

## APPLICATIONS OF AI IN EFFECTIVE MANAGEMENT OF COVID-19

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### ABSTRACT

*Applications, AI finds its application in effective management of viral pandemic COVID-19 which has affected entire world since the beginning of 2020. Although AI and ML has many existing applications in healthcare, but the outbreak of this pandemic has reshaped the use of AI vastly and has given scientists a unique opportunity to apply these tools and technologies to fight the disease in numerous ways. With humungous amounts of data backing up the process, AI has been significantly implemented in areas like detection of geographical clusters of cases, early warning signals and detection of disease, monitoring the spread of virus, contact tracing, forecasting and projection of cases, reducing the time taken to development of vaccine, rapid trials and test results, reducing administrative burden, balancing workload of healthcare staff and providing new insights on the behaviour and strength of virus and its symptoms. AI has achieved this by organizing the information and providing it in real time with high accuracy, as and when required to support the decision making in these critical times.*

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**Keywords:** *Viral Pandemic COVID-19, Geographical Clusters, Data Backing Up, Artificial Intelligence (AI).*

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### Introduction

**Artificial Intelligence (AI)**, as the name suggests, is the replication of human intelligence demonstrated by machines, which are able to learn through experience and take actions which maximize the chances of achieving the goals. These are programs that mimic the human mind and perform cognitive functions like learning and problem solving. Artificial Intelligence and Machine Learning (AI & ML), which is essentially a disruptive technology has changed the equation in current times. It delivers promising results, giving rise to newer strategies, which implement optimization of resources giving maximum output by automating several tasks. This is an entire field of study which draws its basics from fields like mathematics, statistics, psychology, philosophy, linguistics, computer science and many other fields.

China, the first epicentre of coronavirus has been successful in controlling the outbreak due to its technological advancement and effective implementation of AI. Some examples of this are use of sensors for mass surveillance and to measure the population movements, early detection of infected individuals by advanced machines, projecting the trends and evolution of cases, ramping up required healthcare facilities and staff quickly, speeding up genome sequencing and early diagnoses followed by implementing robotic process automations for maintenance and delivery of essential services.

### Information Management

As we know, this pandemic is new and very little is known to the world about the characteristics of this virus, how it spreads, its severity, precautions and treatment, AI has served as an important bridge to collate the information from various sources and organizations throughout the world and provide useful insights. Advancements in conversational AI, natural language processing, rapid response agents and chatbots have given the general public an open access to all this critical information. Applications like MyGov Corona helpdesk, which is a WhatsApp chat-bot registered about 1.5 crores users with 2.5 crores of chats within a week of its launch, similarly many chat-bots were launched by central and state governments to dispense the authentic information to the people.

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AI has led to better organization and access to scientific publications, medical journals and supporting research to the doctors and researchers. AI has a specific use-case of screening several thousands of documents and research papers published on similar pandemics and the broader family of coronaviruses, extracting out the relevant information, finding out the answer to any specific question in discussion, without having to go through all the documents manually. For an example, in Wuhan, almost 2000 research papers were published in the first few weeks of this virus outbreak and Microsoft Research in March'20 presented their work consisting a summary of 30,000 documents.

**Early detection** is a critical aspect for any disease to provide necessary medical support and stop the spread in nascent stage. We can save many lives by fast diagnosis and screening process to curb the spread of infection. AI and ML enables fast, scalable and cost-effective solutions by providing extra support to existing screening process of radio imaging, X-Ray, CT-Scan and blood sample. It has been proven to provide highly accurate results rapidly, irrespective of a patient being symptomatic or asymptomatic, sometimes surpassing the human cognition by capturing the minute details in the reports which can easily be missed by human eyes. For an instance, detection of pneumonia cases by screening reports using visual AI, having an accuracy of 90-95% saves a lot of time of healthcare workers. AI & ML helped us in identifying small set of features, out of thousands of parameters which are collected by doing blood /swab tests, which can differentiate an infected person from a healthy person. Researchers in Wuhan found out that 11 relevant indices (creatinine kinase isoenzyme, bilirubin total, creatinine, GLU, lactate dehydrogenase, kalium, platelet distribution width, basophil, calcium, total protein, and magnesium) are helpful for this purpose.

**Contact tracing** is a monitoring process which uses digital platform to combat the spread of disease. When a person is detected for infection with coronavirus, all the people who have come in close contact to these individuals are alerted. This has been possible through a blend of GPS, Bluetooth, contact details, network-based API, Social Graph, mobile-tracking data, system physical data and deployment of an intelligent platform to provide real time updates to the people. AI is very helpful in such a scenario as by analysing the data, it can predict the geographical clusters, automatically identify the hotspots and allow the authorities to make regulations on public movements accordingly. It can be very useful in identifying the patterns of spread of virus geographically which can be visually seen by the help of maps and network graphs. AI can learn from the outcome and help us identify which measures led to reduce the spread and which measures were ineffective to control the spread, which can be repeated successfully in other locations as well. Government applications like Aarogya-Setu are designed for this specific purpose, when a person is detected with coronavirus infection, it will immediately send notifications to people and segregate them based on levels of risk and suggest actions accordingly.

### **Projection and Contingency Planning**

Researchers across the globe have been using forecasting techniques to project the trend and seasonality components of various time dependent phenomena and predict the future numbers with reasonable accuracy. AI/ML algorithms are helpful in doing this by predicting the spread of disease and increase in number of cases 5-10 days ahead of time. This will augment the projections made by experts of the field by proposing multipliers and infection rate. Short term predictions can be made for infected cases, asymptomatic/critical patients and mortality rate, thus helping medical institutions identify the number of ventilators required by the end of next week, enabling them to scale up the medical facilities. On a larger scale, authorities can make informed decision about geographical distribution of masks, PPE kits and ventilators when there is already a shortage of these resources.

### **Reducing Workload of Medical Staff and Facilities**

AI can help reduce the administrative workload of paperwork, which saves a lot of time enabling doctors to give more time to patients and attend to more patients than ever before. Automatic creation of clinical notes by converting speech to text can save a lot of time. As pointed out earlier, AI can assist in screening of reports and test results which helps in shortlisting and prioritizing the patients which need immediate care. For an instance, Chinese company Alibaba has come up with a software that can process 300-400 lung scans within 30 seconds giving an accuracy of 96%, which would otherwise take more than 1 hour for an experienced doctor to check the same number of reports, or even more. Such systems categorize the results with probabilities associated with them, reports where system has assigned high probability of infection can directly be processed and cases where probability is low can be manually check by doctors to avoid any possible errors.

**Drug Research,** AI has traditionally lent major support to drug research by providing effective ways to find vaccine using the power of computer science, machine learning and statistics. Simulation and modelling, which is a part of AI toolkit, enables running millions of experiments on finding the perfect combination of molecules saving significant amount of time and months of experimentation. Predictions using AI to identify the virus structure and infinitely possible combinations for study of protein folding has enabled bio-medical researchers to gain a lead over coronavirus. It is also helpful in accelerating the clinical trials and drug testing which happens in real time, hence reducing the overall vaccine development time. As per WHO, we will hopefully be able to contain this pandemic much faster as compared to previous times when similar pandemics have hit the world.

Digital technologies including AI/ML and information technology are therefore helpful in building an intelligent coordinated platform in response to this pandemic. While there are many dependencies like hardware, IT infrastructure, heavy investment in R&D and skilled taskforce, AI/ML can help build the tools to tackle tomorrow's problems. Researchers throughout the world have high hopes that AI can be used to control the spread of coronavirus. Further, this pandemic has alerted us to make significant changes in technology, lifestyle and more importantly an attitude which can lead us to solving our problems in innovative ways using AI

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