GO-COVID: AN INTERACTIVE CROSS-PLATFORM BASED DASHBOARD FOR REAL-TIME TRACKING OF COVID-19 USING DATA ANALYTICS

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Abstract

Currently, COVID-19 is the biggest obstacle for the survival of the human race. Again, as mobile technology is now an essential component of human life, hence it is possible to utilize the power of mobile technology against the treat of COVID-19. Every nation is now trying to deploy an interactive platform for creating public awareness and share the necessary information related to COVID-19. Keeping all of these in mind, authors have deployed an interactive cross-platform (web/mobile) application GO-COVID for the ease of the users, specifically in India. This dashboard is featured with all the real-time attributes regarding the novel coronavirus disease and its measures and controls. The system deliberately aims to maintain the digital well-being of the society, create public awareness, and not create any panic situation among the individuals of the society. The application uses modern AI-ML tools to analyze the disease among the individuals with the help of an informative test and has also deployed a chat-bot for user ease of interaction. The application also collects the geo-location and other necessary historical data to ensure your safety and distancing from the affected personals. The same is also used to backtrack the ones affected and perform tests. All of these features enable the app to compete with the pandemic in this modern world.

Keywords: COVID-19, pneumonia, mobile application, Artificial Intelligence-Machine Learning (AI-ML) tool, chat-bot, geo-location

I.   Introduction

In Wuhan city of China, due to some unknown causes a local outbreak of pneumonia was detected in December 2019. Initially, the disease got named severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) [XXXIX-XL]. Corona Virus Disease 19 (COVID-19) caused by the novel coronavirus is confirmed officially later by the World Health Organization and they also announced COVID-19

as the Public Health Emergency of International Concern (PHEIC). This ongoing outbreak of pneumonia spread rapidly all over the globe, causing more than 1,83,820 deaths soon got identified as the cause of the novel coronavirus. As of April 25, 2020, more than 22,398 confirmed COVID-19 cases found in INDIA. Since then, no medicine is invented, which could cure the disease caused by the deadly virus, and social distancing was found to be a promising way to saturate the growth of the disease. Thus, most of the nations declared lockdown of the entire state to set a bar on the growing numbers of the disease. But it was found 42% of the society was not aware of the pandemic yet, and the lockdown caused a huge economic break.

Nowadays, wireless communication [II-V, XV, XIX-XXVII, XXIX] in terms of mobile technology is an essential part of our life. This technology is now the guiding force for human life to perform any activities [VI-VII, XXVIII]. Again, in this pandemic situation, fake news prevention and distribute genuine information [I, VIII, X, XXXI], i.e., information regarding public awareness, test centers, geo-tracking, etc. to everyone in every time with minimum expense, it is perhaps the biggest challenge to any administration all over the world. Mobile technology is the only one-stop solution for everything above mentioned problems [IX, XVI, XXX].

In response to this ongoing public health and economic emergency, we developed and deployed an interactive dashboard accessible online, to visualize and track reported cases of coronavirus disease 2019 (COVID-19) in real-time [XXXII, XXXVIII, XLI-XLII]. The dashboard illustrates on the location and number of confirmed COVID-19 cases, deaths, and recoveries for all affected in a country, state as well in a district. The dashboard is implemented for the common people, public health authorities and the researchers to provide a user-friendly tool to track the outbreak as it gets opened. The dashboard is entitled with many unique features such as geo-tracking to map the relationship diagram, catboat for test-oriented queries, graphical representation of the data for user ease, and the recent news & blog section are considered for future enhancements.

Keeping all of these complex features in mind we have used all the promising technologies to build the mobile application as well as a web application. The speed and security are also enhanced by using decoupled cloud architecture for the entire system (i.e. separating the client-side cloud and the server-side cloud). The use of modern ML [XVII-XVIII] tools has also made this system advanced from the others. The dashboard is capable to report cases at the state level, city level and at the country level in INDIA. The COVID-19 related data published on the dashboard aligns with the WHO situation reports and the Ministry of Health and Family Welfare, Govt. of India for within and outside of INDIA, particularly [XXXIII-XXXVII].

The letter is organized as firstly, related studies, following proposed system model, next implemented results and discussions. Lastly, we present some concluding comments.

II. Related Studies

In this pandemic condition, a couple of mobile applications are introduced by government institutions and others, which are providing valuable information to the people to aware of the pandemic situation, like the number of confirmed cases, number of recovered instances, number of death as of now, etc. In this research, authors have restricted themselves from studying the mobile applications used now in India as our implemented app is showing useful information related to India. A brief review is presented here.

Microsoft Bing [XI] is taken the novel attempt to implement a software solution for the COVID-19 pandemic across the world for data transparency and increasing traceability. Bing map comes with an interactive platform that focused on the world map. When hovering over the different countries, it used to render the COVID-19 statistics (Confirmed cases, Active cases, Deaths, Recovered) of the particular nation. In the web application of the Bing map, the statistics even at the district level of few countries like INDIA, as of 25th April 2020 is also shown.

APOLLO, one of the biggest medical giants in India, developed a risk assessment scanner for COVID-19 outbreak in INDIA and named it **"covid.apollo247"** [XII]. This risk assessment scanner comes with a tag line 'Stay calm amidst the current paranoia surrounding COVID-19' and is successful in reaching a major part of the society during this outbreak. The solution could efficiently predict the chances of risk (Low, Mid, High) of having positive coronavirus tress depending on multiple users given parameters using their ML algorithms.

A team of twenty plus members (teachers and students) from Mahindra Ecole Centrale developed a dashboard for smooth user experience and quality visualization of real-time data [XIII]. The website shows the real-time data of the infected, cured, and deaths in INDIA, though some inconsistency is also observed in their application. Several graphs and charts are used in the website to visualize the data also at the district level, but more accuracy is expected concerning their results.

The Government of India took the initiative and developed a mobile application named **Aarogya Setu** [XIV] to connect essential health services with the people of INDIA. Basically, it is a mobile application; still, the use of web views was found in the statistics display dashboard. They have also come up with a geo-tracking facility that helps the system to track the coronavirus affected people and form a cluster.

Different countries are also using similar types of Mobile applications to combat COVID-19, the name of the Mobile applications are shown in Table 1.

Table 1: Different COVID-19 Mobile Applications used in various Countries

Country	Mobile Application Name	Remarks
Singapore	Trace Together	Blue Trace protocol used
Australia	Covid Safe	Similar product of Trace Together
Poland	ProteGO	Currently not available
Germany	ITO	Android supported application
Czech Republic	eRouska	Use Bluetooth
Israel	Hamagen	Use Bluetooth and GPS
North Macedonia	Stop Korona	Use Bluetooth

## III. Proposed System Model
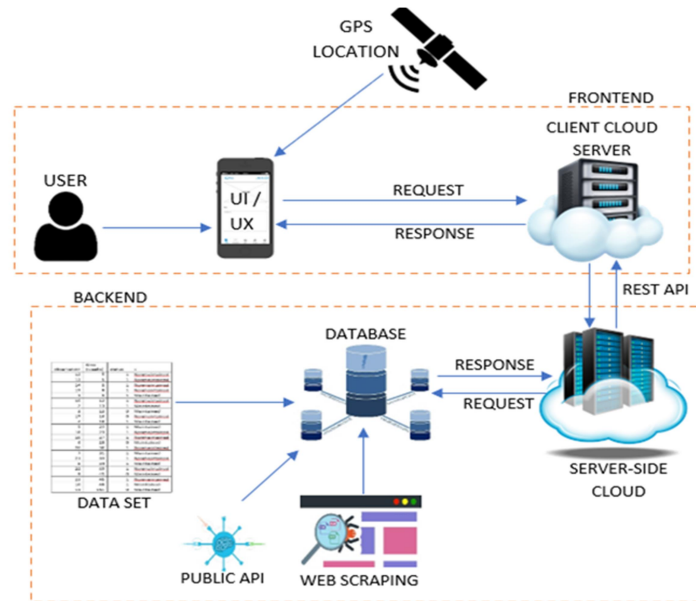
Fig. 1: Decoupled architecture of the developed cross-platform application (mobile/web)

The system model of the developed system is shown in figure 1; authors have used a decoupled architecture for our designed interactive dashboard Go-COVID. The entire model has divided into two major components the frontend and the backend. In the frontend, the user is provided with a cross-platform application (mobile/web), i.e., some Use Interface/User Experience (UI/UX), which requests data from the client-side cloud and displays the data to the user. It also collects the geo-location of the

user to keep track of the user's social behavior and is used to backtrack the infected ones. Next comes the backend, which has a database and server-side cloud as its major components. The data from public API, web scraping, real-time datasets is fetched and stored in the database. The database and the server-side cloud also communicate in a similar response for request manner. In contrast, the data communication between the client-side cloud and the server-side cloud is maintained by our responsive REST API's. Thus, it makes the full system unique, helpful, secured, and user-friendly with all the features entitled to the users in an optimized way.

Database Modeling and Design:
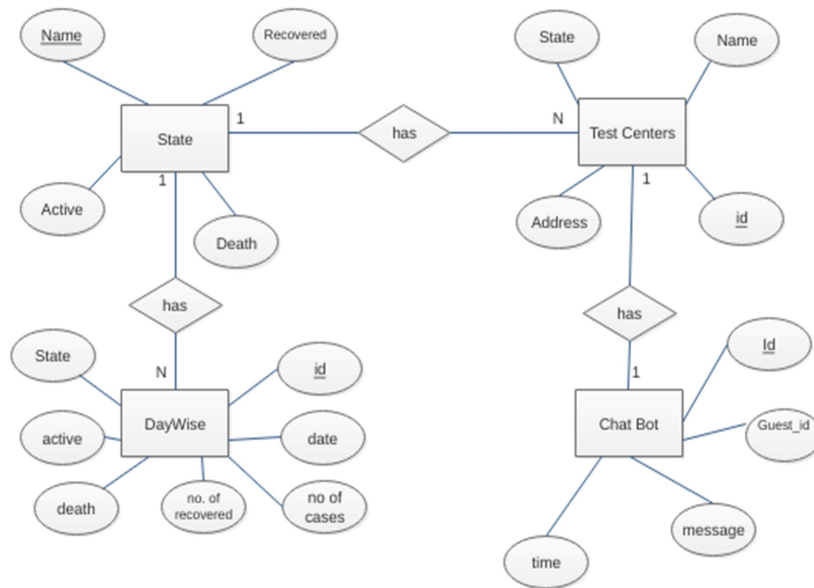
Fig. 2: An Entity-Relationship diagram of the proposed system

The proposed system is built on a cross-platform mobile application developed as a step towards making the general awareness of the people regarding the global pandemic due to COVID-19 on a nationwide scale. The Entity-Relationship Diagram (ERD) of the developed system is shown in figure 2.

The architecture of the proposed solution is a decentralized one where the frontend or the client-side logic is separated from the backend or the server-side logic. This approach allows the system to be more fast, efficient, and scalable. To connect the frontend with the backend, both deployed on two separate cloud computing platforms. The use of Representational State Transfer (R.E.S.T.) APIs plays a significant role in communicating between the client-side server and the database.
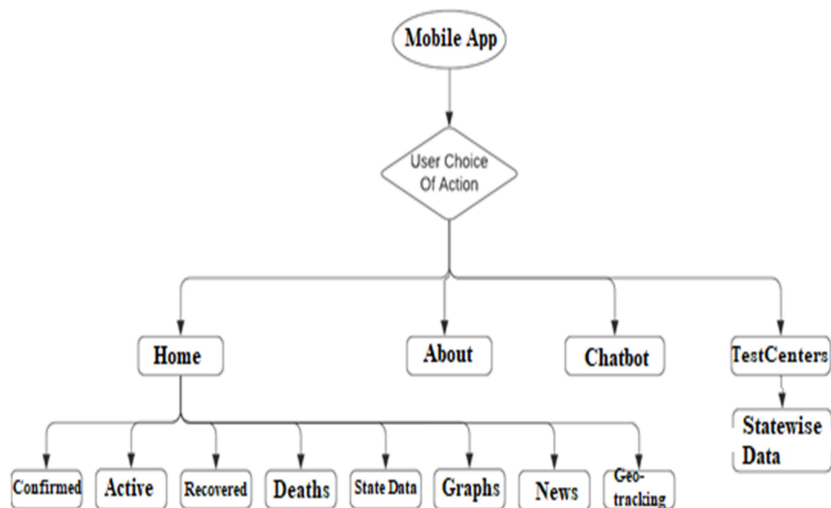
In our proposed solution, the total number of active cases, confirmed cases, active cases, and deaths in the home page using the data provided from the backend database. We are also displaying nation-wide, state-wise and district-wise data of the

number of confirmed cases with the use of geo graphs feature provided by Google Maps' API. With the use of chart.js, which is an open-source JavaScript charting library, we have created two other charts for better data representation. At first, we have created a pie chart that shows the total number of confirmed cases, active cases, and deaths. Another chart we have implemented is a line chart with multiple axes denoting the number of confirmed cases, recovered cases, and the number of deaths. This approach allows the user, simple and easy access to the data in an understandable manner. All the necessary data is provided from the backend database.

To make this proposed solution informative, we have also implemented all the government listed COVID-19 test centres in a state-wise manner for the ease of the user. This feature is also implemented with the help of the geo-location feature provided by Google Maps' API. Once a particular user selects its respective state and the test center nearest to him, from his current location, the shortest path will be displayed to him to the selected test center based on real-time traffic analysis. People can receive authentic news about COVID-19; the proposed solution also comes with a news section that displays news regarding COVID-19 only based on the user's current location.

For quick and immediate suggestions on COVID-19 health-related issues, we have also implemented a chatbot, which allows the user to ask some basic questions, and the chatbot will provide an answer based on the most suitable feedback provided by our machine learning model. After the conversation is over, our machine learning model generates the user's health condition as feedback to the user. As more and more time passes by, the machine learning model will be able to train itself on the cloud and provide more and more accurate results to the user. This approach provides a very interactive experience for the user, which is very easy to use also.

Another key aspect of the proposed solution would be the use of geo-tracking. It allows the user to check all the people that they might have come in contact with if somehow the person is tested corona positive. All the people who have a chance to come in contact with that particular person can now have to be tested if they are corona positive or not, and if they are corona positive, they can be taken care of at the earliest.

Fig. 3: Flowchart of all the provided attributes of the proposed system

Features of the Proposed Solution

- Providing the total number of confirmed, active, recovered, and deaths on a national, state, and district level.

- A news segment to be able to read all the news related to COVID-19 in one place.

- The use of geo-graphs for the total number of confirmed cases in a user-friendly representation.

- Able to see all the test centers state wise.

- Use of Pie chart for better representation of confirmed, active, recovered, and death cases.

- Use of line graph for the day-wise representation of confirmed, active, recovered, and death cases.

- Use of chatbot for an interactive experience.

- Able to predict health state based on the user's condition.

- The use of geo-tracking to keep track of user's health.

- To warn the user about the persons those with contacted the user, in case of any of they having corona positive.

- The use of modern Machine Learning (ML) and Artificial Intelligence (AI) tools for better accuracy over time as the models train itself with time.

UML Diagram of the Developed System:
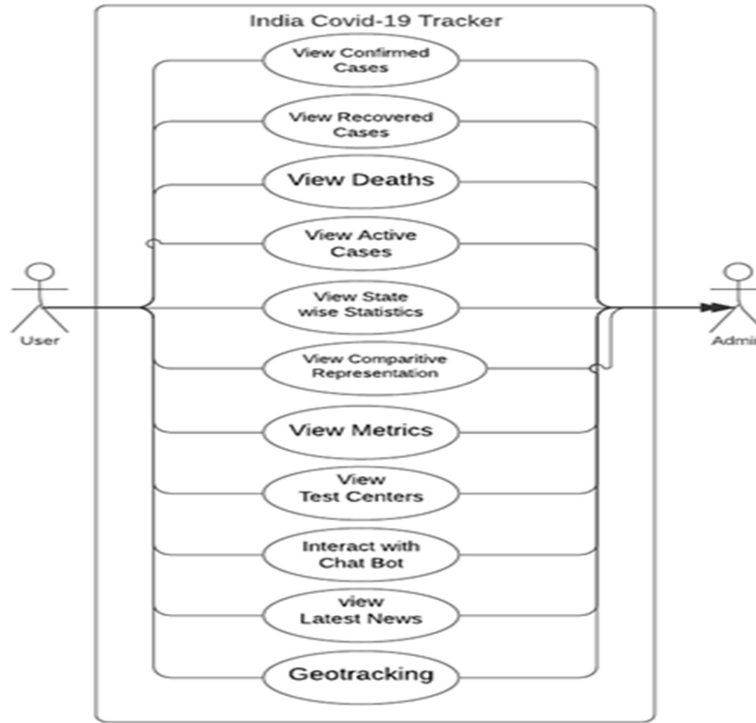
Fig. 4: UML Use-Case diagram of the developed system

In figure 4, the UML use case diagram helps in defining the architecture of the developed application.

IV. Results and Discussion

We have implemented a mobile application that works for both Android as well as IOS for the ease of the user. The mobile application is based on the Flutter framework using Dart as the primary language. The fetching and updating of data are done using representational state transfer (Rest API), which is done using python on the Django framework. The application mainly consists of an array of graphs used to make the users aware of the current scenario of COVID-19's impact. The graphs are listed below. The application is also integrated with a chatbot that uses modern machine learning and A.I. tools to predict the health condition of the user based on the input provided by the user. We are storing all the data gathered from their responses for training our machine learning model and providing the user with better results over time. Lastly, we have also provided a list of test centers for COVID-19 in a state-wise manner of India for the user to quickly locate the test centers in case of a medical emergency.

Figure 5 (a) depicts the state-wise statistical data (death, active cases, confirmed cases, recovered) is shown on the map of INDIA. The user needs to hover on each

state to view the real-time data of that state. This is implemented with the help of Google Geo-charts. The colour representation is provided for better understanding, i.e., lighter the colour indicates a smaller number of confirmed cases and vice-versa. Where, figure 5 (b) shows district-wise real-time statistical data (death, active cases, confirmed cases, recovered) of each state.


(a)   (b)

Fig. 5.

(a)   (b)
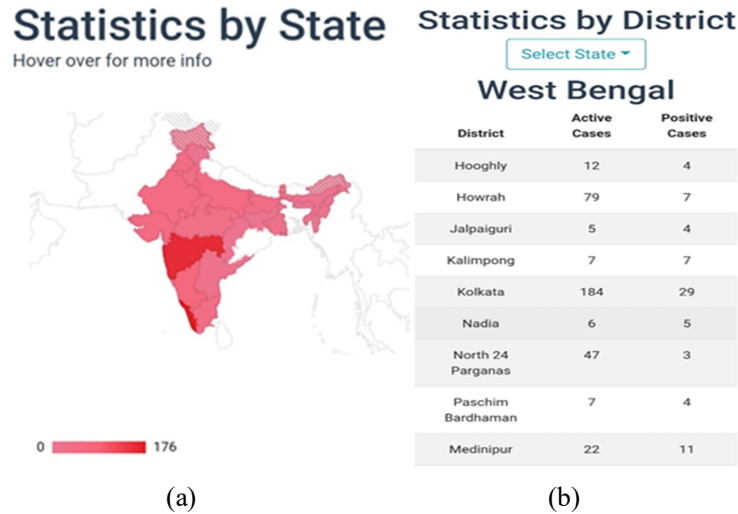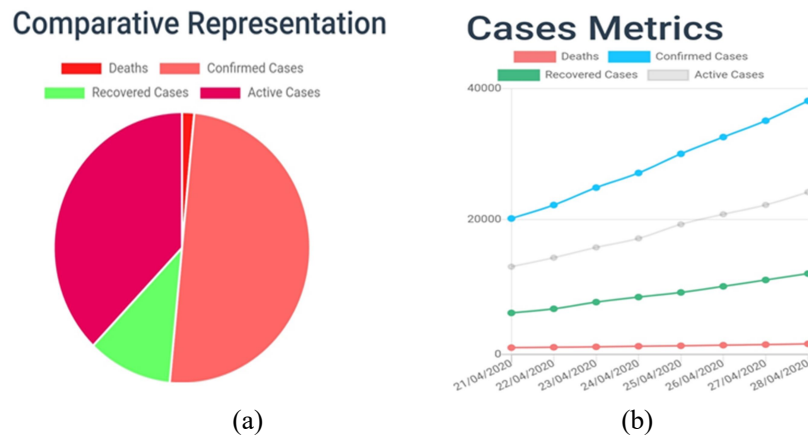
Fig. 6.

Figure 6 (a) represents a pie-chart representation of the total number of active, recovered, deaths, and confirmed cases for better visualization. This is an interactive chart with the ability to show more data on hover. Figure 6 (b) describes a graphical representation of the total number of recovered cases, deaths, and confirmed cases in

a day-wise format of the last seven days. The user can hover over each date mark to view the statistic of the particular date.

(a)　　　　　　　(b)
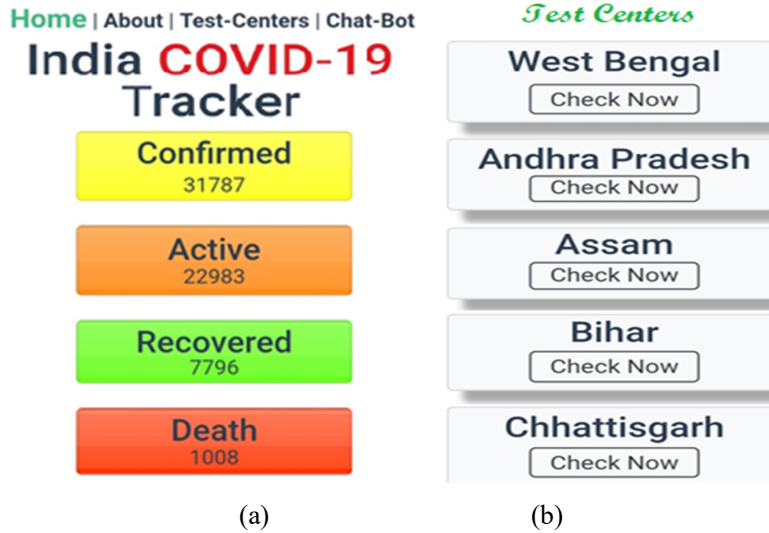
Fig. 7.

Figure 7 (a) provides a dashboard for viewing the total number of active cases, recovered cases, deaths, and confirmed cases in total of the entire nation. In figure 7 (b), a state-wise list of all the test centers across the country are given. The user needs to click on the state to view the details of the test centers further.

(a)　　　　　　　(b)
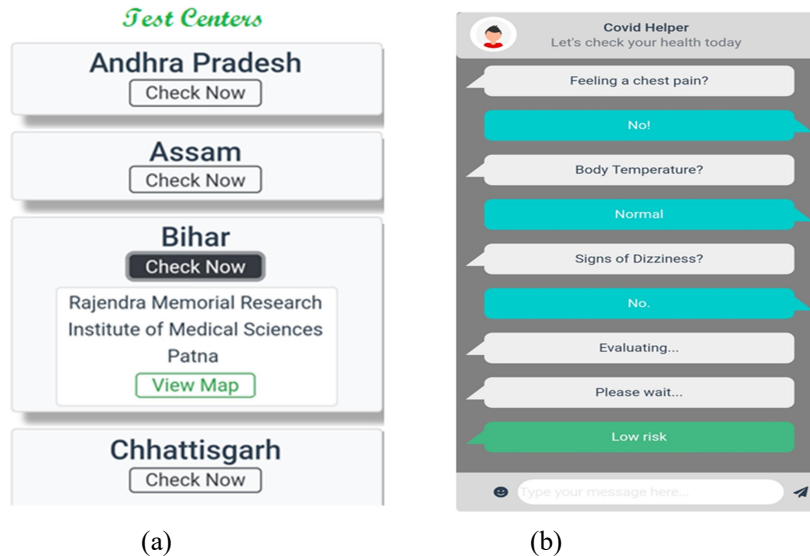
Fig. 8.

Figure 8 (a) shows the continuation of figure 7 (b). The user can click on the preferred test center, and the route direction to the test center can obtain through the Google map. Figure 8 (b) shows a test-oriented Chat-bot, which is provided to help the user to determine their health condition and the stage of risk (i.e., chances of being affected by the Coronavirus diseases). This system is equipped with modern AI-ML tools, which helps it to determine the risk based on some user inputs.

Comparative Study among Various Mobile Applications Currently Used in India to Combat COVID-19

In this section, authors have prepared a comparative study in Table 1 among various mobile applications that are used in India to combat COVID-19 along with our implemented application. The table depicts that among all the mobile applications, our implemented application covers more features apart from world data.

Table 1: Comparative Study of various Mobile Applications

Developed Systems	Real-time informative data	District-wise data	World data	Test centre details with Map	Test oriented Risk identifier	geo- location tracking	Chat bot	News	Weekly Status Graphical Representation
Microsoft Bing	√	√	√	x	x	x	x	√	x
Apollo247	x	x	x	x	√	x	x	x	x
Mahindra Ecole Centrale	√	√	√	x	x	x	x	√	√
Aarogya Setu	√	x	x	√	√	√	x	√	√
Chatbot (My Gov)	x	x	x	x	x	x	√	√	x
Go-COVID	√	√	x	√	√	√	x	x	√

V. Conclusion

Authors have proposed and implemented the mobile application Go-COVID with the aim in mind to make the society aware in maximum capacity about the current pandemic situation of the nation due to the COVID-19. With the help of

technological advancement, we can provide critical information to the people in their mobile phones with the ease of accessing it wherever they want it. Using the aid of modern Machine Learning algorithms and AI tools, we can predict the health condition of a particular user. In case of a medical emergency, our application helps a user to reach a test center using Google maps. Considering the usefulness and impact of the dashboard, we are planning to extend this application further, i.e., the tool will provide similar information about the entire world regarding COVID-19. We strongly believe that in the early stage, this application plays a pivotal role in controlling the diseases. Thus, the advanced technology-based mobile application performs a significant role to combat against COVID-19.

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