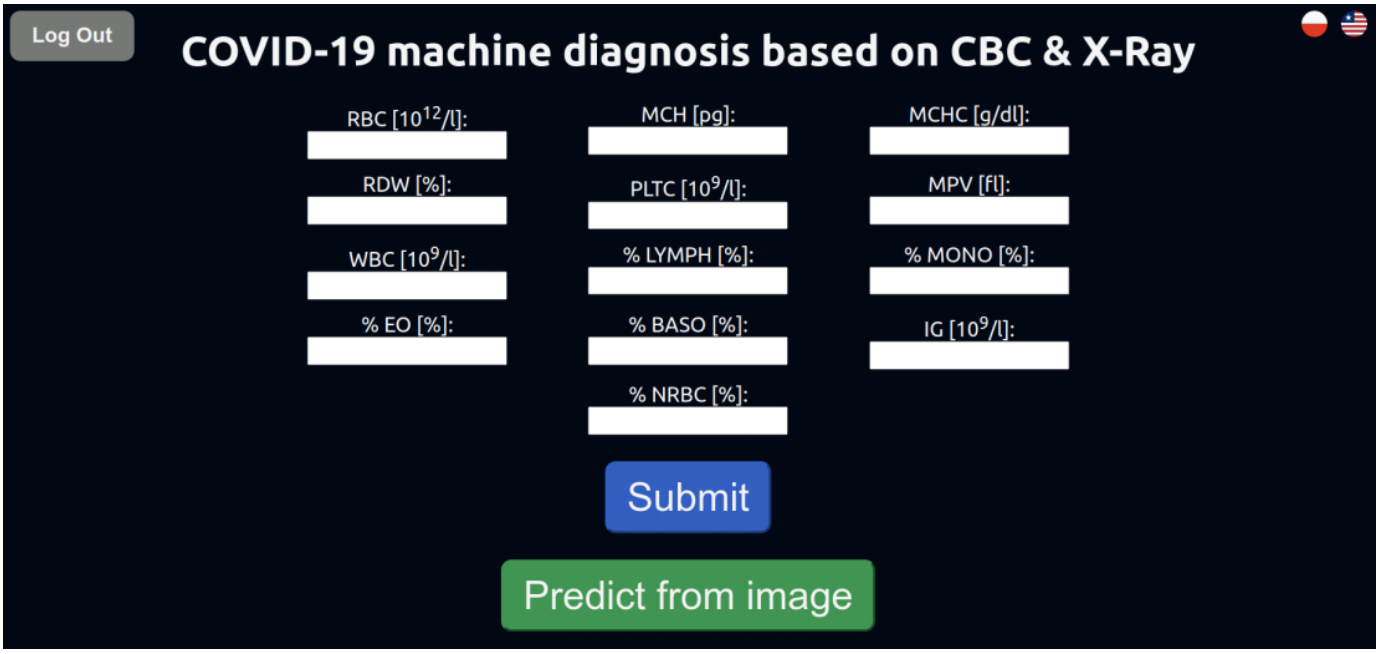
[2]Following an epidemic in Wuhan, the coronavirus illness 2019 (COVID-19) has become increasingly widespread over the world. A quick, accurate, and easily accessible clinical assessment of the disease's severity can aid in resource allocation and prioritisation in order to prevent mortality. The study's goal was to create and evaluate an early scoring tool that used widely available complete blood count (CBC) biomarkers to stratify the risk of death. From January 10 to February 18, 2020, 375 COVID-19 patients were hospitalised to Tongji Hospital in China, and a retrospective study was done on twenty-three CBC blood indicators for predicting disease mortality. Machine learning-based core biomarkers among CBC values have been identified as mortality predictions. For forecasting the mortality risk among COVID-19 patients, a multivariate logistic regression-based nomogram and scoring system were created to categorise the patients into three risk groups (low, moderate, and high). The random forest feature selection technique was used to identify lymphocyte count, neutrophil count, age, white blood cell count, monocytes (percent), platelet count, and red blood cell distribution width parameters gathered at hospital admission as key indicators for death prediction. A CBC score was developed to calculate the patients' death probability and was used to divide them into three sub-risk groups: low "(=5 percentage, moderate

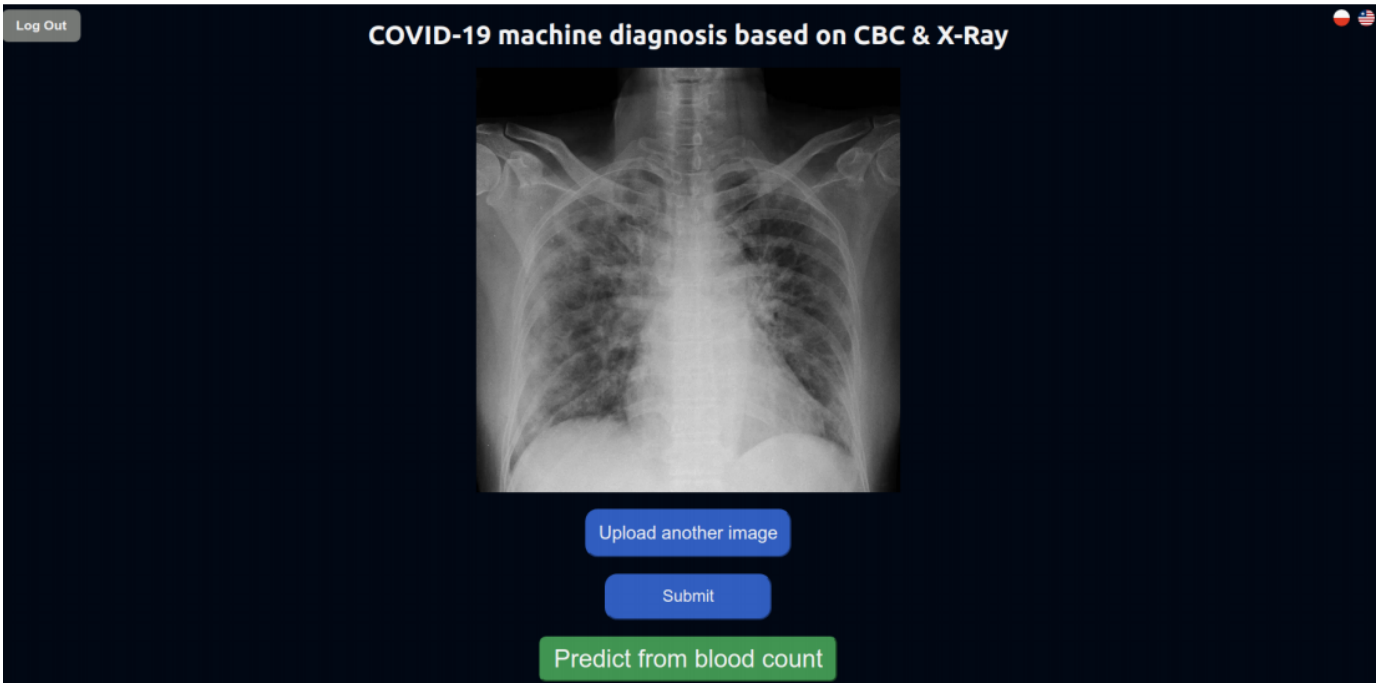
(>5 and =50 percentage), and high (>50 percentage), respectively".[3] For the development and internal validation cohorts, the model's area under the curve (AUC) was 0.961 and 0.88, respectively. An external cohort of 103 patients from Dhaka Medical College in Bangladesh was used to validate the proposed model, yielding an AUC of 0.963. The proposed CBC parameter-based prognostic model and related web-application can assist medical physicians in improving the care of COVID-19 patients in low-resource countries by predicting mortality risk early.



[4] The workflow that can be used to construct COVID-19 machine learning diagnosis systems based on multimodal data is investigated in this thesis. Medical records are now maintained in an unorganised manner, making analysis difficult. Prequalifying for Real Time PCR tests, which can take up to a day, are expensive, often limited, and require specialist laboratory equipment, can benefit from such study.

they provide a strategy for establishing a user-friendly website that allows anyone to acquire a prediction based on their input and outline possible data processing approaches, particularly for huge medical datasets. they also show three models that can be used as stand-alone solutions or stages in the COVID-19 machine diagnosis. The first model uses natural language analysis to extract COVID-19 infection-related variables from doctor-written reports, particularly those detailing heart and lung issues. For COVID-19 diagnosis based on X-ray scans, the second model employs convolutional neural networks. they also look into data balancing approaches such as undersampling and oversampling, as well as a classification model for analysing whole blood count results.



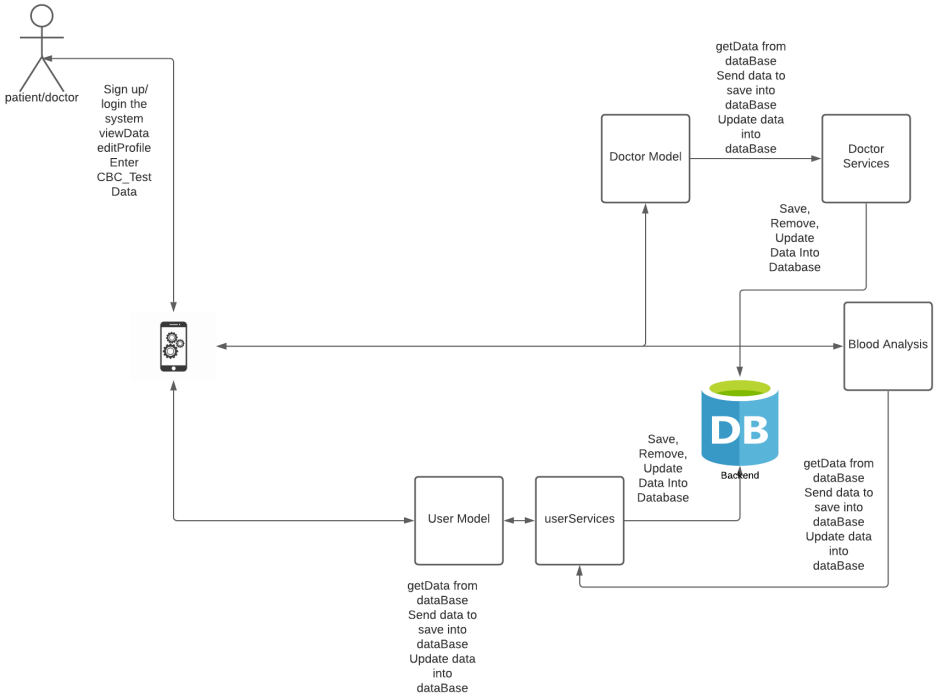


3 System Description

3.1 Problem Statement

Patients are having and suffering from a lot of issues(corona virus now days)because they can't understand the blood test data and aren't sure what to do or which doctor to see. The results of the blood tests do not reveal the specific nature of the problem to the patient.

3.2 System Overview



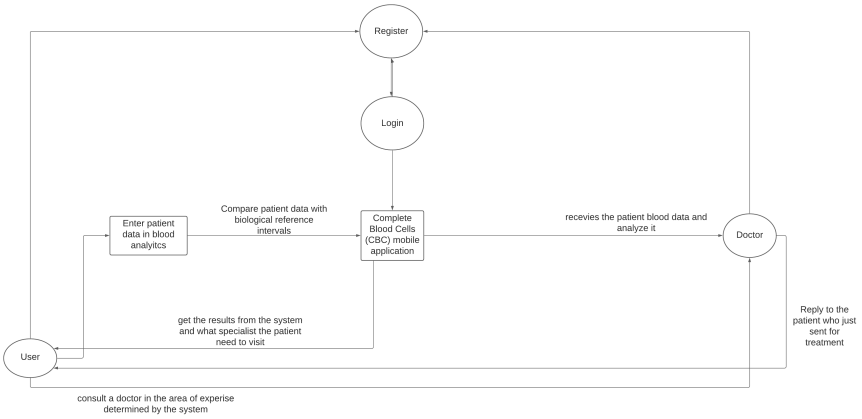
The user can quickly determine whether the patient has corona virus or not, where the system analyze the blood data entered by The patient and sends back a report whether he/she positive .if the patient is diagnosed with COVID-19 , the application will ask the one to see a doctor or provide a communication with any doctor in the application's chat system.

3.3 System Scope

In the proposed application, the user (patient) enters his blood numbers, and the application analyses the data and gives the user feedback whether the user has corona or not and which type of doctor he/she should see, or the user can use the application's chat system to exchange messages with a doctor who is also using the app to help patients with their specific illness.

3.4 System Context

Context Diagram: https://lucid.app/lucidchart/33492a5b-ab8f-4fc5-801e-f1bc8d02328c/edit?viewport_loc=-1522%2C84%2C4992%2C2253%2C0_0&invitationId=inv_963edc47-f0b0-467e-90df-e99e434384c2



3.5 Objectives

USER OBJECTIVES:

- If the user is signing up for the first time, he must create an account
- Users may enter and submit their blood analytics data , system starts to analyize data and sends back a report whether the one has a corona virus or not
- The user can communicate with the doctor and send him messages.
- In addition, the user can provide feedback and rate the app in the play store

3.6 User Characteristics

- Patient: Shall have a basic understanding of how to use a mobile device and navigate through the mobile application.
- Doctor: Shall have a basic understanding of the the mobile application's interface and how to navigate through it.

4 Functional Requirements

4.1 System Functions

Table 2: Add User into database Description

Name	addUserIntoDatabase
Code	FR01
Priority	Extreme
Critical	It's extremely important.
Description	Add a new user into the system and the firebase.
Input	strings from the user's form
Output	No outputs for this function
Pre-condition	The user will enter the system and free to use all other functions
Post-condition	Redirect to the login page
Dependency	This function depends on the user being registerd into the system
Risk	Without it we can't proceed into the system without users

Table 3: Edit Profile Description

Name	editProfile
Code	FR02
Priority	Important
Critical	It's a normal function.
Description	The user can edit his/her profile including firstname , lastname, email, birthdate, phone, password
Input	firstname, lastname, email, birthdate, phone, password
Output	Updates the user info
Pre-condition	After user input something in the system
Post-condition	Redirect to the home page after giving a message to the user that his/her info has been updated.
Dependency	This function depends on the user input when the user is added into the system
Risk	The users can't update their update if they written their information wrong

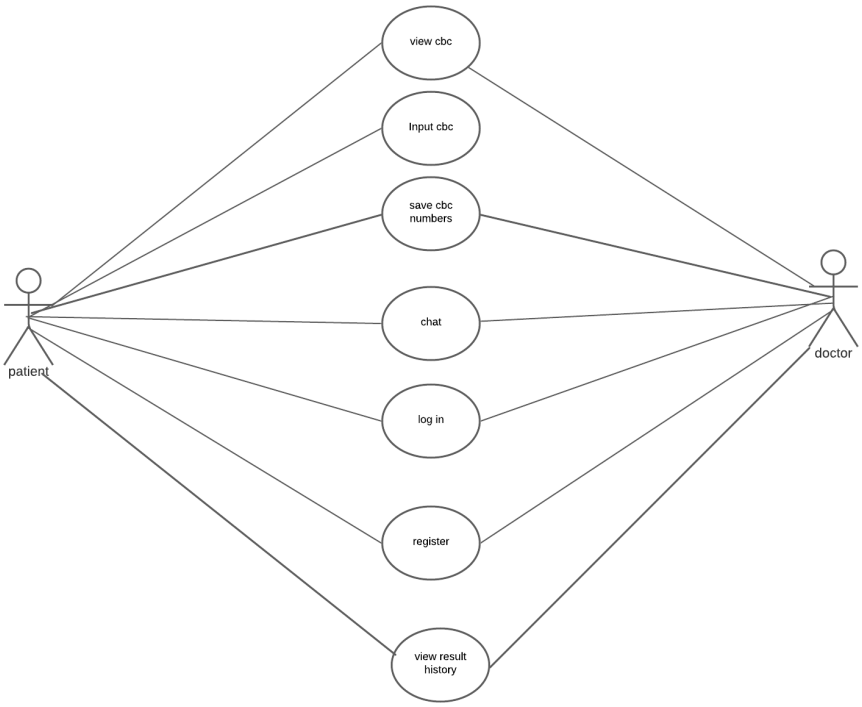
Table 4: View results

Name	viewHistory
Code	FR02
Priority	Important
Critical	It's a normal function.
Description	The users can see their results history from previous CBC tests
Input	No inputs for this function
Output	It will view the history from the firestore
Pre-condition	After user input something in the system
Post-condition	View the information for every CBC test that the user has made before
Dependency	This function depends on the user and whether or not has made a test before or not
Risk	Not having the option to see previous results is not efficient and can be client demanding

Table 5: getResults

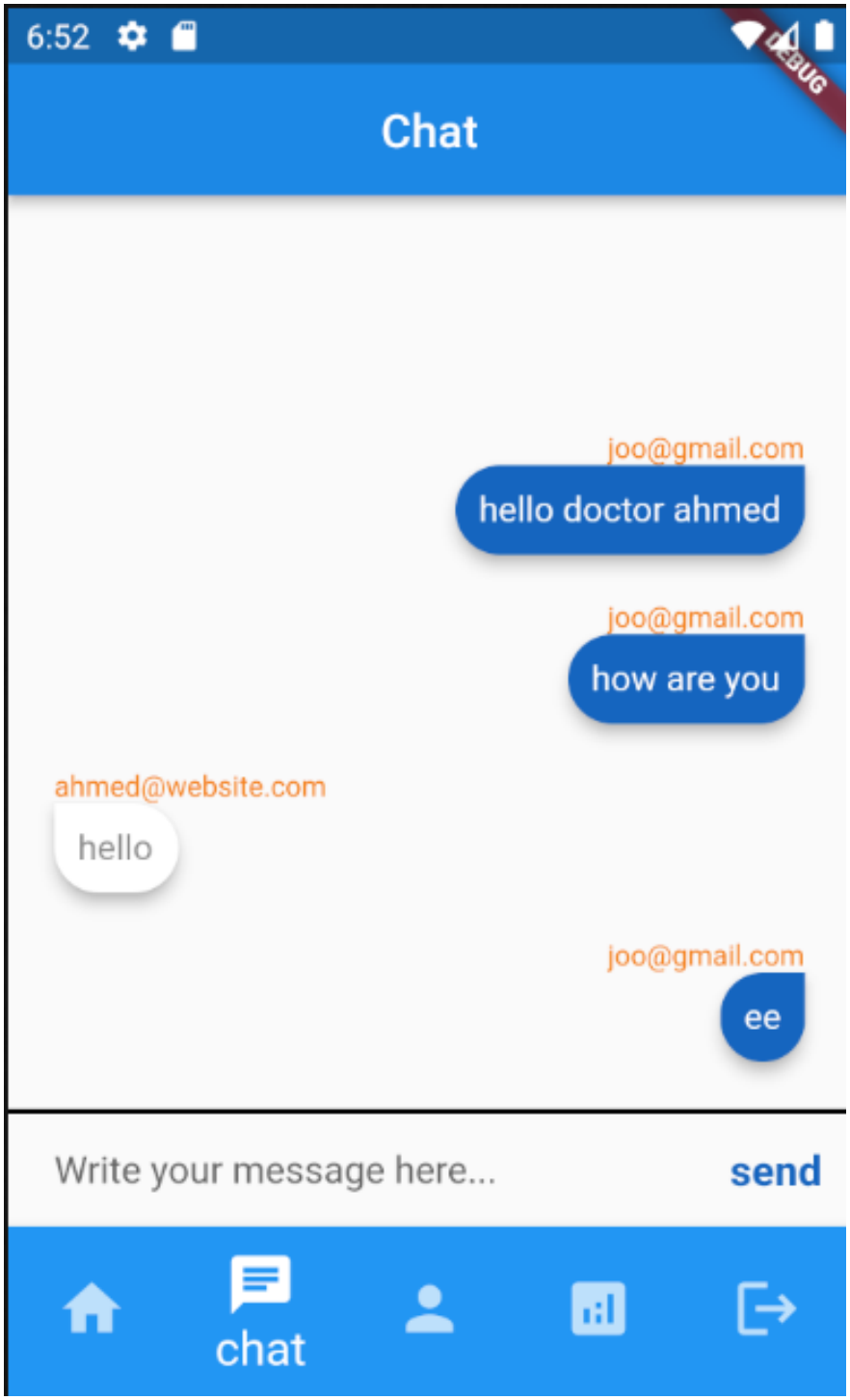
Name	getResults
Code	FR03
Priority	Important
Critical	It's a normal function.
Description	The users can see what is problem in the test
Input	No inputs for this function
Output	It will view the problems in the test
Pre-condition	After user input data of CBC test
Post-condition	View the information results of CBC test that the user entered it
Dependency	This function depends on the data that the user entered
Risk	if the user don't enter the data of CBC this function will not run

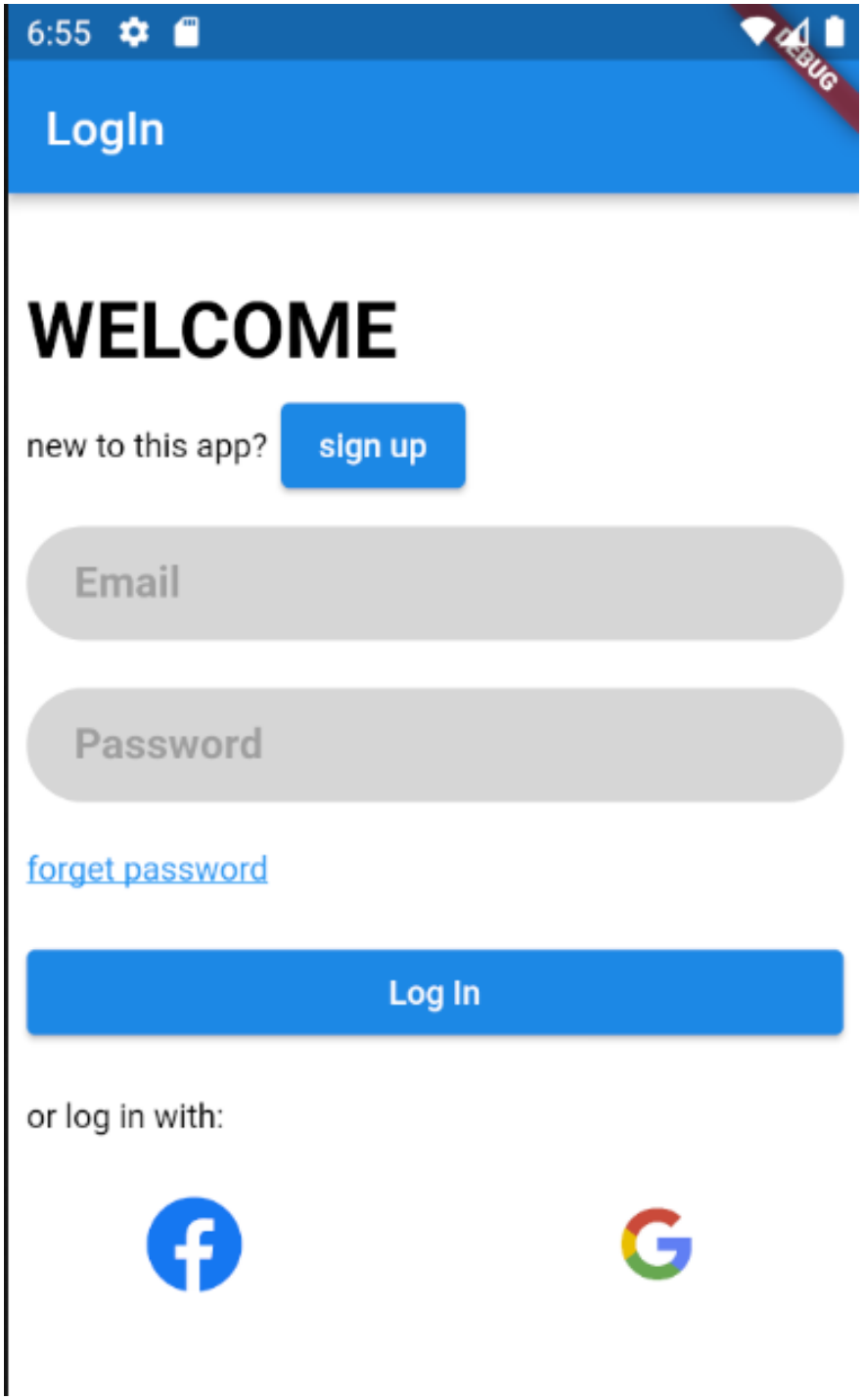
Inheritance Relationships: https://lucid.app/lucidchart/48345e3a-c507-4b03-9faf-68bfcc699b24/edit?page=0_0&invitationId=inv_b25ba821-350a-44fc-ac79-4b279512782d#

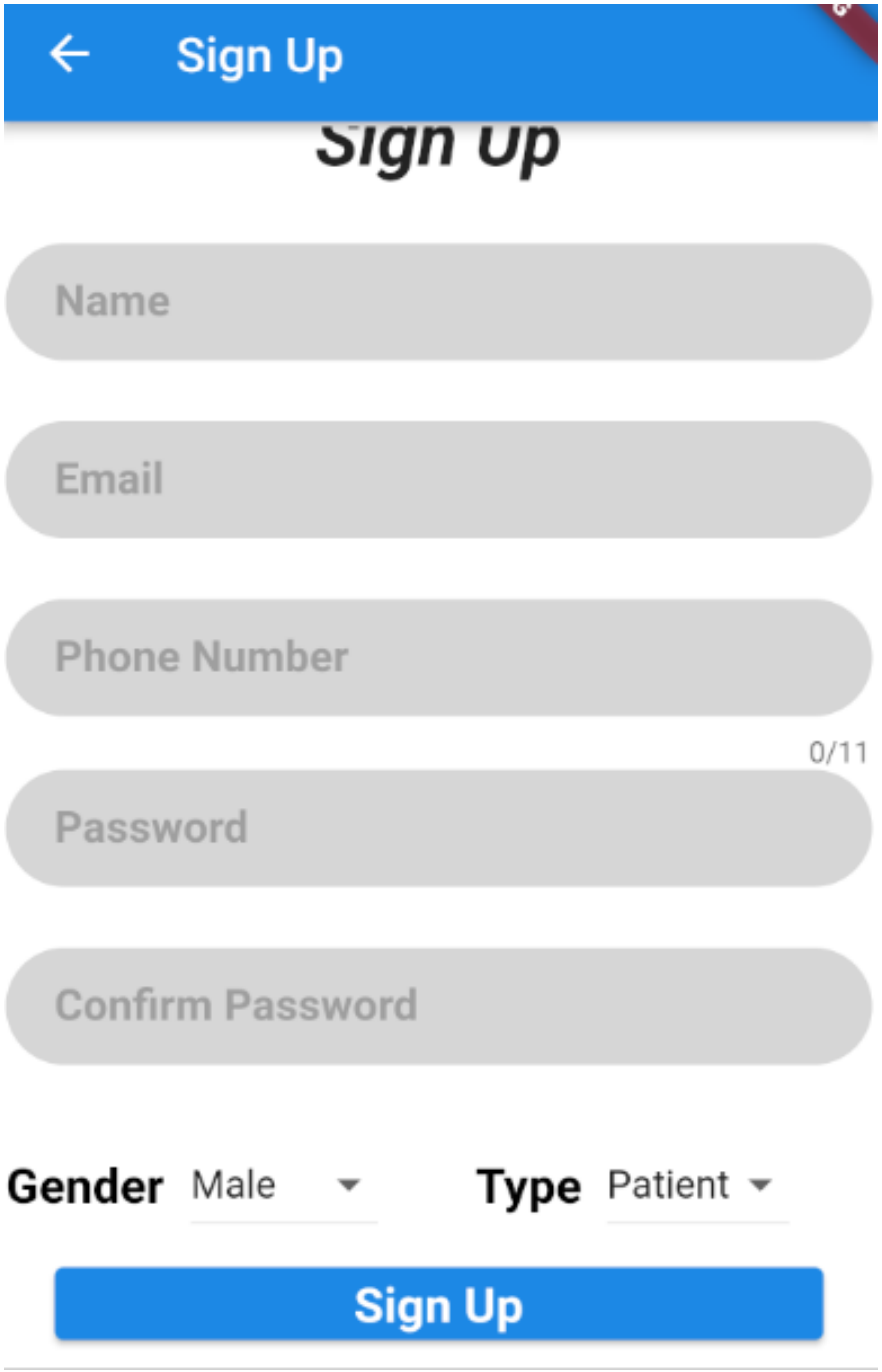


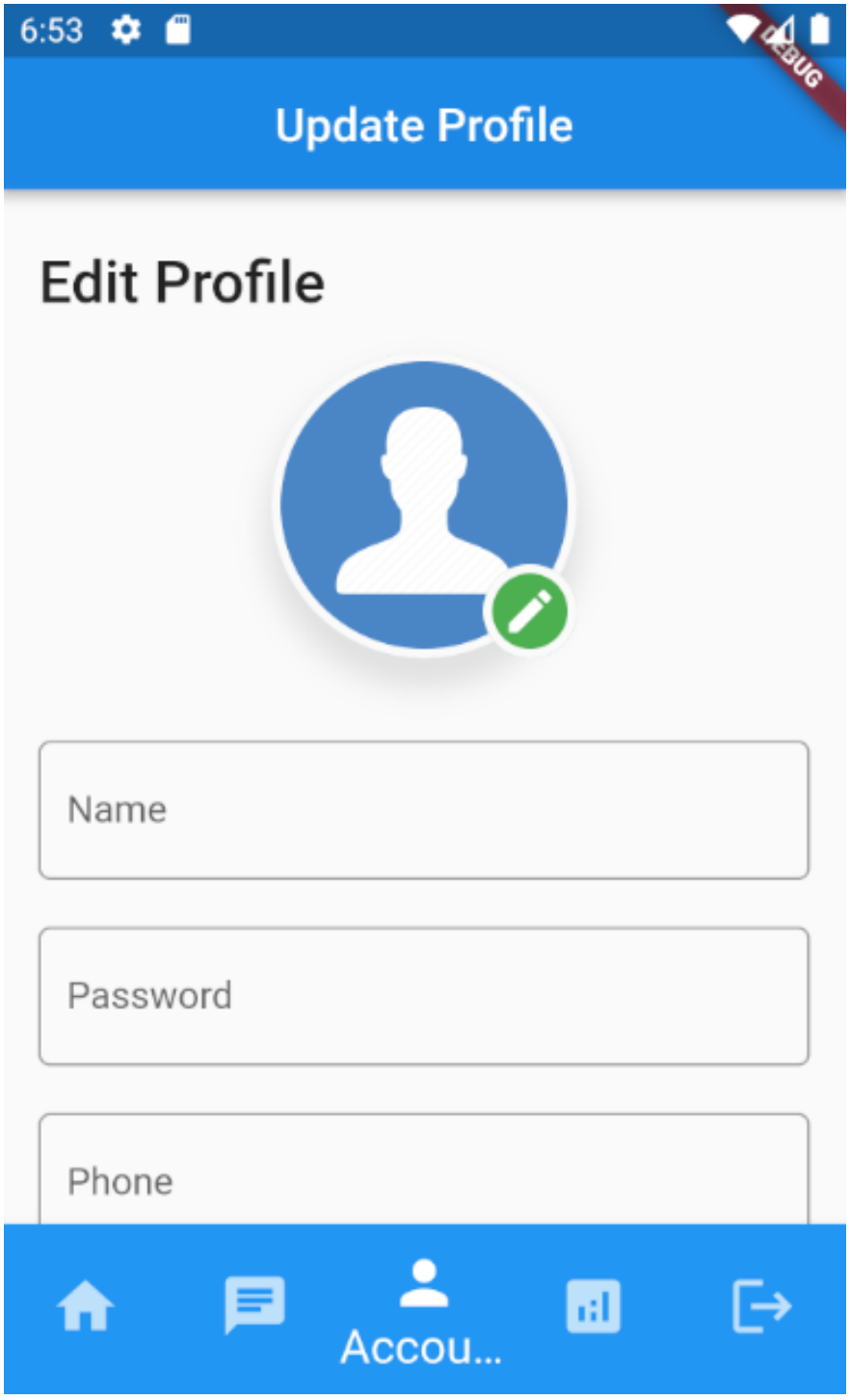
5 Interface Requirements

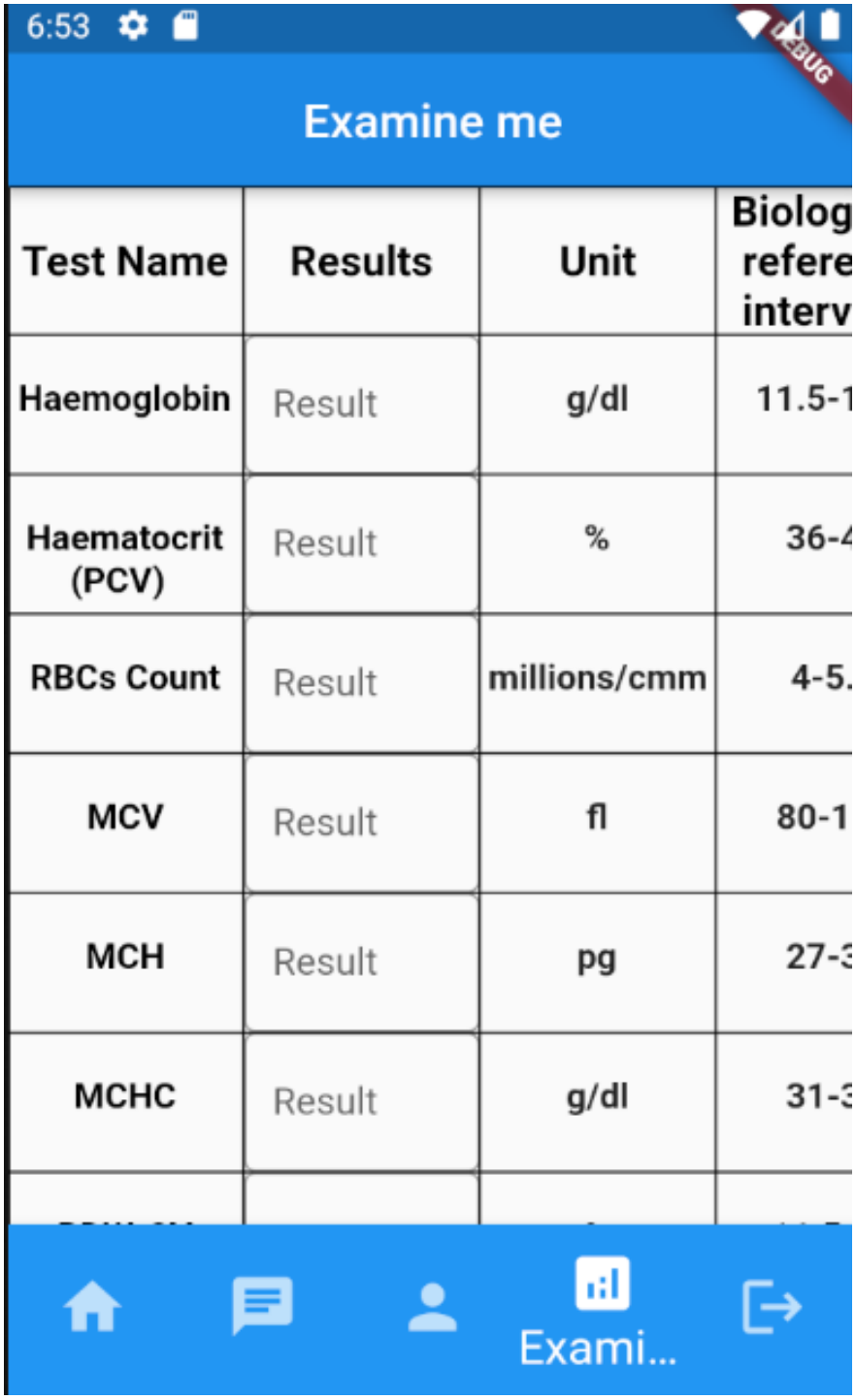
5.1 User Interfaces

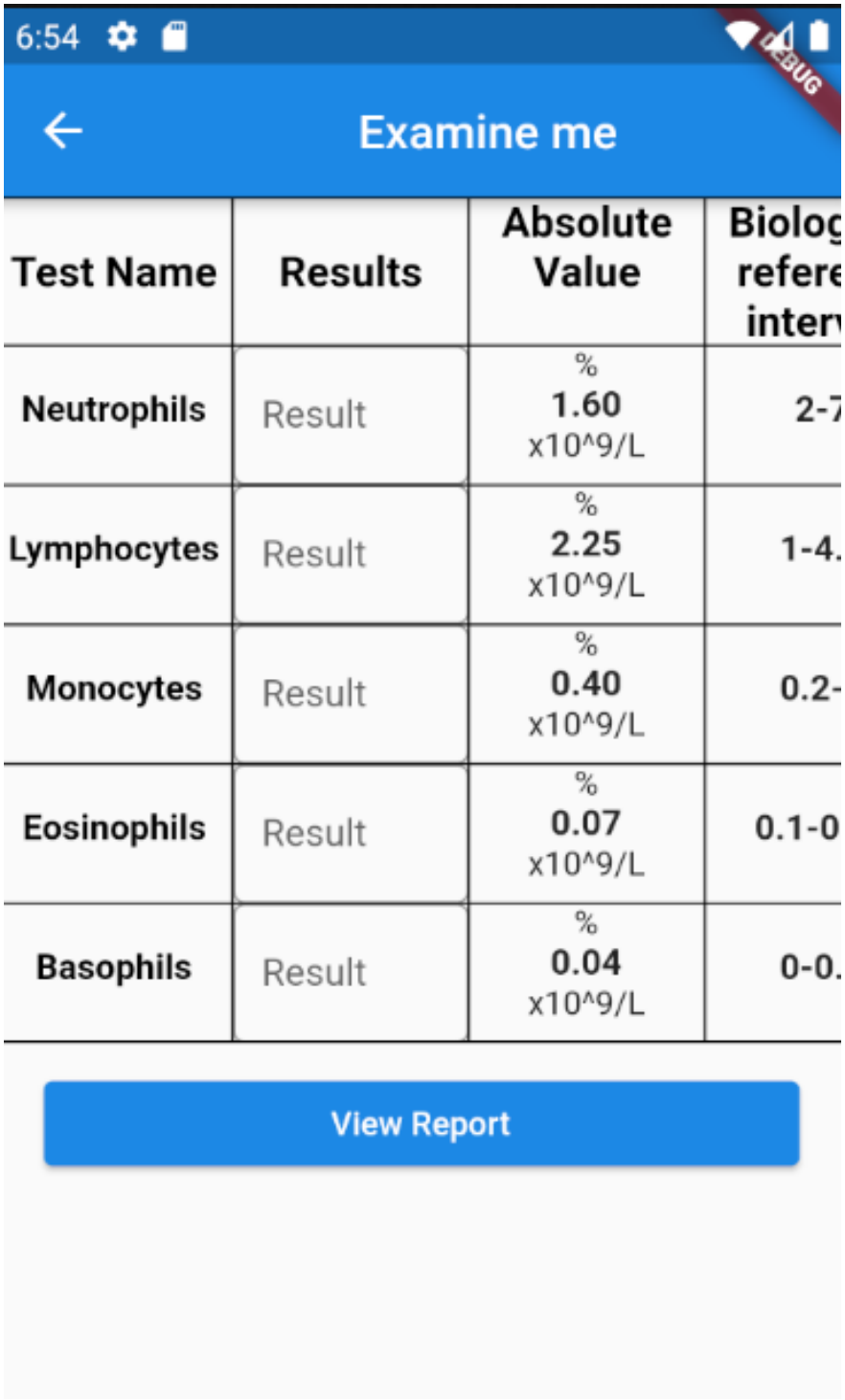


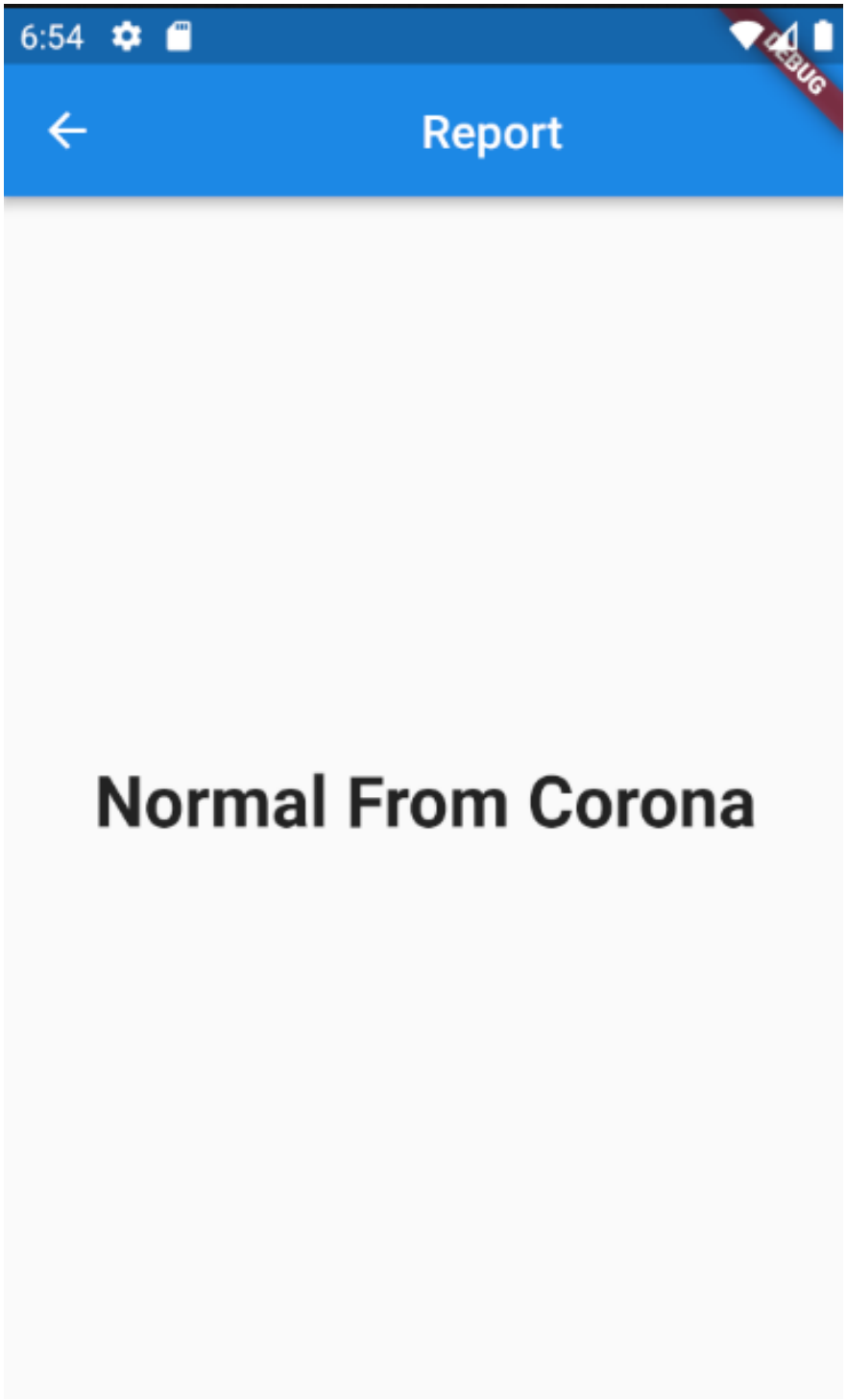

6:55
DEBUG
LogIn
WELCOME
new to this app?
sign up
Email
Password
forget password
Log In
or log in with:

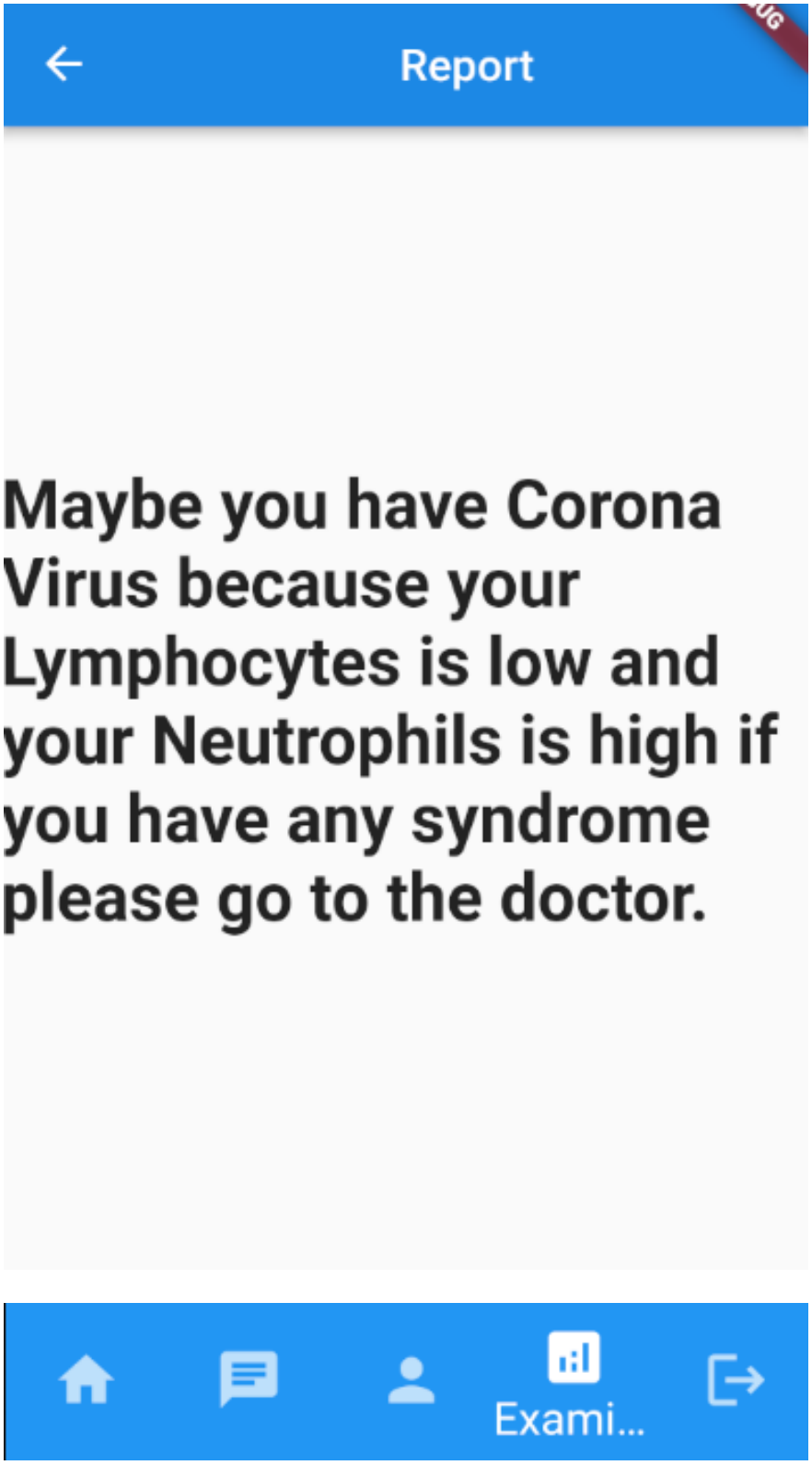

Sign Up
Sign Up
Name
Email
Phone Number
0/11
Password
Confirm Password
Gender
Male
Type
Patient
Sign Up


6:53
DEBUG
Update Profile
Edit Profile
Name
Password
Phone
Accou...


6:53
DEBUG
Examine me
Test Name
Results
Unit
Biolog
refere
interv
Haemoglobin
Result
g/dl
11.5-1
Haematocrit (PCV)
Result
%
36-4
RBCs Count
Result
millions/cmm
4-5.
MCV
Result
fl
80-1
MCH
Result
pg
27-3
MCHC
Result
g/dl
31-3
Exami...


6:54
DEBUG
Examine me
Test Name
Results
Absolute Value
Biolog refere interv
Neutrophils
Result
%
1.60
x10^9/L
2-7
Lymphocytes
Result
%
2.25
x10^9/L
1-4.
Monocytes
Result
%
0.40
x10^9/L
0.2-
Eosinophils
Result
%
0.07
x10^9/L
0.1-0
Basophils
Result
%
0.04
x10^9/L
0-0.
View Report


6:54
DEBUG
Report
Normal From Corona


Report
Maybe you have Corona Virus because your Lymphocytes is low and your Neutrophils is high if you have any syndrome please go to the doctor.
Exami...

5.1.1 External APIs

[5] Smart Blood Analytics Swiss (SBAS) is an API that uses advanced machine learning algorithms to provide different AI models for predicting the most probable diagnoses, based solely on an individual's blood test results.

Gather patient's blood test results: Complete blood count with differential and common parameters from biochemistry, hemostatic, enzyme, lipid, protein amino acids, vitamins and hormone panels are usually sufficient for our models to predict the right disease, confirm a human made diagnosis or expand the differential diagnosis.

Decode blood test results: Using machine learning algorithms built revolutionary models to predict hundreds of groups of diseases and medical conditions in the field of internal medicine. Our models can recognize disease-related blood laboratory patterns that are beyond medical knowledge, resulting in a higher diagnostic accuracy compared to traditional quantitative interpretations based on reference ranges or physician's decision-based reference intervals.

Take diagnostics to a higher level Smart Blood Analytics report includes a list of most likely diseases and includes an intuitive multilevel pie chart, which helps physicians to speed up and improve diagnostics, or help patients to be better informed about the outcome of their blood tests and therefore increase their participation during the treatment decision-making process.

6 Non-functional Requirements

6.1 Safety

The system will detect any attacks and it should be secure

6.2 Availability

The system should be available at any time without any failure.

6.3 Scalability

our system is able to increase its capacity and functionalities based on the users demand. it can remain stable while adapting to changes and upgrades

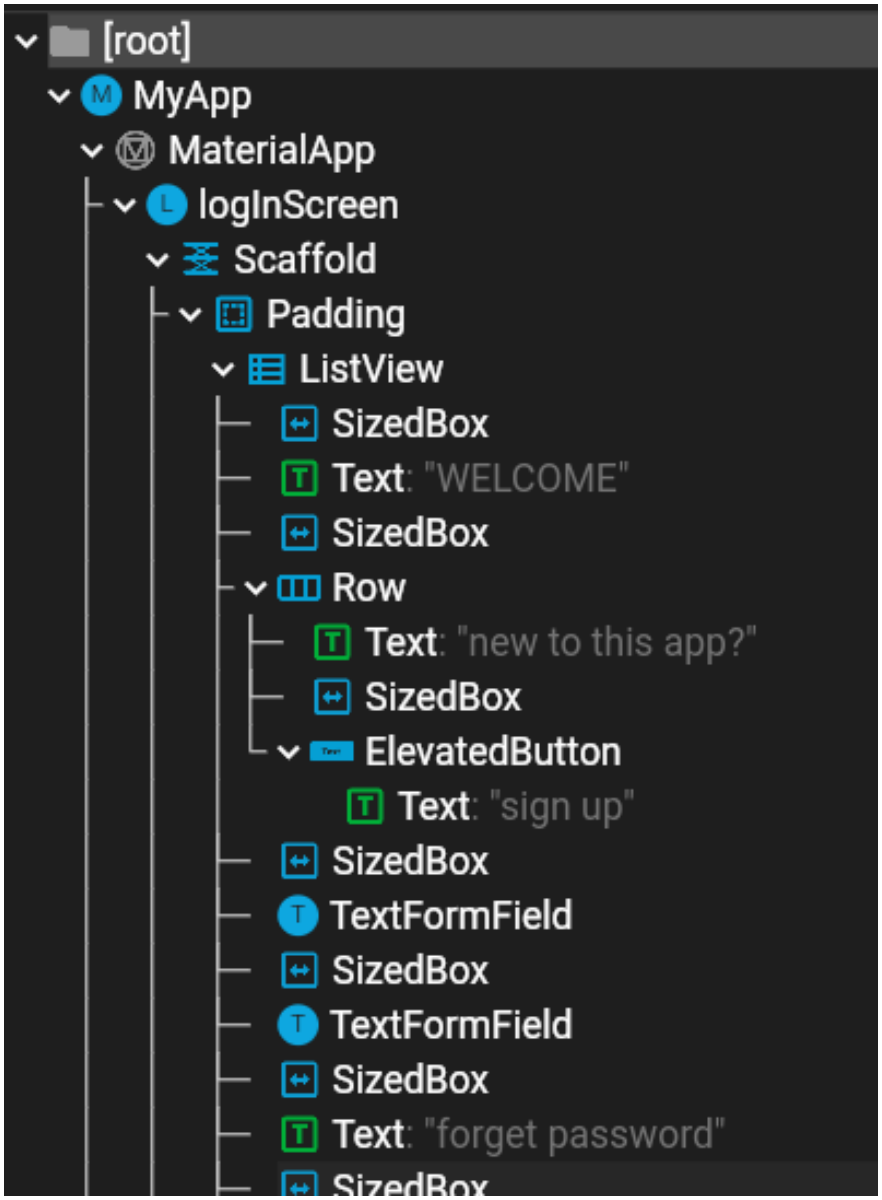
7 Data Design

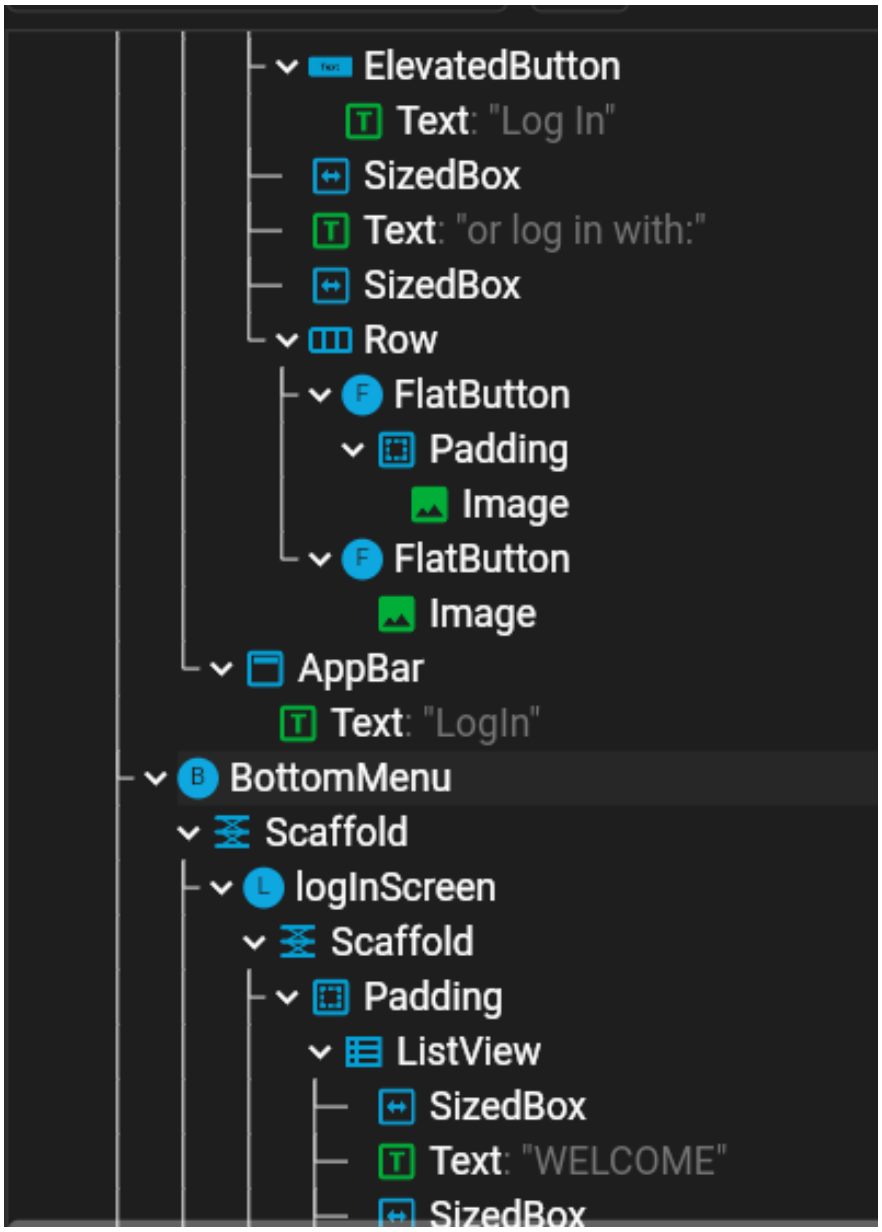
7.1 Data Description

- The data was originally stored in a paper-based format.
- Forms and API are the methods we use to collect data in our system.
- The database size will be determined by the number of people that register and log in to the system.

- We expect a small percentage of individuals to use the app, with the majority of them being patients and doctors, and we expect the number of users to expand over time as the service continues to perform properly with no issues.
- How is your entity keys(ids) constructed (is there a specific code or format for ID definition)
- In the chat section, where patients and doctors exchange messages, the data will include the date and time of the text sent, as well as the time and day of the text sent.
- we are using Fire base .
- The insert, delete, and edit, queries are the most significant queries that we will employ in our data.

7.2 Database design description

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Text: "Log In"
SizedBox
Text: "or log in with:"
SizedBox
Row
FlatButton
Padding
Image
FlatButton
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Text: "LogIn"
BottomMenu
Scaffold
logInScreen
Scaffold
Padding
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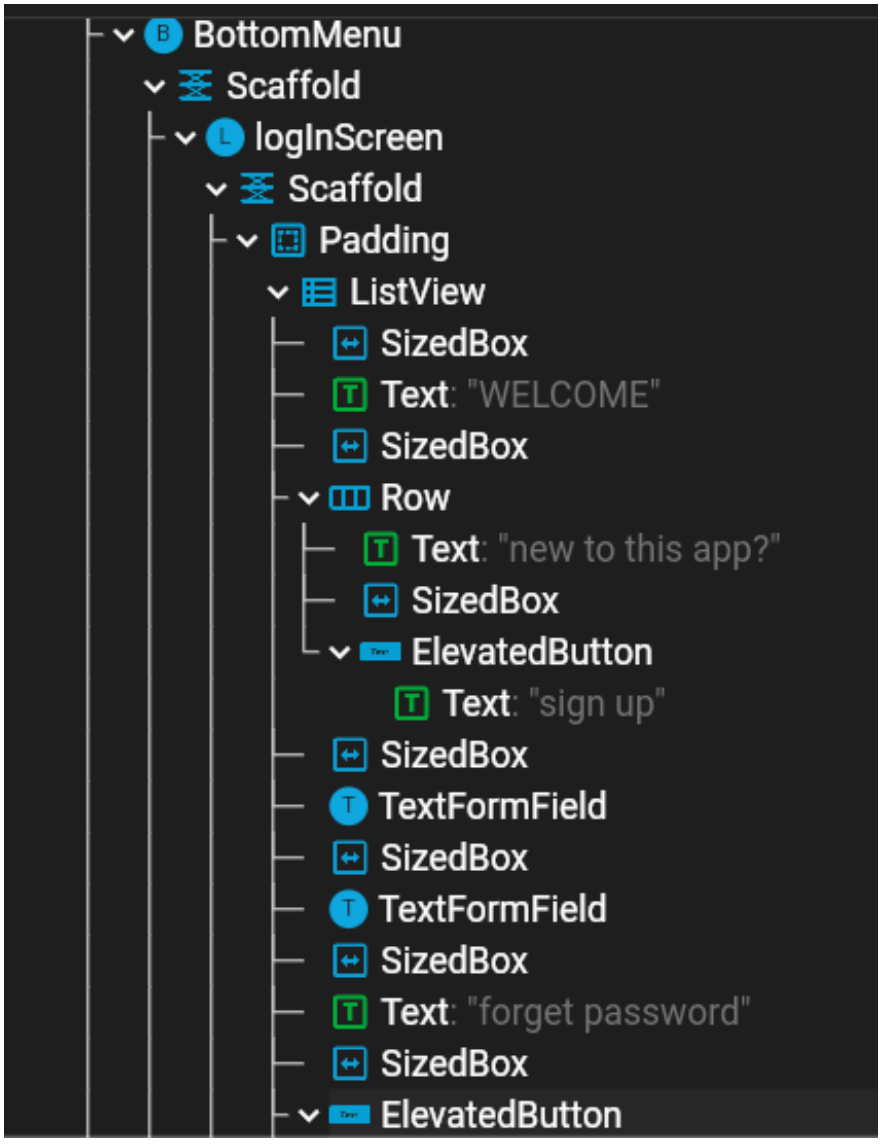
Text: "WELCOME"
SizedBox


BottomMenu
Scaffold
logInScreen
Scaffold
Padding
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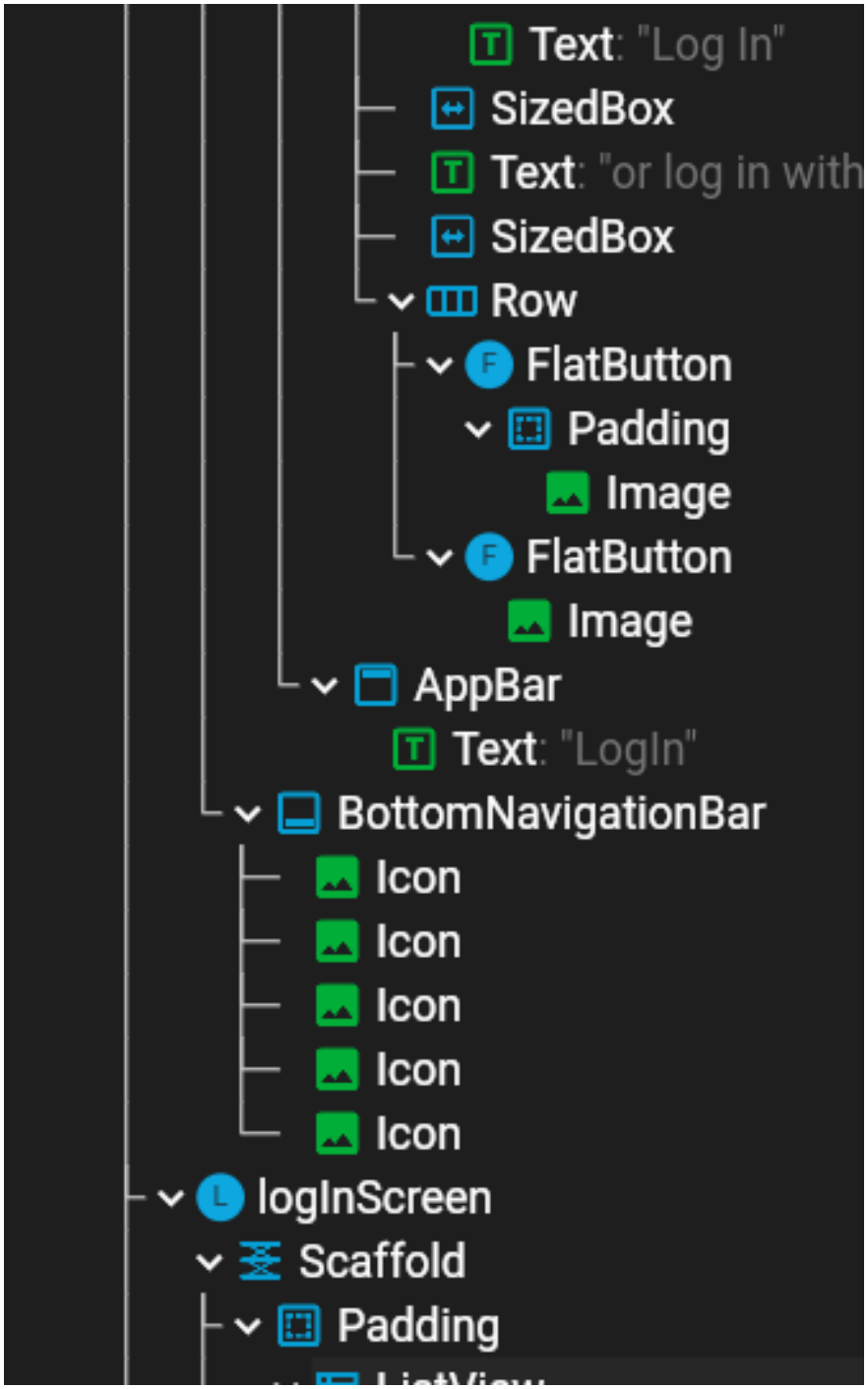
SizedBox
Row
Text: "new to this app?"
SizedBox
ElevatedButton
Text: "sign up"
SizedBox
TextFormField
SizedBox
TextFormField
SizedBox
Text: "forget password"
SizedBox
ElevatedButton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Text: "or log in with
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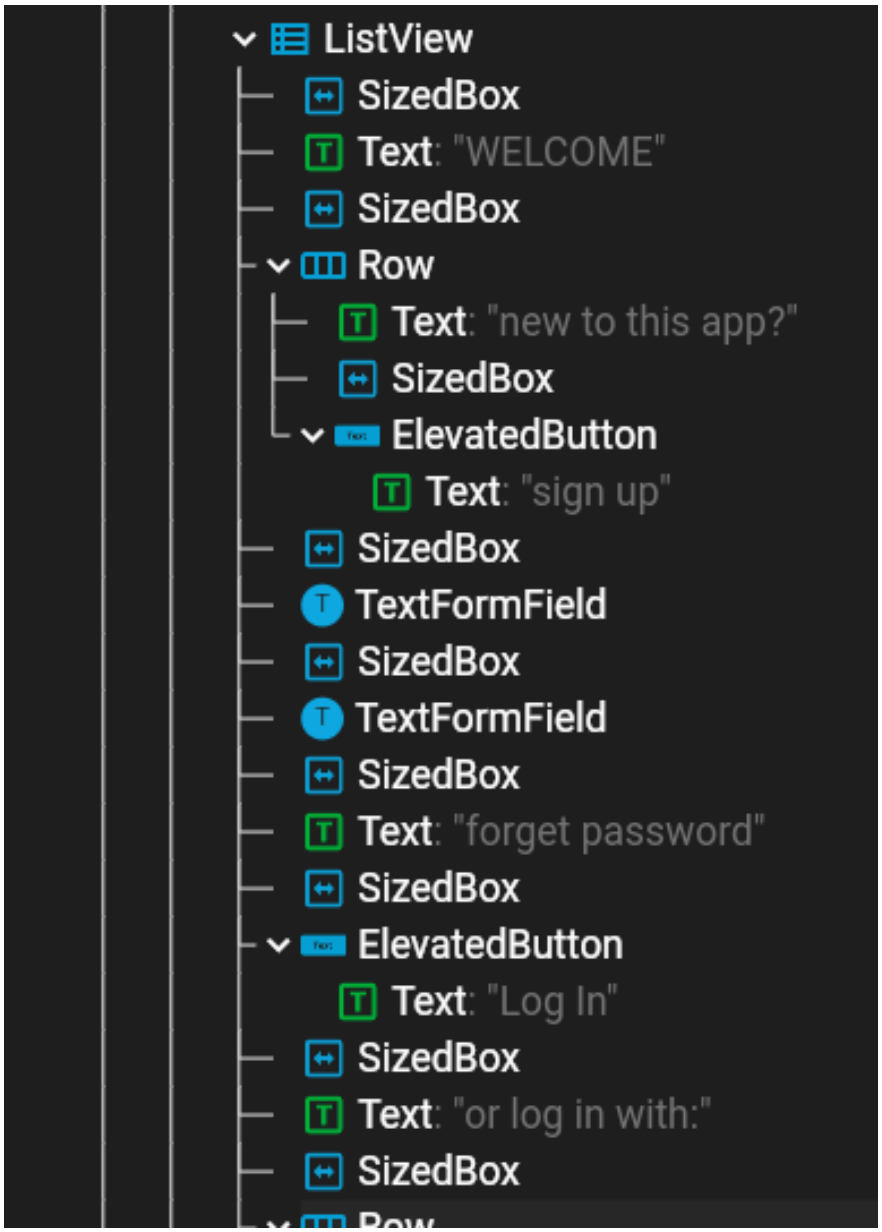
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SizedBox
TextFormField
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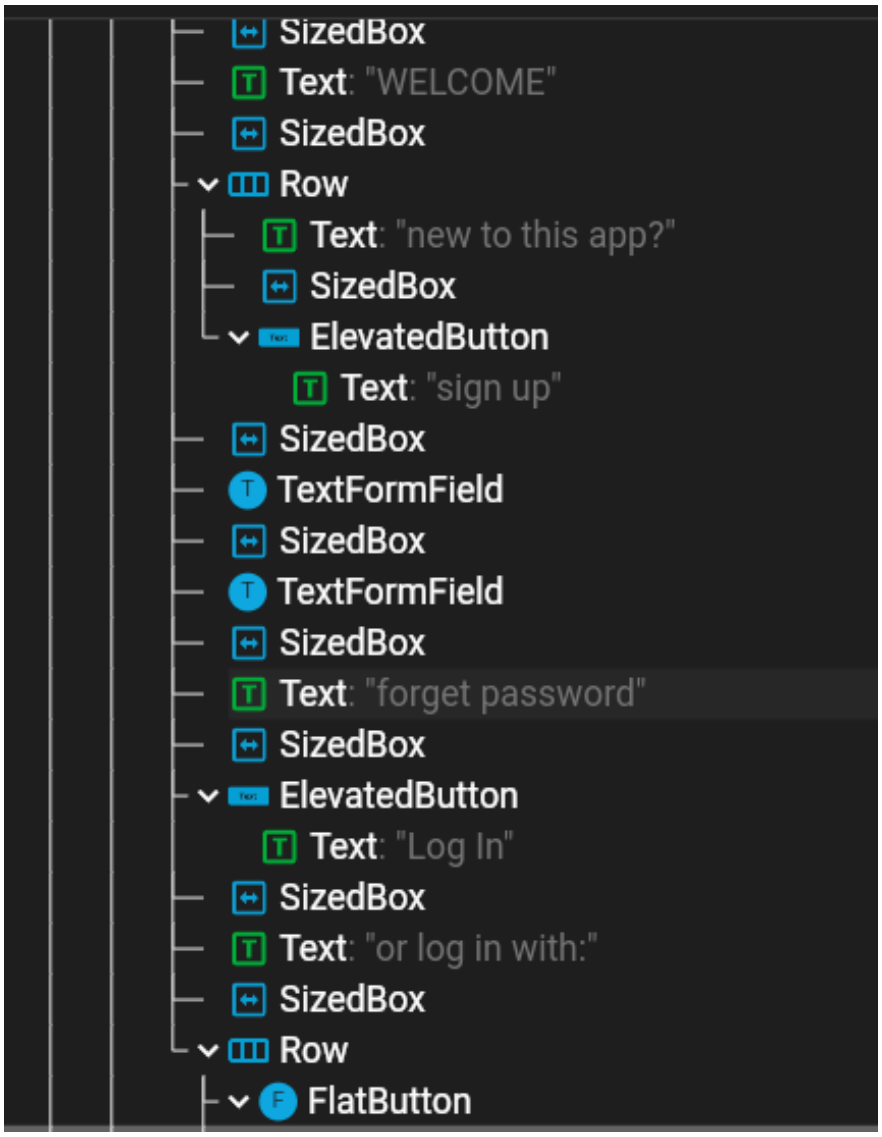
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Text: "sign up"
SizedBox
TextFormField
SizedBox
TextFormField
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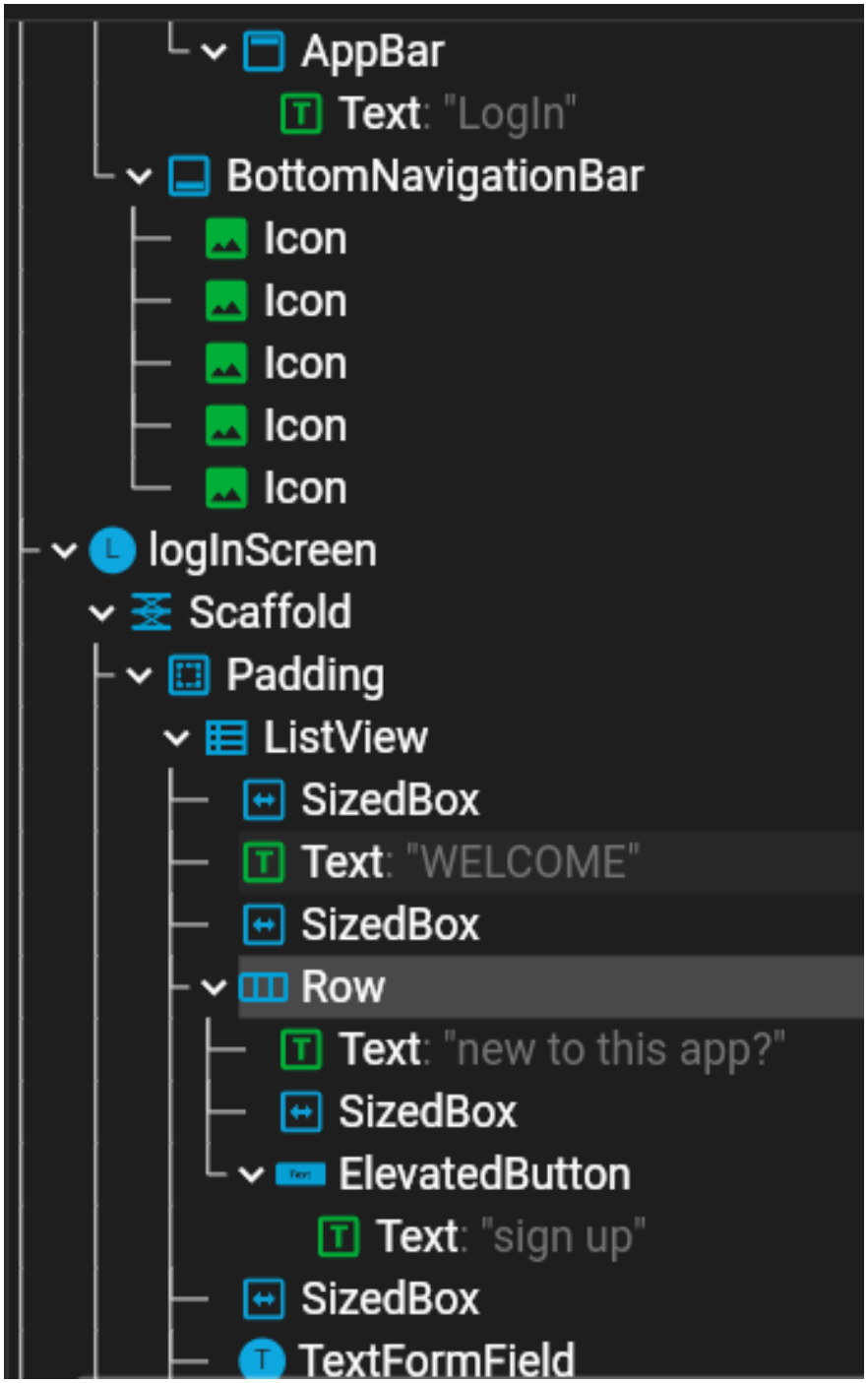
SizedBox
Text: "or log in with:"
SizedBox
Row
FlatButton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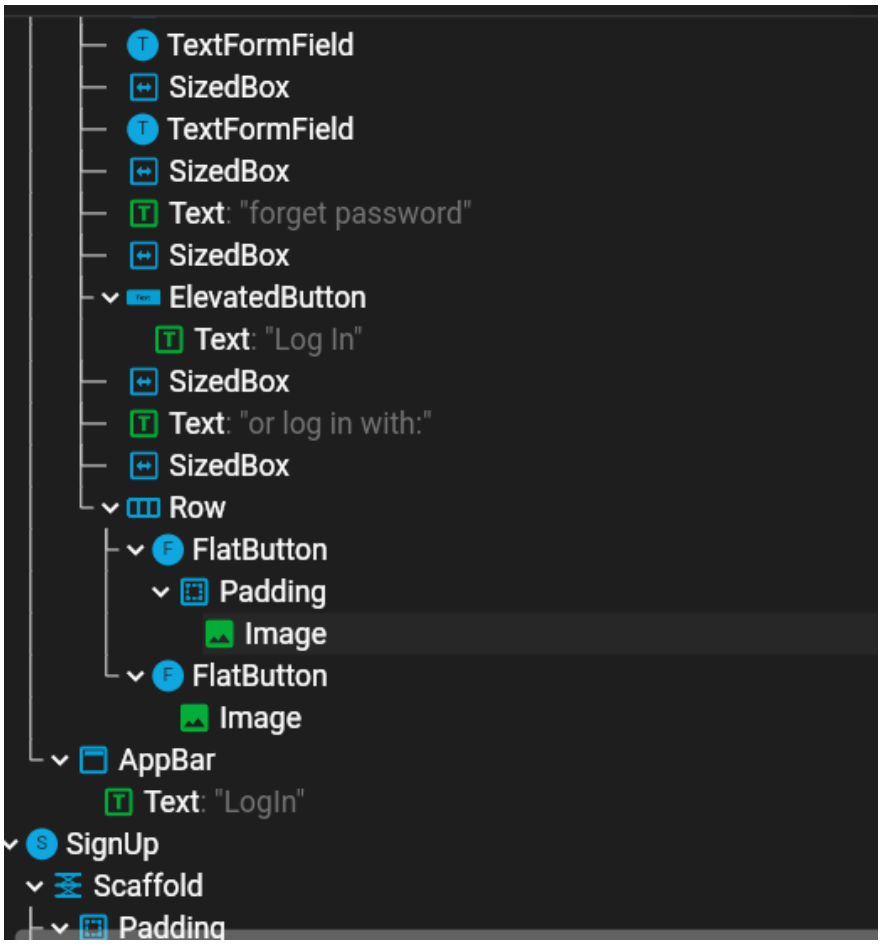
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Text: "forget password"
SizedBox
ElevatedButton
Text: "Log In"
SizedBox
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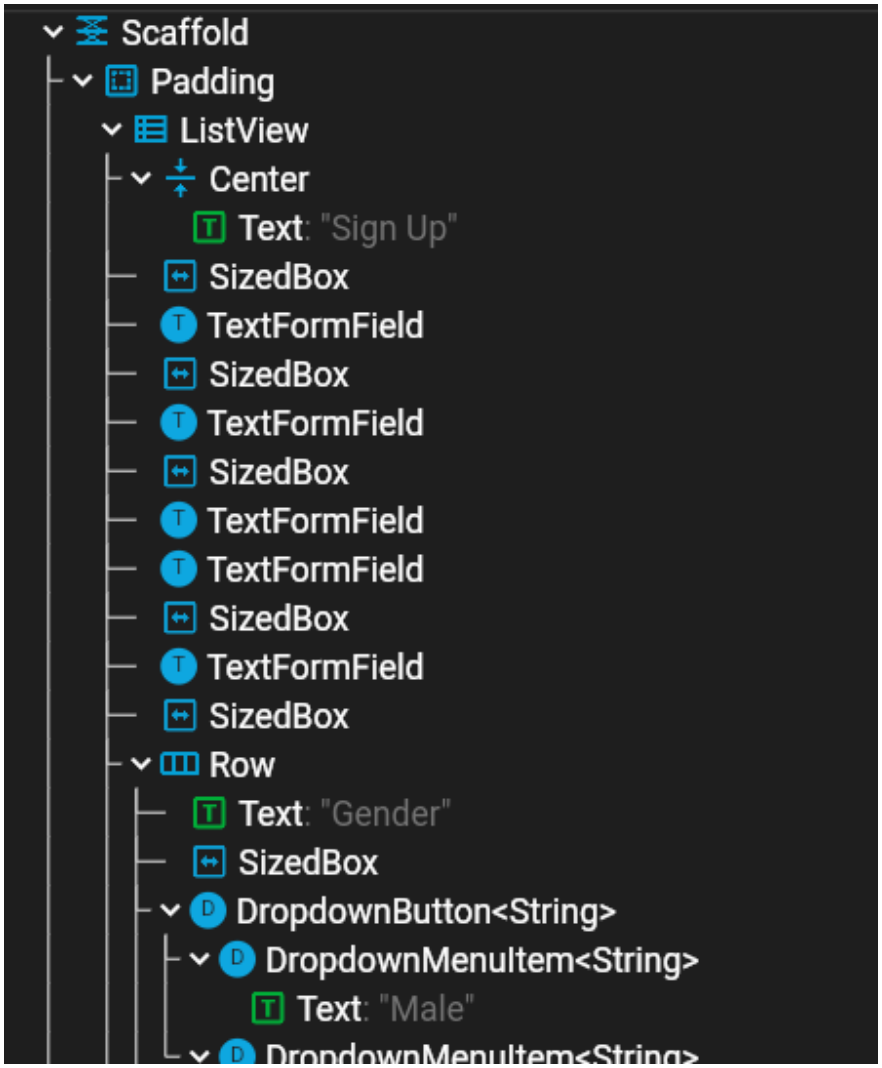
SignUp
Scaffold
Padding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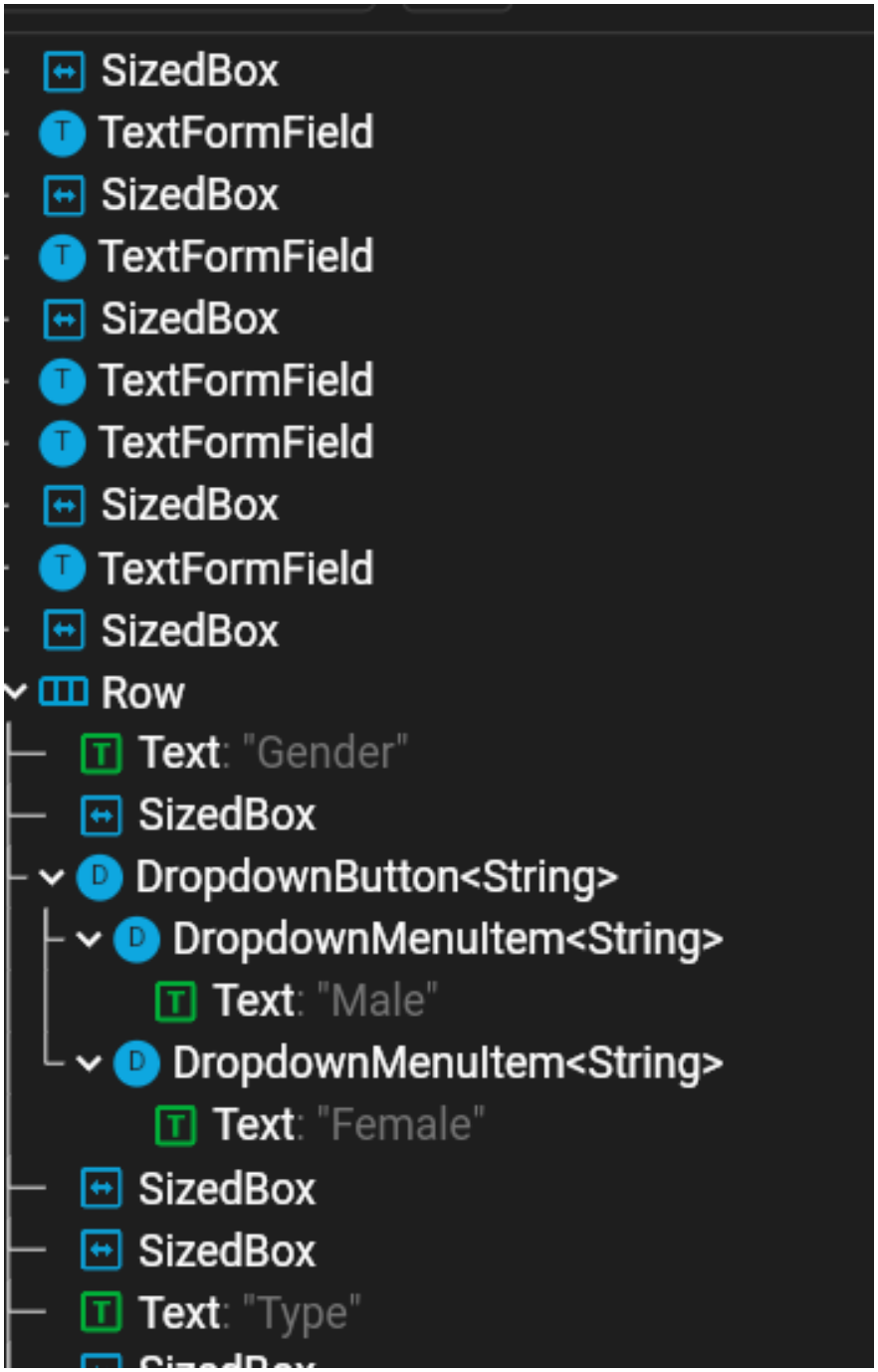
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TextFormField
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SizedBox
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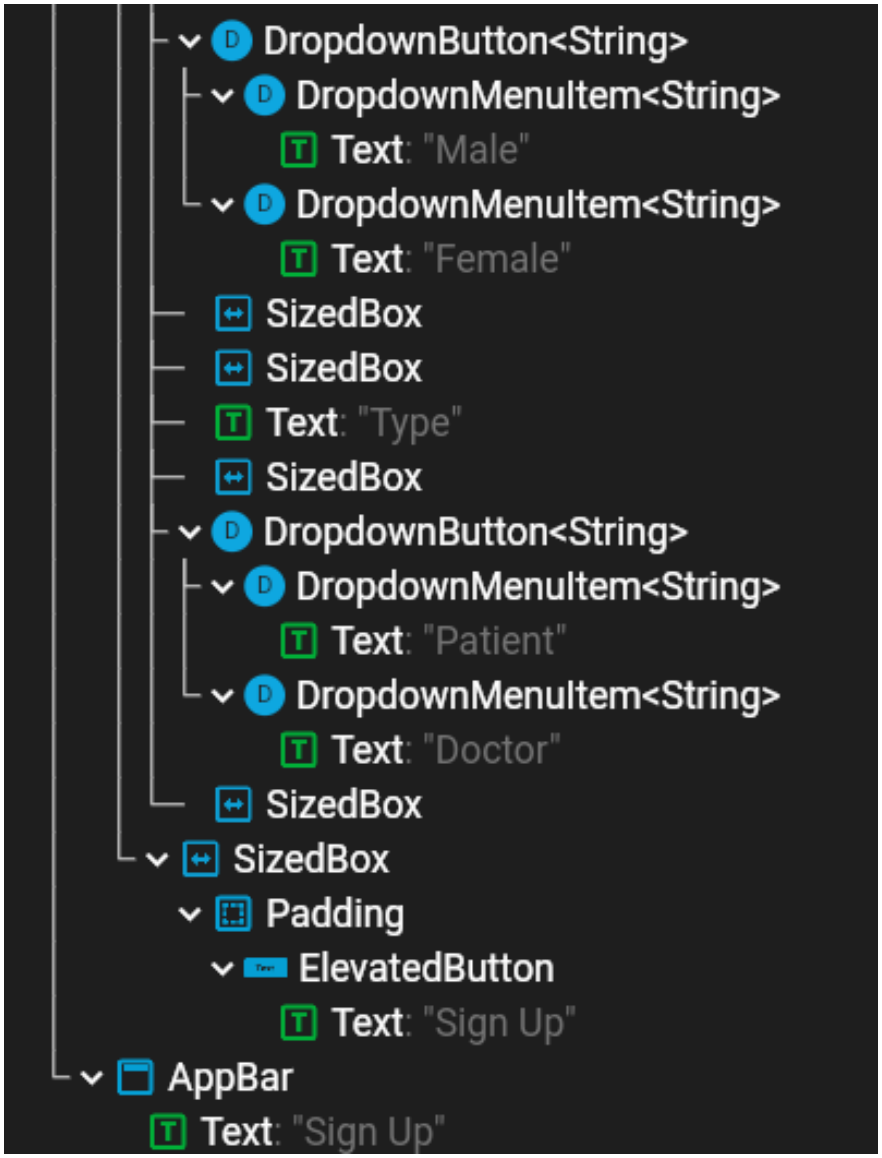
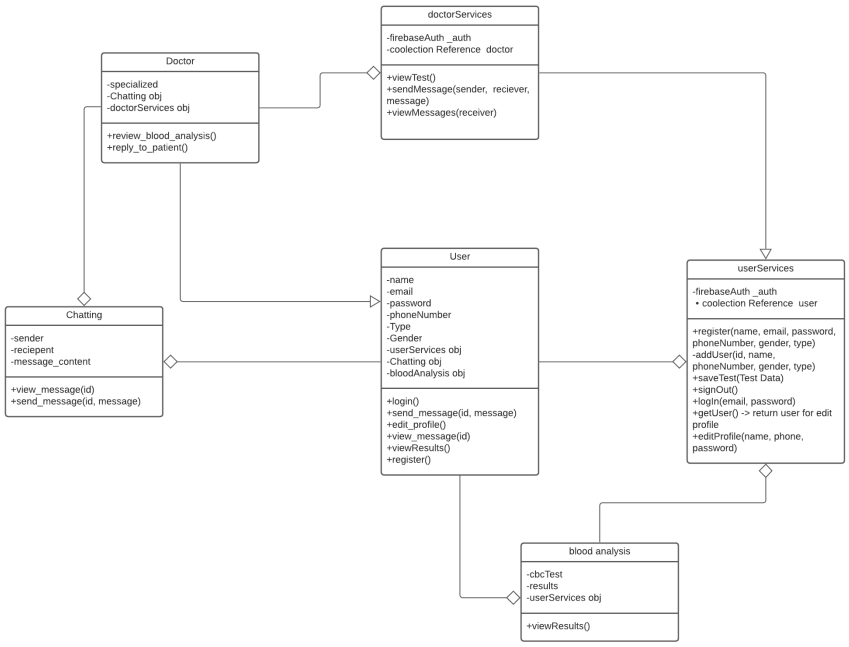
Text: "Female"
SizedBox
SizedBox
Text: "Type"

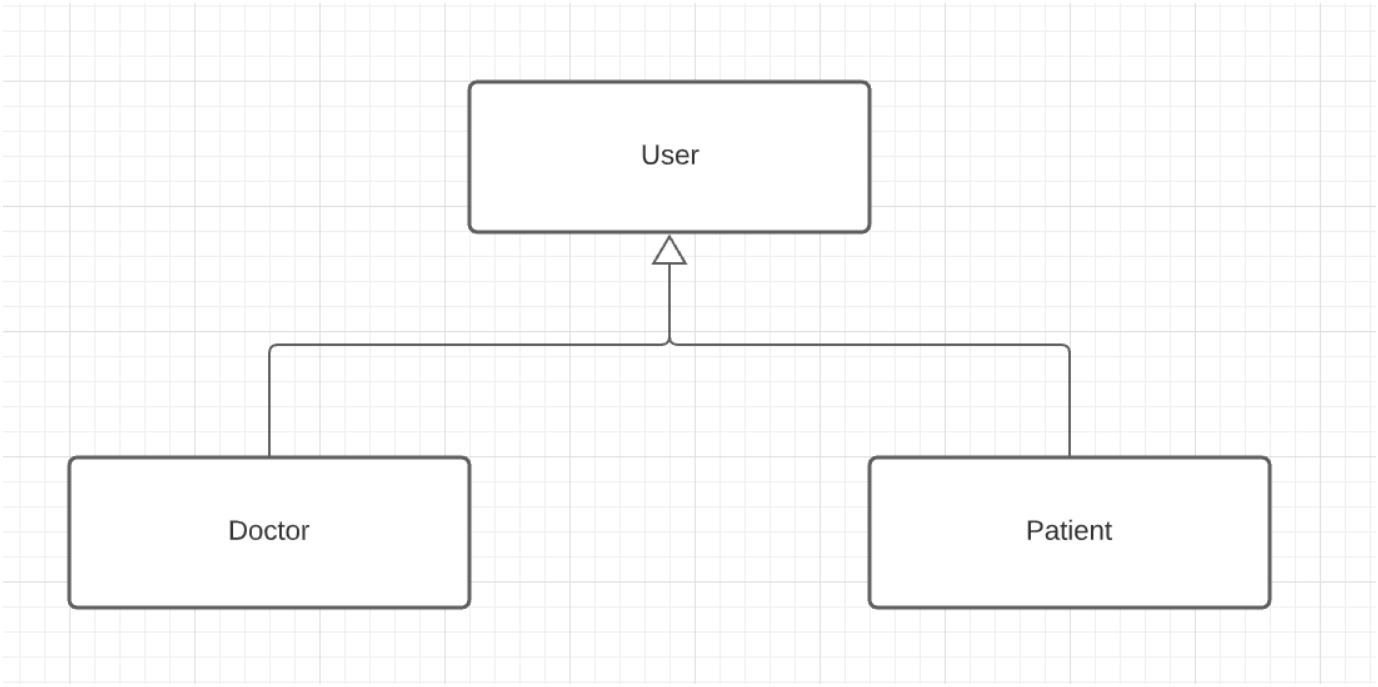


8 Preliminary Object-Oriented Domain Analysis

Class Diagram: https://lucid.app/lucidchart/4552dc0c-9328-4188-a4cd-3c290f0092d8/edit?viewport_loc=-618%2C-302%2C3328%2C1502%2C0_0&invitationId=inv_2f7ff5fb-6351-470e-b0c9-6a1257a12dd6



Inheritance Relationships: https://lucid.app/lucidchart/2a772a96-7d90-4ce7-bcf8-d79ce92a3554/edit?viewport_loc=90%2C78%2C1664%2C751%2C0_0&invitationId=inv_42581e07-7aaa-412d-bd64-caa80ef6e304



8.1 Class descriptions

Table 6: User

Abstract or Concrete:	concerte
List of Superclasses	null
List of Subclasses	doctor
Purpose	Make a general class that will contain all data of doctors and patients.
Collaborations	This class will interact with patient and doctor because it contains all data of doctors and patients.
Attributes	-name -email -password -gender -type
Operations	+login(email, password) +sendmessage(receiver, message) -addUserInDB() $-_{c}heckUser()$ + $viewResults()$ + $editProfile(name, phone, password)$ + $signUp(name, email, password, phoneNumber, gender, type) + signOut()$
Constraints	enter wrong name or password

Table 7: Doctor

Abstract or Concrete:	concerte
List of Superclasses	User
Purpose	Receives the patient blood data and analyze it and Reply to the patient who just sent for treatment.
Collaborations	Doctor will interact with patients and view blood analysis.
Attributes	-specialized
Operations	+reviewbloodanalysis() +replytopatient()
Constraints	chat system isn't working , doctor sends wrong messages to wrong patients

Table 8: userServices

Abstract or Concrete:	concerte
List of Superclasses	null
Purpose	Connection and save, remove and update data into database
Collaborations	Enter data that will saved and updated into dataBase
Attributes	-FirebaseAuth $_{a}uth - CollectionReferenceuser$
Operations	+register(name, email, password, phoneNumber, gender, type) $+_{a}ddUser(id, name, phoneNumber, gender, type)$ + $saveTest(TestData)$ + $signOut()$ + $logIn(email, password)$ + $getUser() - > returnuserdatatouploadprofile$ + $editProfile(name, phone, password)$
Constraints	Send data to user not true or update data in wrong user and so on

Table 9: Chatting

Abstract or Concrete:	concerte
Purpose	patients and doctors interacts and sends messages with each other
Collaborations	patients and doctors interact and send messages with each other
Attributes	-sender -reciepent -messagecontent
Operations	+viewmessage(id) +sendmessage(id, message)
Constraints	chat system isn't working

Table 10: Blood Analysis

Abstract or Concrete:	concerte
Purpose	Compare patient data with biological reference intervals
Collaborations	patients and doctors interact and send messages with each other
Attributes	-TestData -userServices obj
Operations	+BloodAnalysis(Test Data) +saveTest() +getResults() All of these functions return low or high or normal data -getHaemoglobin() -getHaematocrit() -getRbcs() -getMcv() -getMch() -getMchc() -getRdwCv() -getPlateletCount() -getNeutrophils() -getLymphocytes() -getMonoCytes() -getEosinophils() -getBasophils()
Constraints	whole system shut or breaks down

9 Operational Scenarios

9.1 Patient

The patient can login or create account if he is using application for the first time ,then he enters his data in blood analytic and get the results from the system to show whether of not the patient/user may have corona or not from the complete blood count data that will be enter by him/her.

9.2 Doctor

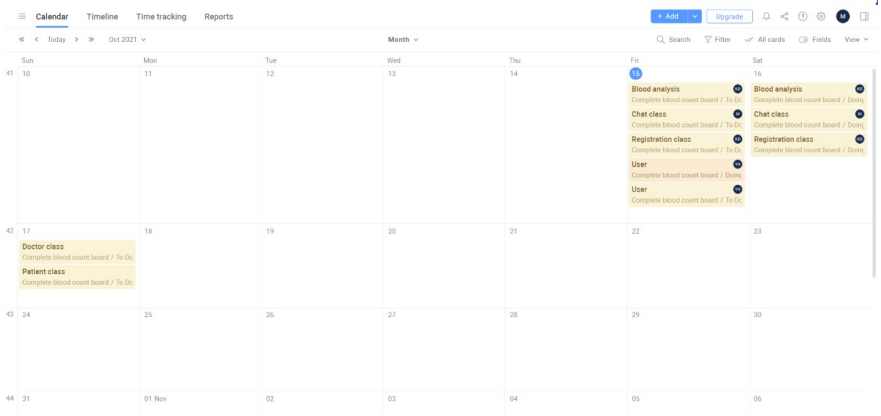
If the doctor is using the application for the first time, he can also login or establish an account. The doctor will get the patient's blood data and study it before responding to the patient who has been sent for treatment.

9.3 Complete Blood Cells (CBC) mobile application

The application compares patient data to biological reference intervals, obtains the results, and gives them to the patient, along with information on which doctor they should see.

10 Project Plan

Planyway: https://planyway.com/app?boardId=61699ca0043a605bca2a068a


Calendar
Timeline
Time tracking
Reports
+ Add
Upgrade
Today
Oct 2021
Month
Search
Filter
All cards
Fields
View
Sun
Mon
Tue
Wed
Thu
Fri
Sat
Blood analysis
Complete blood count board / To Dc
Chat class
Registration class
User
Doctor class
Patient class
01 Nov

References

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