

Artificial Intelligence and the Global Fight against Covid-19

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Introduction

This info pack aims to explain AI technology, the use of AI in the healthcare system and the role of AI in the fight against Covid-19.

Covid-19 refers to a disease, the coronavirus disease, caused by a virus (SARS-CoV-2). It was first identified in December 2019 in Wuhan City, Hubei Province, China. The World Health Organisation (WHO) announced a global pandemic on [11 March 2020](#). The virus then spread to every part of the world, resulting in a global pandemic. [Over 8 million](#) people have been infected by Covid-19. More than [400,000](#) people have died due to the virus, while over 4 [million](#) have recovered. Even thou-

gh the pandemic has partially lost its effect in some countries that contained the virus, there is still no vaccine to mitigate the Covid-19 virus. Furthermore, societies have not gained herd immunity against the virus. Many studies about vaccines against Covid-19 are still on-going.

One of the most important issues expressed during the pandemic has been the [occupancy rate of hospitals and social distancing rules](#). Artificial intelligence (AI) technology is providing many solutions for these problems. AI has been used to reduce the burden upon hospitals and to provide more predictable planning to fight the disease. AI technology has provided significant support for social control and the process of vaccine development and treatment.



(Fabio Alarico Teixeira - Anadolu Agency)

What is AI technology?

AI is defined as the capability of a machine or computer system to copy human intelligence processes, draw conclusions from experiences, adapt to new information and carry out human-like activities. This may include: [planning, learning, reasoning](#), problem solving, knowledge, representation, perception, motion, manipulation and creativity. In other words, AI is an artificial operating system that is trying to resemble human intelligence. AI is expected to display high cognitive functions or behaviours such as: perception, learning, connecting plural concepts, thinking, arriving at ideas, solving problems, communicating and making decisions. AI systems should also be able to generate reactions from their thoughts (actuator artificial intelligence) and can physically exhibit those reactions. AI is unceasingly evolving in its usefulness to [many divergent industries](#) such as: education, the automotive industry, healthcare and the defence industry. Machines, which are used in AI technology, are wired using a cross-disciplinary approach based on mathematics, computer science, psychology, and linguistics.

[John McCarthy](#) coined the term artificial intelligence in 1956. However, AI has only become popular nowadays thanks to enhanced data volumes, advanced algorithms and improvements in computing power and storage. Early AI research in the [1950s](#) developed subjects like problem-solving and symbolic methods. In the 1960s, the US Department of Defence took an interest in this type of work and began training computers to mimic basic human reasoning. For example, the Defence Advanced Research Projects Agency (DARPA) completed street mapping projects in the 1970s. Moreover, DARPA produced intelligent personal assistants in 2003, long before Siri, Alexa or Cortana were household names. This early work paved the way for the automation and formal reasoning that we see in computers today, including decision support systems and

smart search systems that can be designed to supplement and enhance human capabilities.

The progress of AI technology over the years:

Neural Networks (1950s-1970s): Neural networks are calculating systems with interconnected nodes which is called multi-stage interconnection networks are high-speed computer networks that work much like neurons in the human brain. These neurons [can identify hidden patterns and correlations in raw data](#) and conglomeration. They classify it through the use of algorithms, continuously learning and developing as time progresses.

Machine Learning (1980s-2010s): Machine-learning algorithms apply statistics to find patterns in thumbing amounts of data. Data, in this case, encompasses many things – numbers, words, images, clicks, and many other features. If anything can be digitally stored, it can be fed into a machine-learning algorithm. Machine learning is the process that powers many of the services we use today: recommendation systems like those on Netflix, YouTube, and Spotify, search engines like Google and Baidu, social-media feeds like Facebook and Twitter, and voice assistants like Siri and Alexa.

Deep Learning (Present Day): Deep learning is a type of machine learning that trains a computer to perform human-like tasks such as recognising speech, identifying images or making predictions. Instead of organising data to run through predefined equations, deep learning sets up basic parameters about the data, and trains the computer to learn on its own by recognising patterns using many layers of processing.



(Elif Öztürk - Anadolu Agency)

What forms does AI take in the field of healthcare?

Through the use of technology, there have been many developments in the diagnosis and treatment of many health problems. As AI finds its way into everything from our smartphones to the supply chain, applications for healthcare fall into three broad [groups](#): patient-oriented; clinician-oriented; and administrative/operational oriented AI. Pundits claim that the future of AI in healthcare could include tasks ranging from simple to complex: everything from answering a phone to medical record review; population health trending and analytics; therapeutic drug and device design; the reading of images for radiology; clinical diagnoses and treatment plans; and even conversations with patients.

AI healthcare draws from complex algorithms and software to resemble human cognition, interpretation and comprehension of complicated medical and healthcare data. In particular, AI is the ability of computer

algorithms to proximate conclusions without direct human input. AI technology uses traditional technologies in healthcare to obtain information, process it and give well-defined output to the end-user.

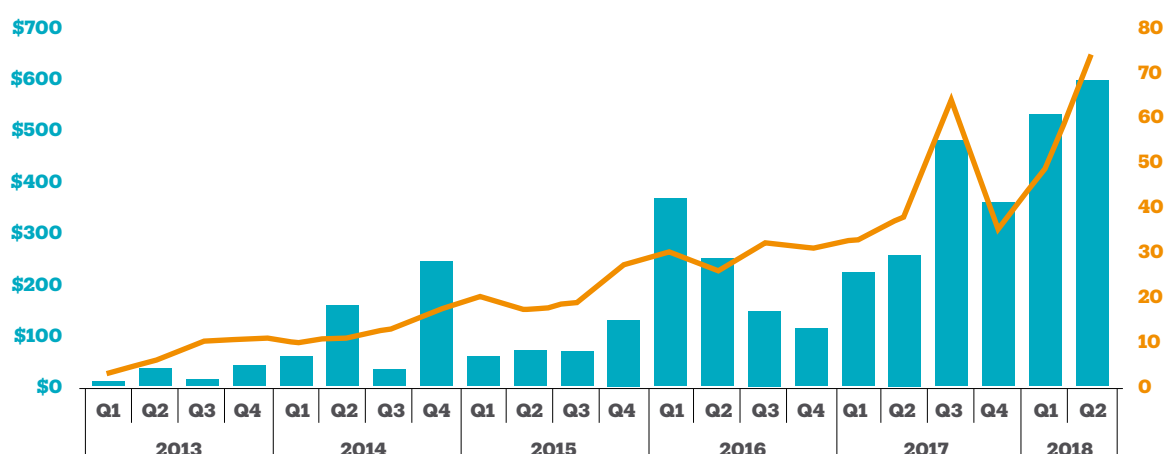
The major target of health-related AI applications is to analyse relationships between precaution or treatment techniques and patient outcomes. AI technologies have been improved and applied to [practises](#) such as treatment protocol, drug development, diagnosis procedures, personalised medicine, patient care and follow-up. Some medical institutions such as: The Mayo Clinic, Kettering Cancer Centre and the British National Health Service [have improved](#) AI algorithms for their centres. In addition, advanced technology companies such as [Google](#), [Amazon](#) and [IBM](#) have developed AI algorithms for healthcare.

AI in healthcare funding hit a historic high in Q2'18

Disclosed equity funding, Q1'13 - Q2'18

Equity funding (\$M)

Equity deals



Source: cbinsights.com

AI has affected doctors, hospitals and other entities related to healthcare. One of the biggest challenges for hospitals is that they cannot predict when the conditions of their gravely ill patients, such as types of cancer, cardiac disease and diabetes will become life threatening. Healthcare personnel sometimes cannot observe minor changes in the health status of patients. In this case, when AI becomes involved, it can analyse even minute patient data. For example, [Deepmind](#), which is working on an AI system, has focused on predicting acute kidney failure 48 hours in advance. It may be pos-

sible for AI systems to warn doctors before the onset of an upcoming disease.

There are countless other examples of AI, and data analytics begin applied in the fight against Covid-19. It is important to note that the shift toward AI and data-led solutions are not unique to the current pandemic. Historically, technologies like AI have been used to decrease patient wait times, promote the development of [custom-made medicines](#) and to [reduce clinical disparity](#). Big data has also been used to manage previous worldwide health issues like the [Ebola outbreak](#).

The benefits of AI in healthcare:

While Neuro Linguistic Programming (NLP) and Machine Learning (ML) are already being used in the healthcare system, they will become increasingly significant for their potential in the following areas:

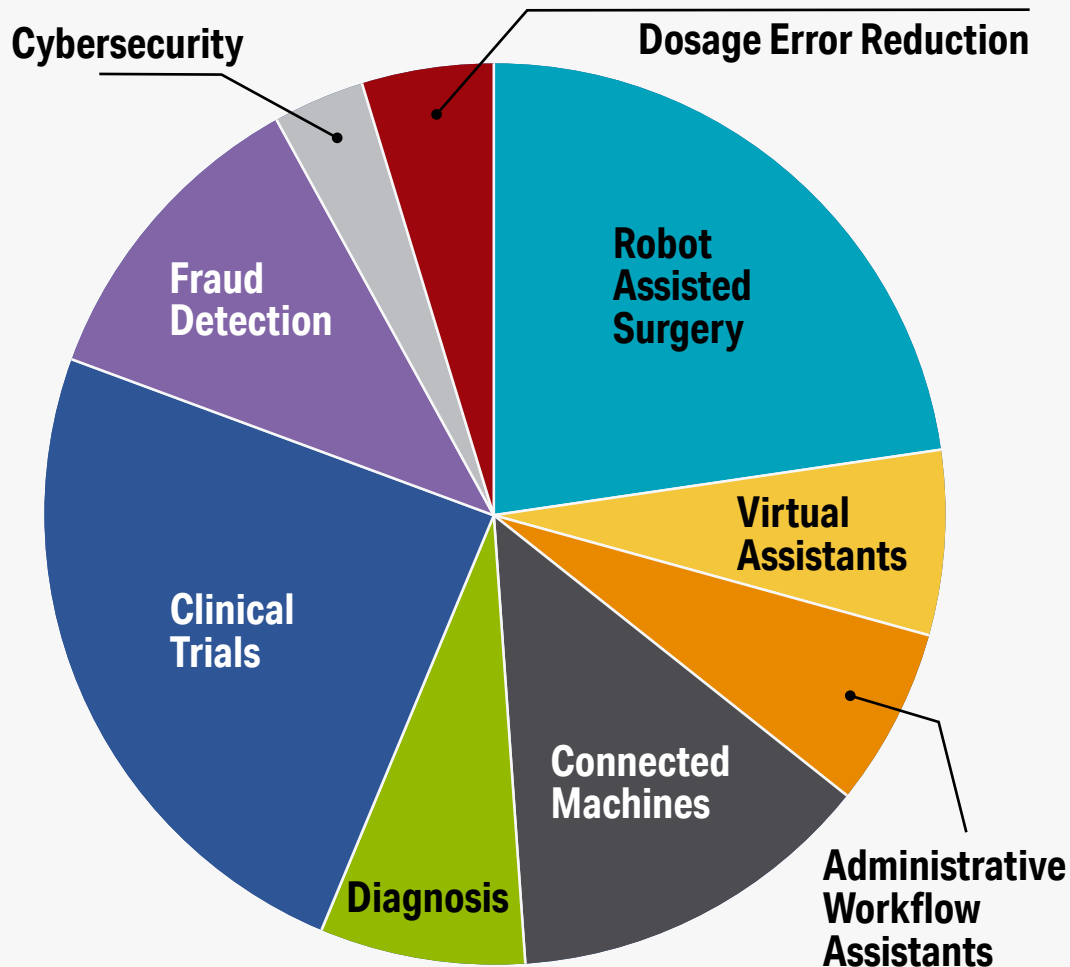
1. Improve provider and clinician productivity and quality of care
2. Increase inpatient engagement in their own care and facilitation of patient access to care
3. Acceleration of speed and reduction of cost in the development of new pharmaceutical treatments
4. Personalisation of medical treatments by leveraging analytics to mine significant, previously untapped stores of non-codified clinical data

Artificial intelligence and the fight against Covid-19

The pandemic caused by Covid-19 is the first global public health crisis of the 21st century. AI is a potentially powerful tool in the fight against the Covid-19 pandemic. Since the outbreak, there has been a scramble to use AI. Projects directly related to pharmacology, medical and hospital care, and mobility analysis have used AI as a [crucial ally in data science](#) to make progress

and deliver results. Today, multiple AI-powered projects based on data science, machine learning, and big data are being used across a broad range of fields to predict, explain and manage the different scenarios caused by the health crisis. There are five areas where AI can contribute to the fight against Covid-19: early warnings and alerts; tracking and prediction; and data dashboards.

Global artificial intelligence in healthcare market share, by application, 2018 (%)



Source: grandviewresearch.com



(Haluk Satir- Anadolu Agency)

How does AI fight against Covid-19?

AI technologies are being widely strengthened to help manage Covid-19 pandemic. Several governments have issued calls for contributions from AI experts worldwide to help find solutions to the crisis.

Within the context of the pandemic, AI is being applied and is delivering results in three fields: virus research and the development of drugs and vaccines; management of services and resources at healthcare centres; and analysis of data to support public policy decisions aimed at managing the crisis, such as confinement measures.

There are many examples where AI technology has been used in the fight against Covid-19. The contributions of AI to the healthcare system have been in effect for a long time. These contributions have even led to concern and controversy over the idea that doctors might lose their professions, perhaps being replaced by AI robots and systems. AI technology was involved in the process of Covid-19 before the occurrence of the

pandemic. [Bluedot](#), a Canadian start-up company, was [aware of the threat](#) of Covid-19 before anyone else. Bluedot, which monitors infectious diseases and uses machine-learning-based AI to predict outbreaks and virus spreads, informed official authorities that there was a pandemic alarm in December 2019. [The company](#), which uses 100 different datasets such as reports, ticket sales, population density and climate information, pointed out the existence of a pneumonia epidemic in the city of Wuhan and other cities of China.

With the spread of the disease, a variety of AI applications was rapidly developed. These applications follow the spread of Covid-19 and make predictions about the pandemic. The system called [HealthMap2](#) uses indirect sources such as Google searches, social media posts, blogs and forums to guess about the spread of the virus by using data. It also presents analysis and predictions about the attitudes of societies toward the pandemic.

[Various AI applications](#) have been frequently used in the diagnosis of the Covid-19 virus, treatment studies for infected people and vaccine research. Scientists have gained time in experimenting on the predictions of the genome sequence and protein structure of Covid-19 by using AI technology. Consequently, scientists were able to define the sequence of the virus in a very short time, just one month. The sequence of the virus was subsequently shared with scientists, creating an opportunity for countries to quickly produce their own diagnostic kits. AI applications have been influential in accelerating the [kit process](#).

On the other hand, AI has been directly involved in the diagnosis of the virus. China has revised the AI practices used to diagnose lung cancer, which were also used for the detection of suspected Covid-19. The software can detect lung sickness and pneumonia caused by Covid-19 by using computerised tomography images. Nearly 400 case scans can be performed within 30 seconds to speed up health services. In addition to this, through the use of AI, [South Korea](#) was able to produce test kits within a few weeks with vending machines, whereas they normally require 5-6 months to design. South Korea has the opportunity to isolate infected people at an early stage of the disease.

Likewise, Turkish organisations are also using AI technology in healthcare. In this regard, the President of Is-

tanbul Technical University, Professor Mehmed Karaca, announced that the University [produced a device](#) that identifies chronic patients, fever, cough and blood values. He added that the device would begin production on 15 June 2020. Karaca also stated that the device would measure oxygen in the blood and fever, and it will also process data.

AI has also been used as an [observation tool](#) to confirm the location of crowded populations and infected people. People are followed step by step in many countries, including Singapore, China, Taiwan, Israel and South Korea. Location information from mobile operator companies is used, along with location-tracking applications. If information is not available through location services, the identities of people are ascertained through cameras. It is claimed that China was able to control the pandemic primarily through the use of these tracking systems. People were not allowed to go out without showing their faces to cameras, which were set up in many locations. In other words, AI has provided the opportunity for social control in the fight against Covid-19. However, such surveillance has threatened to people right to privacy. Even the legal possibility of social control has been subjected long and heated debates. Human rights organisations have objected to the misuse of tracking software and the subsequent breaches of privacy.

Conclusion

The Covid-19 pandemic has significantly affected the world. The healthcare system and social distancing rules have come into prominence during the crisis. Technological developments have been among the most significant tools in the fight against Covid-19. AI, which is a relatively new technology, has contributed significantly to the struggle against the pandemic. It has

been used in many areas, such as the determination of the genetic sequencing of the virus, production of test kits, vaccine studies, treatment processes, preventive diagnosis and social control. After this experience, the use of AI in the healthcare sector will increase, pushing states to invest more in this field.

