STONY BROOK UNIVERSITY

Department
of
Electrical and Computer Engineering

ESE-543

MOBILE CLOUD COMPUTING

PROJECT

COVID-19 TRACKER

Submitted by-
KARTIK ANEJA (#112817127)
NITIN ASTHANA (#12995559)
PRANAV PRABHUNE (#112748881)

COVID-19 TRACKER

ABSTRACT:

We all know that the world is dealing with an unprecedented challenge of the coronavirus which has infected millions across the globe. The virus very contagious and has spread to almost all the countries except a few. In these tough times we ought to know the situation around us and in order to stay safe. This was the primary idea behind development of the COVID -19 tracker app which provides information on our android device. The app provides a platform to the user where he can track the total number of COVID-19 cases all over the world. This app provides the details like total cases, recovered cases, demised cases, active and critical cases which is enough to know that whether travelling is safe or not. The app also includes a search bar for the users to navigate through the list of countries affected by the COVID -19 and look at the statistics of a particular country. It also has an additional feature which allows you to report your symptoms which might enable the authorities to take an early and informed decision. It also lets users assess and report his symptoms or any travel history which is stored on the cloud and help in identifying hotspot and cluster zones. The app we have developed makes use of Cloud Firestore, REST API and volley library to achieve its purpose.

MOTIVATION:

With humanity's on-going fight with the pandemic of COVID-19 disease, we have developed a COVID-19 Tracker app**.** Although some of the medical institutions have made progress regarding the vaccine development, there is no surety about the vaccine reaching to the masses in the immediate future. The app can help authorities to do regressive contact tracing, identify hotspots that can help slow the spread and flatten the curve. The stored data on the cloud can be visualized and studied by the epidemiologists to forecast future trends and aid authorities in taking necessary actions

DESIGN:

The simple arc loader is used in the app which is a sign of data being fetched from the server. Pie chart along with the legends are present on the home screen. Global stats are displayed below the pie chart. The track countries will direct to the list of affected countries. All of the items in this list view have an onClick listener which will direct to the details of that particular country. The data received was in the JSON format. The check status button on the main activity opens a new activity where the user can choose from two options. One option being to assess and report himself and the other one is to view info in the area around him. The assess yourself option asks the user questions about his travel history and if he has any symptoms and stores this information on the firebase cloud. Each user's information is stored in different documents. In the view info activity, the java code fetches the data from the cloud and displays the total number of suspected cases in the region the user is located, and it tells how safe the area is for the user.

TECHNOLOGIES USED:

1. **Android Studio: -** We have developed the android app using Android Studio. It is the official IDE for google's android development platform. Its extended features enable easy development of an android app as compared to the eclipse. Its template-based design structures facilitate easy design of the layout by adding and adjusting the standard components like buttons, views, texts and other aesthetics. It has built-in support for the Google Cloud Platform which allows to integrate Firebase Cloud Messaging and Google App Engine. The gradle based app building and android-specific refactoring provides a very conducive and user-friendly platform.

2. **Firebase**: - Firebase is a mobile and web application development platform developed by Google. It can be integrated with the Android Studio and can be used to store data entered by the user on the app to the cloud. This data can be accessed by the owner of the app and can be used for multiple purposes. This includes things like analytics, authentication, databases, configuration, file storage, push messaging, and the list goes on. The services are hosted in the cloud, and scale with little to no effort on the part of the developer. Client SDKs provided by Firebase interact with these backend services *directly*, with no need to establish any middleware between your app and the service.

3. **Cloud Firestore**: - It is a flexible, scalable database for mobile, web, and server development from Firebase and Google Cloud Platform. It also offers seamless integration with other Firebase and Google Cloud Platform products, including Cloud Functions. The Cloud Firestore data model offers flexibility by allowing the use of hierarchical data structures. It uses data synchronization to update data on any connected device. Cloud Firestore also offers offline support. When an offline device is back in the network, the Cloud Firestore will update the database and make the necessary changes.

4. **Pixel 3A**: - We are using google Mobile Phone Pixel 3A. It has a 64-bit Octa-core CPU with Android Operating System version 10 installed in it.

5. **REST API: -** REST is the acronym for Representational State Transfer. It is an architectural style for distributed hypermedia systems. By separating the user interface concerns from data storage concerns, the user interface's portability across multiple platforms improves. This also improves scalability by simplifying the server components. Each request from client to server must contain all the information necessary to understand the request. Therefore, the session state is maintained solely on the network. When a response is cacheable then a database cache is entitled to reuse the response data for later, similar requests. By applying the generality software engineering principle to the component interface, the overall system architecture is simplified, and interaction visibility is improved. To get a uniform interface, multiple architectural constraints are required to guide component behaviour. REST is characterized by four interface constraints: resource identification; resource manipulation by representations; self-descriptive messages; and

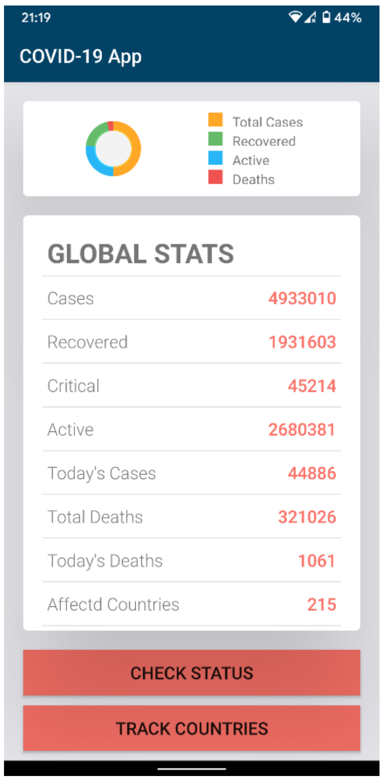
hypermedia as an application state engine. REST enables client functionality to be expanded by downloading and executing applet or script code.

6. **Volley Library**: - Volley is an http library which facilitates faster and easier networking for android apps. It has numerous desirable features. The network requests are automatically scheduled on multiple concurrent network connections. Transparent disk and memory response caching with standard HTTP cache coherence is present. There are debugging and tracing tools which are an added advantage. Strong ordering that makes it easy to correctly populate your UI with data fetched asynchronously from the network.

TECHNICAL CHALLENGES:

1. We faced a conundrum while trying to display the data in the graphical manner. We finally decided to move on with the Pie chart.
2. We were unaware of the JSON format and the technicalities related to the received data.
3. We had trouble connecting to the cloud and integrating it with Android studio.
4. The querying system for the cloud database is relatively slower, therefore it is taking a little longer duration to fetch the data from the cloud.
5. The application uses all the modern technologies with its updated version. When we tried to run the app in the older version of the android, it was not working properly, and some activities were not behaving properly. Therefore, we assume that the user uses the updated version of the android and a relatively new mobile phone.

IMPLEMENTATION


21:19 44%

COVID-19 App

🟧 Total Cases
🟩 Recovered
🟦 Active
🟥 Deaths

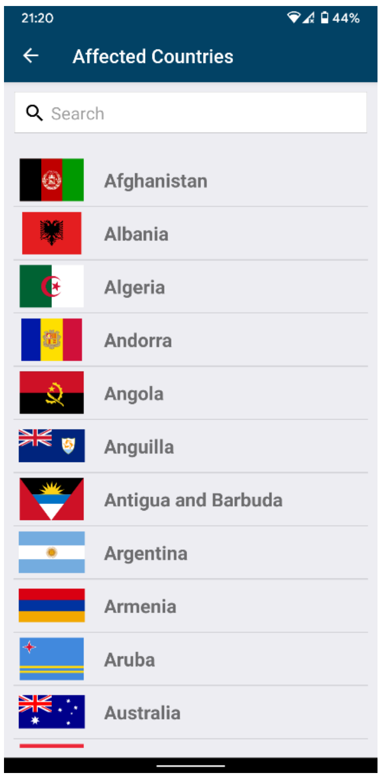
GLOBAL STATS

Cases	4933010
Recovered	1931603
Critical	45214
Active	2680381
Today's Cases	44886
Total Deaths	321026
Today's Deaths	1061
Affectd Countries	215

CHECK STATUS

TRACK COUNTRIES

Fig 1. Home Screen

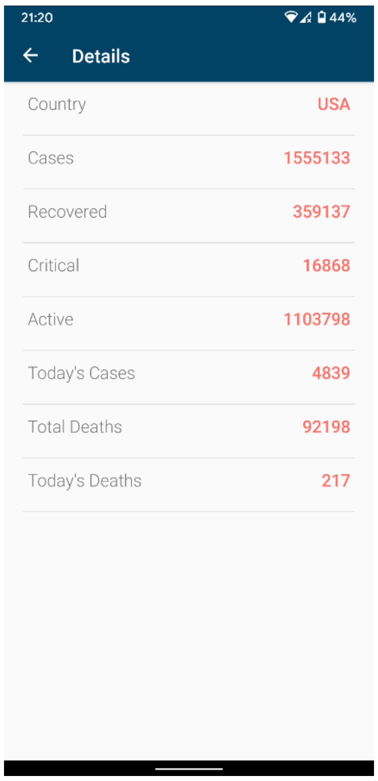

21:20 44%

Affected Countries

Search

Afghanistan
Albania
Algeria
Andorra
Angola
Anguilla
Antigua and Barbuda
Argentina
Armenia
Aruba
Australia

Fig 2. Track Countries


21:20 44%

Details

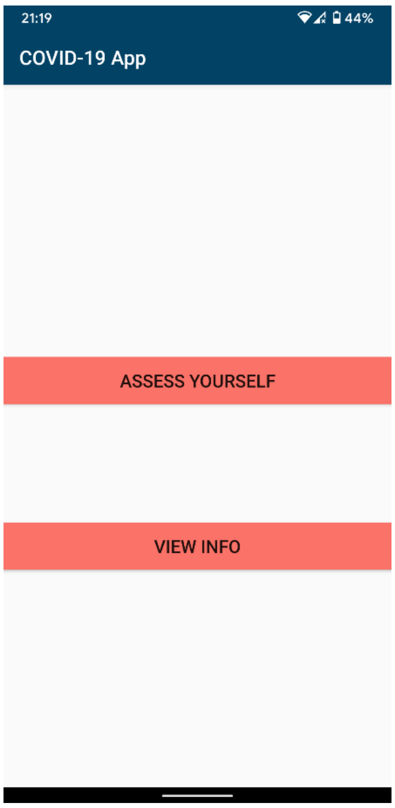
Country	USA
Cases	1555133
Recovered	359137
Critical	16868
Active	1103798
Today's Cases	4839
Total Deaths	92198
Today's Deaths	217

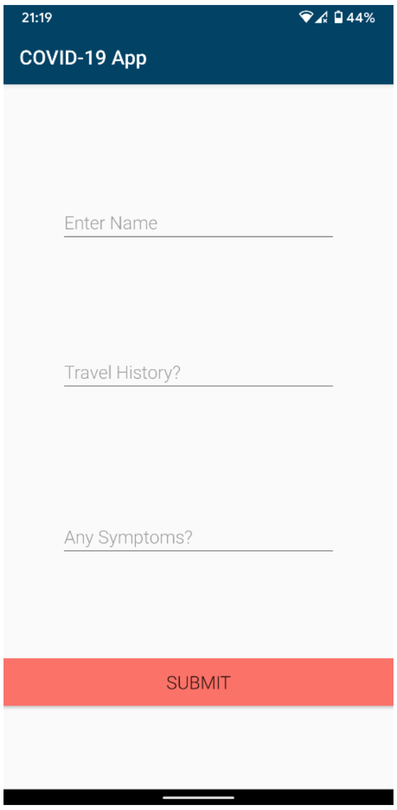
Fig. 3 Country-wise Details

The screen in Figure 1 is the home screen for the application. It gets displayed every time we open the application. The numbers are updated every 10 minutes and initially there is a simple arc loader while the data is being received. This is a Relative layout and the under that, we have a constraint layout having two Card Views. The legends and the pie chart are a present in the card view. Under that there is a scroll view just in case all the above-mentioned data is not visible on the screen at a time. Below that we have two buttons each having a unique functionality and directs us to the corresponding window. The TRACK COUNTRIES button allows us to get country wise statistics. The check status button enables us to access a short questionnaire which reports the data to the cloud and sends a response according to the statistics.

The TRACK COUNTRIES button directs you to the activity mentioned above. This activity has a search window and a list of all the affected countries in alphabetical manner. The search window filters the search and displays the corresponding countries. All the countries are a part of the list view. And we can click on any country to get its details.

Clicking on any country will direct us to the window shown in Figure 3. It has all the details and these details are updated every 10 minutes.





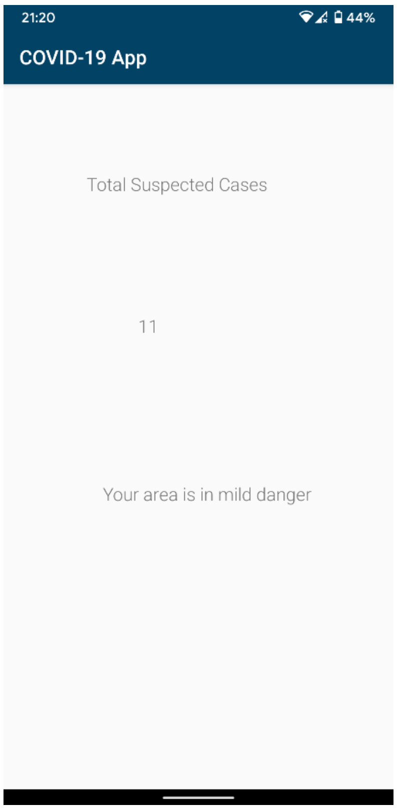


Fig 4. Check Status Button Fig 5. Address Yourself Activity Fig 6. View Info Activity

Next on the home page is the "Check Status" button which is shown in Figure 1. When we will click on that a new activity page will open which is there in Figure 4. In this activity there are two buttons namely "ASSESS YOURSELF" and "VIEW INFO". The "ASSESS YOURSELF" activity will ask the user to enter his name, his travel history and if he possesses any symptoms. This data entered by the user is stored in the google cloud firebase database. The "VIEW INFO" button will tell the user about the suspected cases in his location and also whether his location is safe or not depending upon the number of suspected cases We are able to give this information by fetching the data which is stored in the cloud database.

EVALUATION:

We tried to run our application for various cases. The cases also included a number of negative scenarios like can we do not enter any information in the asked questions. All these scenarios are now covered in the application. Since our application has a lot of cloud and API interaction, the performance of our application solely depends on the response times of the cloud APIs. We tried to find the average time of response but as said before since we are using free trial services the service is very slow and response time is unpredictable. We also evaluated the performance of each of the threads these again depend on services. Also, the amount of on mobile device memory for storing data is minimal in our application since all the data is stored inside the cloud.

FUTURE WORK:

1. A notification feature can be added to the app such that whenever a new corona positive tested person enters your area you will get an alert notification in your mobile phone.
2. We can integrate the app with the hospital official. So, if a person persists any symptoms, he can be connected with the nearest testing centre and for health check-up with the nearest hospital based on the location of the mobile.
3. We can also add the Bluetooth activity in the app. This activity will help the user to find if he has been in contact with any positive case person so that he can take the precautionary measures priorly.

REFERNCES

1. https://developer.android.com/training/volley [Volley Library]
2. https://restfulapi.net/ [REST API]
3. https://github.com/blackfizz/EazeGraph [Pie Chart]
4. https://github.com/generic-leo/SimpleArcLoader [Simple Arc Loader]
5. https://cloud.google.com/firestore/docs/client/get-firebase [FIREBASE]
6. https://cloud.google.com/solutions/mobile/mobile-firebase-app-engine-flexible [Integration of app with Firebase]
7. https://firebase.google.com/docs/firestore/query-data/queries [Cloud Database]