University Institute of Engineering and Technology Panjab University, Chandigarh – 160014, INDIA

MINOR PROJECT - SEMESTER 7

"Cross-Platform App for Motion Sensing Glove"

Project Mentor: Dr. Mamta Juneja

Submitted by
(GROUP 26)

Jannat Chawla UE171015
Shivali Sharma UE173094
Yuvraj Singh Midha UE17312

ABSTRACT

Motion sensing glove App shows all the details regarding a patient's movement.

Measurement of any irregularity in finger joint movements assists physicians towards early detection of various joint-related physical disorders. Motion sensing glove is a promising device that measures all the finger joint angles through accurate flex sensors installed on a comfortable fabric glove which the patient has to wear and clench their finger for routine analysis. All the measured data is well captured and stored through a mobile application compatible with both Android and ios users for references and interpretation in real-time. Its superior design, digital methodology, comfort of use and real-time data management enables it to be an innovative device.

Table of contents:

1. INTRODUCTION……4

1.1 Background of the project……..5

1.2 Existing System……..5

2. OBJECTIVE……..6

3. SPECIFICATION AND DESIGN…….7

3.1 System Analysis…….8

3.2 Requirement Analysis……8

3.3 Technical Requirement ……8

3.4 Design……..10

4.PROGRESS TILL DATE…..……13

5.CONCLUSION AND FUTURE SCOPE…….14

6. REFERENCES AND BIBLIOGRAPHY……15

1. INTRODUCTION

A motion sensing glove is developed which senses motion of our fingers via flex sensors and displays angle between Distal Interphalangeal joint (DIP) and Proximal Interphalangeal joint (PIP) of fingers in order to determine one's ability to bend his/ her finger.Analysis of the movement of human fingers and the relationship between different finger joints has been a vital area of scientific research for many years. Studies have been carried out to understand various patterns of finger movements for applications in different fields like robotics, physiotherapy, sign language, gestures etc.

Various techniques have been used for analyzing human finger movements while performing different types of tasks like gripping, holding, pressing etc. Flexion and abduction of fingers were checked by studying the coordination between three joints of the fingers- Meta Carpo Phalangeal (MCP) joint, Proximal Inter-Phalangeal (PIP) joint and Distal Inter-Phalangeal (DIP) joint. Finger movements about different joints can be very effective in choosing a particular therapy

To view the readings and other information gathered from the glove we need to connect the built hardware device with a software. For this, the "GLOVEAPP" which is a cross-platform app allows the user of the motion sensing glove to read the information that this glove generates. This app allows the user to download the readings and create the manual readings. It will also show the analysis of the information over time . And it helps the doctor and the patient to read the degrees of the motion in the fingers. With the help of this patient and doctors can easily focus no the further improvement of the muscles and bones. This app removes the stress of visiting the clinic repeatedly.

1.1 Background of the Project

“GloveApp” is a cross-platform app that connects the motion sensing glove and provides the doctor and patient with the readings of the movement. On daily basis it automatically updates the new readings and depict it on the screen. The main advantage of this app is that it allows the doctor to view patients movements accurately and remotely. This app could be prove very beneficial amidst the covid-19 time . The technologies used in this app are react native , css, html , and firebase .

1.2 Existing System

The **Existing system** that Physiotherapists use is the conventional goniometer to evaluate the extent of impairment caused due to injuries on the human hand for its recovery. They measure the joint movement one by one for each joint which is a time-consuming and cumbersome.

Manual Evaluation is:

1. Time consuming
2. Involves human error

2. OBJECTIVE

The main objective of the “GloveApp” is to manage the information gathered from the motion sensing glove.A soft hand glove with flex sensors has been developed to measure angular finger joint movements of the human hands.

- Automation saves time (both for patient and physiotherapist)
- Discards human error
- Circumventing the hassle of recording and maintaining the database of each patient’s readings by providing a provision of automated system
- Data accessible by both patient and doctor via app interface at anytime

3. SPECIFICATION AND DESIGN

3.1 System Analysis

Analysis can be defined as breaking up of any whole so as to find out their nature, function etc. It defines design as to make preliminary sketches off , to sketch a pattern or outline for plan. To plan and carry out especially by artistic arrangement or in a skilful wall. System analysis and design can be characterised as a set of techniques and processes, a community of interests, a culture and an intellectual orientation.

The steps involved during system analysis process are:

1. Understanding application.
2. Planning.
3. Scheduling.
4. Developing candidate solution
5. Performing trade studies.
6. Performing cost benefit analysis
7. Recommending alternative solutions
8. Selling of the system.

System analysis can include looking at end-user implementation of a software package or product and involves gathering requirements for the system. Thus, system analysis is the process of investigating a system, identifying problems, and using the information to recommend improvements to the system.

3.2 Requirement Analysis

Requirements analysis is critical to the success of a systems or software project. The requirements should be documented, actionable, measurable, testable, traceable, related to identified business needs or opportunities, and defined to a level of detail sufficient for system design.

3.2.1 Functional requirement

In app development Functional requirement provides app developer with a blueprint of how the application and its component will behave or function. The functional requirements describe what the application system should do. The functional requirements of the application are as follows

- The “GloveApp” allows both the patients and doctors to register.
- It allows the registration through mobile number and through email.
- The ”GloveApp" will display all the readings in the tabular form.
- The “GloveApp” allows the doctor to download the readings in the excel sheet.

- The “GloveApp” has different dashboard for the doctor.
- It’s user interface is too easy to learn and use.So that an uneducated patient can also use it.

3.2.2 Non-functional requirement

Non-functional requirements are not concerned with the functions of the system. Instead, they look at the criteria to which the website is expected to conform to. Non-functional requirements can include things like response time and reliability. Some of the Non-functional requirement for the “GloveApp” are:

- The application should be compatible with the last three major versions of Firefox, Chrome, Safari and Internet Explorer
- The application should be compatible with the android and iOS too.
- Should be user friendly and content should be readable by all types of users.
- Should take minimal time, effort, resources or cost to create the cross-platform app.
- Should provide the correct information about all the modules.
- Should consider the Response times such home page loading, screen open and refresh times of each pages
- Should be easily accessible to even non-technical persons.

Usability Requirement

The system uses a web browser as an interface. Since all users are familiar with the general usage of browsers, no special training is required. The system is user friendly and online help makes using the system easy.

Maintainability and Portability Requirements

Changes (new parts on addition, password changes, and database changes) must be verified once per day at least.The portal should be open to modifications and changes. The code should be well written that it is read by everyone and can be modified. The code should be edited in Various famous platforms like Visual Studio , Visual Studio Code, Atom , Sublime text editor etc.

3.3 Technical Requirement

Application system : Visual Code

Technologies Used : React Native, HTML5, CSS3, Bootstrap, Firebase

React Native

React Native is a JavaScript framework for writing real, natively rendering mobile applications for iOS and Android. It's based on React, Facebook's JavaScript library for building user interfaces, but instead of targeting the browser, it targets mobile platforms. In other words: web developers can now write mobile applications that look and feel truly "native," all from the comfort of a JavaScript library that we already know and love. Plus, because most of the code you write can be shared between platforms, React Native makes it easy to simultaneously develop for both Android and iOS.

React Native currently supports both iOS and Android, and has the potential to expand to future platforms as well. In this book, we'll cover both iOS and Android. The vast majority of the code we write will be cross-platform. And yes: you can really use React Native to build production-ready mobile applications! Some anecdota: Facebook, Palantir, and TaskRabbit are already using it in production for user-facing applications.

HTML5

HTML5 is the latest evolution of the standard that defines HTML. The term represents two different concepts. It is a new version of the language HTML, with new elements, attributes, and behaviors, **and** a larger set of technologies that allows the building of more diverse and powerful Web sites and applications. This set is sometimes called HTML5 & friends and often shortened to just HTML5 Designed to be usable by all Open Web developers, this reference page links to numerous resources about HTML5 technologies, classified into several groups based on their function

- *Semantics*: allowing you to describe more precisely what your content is
- *Connectivity*: allowing you to communicate with the server in new and innovative ways
- *Offline and storage*: allowing webpages to store data on the client-side locally and operate offline more efficiently.*Multimedia*: making video and audio first-class citizens in the Open Web.
- *2D/3D graphics and effects*: allowing a much more diverse range of presentation options.

• *Performance and integration*: providing greater speed optimization and better usage of computer hardware

• *Device access*: allowing for the usage of various input and output devices

• *Styling*: letting authors write more sophisticated themes.

CSS3

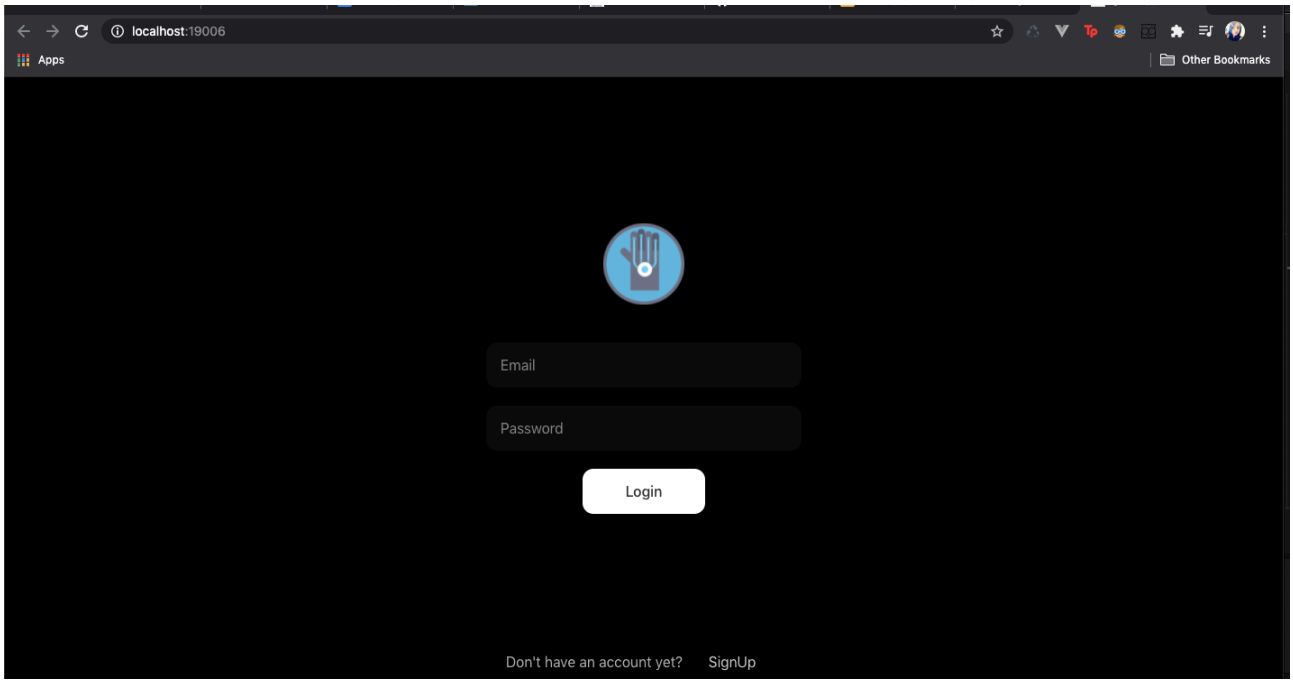
CSS3 is the latest evolution of the *Cascading Style Sheets* language and aims at extending CSS2.1. It brings a lot of long-awaited novelties, like rounded corners, shadows, gradients, transitions or animations, as well as new layouts like multi-columns, flexible box or grid layouts. Experimental parts are vendor-prefixed and should either be avoided in production environments, or used with extreme caution as both their syntax and semantics can change in the future .

Firebase

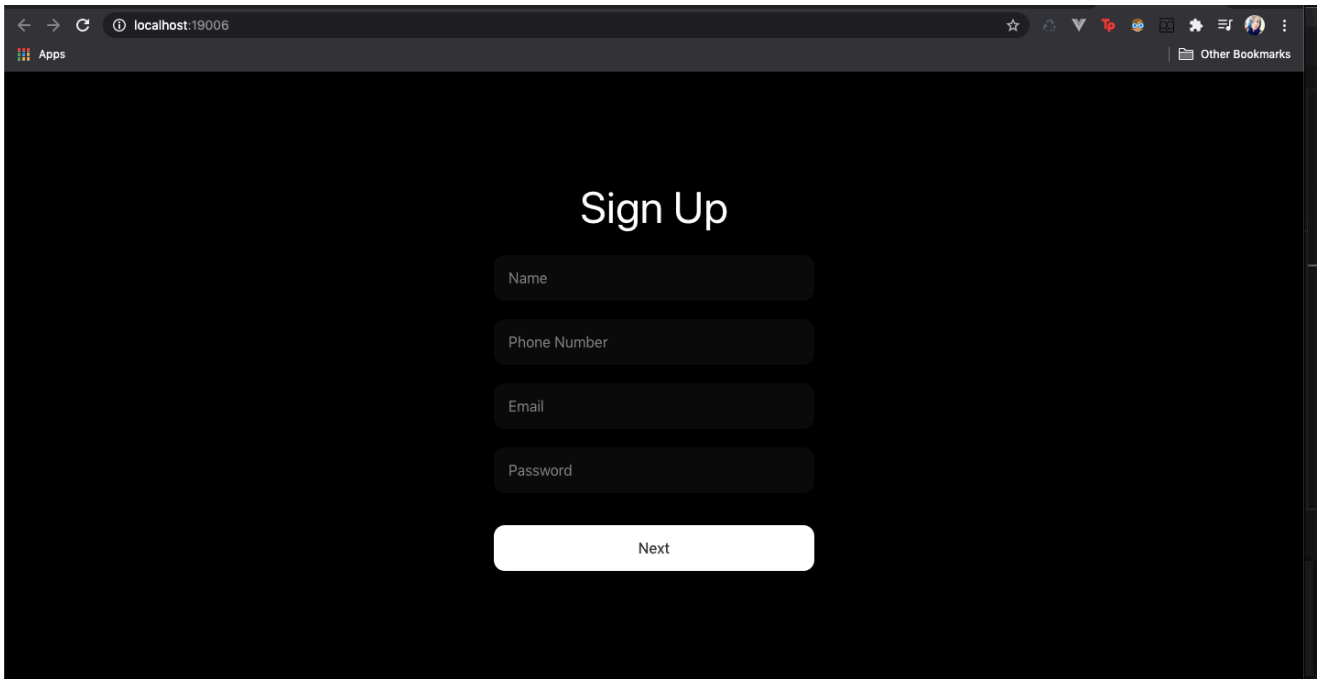
Firebase is a Backend-as-a-Service (Baas). It provides developers with a variety of tools and services to help them develop quality apps, grow their user base, and earn profit. It is built on Google's infrastructure.

3.4 Design

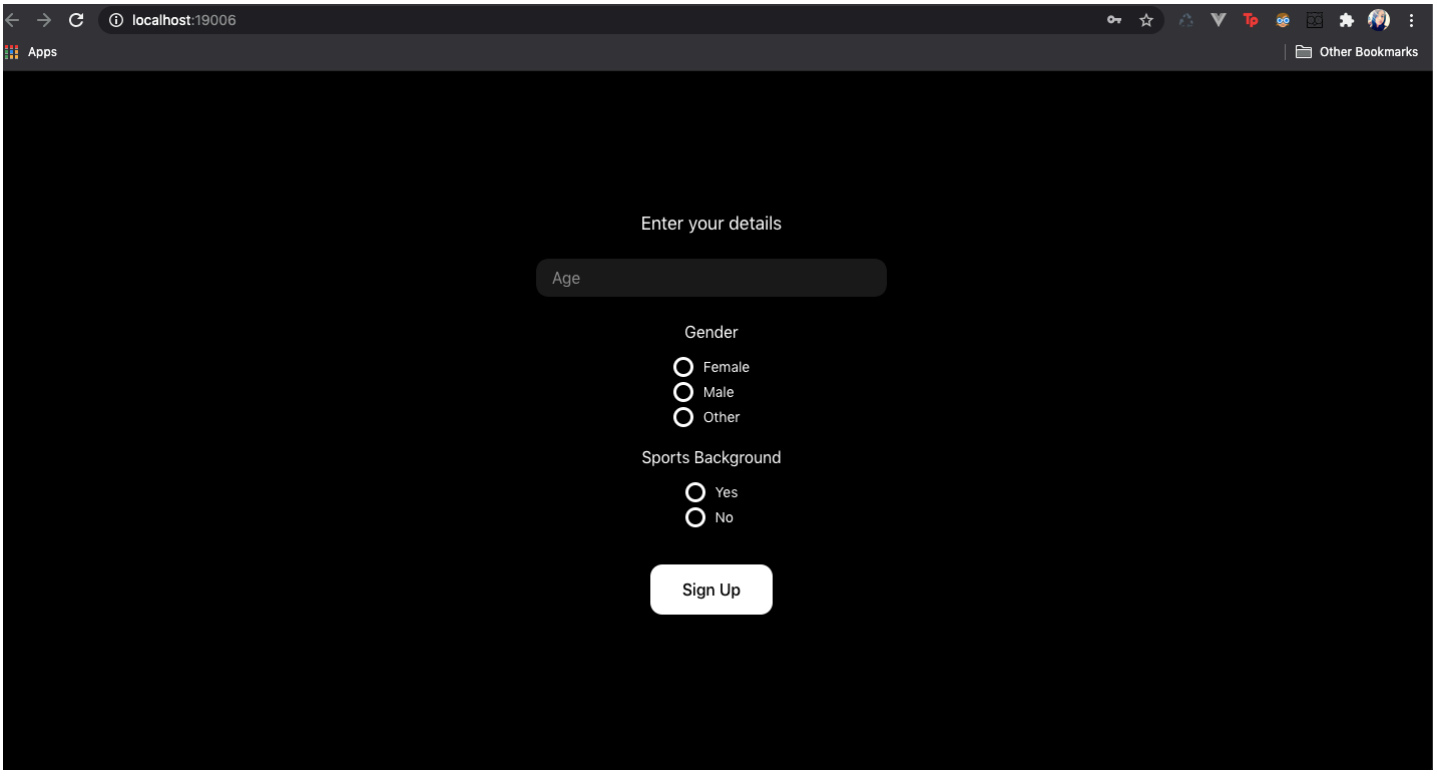
1. Login Page: It is the login page of the app and allows only authorised users to login in. In this email and password are both checked and if the result is true then it is redirected to the readings page.



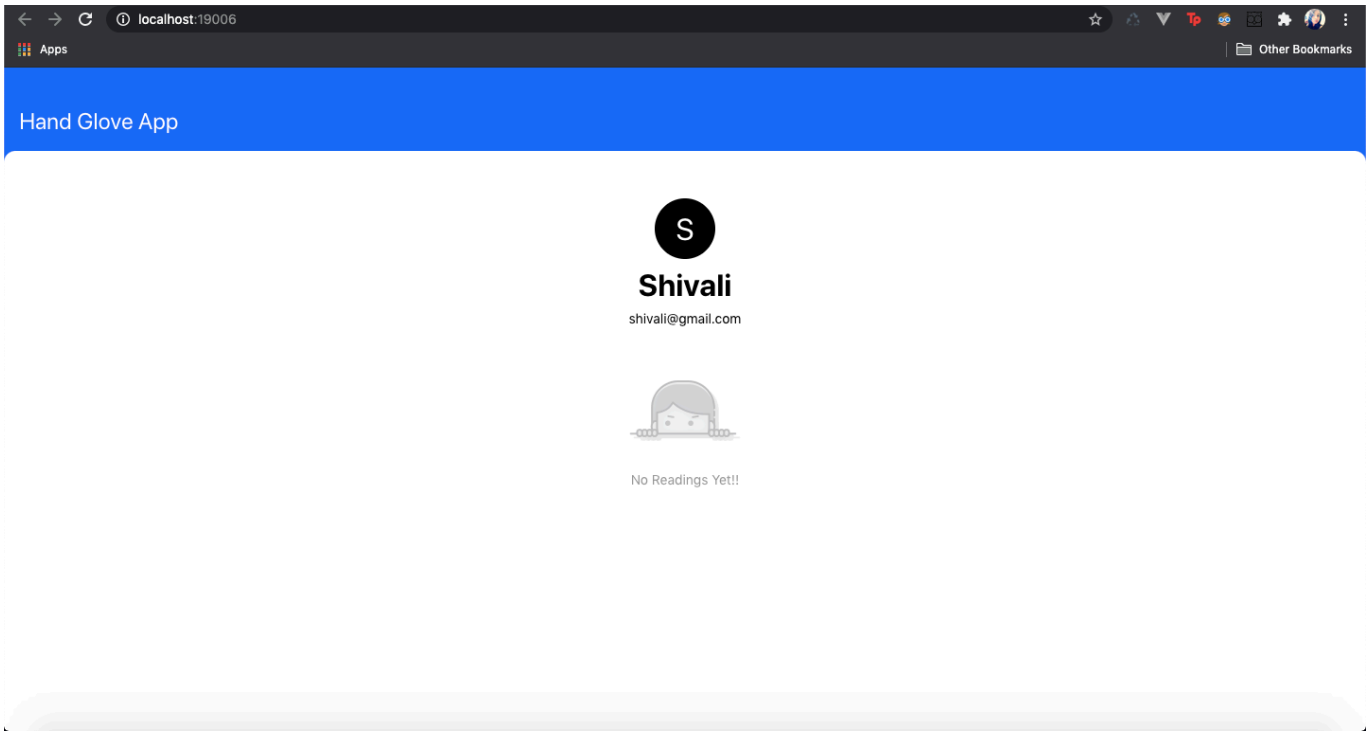
2. Signup Page: It is the sign page of the app and allows only new users to register in. In this phone number ,email and password are both checked and if the result is true then it is redirected to the readings page.



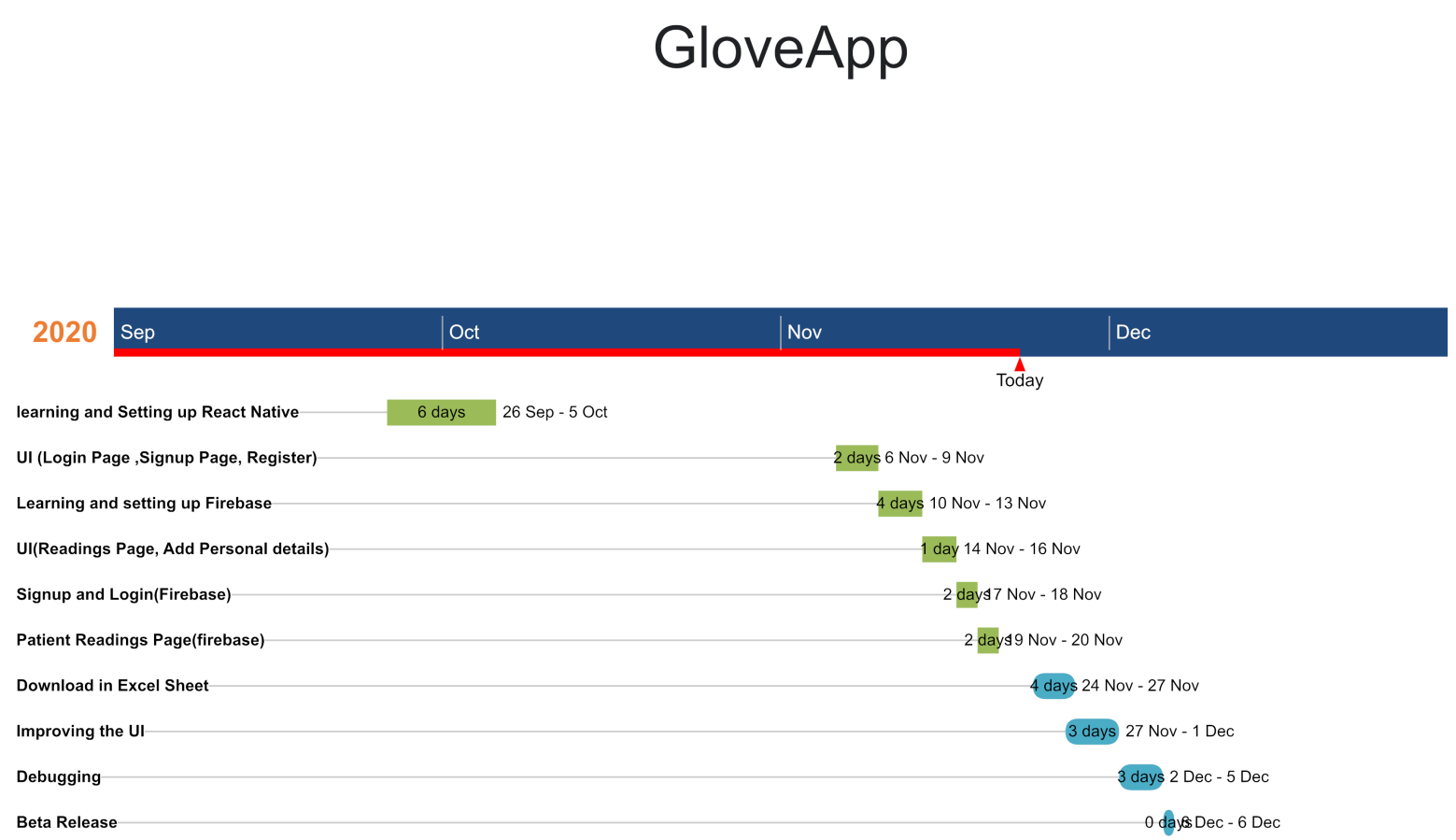
3. Details Page: This form collects the personal information of the patient regarding it's sports background.



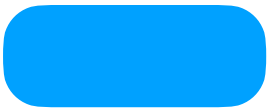
4. Readings Page: When a user successfully login or signup then the readings page will be loaded that will show the details of its movement in the tabular form.



4. PROGRESS TILL DATE



—> Task completed



—> Incomplete Task

5. FUTURE WORK PLAN

5.1 Graph visualisation of database on one graph to track recovery: Showing the data in the form of graph . The daily analysis of the movements will be added and depicted in the form of a graph .

5.2 Improving the User Interface: We will be improving its User Interface by adding new graphics. Making it more attractive and

5.3 Report generation: Adding a new feature that allows the doctor to download the report and it will automatically generates the report in a excel sheet and can be used for further diagnosis.

5.4 Debugging: Debugging the further errors before deploying the app. Checking its compatibility on various platforms and ensuring it's smooth working.

5.5 Beta Release: After performing all the above we will release the beta version of the app and then gather the information from its users. And generating the report on further improvements.

6. REFERENCES AND BIBLIOGRAPHY

References

i) React Native Tutorial for Beginners - Crash Course 2020—-

ii) Firebase Firestore Tutorial —

iii) React Native + Firebase Tutorial —

iv) https://rnfirebase.io/

v) https://firebase.googleblog.com/2016/01/the-beginners-guide-to-react-native-and_84.html