

Fighting COVID-19 and helping economy to reopen using Blockchain Technology

¹Prof. Vishal Shinde, ²Miss.Bhavna Kheur, ³Miss.Manisha Lahane, ⁴Mr.Valmik Dusane

¹Asst.Professor, ^{2,3,4}UG Student, ^{1,2,3,4}Computer Engg. Dept. Shivajirao S. Jondhle College of Engineering & Technology, Asangaon, Maharashtra, India.

¹mailme.vishalshinde@gmail.com, ²bhavna.kheur@gmail.com, ³manishalahane36@gmail.com ,
⁴valmikdusane@gmail.com

Abstract-The paper introduced a practice on personal health and management of the data on the blockchain technology. When the global community which is dealing with the pandemic situation and economy reopen strategy, a solution is needed to cover various aspects: health collection of data and monitoring it, data privacy control, data record, identity across the world and collaboration of the regions. By using this technology distributed ledger technology it can identify, decentralized identity for verification, verifiable credential, and distributed storage, the project which is built using GreenPass solution to address COVID-19 and the issues regarding the economy reopen at the community level. It also envisions GreenPass solution as the personal data vault with the data security also with the use of ownership of data and permission management, as a green pass for the future of data as a personal property right new world.

Keywords-COVID-19, Health code, Blockchain, Verifiable Credentials

I. INTRODUCTION

Coronavirus (COVID-19) has now spreading so far and wide, creating a global pandemic. There is no idea of covid that it will go away soon as it is spreading wide. Viruses do not know of boundaries and races. Due to the large number of patients, and consequent shortage of medical services, people have suffered a lot. Community level control is proven to be the effective way to control the virus spread in the early stage. It is also one of the more complicated measures to be executed in reality. Everyone (including employers) needs to be involved. The effective solution is to completely shut down certain areas due to covid and request that people stay at home. However, this is not sustainable in a longer period. Besides the COVID-19 mitigation the economy reopening has become a major concern on each government, business, and individual. A large percentage of service sector businesses might not reopen again due to financial loss. They desperately need a solution - maintain a healthy environment to keep business open and keep customers happy. Cross border business and international travel is also in the center of the hurricane. Most countries closed borders to prevent the import and rebound of the pandemic. Even though people are tested as negative, they still can't use it as evidence to go through because each country has its own standard and policy. Airline companies are dying due to the lack of global collaboration. In many countries, their current practice is to measure your body temperature then check a code provided by a mobile carrier which indicates you are not from an infected area in 14

days. If both statuses are green, you are free to enter.

II. AIMS AND OBJECTIVE

a) Aim

The Aim is to identify the covid patients whether patients are positive or negative. This can reduce the workload dramatically and improve accuracy and time. If all of the raw evidence and data points are recorded on the blockchain, it will be immutable and unchangeable. This is mainly useful for tracing a specific point where any incident has occurred.

b) Objective

The main objective of the study is to present the outlook of the covid patients which are increasing day by day. In order to make these methods safe and sustainable, this system is a platform which can decrease the number of patients in the country.

III. LITERATURE SURVEY

The Covid application is used for the people to check whether the patient is covid positive or negative through this application. The project involves the security of the data and the data is encrypted in this application.

Paper 1: Artificial Intelligence (AI) and Big Data for Pandemic: A Survey on the State of the Arts in the COVID-19

The paper represents the pandemic situation in which the people identify the applications which are fighting against COVID-19 situation also highlight the challenges which the

people are facing and issues with the solutions, and then they also come up with recommendations for the effective communication to control the COVID-19 situation[4].

Paper 2: Implementation of an Informative Website of Covid19 Predictor

Implementation of an online information sharing platform has been presented which exploits the technological advancements like web scrapping, prediction, web application framework, cloud hosting etc. to help common people to be aware of data analysis of COVID-19 infection in India [5].

Paper 3: Deep Learning for the Classification and Localization of covid Markers in Point of Lung Ultrasound through CT scan:

Deep learning (DL) has been useful in the detection of medical images of the lungs and in the recent pandemic situation, some investigation have been started regarding the diagnosis of the lungs. While it also focuses on CT scans, it tells us about application of DL techniques used for the

analysis of lung ultrasonography (LUS) images. Specifically, which is annotated dataset of lungs images are collected from the several hospitals in our country, with labels indicating the degree of disease severity at a frame-level & video-level, also the pixel-level that is the segmentation masks [6]

IV. EXISTING SYSTEM

In the existing system, it can reduce the workload dramatically and improve accuracy. If all of the temporary evidence and data points are recorded on the blockchain, it will be unchangeable and secured. This is mainly used for tracing back to a specific point where any incident has occurred. In the long term, the solution should be expandable and become a dynamic personal health status passport, to avoid the hurdles again. Of course, all of which should be under strict privacy control. This is the most important aspect of making a policy and solution sustainable. [4]

V. COMPARATIVE STUDY

SRNO.	PAPER TITLE	AUTHOR NAME	METHOD	ADVANTAGE	DISADVANTAGE
1.	Artificial Intelligence (AI) and Big Data for Coronavirus Pandemic: A Survey on the State of the Arts	Quoc-Viet Pham; Dinh C. Nguyen; Thien Huynh-The; Won-Joo Hwang	Artificial Intelligence and Big data Analysis	It helps providers detect which patients are most likely to have severe cases of COVID-19	System do not have accurate data also it can contain fraud data as compared to other data.
2.	Implementation of an Informative Website – "Covid19 Predictor".	Shuvankar Roy, Mahua Nandy Pal, Sonali Bhattacharya, Srirup Lahiri	Django, Heroku.	It provides security to client-server data transmission by default.	Time Consuming
3.	Deep Learning for Classification and Localization of covid Markers in Point-of-Care Lung Ultrasound	Subhankar Roy; Willi Menapace; Sebastiaan Oei; Ben Luijten; Enrico Fini; Cristiano Saltori; Iris Huijben;	Deep Learning Data Analysis.	It advances the state of the art in the automatic analysis of LUS images for supporting medical personnel in the diagnosis of COVID-19	Failed to capture the images and it is not the accurate data here accuracy is low
4	Artificial Intelligence and COVID19: Deep Learning Approaches for Diagnosis and Treatment.	Mohammad Jamshidi; Ali Lalbakhsh ; Jakub Talla; Zdenek Peroutka; Farimah Hadjilooei; Pedram Lalbakhsh	Artificial Intelligence And Deep Learning.	Improve the efficiency of the covid detection accuracy.	limited storage of data capacity

VI. PROBLEM STATEMENT

Today, Covid-19 poses a serious threat not only to the financially but also physically to the nation. The increasing amount of patients causes a treat to the economy of the people in the country it has been adversely affected the economy of the country. However, due to this project there can be increase in the economy by finding the accurate temperature of the colleagues or employees in the industry.

VII. PROPOSED SYSTEM

The proposed system is designed which is an effective method capable of detecting COVID patients. It is a data analysis services that can read the user’s data with the owner’s personal permission. This will generate results, such as a QR code with color status. The analytical process is essentially an algorithm. GreenPass is not just a short

term tool for combating COVID-19. It has an open architecture to include an array of data for the owner . It should be our green pass to help us gain access to friends and places across the world, with a balance between freedom, health, and privacy. The analysis in GreenPass is currently quite simple. A data immutable platform in place is valuable. It also need to make the raw data trustable at the time it is entered into the system. GreenPass platform supports all kinds of IoT device connections, such as Bluetooth ready thermometer, weight, blood sugar checker, etc. By enabling data collection directly from IoT devices, this DLT-driven system will be more trustable and valuable for data owners and potential data users.

VIII. ALGORITHM

The general working of system algorithm is given as follow:

Step-1: Login to the Application

Step-2: Select the option Greenpass in the application

```
public class GreenPassFragment extends Fragment {
    public View onCreateView(@NonNull LayoutInflater inflater,
        ViewGroup container, Bundle savedInstanceState) {
        View root = inflater.inflate(R.layout.fragment_green_pass,
            container, false);
        return root;
    }
}
```

Step-3: Check the temperature with the help of Bluetooth sensors. If scanner turns green then the report is negative. Else report is positive (scanner turns red).

Step-4: Predicting the test result

```
public class ExampleInstrumentedTest {
    public void useAppContext() {
        // Context of the app under test.
        Context appContext = InstrumentationRegistry.getInstrumentation(
            ).getTargetContext();
        assertEquals("com.voidmain.gatepass",
            appContext.getPackageName());
    }
}
```

Step-5: Tracing the patient's current location. **Step-6:** As a reference in the investigation of test data, knowledge-based determine whether the person needs an appointment or not.

```
public class AppointmentsFragment extends Fragment {
    public View onCreateView(@NonNull LayoutInflater inflater,
        ViewGroup container, Bundle savedInstanceState) {
        View root = inflater.inflate(R.layout.fragment_appointment,
            container, false);
        return root;
    }
}
```

If yes, book an appointment with the doctor. Else appointment is rejected.

The appointment is booked according to the preference of area.

IX. MATHEMATICAL MODEL

The individuals which are aware about the virus and the lockdown, are called the partially controlled individuals of covid-19 (P), as the population is not controlled by the other people. The second category of people are who follows the quarantine by staying or working at home from the starting of the closure. This type of population is called a totally controlled population (C). The infected, uninfected, recovered, or the dead individuals are the rest of the numbers. Let us define a discrete-time model with the six following main compartments:

(i) S: the number of people that are suspected to

infection or who are not yet infected, or who did not get profit from the awareness program

(ii) P: the number of people which are partially controlled. People who did not follow the quarantine and left their homes.

(iii) C: the number of susceptible people who are not infected or totally controlled from the covid people who did not leave their houses. Therefore, these are considered as people who respect quarantine.

(iv) I: the number of infected people who are spreading the epidemic and partially controlled categories.

(v) R: the number of recovered people from the epidemic, and can return to their houses during the quarantine.

(vi) D: the death toll from COVID-19 who are dead in this epidemic situation. All these considerations lead to the following system of difference equations:

$$\begin{cases} \frac{dS}{dt} = -\lambda(1-k)SI \\ \frac{dI}{dt} = \lambda(1-k)SI - \alpha I \\ \frac{dR}{dt} = \alpha I \\ S + I + R = N \\ S(0) = S_0, I(0) = I_0, R(0) = R_0 \end{cases} \quad (1)$$

with initial conditions $S_0 \geq 0, I_0 \geq 0, R_0 \geq 0$, and $D_0 \geq 0$

$$\frac{dI}{dS} = -1 + \frac{R_k}{NS} \quad (2)$$

$$I(S) = I_0 + S_0 - S + \frac{R_k}{N} \ln\left(\frac{S}{S_0}\right) \quad (3)$$

$$R_k = \frac{\lambda(1-k)N}{\alpha} \quad (4)$$

When $k = 0, R = R_0$ therefore the $R_k = (1-k)R_0$. As $0 < k < 1$ it is easily defined as $0 < R_k < R_0$.

By solving the following equation we get the equation as:

$$\frac{dS}{dR} = -\frac{R_k S}{N} \quad (5)$$

$$S = S_0 e^{-R_k \left(\frac{R}{N}\right)} \quad (6)$$

$$\frac{dR}{dt} = \alpha \left[N - R - S_0 e^{-R_k \left(\frac{R}{N}\right)} \right] \quad (7)$$

When the value of R is small as compared to other pandemic situation because the covid cases has been decreasing day by day.

We get the following result:

$$R(t) = \frac{N^2}{R_k^2 S_0} \left[\frac{R_k S_0}{N} - 1 + \beta \tanh\left(\frac{1}{2} \alpha \beta t - \varphi\right) \right] \quad (9)$$

$$\frac{dR}{dt} = \mu \operatorname{sech}^2(vt - \varphi) \quad (10)$$

$$\beta = \left[\left(\frac{S_0 R_k}{N} - 1 \right)^2 + \frac{2 S_0 R_k (N - S_0)}{N} \right]^{\frac{1}{2}} \quad (11)$$

$$\varphi = \tanh^{-1} \left[\frac{1}{\beta} \left(\frac{R_k S_0}{N} - 1 \right) \right] \quad (12)$$

$$\mu = \frac{\alpha \beta^2 N^2}{2 S_0 R_k^2} \quad (13)$$

2. SOLIDITY

The true objective is to have a covid library that can store and assess the number of patients with single appointment (precedent underneath) on the blockchain.

$$f(x) = \begin{cases} x^2 & \text{if } x < 100 \\ 1000 \cdot \sqrt{x} & \text{otherwise} \end{cases}$$

3. SKEW

Skewness is a proportion of the asymmetry of the information around the example mean. In the event that skewness of the covid pandemic is negative, the information spreads out more to one side of the mean than to the other side. In an event the skewness is measured between the number of recovered and the number of daily patients is zero or not. The skewness of a conveyance is characterized as,

$$CIR = \frac{\text{Number of Daily Confirmed Cases}}{\text{Total Confirmed Cases}} \times 100$$

$$CRR = \frac{\text{Number of Daily Recovered Cases}}{\text{Total Recovered Cases}} \times 100$$

Where the CIR is the confirmed cases and the CRR is the Recovered cases measured by the multiples. When recovery is set to 0, skewness adjusts for the methodical inclination, and the accompanying condition applies:

$$\sum_{i=1}^{m+1} [C(y(\tau_{i-1} + 1): \tau_i)] + \beta f(m)$$

Where C is the cost function and the m is the minimization of the pandemic present in it.

X. SYSTEM ARCHITECTURE

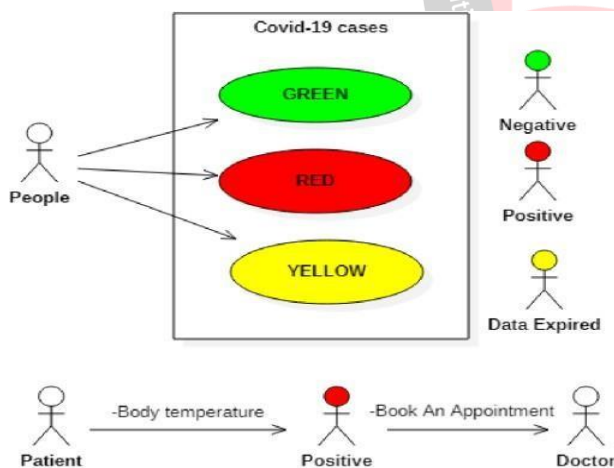


Fig.1: System Architecture

Description: There are 2 types of phases:

1. Training phase
2. Testing phase

1) **Training phase:** The system takes a record through the temperature record either by the Bluetooth sensor or manually by giving the temperature record whether the person is positive or negative.

2) **Testing phase:** In testing phase it verifies the record if the person is positive it returns red while if the

person is negative it turns green and the record is maintained for 14 days.

XI. ADVANTAGES

- 1) It reduces time and the person is cured without getting in contact with the other person
- 2) Symptoms are detected and the appointment is booked immediately
- 3) Easily acquired.
- 4) Easy to operate and it's not time consuming the impossible triangle of safety, mobility, privacy, become possible.
- 5) Blockchain technology is revolutionizing the infrastructure of next generation application and business.
- 6) Data ownership, privacy control, personal data property rights, globalized collaboration framework, blockchain technology. It is used for many purposes in the covid situation in this pandemic.
- 7) Easy to Maintain as compared to other application of the covid and the safety is also more according to the other application in covid.

XII. DESIGN DETAILS



Fig 1.1 Home page.

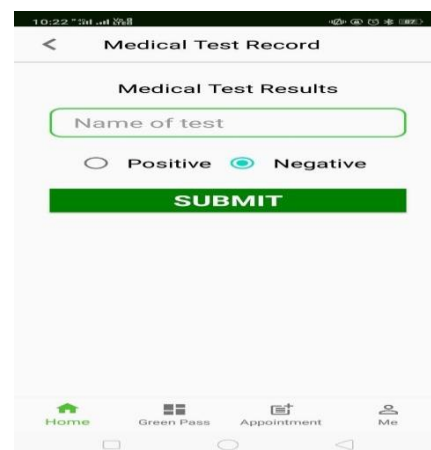


Fig 1.2 Covid test record.



Fig 1.3 Covid Positive(Green)

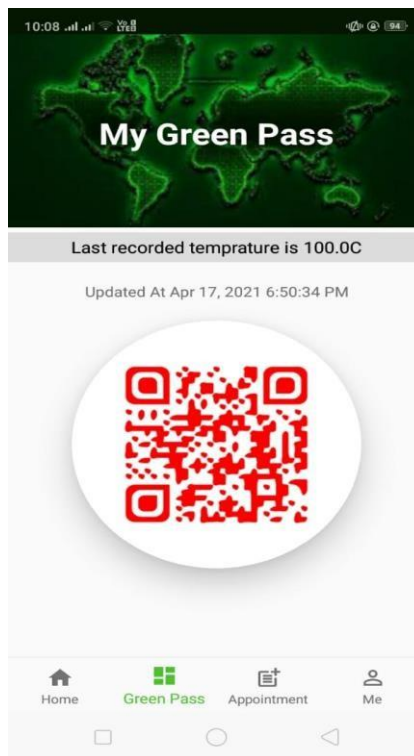


Fig 1.4 Covid Negative (Red)

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XIII. CONCLUSION

Thus, We have tried to implement paper Weimin Xin XingHanDa “Fighting COVID- 19 and helping economy reopen by using blockchain technology, IEEE 2020” with combining another paper. The main purpose of this system is to analysed and detect the users body temperature to know the covid status and get aware about there health issues. The world is suffering in this pandemic and economy crisis. GreenPass is a good practice to utilize the emerging technology, blockchain, to solve the problem. It makes

REFERENCES

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