

RAD365



AI & COVID-19

Uncovering a Potential Pandemic Tracker with Outcome Prediction

*The Scope Behind
The Objective
Six Elements
The Ecosystem
Data Universe
Impact on Global Healthcare*

AI and COVID 19: Uncovering a Potential Tracker

The Scope

Investing in advanced research on location intelligence and analytics technologies can yield great results in the healthcare sector. It can augment strategic planning about containing disease (epidemic/pandemic), prevention of the spread between regions, and expansion of medical facilities and supplies, to name a few.

Predicting the spread of the disease with the help of the human movement data can play a vital role in identifying the outbreak pattern of epidemic/pandemic cases. We have encountered a situation (COVID-19) that opened our eyes to how much we need to plan to contain a disease and we are looking at advancement in location intelligence and movement analytics to make more informed decisions in preventing such pandemics in the future. Thus, we can look ahead at the overall scope centered along the following-

- Establishing an assessment model of a single score reflecting the severity of a disease (epidemic/pandemic) like COVID 19
- Establishing well-defined & consolidated data universe encompassing all contributing factors towards the spread of a disease (epidemic/pandemic) like COVID 19
- Establishing a universally applicable & collaborative approach towards containment & combatting a disease (epidemic/pandemic) like COVID 19

The Objective

Our objective is to develop a Single Source of Truth (SSOT) involving data universe encompassing all possible parameters responsible and linked to the disease (epidemic/pandemic) and its spread. Thereupon develop and establish the algorithm, based on artificial intelligence and machine learning, to assist in drawing conclusive affirmatory guide note(s).

The tracker would help users understand COVID-19 or any such epidemic/pandemic in the following ways:

- Better identification of symptoms to introduce a treatment protocol for an epidemic/pandemic like that of COVID-19
- Comprehend the rate at which the disease can spread in a particular location
- Predict the outcome and isolate those who are at risk by better understanding symptoms linked to health conditions
- Identify the pattern of spread and high-risk areas in a country
- Forecast parameters of COVID-19 and/or a similar epidemic/pandemic

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Six Elements Involving the Containment and Combatting of COVID 19

1. Social Distancing

2. Contact Tracing

3. Self-isolation

4. Sewage Tracing

5. Testing

6. Treatment

Extensive contact tracing, self-isolating, social distancing, sewage tracing and testing alongside treatment may reduce the spread of the novel coronavirus, and favor control of the COVID-19 outbreak suggests a study carried out in China. Here is what the above-mentioned tactics mean:

Social distancing

Social distancing refers to the measures taken to increase physical space between people to prevent the spread of a virus. This involves avoiding public gatherings, avoiding hosting visitors at home, staying at home unless absolutely necessary to go out, and always keeping a safe distance from other people.

Contact tracing

Contact tracing is the process of identifying, assessing, and managing individuals who have been exposed to a disease to prevent transmission. As soon as a confirmed SARS-CoV-2 is detected, contact tracing must be implemented and preferably within 48 hours.

Self-isolation

Isolation, unlike quarantine, is when a person confirmed to have a contagious disease has to stay separately from other healthy individuals around them. This is done to prevent the spread of infection.

Sewage Tracing

Biosensors for Virus detection

Infectious diseases pose an omnipresent threat to global and public health, especially in rural areas. Underlying reasons for such maladies can be summarized as the paucity of appropriate analysis methods and subsequent treatment strategies due to the limited access to healthcare facilities.

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Viruses are obligate intracellular parasites that need a host cell to propagate and establish its genetic material replication. Their complicated protection mechanisms can alter very quickly. In response to this situation, viruses break down and manipulate the host immune reaction. This has led to the emergence of viruses that are capable of subverting host immune responses eventually resulting in worldwide viral infections.

Notably, some outbreaks have attracted attention in the last decade; influenza A H1N1 subtype in 2009, Ebola virus outbreak in 2014, and the current coronavirus pandemic that began in late 2019.

Sewage IoT Sensors and the Future of Virus detection

There is an arm of science that is focused on insights about human behaviour and public health by analysing the contents of sewage. Popular as wastewater-based epidemiology (WBE), this technology plays a vital role in monitoring a pandemic outbreak.

Leveraging an IoT sensor to monitor wastewater could help prevent some of these highly infectious diseases from spreading rapidly. In the case of the current coronavirus outbreak, studies have showed that Sars-CoV-2, the virus that causes the coronavirus disease (Covid-19), travels to the gut in a positive individual with a high viral load. Isolated from the faeces and urine of infected people, the virus can typically survive for up to several days in an appropriate environment after exiting the human body. A smart sewage surveillance system will be proactively monitoring the presence of several kinds of virus and extent of disease transmission.

The IoT sensors will be deployed in three levels: Level 1 would include individual houses, level 2 would include buildings and housing societies, and level 3 will comprise the community. These sensors will pick up biomarkers of COVID-19 in faeces and urine that make their way into the sewerage system. As it is folded and unfolded, the sensor will filter the nucleic acids of pathogens, which will react with preloaded reagents to show the presence of infections. It can also be tweaked without hassle to detect coronavirus, the virus that has affected 10 million people across the world.

In the case of asymptomatic infections in the community or when people are not sure whether they are infected or not, real-time community sewage detection through the IoT sensor can determine whether there are COVID-19 carriers in an area to enable rapid screening, quarantine, and prevention.

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If COVID-19 can be monitored in a community at an early stage through WBE with a smart IoT sensor, an effective intervention can be taken as early as possible to restrict the movements of that local population, working to minimize the pathogen spread and the subsequent threat to public health.

Future Perspective

We are proposing to develop septic tank sensor to detect COVID-19 and any such pandemic involving virus/bacteria infections which has a possibility of community spread. The sensors will not replace the established laboratory tests but could be used as an alternative method for clinical diagnosis and to proactively measure & track the virus concentration & foot print in real-time. We foresee that the sensors will offer a complete and immediate picture of population health once deployed in the near future.

Testing

When a communicable disease outbreak happens, the ideal response is to start testing early. That leads to quick identification of cases, quick treatment for those infected, and immediate isolation to prevent further spread. Early testing also helps identify anyone who came into contact with infected people so they too can be treated immediately. Testing is important in the bigger public health picture in terms of mitigation efforts as it helps characterize the prevalence, spread, and contagiousness of the disease.

Treatment

Like in the case of COVID-19 where no drugs or therapeutics are approved to prevent or treat the disease, clinical management is likely to include infection prevention, control measures, and supportive care, including supplemental oxygen and mechanical ventilatory support as needed.

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The Ecosystem

The application ecosystem revolves around the three main areas

Data Service

Data exists in various systems across society. When these systems exist in silos it poses a challenge for the governing entity looking to make data-driven decisions, as not all members of the organization are operating off with the same data. In the case of a pandemic outbreak like COVID-19, moving toward a single source of truth model can overcome the challenge.

Our app aims at developing a single source of truth (SSOT), the practice of aggregating the data from many sources to a single location. An SSOT is not a system, tool, or strategy, but rather a state of being for an institution's data in that it can all be found via a single reference point.

Creating a single source of truth ensures that strategies can be implemented based on standardized, relevant data across the organization. Without a single source of truth, data sets exist in siloes and each institution will operate as a black box. Implementing a single source of truth (SSOT) and sharing the same with government can enable authorities to make data-driven decisions based on the granular detailed data as a whole, rather than from compartmental data silos. This is to be accomplished in the following ways:

- A portion of the data (PII and transaction data, the hashes of different documents, for example) will be stored in a permission-enabled private blockchain for immutability, security, and transparency
- SSOT database can be shared with different government agencies, authorities, and all other healthcare nodal agencies with proper security and transparency
- Radiology images and related metadata will be stored in an appropriate and robust PACS system with certifications & approval from globally acclaimed healthcare governing bodies

Location service

At its simplest, digital contact tracing via location service will work like this: Phones log their own locations; when the user of a phone tests positive for COVID-19, a record of their recent movements is shared with health officials; owners of any other phones that recently came close to that phone get notified of their risk of infection and are advised to self-isolate.

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Such a tracking system will also take into consideration the following: How to determine the proximity among phones and the health status of users, where that information gets stored, who sees it, and in what format.

Location wise visualization of disease maps with granular details, helps identify more contacts and empowers to carry out a future forecast with an analysis of the current situation unlike what happens with traditional methods. A contact-tracing app like ours will have much impact in a city where a high volume of coronavirus cases and extensive community transmission is continuing to shutter businesses and force citizens inside. It is also especially powerful in areas, such as in sub-Saharan Africa, that are at an earlier stage of the outbreak, and where isolating potential cases could avert the need to shut down schools and businesses.

Our app will gather the data to create a database. When enough data is gathered from digital tracking, we will leverage Big Data analytics and Machine learning to feed our monitoring model that takes into consideration the current situation and predicts the likely outcome.

Individual Severity Prediction

This is a completely new disease. Doctors are still debating the symptoms that it shows. In fact, they are even debating how long a person infected by COVID-19 remains asymptomatic and how long the symptoms persist. Identifying COVID-19 is right now a tricky proposition with many false negatives being detected even with PCR tests.

Our application will expedite the process of detecting suspected cases, prompting them to get tested to check whether they have caught coronavirus or not.

The app will require a user's sex, age, nationality, travel history, symptoms, and other questions deemed important by the app developer. While these questions are important for analyzing the impact or severity of a symptom, they are not specific to every person. Irrespective of the age, sex, and symptoms, the immunity level of each individual varies. There are other biological factors also that determine a person's ability to catch a disease, particularly flu. The symptoms for Covid-19 are nearly similar to the common flu, which is challenging for most tools to tell apart. Our AI-based smart app is trained on several thousand cases and has an accuracy of 99.9% when it comes to detecting possible COVID-19 suspects. However, a laboratory test will help provide an accurate result of what the underlying condition is.

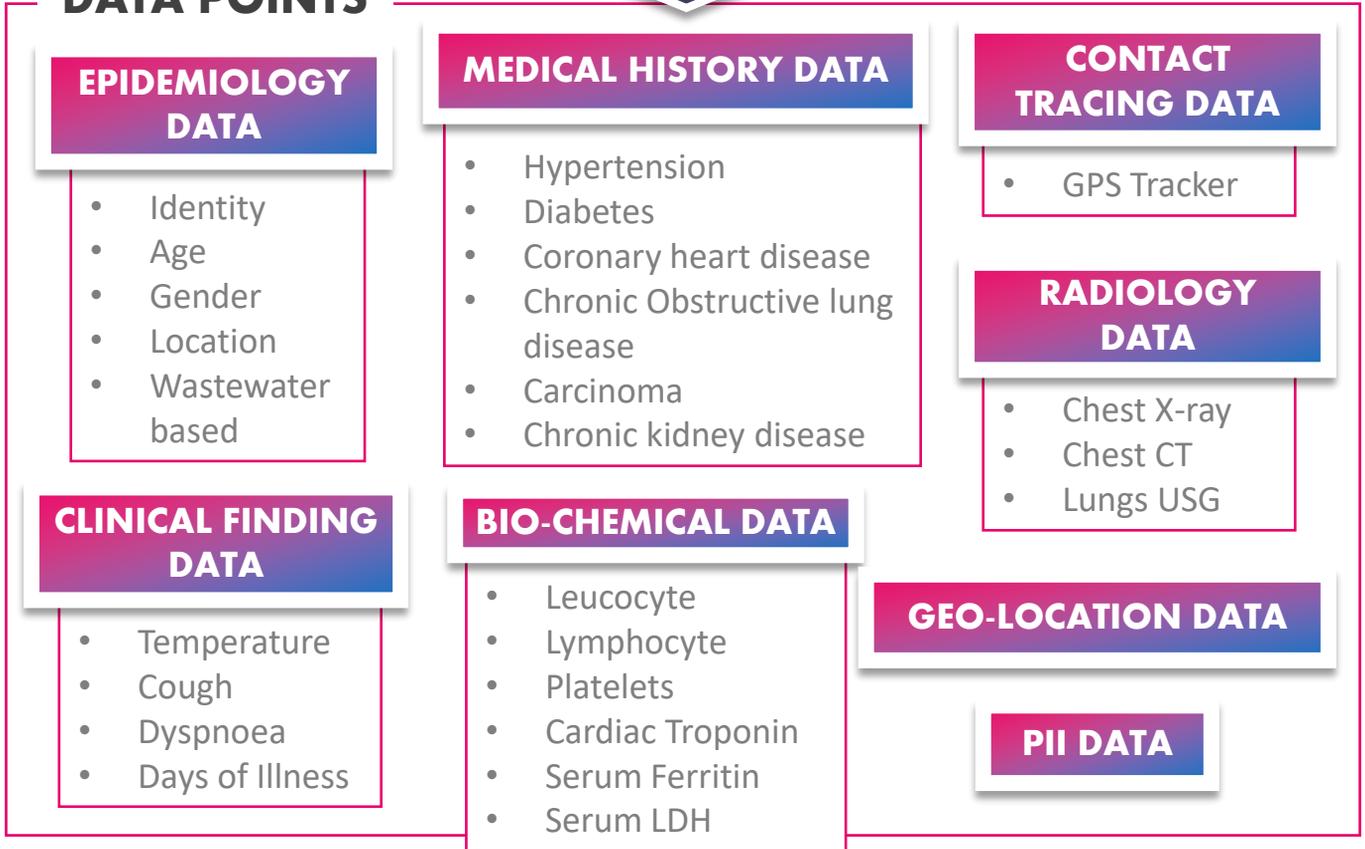
Our app also puts an end to the uncertainty of a user with symptoms or travel history to an affected region or contact with COVID-19 patients. In most cases, these people unnecessarily panic and/or rush to the nearest testing center. While it may be justified on the concerned person's part, it is not feasible for medical facilities to prioritize someone who is scared he may have caught coronavirus without any form of symptom check.

AI and COVID 19: DATA UNIVERSE

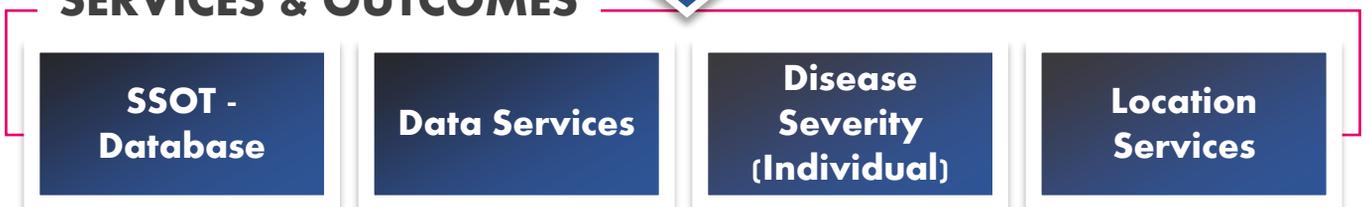
SOURCES



DATA POINTS



SERVICES & OUTCOMES



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Impact on Global Healthcare Management

The app is initially expected to strengthen public health delivery systems of both the State and Central Governments across countries and subsequently offer necessary geospatial information support to agencies and citizens dealing with challenges related to their health, livelihood, and socio-economic distress.

Risk Assessment

The app will help Governments take necessary and timely steps for assessing the risk of the spread of COVID-19 infection and ensuring isolation where required.

Proactive Health Mapping

The app's health mapping feature will help individuals to share and self-monitor their health conditions, thus, creating a digital fence against a pandemic outbreak, such as the COVID-19 spread.

Updating Relevant Advisories

The app will also inform citizens about the latest best practices and relevant advisories pertaining to the containment of a pandemic.

Making Healthcare Accessible

Our app will help people know when to consult doctors per the score generated. In the future, there is a provision to connect with doctors online and place orders for medicines, making healthcare accessible for everyone on their fingertips.

Aiding Decision-making and Strategizing

Leveraging available geospatial datasets and analytic tools, the app will aid governments in decision-making during the current COVID-19 outbreak. It will enhance area-specific strategies to tackle the overwhelming socio-economic impact, especially in the recovery phase.

The app will address some key issues around user privacy and scalability. We look forward to ensuring that it works as effectively when millions of users are using the app.

Special note: Pre-condition for the app success – Usage of the app has to be implemented on a mass scale. The majority of citizens must install and use the mobile app. Only then the SSOT database will be effectively established with a wide horizon of data points contributing towards the same.

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Core Team Members

Dr. Sanjib Pal (*Founder & President*)

Dr. Sanjib Pal is an entrepreneur, innovator, and healthcare technology expert. He is the founder and president of RAD365. Dr. Pal is driven by his vision to enable radiologists to deliver unparalleled patient care at scale. He has more than two decades of experience in handling the entire operations in the Teleradiology domain in India and four other countries. Dr Pal in his earlier professional phase has dealt with healthcare clients in the USA in his earlier roles in Teleradiology & Healthcare majors, as the Global head of operations.

Nirendu Konar (*Chief AI Scientist*)

An MTech from IIT Kharagpur and MBA from the University of Phoenix, the US, Mr. Nirendu Konar holds more than two decades of experience in the areas of enterprise security, business intelligence, and data science. His current interests lie in offering AI and machine learning (ML) solutions, especially focused on deep learning-based automated image interpretation to healthcare enterprises. Nirendu is currently a faculty of data analytics and IT with ICFAI Business School, Kolkata. He has previously worked in companies such as SAIL R&D, India; Mastech South Africa; Alphasoft Services, the US; Cisco Systems in the US and the UK; and Wipro Technologies, India.

Dr. Tapan K Biswas (*Chief Radiologist & Researcher*)

Dr. Tapan K. Biswas's passion lies in the conjoined intersection of technology, medicine, and research – as well as everything in between. He is currently spearheading the healthcare research wing in RAD365 since 2019. Dr. Biswas passed MBBS in 1975 and obtained his DMRD degree from the Calcutta University in 1981, MD from the Ranchi University in 1983, and FRCP from the Royal College of Physicians, Edinburgh in 2014, and PhD from Jadavpur University in 2019. He was a research fellow in Royal North Shore Hospital, Sydney University, Australia; Chittaranjan National Cancer Institute, India; and Center for MR Spectroscopy and Women's Hospital, Harvard Medical School. Dr. Tapan K. Biswas was previously working as an assistant professor in the radio-diagnosis department in KPC Medical College, Kolkata.

Mriganka M Chaudhuri (*Chief Operating Officer*)

Mriganka is a recognized marketing professional. He is the COO of RAD365, has a history as a marketing & operations specialist in organizations across industries, including information technology (hardware/software), electronics, FMCG, and ITeS, Mriganka has managed top-notch national and international brands as the head of marketing, country manager, and associate VP prior to joining RAD365. In 25 years of experience, he has headed several marketing, sales and operational teams comprising more than 1000 individuals. His expertise involves business operations, management, strategic business expansion, sales and marketing management, brand management, and team building.

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Our Global Presence

Thank You!!

Stay Safe!!

USA

 3350 SW 148th Avenue
Suit No 110, Miramar
FL, USA 33027

UK

 Devonshire House
60 Goswell Road
London, UK EC1M 7AD

INDIA

 Asyst Park, 7th Floor,
Block GN 37/1, Sec V, Salt lake
Kolkata, INDIA 700 091

Phone: +1 954 859 9540
+91 983 196 0488

Email: info@rad365.com

CANADA

 IBM Innovation Space,
3600 Steeles Ave E., Markham,
Ontario, CANADA L3R 9Z7