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Covid 19 Contact Tracing with Machine Learning

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Abstract- Covid 19 has created a havoc in the lives of all, destroying life, business, economies etc. A lot of efforts have been made in the backdrop of it to contain the disease as much as possible, but the history of cases and deaths doesn't seem to prove that the existing containment measures put forward by the law enforcement agencies worked well enough to protect the lives of people.

Social Distancing, Lockdowns can be helpful up to some extent but they have their own limitations, after all how long can an economy survive with lockdowns and closing all the economic activities.

Therefore, it is imperative to devise new strategies which includes application of Machine Learning like use of Wi-Fi, Geo Tagging, AI, and Predictive Analytics to correctly estimate the extent of infections that can happen and also provide a sustainable and viable solution for contact tracing, which will eventually help in minimizing the spread of the infectious disease.

Many technologies have been developed through the applications of Machine Learning and AI, which helps in correctly analyzing the cause of the problem and get a solution for the same.

In India, itself one such example of the application of AI and Machine Learning can be seen in Aarogya Setu, which takes Wi-Fi and Bluetooth as a tool to identify the list of positive cases in a particular location and maintains a data base for the same.

1. INTRODUCTION

To effectively combat this disease, global response measures have been taken, including contact tracing, case isolation, social distancing, and various health measures. But most importantly, through the use of computerization and automation technologies, contact tracing remains the most important factor and element for successful disease prevention. Computational algorithms can be used to design the use of contact tracking applications to build a memory close to the contact.

Developing a vaccine and contact tracing becomes a crucial part of it. Healthcare industries and several of its stake holders are highly dependent and reliant on the usage and adoption of Machine Learning and improved usage of AI.

Government and law enforcement agencies are working hard to keep the disease in check through the usage of contact tracing. Lockdowns have been imposed in many places and cities but it can't be a permanent solution for this problem. Various tracing technologies need to be devised which utilizes the existing technologies like WI-FI, Bluetooth Energy which can of high efficiency and accuracy.

Therefore, contact tracing can be done with the help of WI-FI signals and machine learning algorithms.

2. RELATED WORKS

COVID-19 Pandemic and the Role of IoT, Drones, AI, Block chain, and 5G in Managing Its Impact.

Published by: Vinay Chamola, Vikas Hassija, Vatsal Gupta, and Mohsen Guizani

Covid 19 has left a disastrous spell on most of us, with high infection and high death rates. Therefore, it becomes essential to understand the entire transmission of the virus, so that prevention can be done up to some extent.

Unfortunately, there have been only a handful intervention to effectively do and curb the spread of the covid disease. One of the most effective and reliant mechanism to curb and check the infection rates is through contact tracing. Through, it becomes essential to understand the entire transmission of the virus, so that prevention can be done up to some extent.

In addition to various technologies, use of IoT, UAVs, Block chain, AI can be of great help as they can help in contact tracing and help in keeping a control over the transmission of the disease to a great extent.

Exploiting COVID-19 Contact Tracing Recommendation through Social Awareness.

Published by: Amevi Acakpovi, Emmanuel Kwaku Ofori, Wisdom Torgby, Marcellinus Kuuboore

Covid 19 has left a disastrous spell on most of us, with high infection and high death rates. Therefore, it becomes essential to understand the entire transmission of the virus, so that prevention can be done up to some extent.

For the purpose of transmission control of the virus, contact tracing becomes a very important issue, as it is key in preventing the disease by conducting a detailed study and trace back the possible infections that may have occurred during the course of the time. For the purpose of contact tracing Algorithm can be of high usage, as it can be used to measure the touch points, contact frequencies, proximity contacts which can finally help in tracing for the effective contact tracing. Various evaluation methods can be used for this like Precision, Evaluation and F- Measures.

Applications of machine learning and artificial intelligence for Covid-19 (SARS-CoV-2) pandemic.

Published by: Samuel Lalmuanawma, Jamal Hussain, and Lalrinfela Chhakchhuak

Machine Learning, Artificial Intelligence play a major role in predicting what's going to happen in future and helps in taking corrective steps to some extent. Hence, the same can be applied in tackling the covid-19 situation for predicting, screening, examining, tracing and development of covid drugs.

It works on multiple angles and take into consideration of many areas like improved treatment, screening, prediction, forecasting and contact tracing. Therefore, Machine learning can really be helpful in identifying the route cause and take corrective actions before it gets too late.

Contact Tracing of Infectious Diseases Using Wi-Fi Signals and Machine Learning Classification.

Published by: Anvar Narzullaev, Zahriddin Muminov and Mavlutdin Narzullaev

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For the purpose of contact tracing Algorithm can be of high usage, as it can be used to measure the touch points, contact frequencies, proximity contacts which can finally help in tracing for the effective contact tracing.

In addition, a new technology is used that uses WI-FI signal data from potential contacts and confirms the patient's smartphone to detect whether they share a common space, which is useful for identifying Covid patients.

Machine learning algorithm helps Bluetooth contact tracing systems discern per-event risk of COVID-19 transmission

Published by: Dave Muoio

Bluetooth-based contact tracking systems are being designed and implemented at the federal, state, and organizational levels around the world. Although these systems can identify events in which close contact may occur, they can hardly distinguish between high-risk contacts or contacts that can cause infection and contacts with the lowest risk. Integrating these features into the extensive Bluetooth contact tracking network can help better guide individuals in deciding whether to quarantine or release personal information for contact tracking, and can help public health authorities to direct your manual contact follow-up work. The event with the highest risk of exposure. "For this method to be practical, that is, to avoid alarms triggered by each encounter

in the short or long term, it is important to reliably estimate the risk of spread of infection from measurements of signal intensity BLE.

3. MODEL METHODOLOGY

The proposed paper make use of database to store all the necessary details which are required like phone number, locations, timestamp and this will be running on server side. Some of the necessary applications as well as algorithm will be implemented in the paper.

Google Cloud Firestore

Firestore is a NoSQL document database which is constructed for high performance, and for application development. Although the interface has similar functions as that of old database and it varies in a way that describes the connections between the data objects.

DBSCAN

DBSCAN uses a density-based method to form spherical clusters in order to cluster input data sets of different densities. LSDBC promotes local scaling by guessing a threshold based on locally available data in the density cluster, where the KNN algorithm is used to find the possible center of the cluster where the local maximum is found. Increase the value of clustering until its density is less than the specified density parameter, resulting in noise in the density gradient and random clustering of data sets.

Fused Location Provider

It is a location API that can intelligently combine various signals to provide the location details which the application wants. So the combined location provider manages the essential positioning tools like GPS and Wi-Fi and offers an API that is used to specify the quality of service which is needed.

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Technology Stack

Android App	Java
Database	Google cloud Firestore
Server side programming	PHP
Machine Learning Module	python

Fig 1: Technology Applications

4. MODEL IMPLEMENTATION

GPS contact tracing requires less absorption than Bluetooth-based contact tracing to be successful. People who test positive can be quarantine and use a web technology that can be used manually to create a track with the help of GPS so that people don't get affected. So the advantages of GPS over Bluetooth is that, the latter needs to exchange details directly through the hardware. DBSCAN may be a popular unsupervised learning method in machine learning to separate high-density clusters from rare clusters. The training data comes from an Android application that returns the user's location coordinates through contact tracing. We will include a data set in JSON document format, but at the same time, the data set can also be copied from the company's database, and GOVT obtains detailed information from patients who test positive.

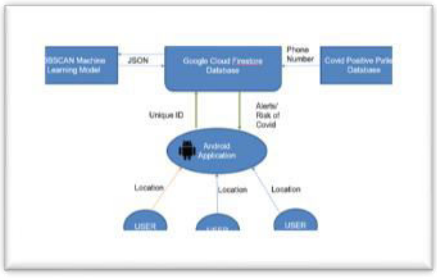

Fig 2: Data flow Diagram

The Android app helps to get the user's location and alert the user based on the risk level. Google Cloud Firestore is used to store data such as the user's phone number and location tracking data. We will not store any other data except the contact number and location data. The dataset that we will use in this task is a JSON data document. A server-side PHP

program is used to convert the data stored in the Google Cloud Firestore into a JSON data document, including all the libraries required by our project, and start reading the dataset and exploring some understanding of the data. The machine learning program will generate a risk level module and warn users that they have been in positive contact.

5. RESULTS

So we created a contact tracing with the help of DBSCAN algorithm. So these are the valued functions which are been used to create the model. So by using this model we will be creating a cluster which is beneficial to detect the patient due to segregating the data in the given cluster.

```
abels = model.labels_
fig = plt.figure(figsize=(12,10))
sns.scatterplot(df['latitude'], df['longitude'], hue = ['cluster-{}'.format(x) for x in labels])
plt.legend(bbox_to_anchor = [1, 1])
plt.show()
```

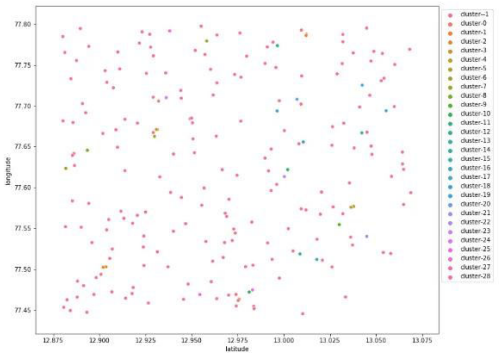

Fig 3: location being shown with the help of clusters

So by analyzing the cluster, we can detect the latitude as well as longitude with the help of users detail like phone number.

So the co-ordinate X-axis denotes latitude and co-ordinate Y-axis denotes longitude.

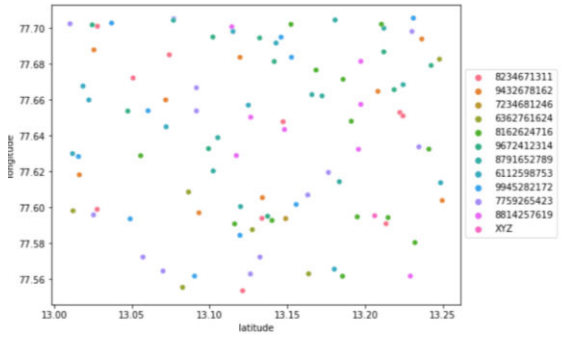

Fig 4: location being identified with the help of phone number

6. CONCLUSION

In this research, we tried to develop an Android App in which it could trace the covid patient with the help of GPS tracker. We have defined a model to meet the objective of Covid 19 contact tracing by means of an application process, which is based on a pre-defined database like Name, contact no and latitude and longitude of the persons and a tracking mechanism using an Android App in order to record COVID Positive patient in which it could trace the COVID patient with the help of GPS tracker by anchoring the Google Cloud Fire store Database.

Based on the result obtained, the clustering algorithm i.e. DBSCAN can perform data point clustering without prior knowledge of the datasets. Our development will helps the users to get an alerts of his/her level of risk.

7. FUTURE SCOPE

We had initiated our project "COVID-19 Contact tracing with ML" using the unique control devices in end to end functionality is MOBILE NO. Our future expansion plan is to build a robotic process with inbuilt AI system in a dedicated server having a secured platform with highly authenticated information.

We will define a TAP (Transaction Authentication Process) based on an OTP system in the registered Mobile No which is a prerequisite before the COVID testing. All the relevant database of the persons will be maintained using the unique Mobile No in a Dedicated Portal & Dedicated server. Post testing, all information will be moved to that portal for future traceability of the movement of that person tested

positive or negative and the risk associated. The GUI based web-based portal will retrieve the information from the database and provide the registered persons during his movement about the risk zone and nature of Risk category H M L (High/ Medium/ Low). For emergency through GPS tracing system two additional inform will provide Hospitals and Labs nearby on Map and Highly Infected Areas on Map. This future modification with this concept will add tremendous value in this system and helped the register person during this pandemic.

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