

AI VS CORONAVIRUS



**The Use of AI
in the Fight against
the Coronavirus Pandemic**

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The Ongoing 2019–20 COVID-19 Pandemic

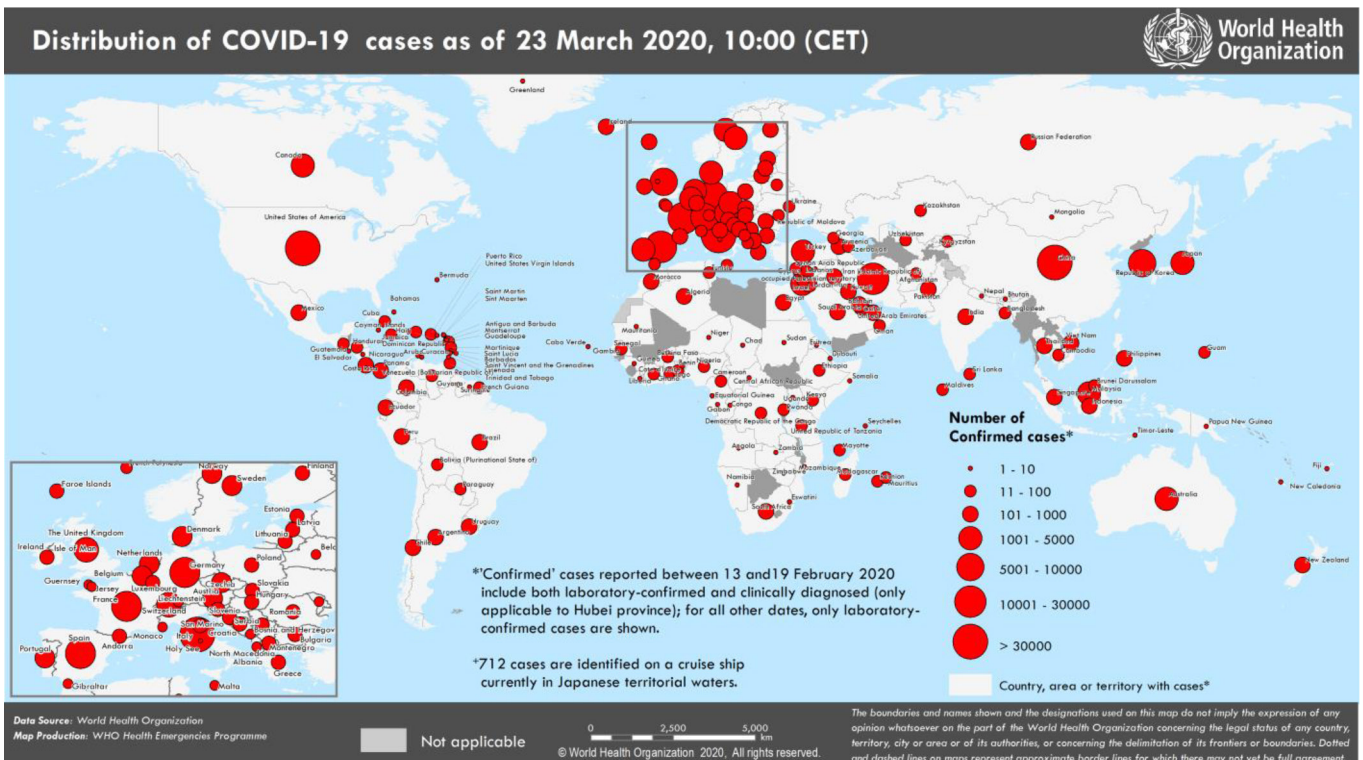
The coronavirus disease 2019 (COVID-19) pandemic is rapidly evolving. It has spread to more than 150 countries. As of 20 March 2020, there are more than 250,000 confirmed cases globally. At least 10,000 have died. More than two-third of cases are outside mainland China, where the virus originated.

There are no vaccines available yet, and there is little evidence on the effectiveness of potential

therapeutic agents. In addition, there is presumably no pre-existing immunity in the population against COVID-19 and everyone is assumed to be susceptible.

Figures 1 & 2 show the pandemic figure of global COVID19 cases. However, the actual number of people with COVID-19 internationally is thought to be much higher, as many with mild symptoms have not been tested or counted.

Figure 1. Countries, territories or areas with reported confirmed cases of COVID-19, 23 March 2020

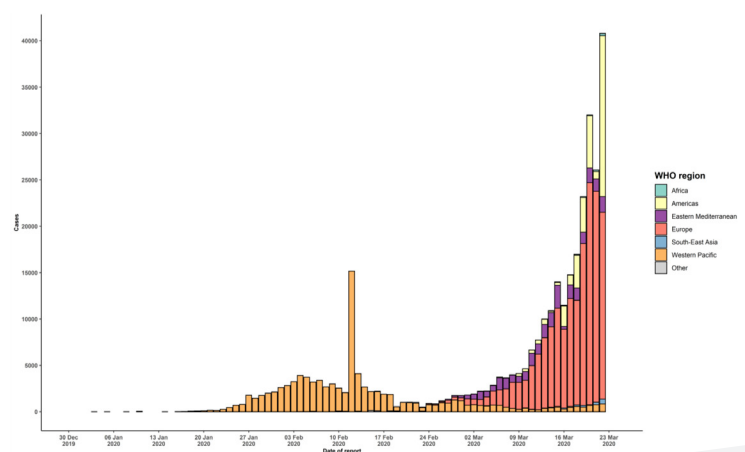


Source: WHO Situation Report – 63

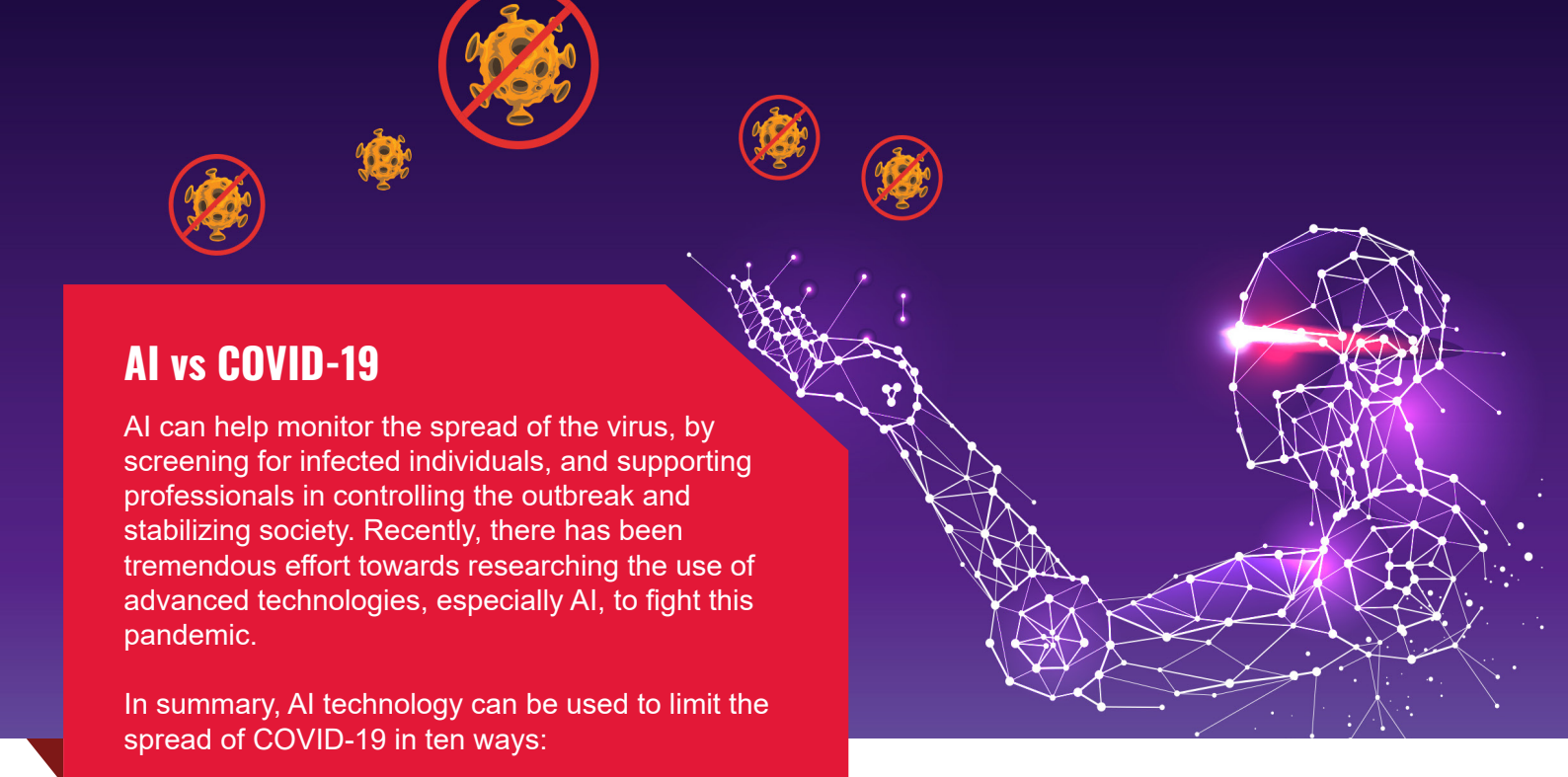
In response to the virus's spread, countries across the world are doing all they can to contain it. Efforts include finding and breaking transmission chains; interrupting human-to-human transmission; identifying, isolating and caring for patients early; providing optimized care for infected patients; accelerating the development of diagnostics; communicating critical risk and event information to all communities; and countering misinformation.

As healthcare professionals, policymakers and the public continue to take precautions against the spread of COVID-19, advanced technologies, such as Artificial Intelligence (AI), will play a critical role in identifying, diagnosing and managing the crisis.

Figure 2. Epidemic curve of confirmed COVID-19, by date of report and WHO region, through 23 March 2020



Source: WHO Situation Report – 63



AI vs COVID-19

AI can help monitor the spread of the virus, by screening for infected individuals, and supporting professionals in controlling the outbreak and stabilizing society. Recently, there has been tremendous effort towards researching the use of advanced technologies, especially AI, to fight this pandemic.

In summary, AI technology can be used to limit the spread of COVID-19 in ten ways:

1. Prediction

AI can be used to predict how many people will contract COVID-19. The model will go beyond confirmed cases and fatalities to predict the number of new cases that are likely to arise in an exposed population. It can also predict the peak infection rates under a given set of conditions, among other outcomes.

To accomplish this, first, gather the data that includes confirmed cases, fatalities, test results, traced contacts of infected people, maps of population densities and demographics, traveler flows and migration, availability of health care services, drug stockpiles and other factors. Then process the data into compatible formats, and use machine learning to recognize patterns and feed into algorithmic models.

2. Detection:

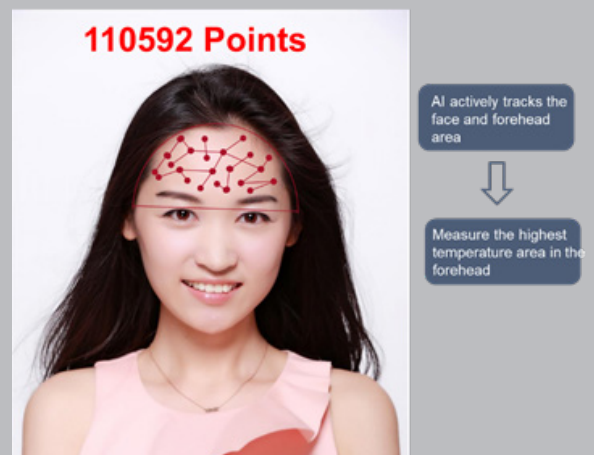
One way AI detects COVID-19 is through the SenseTime Thermal Imaging Human Body Temperature Measurement Solution.

Tech Mahindra partnered with SenseTime to deliver a solution that performs real-time temperature checks. A thermal imaging camera uses an infrared sensor and AI to predict people's temperatures quickly. If the system detects an abnormal body temperature exceeding 37.3 °C, it issues a real-time alarm (sound and light and/or pop-up alarms) and then the emergency plan starts.

This solution greatly improves the accuracy of human body temperature screening, ensures normal traffic speed, and reduces the probability of infection for co-workers.

The imaging solution can issue alerts for people who are not wearing masks, and has facial recognition capabilities even when masks are worn.

Figure 3: SenseTime Thermal Imaging Human Body Temperature Measurement Solution



3. Diagnosis

Tech Mahindra partnered with SenseTime to deliver an AI solution that can read X-Ray or CT scans for pneumonitis with high accuracy. It can read 10 CT scans per second and perform rapid diagnostics.

A CT machine typically has to produce 300 to 400 chest scans per patient to start the diagnosis of COVID-19. It would take a highly experienced doctor 10-15 minutes to go through this information. Trained AI systems, on the other hand, can go through the scans in just 30 to 40 seconds.

The AI-enabled diagnostic solution improves the speed of CT diagnosis and reduces the workload on frontline workers.

Figure 4: the use of AI for multiple CT scans and diagnosis



4. Treatment

AI algorithms and their computing power can be used to develop antibody therapies. Using machine learning, various patterns in the antibodies can be recognized, to identify the ones that show the most promise in fighting off the COVID-19.

AbCellera Biologics Inc. has teamed up with Eli Lilly to develop treatments for COVID-19. A biotechnology startup that uses machine learning to develop antibody therapies, AbCellera recently received a sample from a patient who recovered from the novel coronavirus. It screened more than 5 million immune cells and used machine learning to identify the cells that produced the antibodies that helped neutralize the virus. This led to the identification of more than 500 promising antibodies for therapeutic use. The whole process took less than a week. (Source 1*)

In addition, machine learning can be used to predict the protein structures of the COVID-19 virus. Using this information, researchers can understand the molecular structure of the virus better, which in turn could enable efforts to find vaccines or antivirals.

5. Health on demand

AI systems can help doctors with diagnostics. AI algorithms can use patients' symptoms, medical histories and test results to provide doctors with real-time, analytical second opinions, on demand. The algorithms can also provide real-time medical consultation services online.

This reduces workload on healthcare workers and alleviates pressure on hospitals during COVID-19 pandemic.

6. Contain the spread of the virus:

AI can help reduce human-to-human transmission of COVID-19, through drones- and robots-based delivery, cleaning and surveillance mechanisms; air-quality solutions, and remote or virtual education or work solutions.



7. Fighting 'infodemic'

There is an increasing number of false and misleading information about the COVID-19 outbreak appearing in public discourse, including on social media. AI can be used to create and monitor social networking policy guidelines for culling false rumors, thus curbing the "infodemic" to a great extent.

AI can also be used to streamline searches, so when people search for information related to health or medical information on social media sites, they get routed to authentic and scientific information.

In addition, AI chatbots can be used to promote information about the disease and its symptoms. Individuals can have their queries answered by AI chatbots driven by scientific protocols from the Centers for Disease Control and Prevention.

8. Discovery

Researchers and companies have created a vast dataset of academic literature on COVID-19. More than 30,000 articles about the illness are available, detailing the virus behind it and related pathogens.

The White House, on 16 March 2020, called on tech companies, the academia and other bodies to urge them to use AI analysis to research papers on the COVID-19. Researchers and leaders from the Allen Institute for AI, Chan Zuckerberg Initiative (CZI), Georgetown University's Center for Security and Emerging Technology (CSET), Microsoft, and the National Library of Medicine (NLM) at the National Institutes of Health released the COVID-19 Open Research Dataset (CORD-19) of scholarly literature about COVID-19, SARS-CoV-2, and the coronavirus group. (Source 2*)

The project uses AI to develop new text and data mining techniques that can help scientists determine the origin, transmission and potential treatment of the COVID-19.

This in turn will help medical and public health experts discover new treatment techniques, or uncover factors that make the virus function worse in some patients and not the others.

9. Preparedness to economic disruption

The ongoing spread of the COVID-19 has become one of the biggest threats to the global economy and financial markets.

The Trump administration has put forth the idea of sending aid to individuals, as part of an estimated \$1 trillion effort to ward off recession. (Source 3*)

AI can help provide answers to project the economic fallout of the COVID-19 pandemic.

AI-powered tools can be used to crunch trillions of data points in a day, to track and forecast the demand for commodities around the world. The model can extract prices, rainfall totals, property records, satellite imagery and exchange rates. It can also use neural networks to project the effects of the pandemic on global supply chains.

This is crucial as policy makers, businesses and investors decide how to respond to the economic shock caused by the pandemic.

10. Prevention

AI can help prevent or limit future outbreaks. AI models can take a DNA strand of a virus in animals and predict whether it has the potential to infect humans. In addition, AI can be used to provide recommendations on policies, public health initiatives, disease prevention and response plans for potential outbreaks.



Opening the value chain for inclusive collaboration

The COVID-19 Vulnerability Index (CV19 Index)

An open-sourced AI-based toolkit for predicting people vulnerable to COVID-19

Researchers at ClosedLoop.ai have developed an AI-based model that can identify the people who are most vulnerable to complications caused by the COVID-19. In a Reddit post, the researchers describe how their trained model can “predict the likelihood someone will have a hospital stay due to pneumonia, influenza, acute bronchitis, or other respiratory infections.” Because data on real COVID-19 cases has not yet been released, the dataset uses a proxy event, according to the post. The result is a free and open-source AI-based toolkit, known as the CV19 Vulnerability Index.

The CV19 Vulnerability Index is an open source, AI-based predictive model that identifies people who are likely to have heightened vulnerability or develop severe complications from COVID-19. The CV19 Index is intended to help hospitals, federal/ state/ local public health agencies, and other healthcare organizations identify, plan for, respond to, and reduce the impact of COVID-19 in their communities. (Source 4*)

The COVID-19 Open Research Dataset - CORD-19

Deploying AI to read through COVID-19 research (Source 5*)

The COVID-19 Open Research Dataset (CORD-19) was constructed through collaboration between different organizations, following requests by The White House Office of Science and Technology Policy.

The Allen Institute for AI has partnered with leading research groups to prepare and distribute the COVID-19 Open Research Dataset (CORD-19), a free resource of over 29,000 scholarly articles, including over 13,000 with full text, about COVID-19 and the COVID-19 family of viruses, for use by the global research community.

CORD-19 was constructed through collaboration between Microsoft, NLM, CZI, and the Allen Institute for AI, coordinated by Georgetown University. Microsoft’s web-scale literature curation tools were used to identify and bring together worldwide scientific efforts and results. CZI provided access to pre-publication content, NLM provided access to literature content, and the Allen AI team transformed the content into machine-readable form, making the corpus ready for analysis and study.



This dataset is intended to mobilize researchers to apply recent advances in natural language processing to generate new insights to support the fight against this infectious disease. The corpus will be updated weekly as new research is published in peer-reviewed publications and archival services, like bioRxiv, medRxiv, and others.

By cross-referencing papers and searching for patterns, the algorithms will help researchers better analyze and understand a growing set of scholarly articles about COVID-19. The technology helps to combat information overload, making it easier for researchers identify relevant studies. This could eventually lead to new insights, approaches or solutions to address the COVID-19 outbreak.

Unlocking AI Potential in Pandemic War

We are already seeing hundreds of potential AI-driven use cases ready to be explored. However, most of these are still in their early stages. There are many barriers for us to overcome, among them the lack of data sharing; restrictions on sharing healthcare data; lack of reviews and verifications, as all datasets are recent; and most importantly, successfully building an ecosystem that can be delivered rapidly and monetized in a collaborative manner.

AI-based technologies can be advantageous in fighting the COVID-19 pandemic. However, they need to be combined with 5G to benefit from high speed, low latency, high reliability, and massive number of connections, while simultaneously blending distributed edge computing, cloud and other IT functions. This will require reconfiguring supply chains, reskilling workforces, building new business models, and driving across-the-board operational transformation.

Even though the AI-driven use cases presented earlier are important, they should be prioritized based on the value they bring, ease of deployment and availability of datasets.

Building these use cases requires a vast pool of data, new tools, and collaboration across different vendors and healthcare. Models need to be created, tested and deployed as part of the ecosystem. This requires focus on service integration as well as operations where the focus will be on defining, building, integrating and operating the solution across different vendors, health care providers, governments and businesses.

AI-driven solutions used in pandemic control could also drive the development of smart city management models, including smart public safety, smart environment, and smart health care. Finally, as the COVID-19 crisis escalates, latest technological innovations are needed to fight the outbreak. AI-driven applications will help achieve this, while opening new opportunities for OEM and Service organizations to detect, treat and develop solutions to the COVID-19.

Once the crisis has passed, most of the AI tools that are developed to fight the virus will remain in use. It is also likely that the COVID-19 use cases will inspire new ways to use AI to advance scientific research.



What We Can Do

At Tech Mahindra, we live by the philosophy of “Connected World, Connected Experiences”. Tech Mahindra Next (TechMNxt) is our answer to the future. It’s our strategic transformation approach, powered by disruptive technologies, to better people’s lives and empower them to live happier, healthier, safer and wealthier.

AI is one of our top technology bets, and is core to our strategy. For business and technology solutions, we are investing in the RADIQAL suite (extensible Reality, Automation & AI, Distributed Ledger, IoT, Quantum Computing, All powered by 5G and next-gen networks) .

Our service offerings are aligned to the changing world. Our portfolio of services ranges from designing strategy to delivering impact. This includes infrastructure- and cloud-integrated engineering solutions, enterprise business solutions, data analytics, cyber security, business process, services testing, telecom business and network consulting, customer experience and supply chain digitization.

Tech Mahindra has partnered with 100+ disruptive new-age technology players, start-ups, and academia globally that specialize in niche areas, including AI and 5G, for co-creation and co-innovation.

Tech Mahindra, as an innovator and a leader in AI and machine learning, has developed multiple AI/ML platforms, and is ready to collaborate with the government, local communities and business partners to build solutions using its core competence as system integrator, platforms and ecosystem builder, while offering expertise in consulting, execution and managed services that can help reduce or eliminate the risk of COVID-19 pandemic. One example is where we partnered with SenseTime to develop two solutions for the detection and diagnosis of COVID-19.

Additionally, Tech Mahindra is working with partners to develop antibody therapies for the treatment of COVID-19.

An indirect support area that is tied to the ongoing pandemic is supporting carriers who provide connectivity services to consumers and enterprises to enhance their connectivity, experience attributes and optimize network values. This is necessary due to traffic pattern changes as a result of increased work-from-home and social distancing.

Tech Mahindra believes in the power of AI-based technology combined with 5G, blended with distributed edge computing, cloud and IT functions, and is committed to serve the world in this time of emergency and uncertainty.



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Source

Source 1: <https://www.wsj.com/articles/biotech-company-uses-machine-learning-to-find-coronavirus-therapies-11584437401> and various internet sources

Source 2: <https://www.whitehouse.gov/briefings-statements/call-action-tech-community-new-machine-readable-covid-19-dataset/> and various internet sources

Source 3: <https://www.cnbc.com/2020/03/17/coronavirus-live-updates.html> and various internet sources

Sources4: <https://closedloop.ai/open-source-data-science-to-fight-covid-19-corona-virus/>, <https://inside.com/campaigns/inside-ai-2020-03-18-22180>, and various internet sources

Sources5: <https://innovation.mit.edu/cord19/>, <https://cset.georgetown.edu/covid-19-open-research-data-set-cord-19/> and various internet sources

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Tech Mahindra represents the connected world, offering innovative and customer-centric information technology experiences, enabling Enterprises, Associates and the Society to Rise™. We are a USD 4.7 billion company with 115,200+ professionals across 90 countries, helping over 903 global customers including Fortune 500 companies. Our convergent, digital, design experiences, innovation platforms and reusable assets connect across a number of technologies to deliver tangible business value and experiences to our stakeholders. Tech Mahindra is amongst the Fab 50 companies in Asia (Forbes 2016 list).

We are part of the USD 19 billion Mahindra Group that employs more than 200,000 people in over 100 countries. The Group operates in the key industries that drive economic growth, enjoying a leadership position in tractors, utility vehicles, after-market, information technology and vacation ownership.