



جامعة تكنولوجيا المعلومات والاتصالات

كلية المعلوماتية الطبية
الحيوية



الذكاء الاصطناعي ودوره في مواجهة كورونا فيروس كوفيد-19

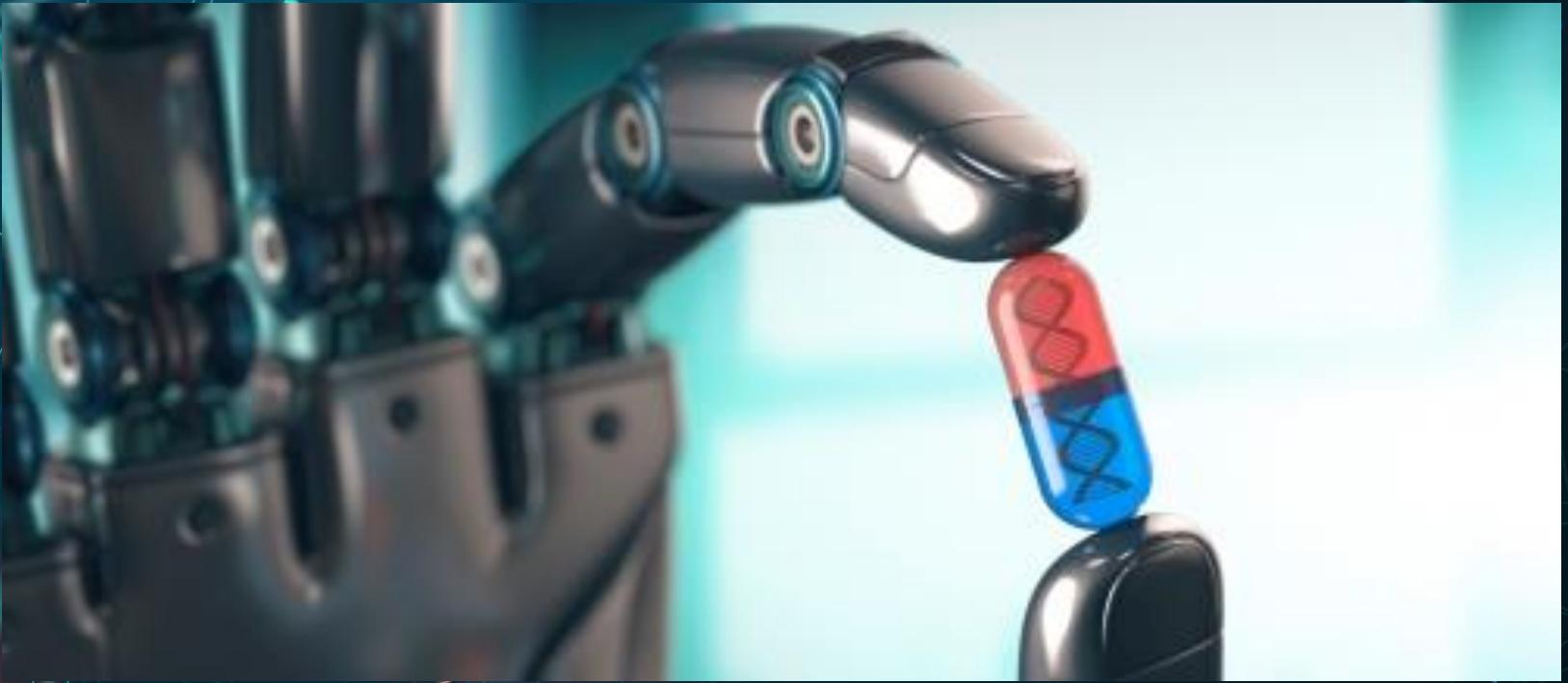
Importance of using Artificial Intelligence Techniques in Medical Field

**Artificial Intelligence versus COVID-19
Techniques used to help the world against Epidemic**

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Artificial intelligence



Artificial intelligence

Artificial intelligence (AI) is being used as a tool to support the fight against the viral pandemic that has affected the entire world since the beginning of 2020.

The press and the scientific community are echoing the high hopes that data science and AI can be used to confront the coronavirus



Expectations of the first countries in the epidemic

01 Thailand

02 Japan

03 South Korea

04 United States



Its uses seem to have included support for measures restricting the movement of populations, forecasting the evolution of disease outbreaks and research for the development of a vaccine or treatment.

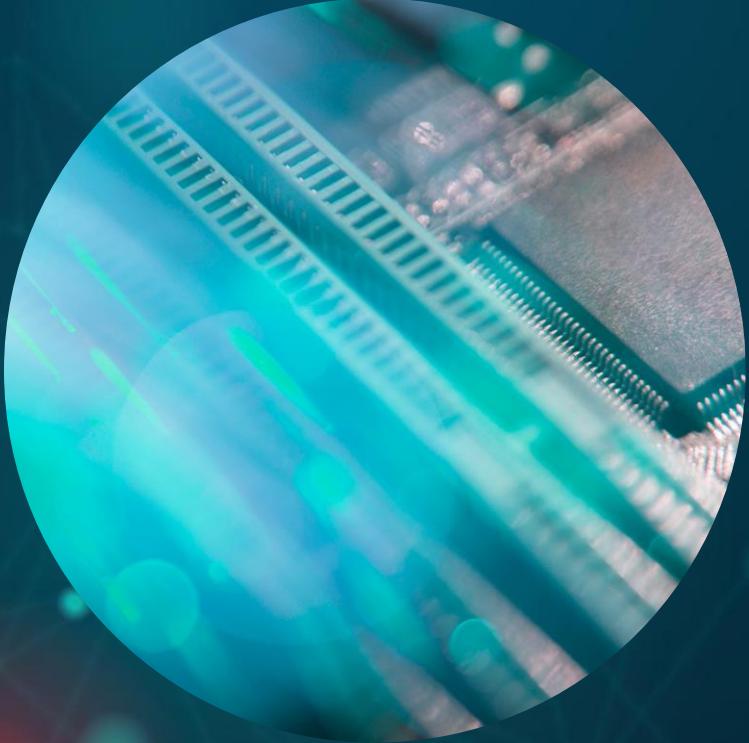
With regard to the latter aspect, AI has been used to speed up genome sequencing make faster diagnoses carry out scanner analyses or, more occasionally handle maintenance and delivery robots

China



Topics

- **The contribution of artificial intelligence to the search for a cure**
- **Artificial intelligence, a driving force for knowledge sharing**
- **Artificial intelligence, observer and predictor of the evolution of the pandemic**
- **Artificial intelligence to assist healthcare personnel**
- **Artificial intelligence as a tool for population control**



The first application of AI expected in the face of a health crisis is certainly the assistance to researchers to find a vaccine able to protect caregivers and contain the pandemic. Biomedicine and research rely on a large number of techniques, among which the various applications of computer science and statistics have already been making a contribution for a long time. The use of AI is therefore part of this continuity.



The American start-up **Moderna** has distinguished itself by its mastery of a biotechnology based on messenger ribonucleic acid (**mRNA**) for which the study of protein folding is essential. It has managed to significantly reduce the time required to develop a prototype vaccine testable on humans thanks to the support of **bioinformatics**, of which **AI** is an integral part.



Similarly, Chinese technology giant Baidu, in partnership with Oregon State University and the University of Rochester, published its Linearfold prediction algorithm in February 2020 to study the same protein folding. This algorithm is much faster than traditional algorithms in predicting the structure of a virus' secondary ribonucleic acid (RNA) and provides scientists with additional information on how viruses spread. The prediction of the secondary structure of the RNA sequence of Covid-19 would thus have been calculated by Linearfold in 27 seconds instead of 55 minutes



Google DeepMind



DeepMind, a subsidiary of Google's parent company, Alphabet, has also shared its predictions of coronavirus protein structures with its AlphaFold AI system.

IBM, Amazon, Google and Microsoft have also provided the computing power of their servers to the US authorities to process very large datasets in epidemiology, bioinformatics and molecular

amazon

Google

IBM

f

Microsoft

Artificial intelligence, a driving force for knowledge sharing



In the **United States**, the White House Office of Science and Technology Policy met with technology companies and major research groups , to determine how **AI tools** could be used to, among other things, screen the thousands of research papers published worldwide on the pandemic

Indeed, in the weeks following the appearance of the new coronavirus , nearly **2,000** research papers were published on the effects of this new virus, on possible treatments, and on the dynamics of the pandemic. This influx of scientific literature naturally reflects the eagerness of researchers to deal with this major health crisis, but it also represents a real challenge for anyone hoping to exploit it.



Chan
Zuckerberg
Initiative

Microsoft Research, the National Library of Medicine and the Allen Institute for AI (AI2) therefore presented their work on 16 March 2020, which consisted of collecting and preparing more than **29,000** documents relating to the new virus and the broader family of coronaviruses, 13,000 of which were processed so that computers could read the underlying data, as well as information on authors and their affiliations.



Kaggle, a **Google** subsidiary and platform that usually organizes data science competitions, created challenges around **10** key questions related to the coronavirus. These questions range from
-risk factors
-non-drug treatments to the genetic properties of the virus
- vaccine development efforts.
The project also involves the **Chan Zuckerberg** Initiative and Georgetown University's Center for Security and Emerging Technologies



Artificial intelligence, observer and predictor of the evolution of the pandemic



The Canadian company **BlueDot** is credited with the early detection of the virus using an **AI** and its ability to continuously review over 100 data sets, such as

- news,
- airline ticket sales,
- demographics,
- climate data
- and animal populations.

BlueDot detected what was then considered an outbreak of pneumonia in Wuhan, China on 31 December 2019 and identified the cities most likely to experience this outbreak

Artificial intelligence, observer and predictor of the evolution of the pandemic



A team of researchers working with the Boston Children's Hospital has also developed an AI to track the spread of the coronavirus. Called HealthMap, the system integrates data from Google searches, social media and blogs, as well as discussion forums: sources of information that epidemiologists do not usually use, but which are useful for identifying the first signs of an outbreak and assessing public).



United Nations
Educational, Scientific and
Cultural Organization



International Research Centre
on Artificial Intelligence
under the auspices of UNESCO



The International Research Centre for Artificial Intelligence (IRCAI) in Slovenia, under the auspices of UNESCO, has launched an "intelligent" media watch on coronavirus called [Corona Virus Media Watch](#) which provides updates on global and national news based on a selection of media with open online information.

The tool, also developed with the support of the OECD and the [Event Registry](#) information extraction technology, is presented as a useful source of information for [policy makers](#), the media and the public to observe emerging trends related to Covid-19 in their countries and around the world.

Artificial intelligence to assist healthcare personnel



For their part, two Chinese companies have developed **AI-based** coronavirus diagnostic software. The Beijing-based start-up **Infer vision** has trained its software to detect lung problems using computed tomography (**CT**) scans. Originally used to diagnose lung cancer, the software can also detect pneumonia associated with respiratory diseases such as coronavirus. At least **34** Chinese hospitals are reported to have used this technology to help them screen **32,000** suspected cases

Artificial intelligence to assist healthcare personnel



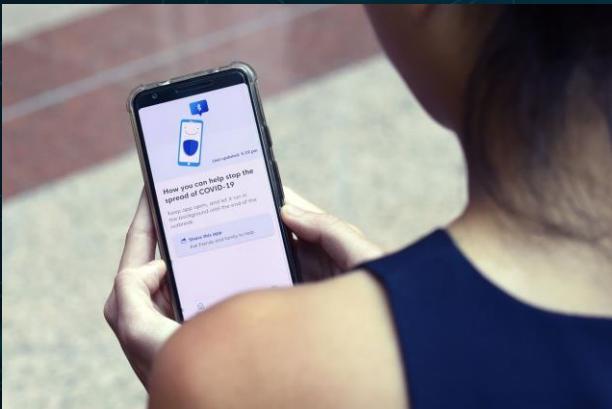
The **Alibaba DAMO Academy**, the research arm of the Chinese company Alibaba, has also trained an AI system to recognise coronaviruses with an accuracy claimed to be **96%**. According to the company, the system could process the **300 to 400** scans needed to diagnose a coronavirus in **20 to 30** seconds, whereas the same operation would usually take an experienced doctor **10 to 15** minutes. The system is said to have helped at least **26** Chinese hospitals to review more than **30,000** cases.

Artificial intelligence to assist healthcare personnel



In South Korea, AI is reported to have helped reduce the time needed to design **testing kits** based on the **genetic make-up** of the **virus** to a few weeks, when it would normally take two to three months. The biotech company **Seegene** used its automated test development system to develop the **test kit** and distribute it widely. Large-scale testing is indeed crucial to overcome containment measures and this testing policy seems to have contributed to the relative control of the pandemic in this country, which has equipped **118** medical establishments with this device and tested more than **230,000** people

Artificial intelligence as a tool for population control



The example set by Singapore in its control of epidemic risks, with the support of technology, is certainly unique and difficult to export because of the social acceptance of restrictive safety measures: issue of a containment order for populations at risk, verification of compliance with the measures by mobile phone and geolocation, random home checks. AI has been quite widely used in support of such mass surveillance policies

Artificial intelligence as a tool for population control



as in **China**, where devices have been used to measure temperature and recognize individuals or to equip law enforcement agencies with "smart" helmets capable of flagging individuals with high body temperature.

Facial recognition devices have, however, experienced difficulties due to the wearing of surgical masks,

Hanvon thus claims to have created a device to increase the recognition rate of wearers of surgical masks to **95%**

Artificial intelligence as a tool for population control



In **Taiwan**, a mobile phone is given to infected persons and records their GPS location so that police can track their movements and ensure that they do not move away from their place of confinement.

In **Italy**, a company has also developed a smartphone application that can be used to trace the itinerary of a person infected with the virus and warn people who have had contact with him or her. According to the designer, privacy would be guaranteed, as the application would not reveal phone numbers or personal data.

Artificial intelligence: an **evaluation** of its use in the aftermath of a crisis



Digital technology, including information technology and AI, are therefore proving to be important tools to help build a coordinated response to this pandemic.

The multiple uses also illustrate the limits of what can currently be achieved by this very technology, which we cannot expect to compensate for structural difficulties such as those experienced by many health care institutions around the world.

The search for efficiency and cost reduction in hospitals, often supported by information technology, should not reduce the quality of services or compromise universal access to care, even in exceptional circumstances.

Artificial intelligence: an evaluation of its use in the aftermath of a crisis



- The importance of attention to the orientation towards specific specialties and investment in the computer field in general and artificial intelligence in particular in the medical field
- The importance of the field of **Biomedical Informatics** / which is one of the colleges of the University of Information Technology and Communications



Thank you