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WHITE PAPER  
ECS ADVANCES ENABLING AI TECHNOLOGIES  
TO FIGHT COVID-19





Given the global scale of the pandemic, Electronic Components and Systems (ECS) and especially Artificial Intelligence (AI) are playing and will continue to play a crucial role in addressing COVID-19 and future outbreaks. The successful deployment of artificial intelligence relies on two pillars: availability of computing power, and access to reliable data. Recent advances in sensor technologies and low-power, high-performance miniaturized computing devices (so called “edge computing”) are taking AI to the next step. AI helps researchers from all over the world to advance scientific research to study and understand COVID-19.

AI had begun to play a significant role in the healthcare domain in the last decade. Now urged by the need to contain Covid-19, all actors including governments, public agencies, large enterprises, research and technology organisations as well as SME's are teaming up nationally and across borders to increase collaborative research and

innovation in AI to speed up the process of finding a cure for COVID-19. To support this international collaborative innovation, the funding programmes H2020, ECSEL JU and EUREKA are launching calls including AI technology to speed up breakthrough in medical discoveries and actionable findings to fight COVID-19.

Recent events have shown the importance of AI use during this crisis; advancements in AI applications such as data analytics, natural language processing (NLP), machine learning, deep learning and chatbots have not only helped to identify, track and forecast the impact of the pandemic but also to support the allocation of resources in hospital, to diagnose patients and search curative treatment as well as to provide real-time information. Though AI technologies cannot replicate human intelligence, it demonstrates the potential that a new technology can offer in combination with human expertise.

# 1. AI TO IDENTIFY, TRACK AND FORECAST THE IMPACT OF THE PANDEMIC

On the last day of 2019, an artificial intelligence warning system run by Toronto startup BlueDot flagged a news report from China about a mysterious pneumonia strain in the city of Wuhan<sup>1</sup>. The system which sifts through 100,000 articles and online posts daily in 65 languages, alerted BlueDot's experts, who immediately saw parallels to the deadly SARS outbreak in 2003. BlueDot used NLP and machine learning algorithms to look at statements from health organisations, commercial flights, livestock health reports, climate data from satellites, and news reports to derive insights about global health trends. It was the combination of the AI and human experts composed of epidemiologists, doctors, veterinarians, and data and computer scientists, which made it possible to predict the start of the pandemic out of this sea of data and also forecasted how it would spread.

A team headquartered at Boston Children's Hospital is implementing a similar machine

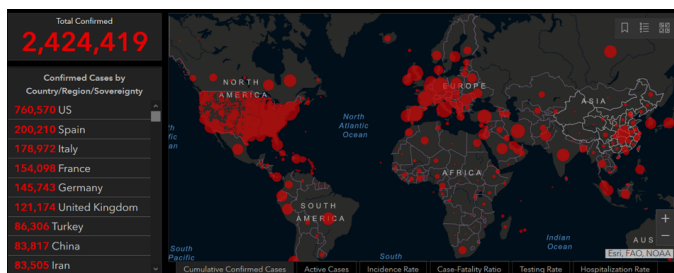
learning system able to scour through social posts, news reports, data from official public health channels and information supplied by doctors to identify patterns of disease contagion in locations outside of China. The automated HealthMap system the hospital used sent an early warning that COVID-19 was spreading out China<sup>2</sup>.

While disease surveillance is crucial, AI technology helps governments to predict and track the spread of COVID-19 and to proactively manage infectious disease risks. Policy decisions can then be based on evidence by analysing how population mobility and control measures affect the spread of the virus, based on anonymized mobile phone data, flight data and movement patterns. AI is not just providing active monitoring: the system is also learning and improving over time. Machine learning and deep learning (The ability to learn from unstructured and unlabeled data) offers one of the best means of support.

<sup>1</sup> <https://www.wired.com/story/ai-epidemiologist-wuhan-public-health-warnings/>

<sup>2</sup> <https://abcnews.go.com/Health/doctors-artificial-intelligence-track-coronavirus-outbreak/story?id=69444963>

COVID-19 Dashboard  
as of 20 April 2020  
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## 2. AI TO HELP TO ALLOCATE SCARCE RESOURCES IN THE HOSPITAL, TO DIAGNOSE THE VIRUS, AND TO SPEED UP DRUG RESEARCH

One of the key challenges the hospitals must address is managing scarce resources (especially protective equipment and ventilators) and prioritising the riskiest patients. The University of Copenhagen used AI technology to create models to calculate and forecast the requirement of intensive care and ventilator support in early stages of COVID-19 infection. This optimises the use of ventilators when their availability is more than limited<sup>3</sup>.

Healthcare workers are also more and more using AI systems to evaluate the patients so as to separate those with the virus, who might better recover at home in self-isolation, from those who would be likely to develop severe lung disease and would be better cared for in the hospitals. The machine is not making decisions but is providing evidence to clinicians and supporting them.

AI can also help to diagnose the virus. One of these methods, is the fever detection. Thermal cameras possessing AI-based multisensory technology have been deployed in public places such as airports. In China, the system can screen up to 200 people per minute and detect their temperature within a range of 0.5 degrees Celsius. This allows to quickly detect a person suspected of having a fever<sup>4</sup>.

A second method developed by multiple companies, is to use computer vision AI to improve the speed and accuracy of CT scanning technologies. Imaging departments in healthcare facilities are being taxed with the increased workload created by the virus; AI-powered diagnosis systems, with deep learning algorithms trained by dozens of thousands anonymized chest CT scans, can now detect coronavirus cases in less than sixty seconds (compared to the 15 minutes it takes an expert to make this diagnosis). Computer vision helps where human vision fails as it is hard to tell the difference between COVID-19 and other infections. This CT scan based on deep learning can be a particularly efficient alternative to the lack of medical staff and to the short supply of viral test kits.

<sup>3</sup> <https://www.financialexpress.com/defence/artificial-intelligence-in-the-fight-against-covid-19/1925737/>

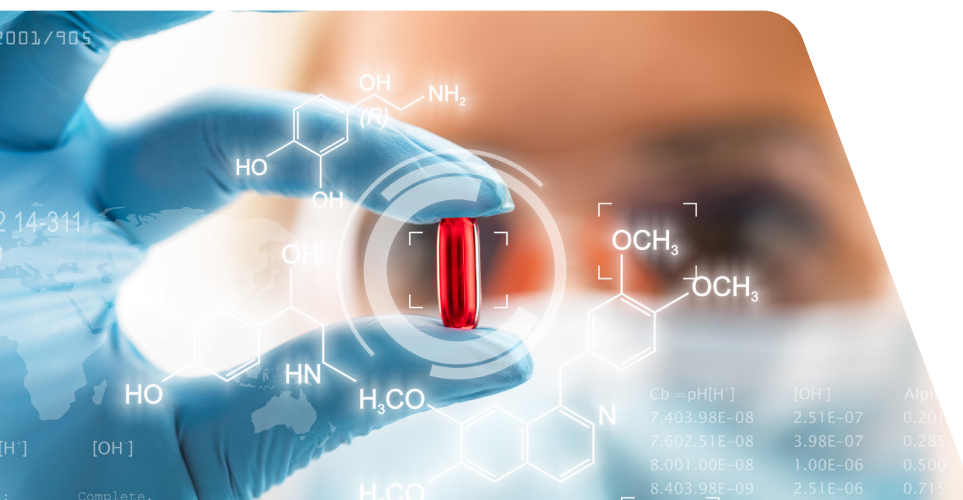
<sup>4</sup> <https://venturebeat.com/2020/03/03/how-people-are-using-ai-to-detect-and-fight-the-coronavirus/>

<sup>5</sup> <https://www.kaggle.com/allen-institute-for-ai/CORD-19-research-challenge>



While developing new medicine is a very lengthy process, it can be speeded up by AI. Looking for molecules that could harm or destroy COVID-19 inside a human's body without doing harm to the patient can take more than 10 years. A number of research projects are using AI to identify drugs that have been developed to fight other diseases, but which could now be used in the fight against COVID-19. AI systems are benefiting from decades of machine learning progress as well as research on protein on other viruses with similar elements which provide important clues to the vaccine formula. Some specific proteins are indeed fundamental for the COVID-19 to survive. AI, with its capacity to digest very large volumes of scientific literature and biomedical research, can also find links between the genetic and biological properties of diseases and the composition and action of new drugs.

This capacity of dealing with massive information coming from thousands of research papers is exploited by a new open dataset called CORD-19, a concerted initiative created by the White House, the Allen Institute for AI and leading-edge research institutes, which has brought together government agencies, tech giants, universities and research labs from all over the world<sup>5</sup>. This dataset, freely available on Kaggle, updated each day, is available to all researchers and offers a full-text search engine. A call to action and a challenge to the world's artificial intelligence experts to develop text and data mining tools that can help the medical community develop answers to high priority scientific questions have been issued to stimulate the international communities to contribute.



### 3. AI TO PROVIDE RELIABLE INFORMATION AND TO VERIFY INFORMATION

On one hand, the rapid spread of the pandemic requires global health organisations to push information to a large population and especially personalised updates. But healthcare systems can be quickly overwhelmed mostly because call centers have seen a major reduction in the number of employees readily available. Hospitals such as in Milan, are using virtual healthcare assistants or chatbots, helping organisations with automating responses to commonly asked questions related to COVID-19<sup>6</sup>.

The chatbots provide reliable information and clear guidelines, recommend protection measures, and even check and monitor symptoms, and advise individuals whether they need hospital screening or self-isolation at their homes. They limit unnecessary access to healthcare facilities and reduce the workload for medical staff. Because of their natural language processing capabilities, the AI chatbots have interactions with the public; these interactions provide real-time insights to understand where there is a trend of unanswered questions and anxiety across different groups of people. Moreover, the questionnaire replies could create an interesting database to develop new studies.

On the other hand, the pandemic has unavoidably resulted in the propagation of fake news on social media platforms. Technology giants such as Google or Facebook are fighting against the waves of conspiracy theories, phishing, and misinformation. And one of those tools is AI. Using machines to process data and learn to recognise, over time, what is important. AI algorithms can suss out which posts tend to be accurate, which words are sensational or panicky, which online sources are deemed authoritative and which posts likely come from robots rather than humans.



<sup>6</sup> <https://www.digitalhealthglobal.com/the-coronavirus-diagnostic-chatbot-by-paginemedice-is-now-available-in-multiple-languages/>

## 4. AI TO MONITOR INTELLIGENT DRONES AND ROBOTS



To minimise exposure of medical staff to infected people, several companies and organisations have engaged efforts to automate some of the procedures that previously required health workers and medical staff to interact with patients. In Washington, a hospital started using robots equipped with tablets in patient rooms, used out of the room by doctors to video chat with the patient<sup>7</sup>.

Some cities and governments have also accelerated the public deployment of AI powered drones and robots. In China, some drones are tracking individuals not wearing protective masks while others are used to broadcast information to larger audiences. Autonomous vehicles are also playing a useful role in providing access to necessary commodities for healthcare professionals. More generally contact-less automated solutions adoptions may be accelerated in the next coming months.

<sup>7</sup> <https://www.cnn.com/2020/03/18/how-china-is-using-robots-and-telemedicine-to-combat-the-coronavirus.html>

<sup>8</sup> <https://www.sciencemag.org/news/2020/02/completely-new-culture-doing-research-coronavirus-outbreak-changes-how-scientists#>







Whereas Artificial Intelligence technology can be a way to invade people's privacy especially with facial recognition, and the biases in training data make it likely to automate discrimination, it is now at the front lines of helping scientists to fight COVID-19 for the common good. An AI system was the first to identify the emergence of a new outbreak in China. But this could not have happened without the knowledge of human epidemiologists who identified where and how to look for evidence of emerging disease. This has demonstrated that the efforts to leverage AI tools in the time of COVID-19 will be most effective when they involve the input and collaboration of humans in several fields of expertise. Because of the pandemic, a torrent of data and scientific papers have been released and an unusual level of collaboration has been demonstrated among scientists enabling research to move faster. This trend is called "a completely new culture of doing research"<sup>9</sup> for the common good.

While the Commission has adopted a recommendation on a Union common toolbox for the use of technology and data to combat the COVID-19 crisis, in particular concerning mobile applications and the use of anonymised mobility data<sup>10</sup>, several Member States in the EU have launched or intend to launch initiatives that involve contact tracing apps<sup>11</sup>. The future of AI is still to be determined but the situation may create great opportunities for its accelerated use.

<sup>9</sup> [https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020\\_en.pdf](https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf)

<sup>10</sup> [https://ec.europa.eu/info/sites/info/files/recommendation\\_on\\_apps\\_for\\_contact\\_tracing\\_4.pdf](https://ec.europa.eu/info/sites/info/files/recommendation_on_apps_for_contact_tracing_4.pdf)

<sup>11</sup> [https://ec.europa.eu/health/sites/health/files/ehealth/docs/covid-19\\_apps\\_en.pdf](https://ec.europa.eu/health/sites/health/files/ehealth/docs/covid-19_apps_en.pdf)



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