

# AI-Powered Tools in Controlling the Spread of COVID-19

Yihan Lai

Abbey College Cambridge, Cambridge CB28EB, United Kingdom.

---

**Abstract:** The COVID-19 pandemic has had a huge impact on human society. This article introduces and evaluates the role of artificial intelligence in pharmaceutical, assisted surgery, screening, tracking, information dissemination and other fields. Artificial intelligence has made progress in these areas and still has potential. At the same time, the development of artificial intelligence in this field could still be useful after the pandemic is over.

**Keywords:** Artificial Intelligence; COVID-19; Coronavirus.

---

## 1. Introduction

Since the beginning of 2020, the COVID-19 pandemic outbreak has spread rapidly around the world. The virus is named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) due to its close relationship with SARS-CoV [1]. Different from other kinds of coronaviruses, SARS-CoV-2 results in a large number of death cases and serious social consequences. Frequent mutations make COVID-19 especially difficult to eradicate [2].

The idea of artificial intelligence (AI) was born almost as early as computers. We have been talking about using AI in medicine for a long time. Many researchers have worked on using AI to fight against disease [3]. In the context of the COVID-19 outbreak, AI has more applications. The specific spreading patterns of the disease give researchers the possibility to work out more accurate models to cure, identify, or track COVID-19. Also, there are so many other areas that need the assistance of artificial intelligence [4][5]. The advantages of high-speed computing and abstract thinking can prove their value in new fields.

In this passage, we introduce the usage of AI in controlling the spread of COVID-19. The ways of using AI to fight against COVID-19 have two main ideas, which are by treating people or cutting down the way of virus diffuses. Then we discuss some shortages of AI and how people can avoid the negative consequence of it.

## 2. Using AI to fight against COVID-19

There are now several ways of using AI to control the spread and the damage of the epidemic. Some are used to help to find patients and the treatment or to assist treatment. The others are used to track patients as well as the other way to ensure the stability of society.

### 2.1 Using AI to protect people from the virus

#### 2.1.1 Improving drug research

Artificial intelligence is used to accelerate drug development. There are numerous success stories to show the potential of AI in medicine development [6]. AI is also used in the research of SARS-CoV-2 antivirals [7]. As AI can find medicine in a quicker, cheaper, and more effective way without too much manpower, it is promising to give play to its unique advantages [5].

The use of machines can greatly increase the chances that some potential drugs being discovered. Researchers are now searching for medicines by using AI-power tools. Artificial intelligence can give out several candidates in a short time. The following scientific checks can be done faster and more conveniently [4].

## 2.1.2 Assisting operation

COVID-19 can cause microbial infection and multiple organ dysfunction<sup>[8]</sup>. In the face of severe pneumonia, more powerful assistance is needed in the operation to treat the complications of COVID-19. AI already has the technical foundations for application in surgery<sup>[9]</sup>. It makes sense to put it into treatment against COVID-19. Reducing the workload of health workers has greatly saved resources to effectively combat the outbreak. The application of AI-assisted surgery can reduce the working pressure of doctors as well as improve the reliability of surgery.

Also, AI can help quickly deploy medical resources. As ICU is very valuable in many countries. Judging whether a patient needs ICU and how is its possibility to be cured is very important<sup>[4]</sup>.

## 2.1.3 Screening cheaper and faster

For almost two years, the mainly used way of screening patients is RT-PCR<sup>[10][11]</sup>. However, this method is expensive and time consuming. Also, though we have an antigen-antibody way to test with high accuracy<sup>[12]</sup>, however, a great deal of money is require and its accuracy depends on users. We still need methods that are more independent of the skills of the users. Some AI-powered tools can be used to fill in the gaps. Researchers are trying hard to screen patients by using the sound of cough<sup>[13][14]</sup>. This is a test worthy of being promoted in socially disadvantaged areas where RT-PCR seems to be too expensive to them. Some of the original models used to diagnose pneumonia should be improved to fight against COVID-19<sup>[15]</sup>.

In addition, many countries have used AI-based computer vision camera systems to scan crowds<sup>[16]</sup>. By the time the UK fought against the epidemic, the technique was used to see if people obey the rules formulated by the government<sup>[17]</sup>.

Rapid and widespread testing can have a societal impact. With the help of AI, low-cost detection methods can achieve miraculous results on a wider battlefield with special advantages. If the number of samples can be overwhelming, the AI screening method can help medical workers identify a large number of cases that would otherwise go unnoticed.

## 2.1.4 Screening more accurately

For those countries that are doing a better job fighting the epidemic, they need ways that can diagnose the patients more accurately. Though RT-PCR is widely used to screen patients, its high false-negative rate can be higher than 30%, even worse in some critical conditions<sup>[18]</sup>. So other methods are needed to get results with lower uncertainty. When CT is used to screen patients, with the help of computer science, it does better than RT-PCR<sup>[19]</sup>. This sensitivity advantage should not be confined to clinical medicine. The technique should be put into the community. To make this come true, we need models that are suitable to be used on mobile devices<sup>[20]</sup>. In addition, using the AI method to enhance RT-PCR is also a wise way<sup>[21]</sup>.

## 2.2 Using AI to maintain social stability amid the epidemic

### 2.2.1 Typical ways of tracking

The epidemic is still raging today. And our response to COVID-19 is inadequate. it is observed that all countries are trying to contain the spread of the virus<sup>[22]</sup>. For example, in the UK, the core function of the mainly used app, NHS COVID-19, is by using Bluetooth technology to warn the users if they have been close to a patient<sup>[23]</sup>. The AI part of this countermeasure will be discussed in the next section. Now we are focusing on the Bluetooth part. The phone which has this app can identify the location of the patient in relation to itself<sup>[24]</sup>. The same technique has also been proved by many researchers that can reduce the influence of the epidemic<sup>[25][26][27]</sup>.

### 2.2.2 AI tracking

With the help of AI, the models to control the spread of COVID-19 are established swiftly. Including the technique based on Bluetooth, researches progress with the help of artificial intelligence<sup>[25]</sup>.

There are some other techniques used. China shows us an effective way of tracking COVID-19 positive patients<sup>[28]</sup>. The technology called ‘health code’ is based on the location technique.

Health code has first appeared in an app called Alipay. It locates the users automatically and whenever a patient with COVID-19 is found, all the codes of people in the block will turn red from green. Everybody needs a green code to enter a public place by provisions of regulations. Once the code turns red, he cannot go anywhere. Communities will assist the government in monitoring the isolation of close contacts of COVID-19 <sup>[29]</sup>.

Based on this, enterprises can get a lot of data. Governments can order them to use these precious data to control the spread of the epidemic. They are not only been used to track patients but also to predict if a person is positive or if a city is dangerous of having an epidemic <sup>[30]</sup>. With the help of AI, this technique has potential that cannot be estimated. For location technology will send tons of labeled data to servers, the data are easy to get and meaningful. Theoretically, it is an ideal condition for AI-powered tools to come into play.

Now, the achievement China has made can tell us the feasibility of the method <sup>[28]</sup>. Compared with previous anxiety, this bold attempt is certainly worth spreading <sup>[31][32]</sup>. There is no denying that this management style has some disadvantages, which we will hit on in the next section.

Evidence proved that with the proper help of artificial intelligence, we can do it even better<sup>[33]</sup>. With the help of computers, supplies will be distributed more rationally and alarms will be sent out more promptly <sup>[30]</sup>. Isolate the sick and limit the spread of the virus by close contact with the help of AI <sup>[34]</sup>. It will become an effective solution. Using artificial intelligence rationally tracking patients can play a big role in enhancing social stability.

### **2.2.3 Information propagation developing**

The most obvious role of AI in social life is to maintain stability in the epidemic environment and is about news feeding. People get nervous under the onslaught of information. With the help of artificial intelligence, social media can disseminate correct information promptly. With the help of big data and neural networks, we can find what we want more easily in the sea of misinformation and fake news <sup>[5]</sup>.

In addition, applying the same idea, researchers also planning to Use chatbots to improve public communication. The technology could be used to care for the emotions of patients and respond to public safety crises <sup>[7]</sup>.

Smoothing the flow of information could be the key to mitigating the impact of the pandemic. It solves more problems than we may think.

### **2.2.4 Subsequent utilization**

Although the impact of the outbreak on humans is gradually diminishing, it is still necessary to insist on studying artificial intelligence. These products of the fight against the epidemic can still play a role in confronting other diseases after COVID-19 is eliminated. Furthermore, they can even provide valuable lessons for progress in other areas.

For example, the spread of COVID-19 promotes the research of blockchain. It can help with volunteer recruitment and fundraising. Its support for the economy cannot be ignored <sup>[4]</sup>. In the post-pandemic era, these technologies can still contribute to the development of human society. So do the technique of artificial intelligence we talk about above.

## **3. Using the technology method reasonably**

While using AI-powered tools there is something have to be considered. The formulation of guidelines is conducive to the development of technology. Treating problems with respect is the best way we can use AI to fight COVID-19.

### **3.1 The dataset used should be large enough**

When training an AI-powered tool, tons of data are needed. Although it is really hard for companies to build a dataset that is ideally large enough, we still need to increase the sampling as we can <sup>[35]</sup>.

People feel “Skeptical”, “Unsure” about artificial intelligence mostly because we cannot be sure how well AI can perform based on imperfect data <sup>[36]</sup>. If researchers can be provided with more convenient access to information and focus

more on data integrity, AI will play a more stable role in fighting the epidemic.

### 3.2 Privacy respecting

To protect the authority of the hospital, also to protect the rights of patients, Researchers, companies or hospitals should take care to protect patients' privacy when using data from patients. Trust in the hospital sometimes is more important than healing the patient itself [37]. For this reason, access to data should be appropriate and compliant. We should not only avoid data breaches, insufficient or ineffective de-identification and biases in datasets but also make sure it is the right time to use the data [38].

### 3.3 The uncertainty of AI

In the process of using artificial intelligence, the bias of the designer and the unreliability of the input data itself can lead to the AI giving surprising results [39][40]. AI-powered tracking tools sometimes give advice that is difficult to understand. As a complex AI tool is always a black box, we should not accept everything without scruple when following AI's instructions. Medical and community workers should not trust machines blindly. Only with the assurance of human judgment can AI consistently perform its best work.

## 4. Conclusion

Although COVID-19 has had a huge impact on human society with a great deal of economic and human damage, people never give up on fighting against the disaster. Many researchers get involved in the fight against COVID-19. So many thoughts of using AI to fight against COVID-19 have been raised. A large number of effective or promising results are also obtained in this process. Artificial intelligence is used to save people in ICU, to protect people from the virus and to comfort people in confusing public opinion. At the same time, its role could well be retained after the epidemic is over.

## References

- [1] Ciotti M, Ciccozzi M, Terrinoni A, et al, 'The COVID-19 pandemic', *Crit. Rev. Clin. Lab. Sci.*, vol. 57, no. 6, pp. 365–388, Aug. 2020.
- [2] Cascella M, Rajnik M, Aleem A, et al, 'Features, Evaluation, and Treatment of Coronavirus (COVID-19)', in *StatPearls*, Treasure Island (FL): StatPearls Publishing, 2022. Accessed: Apr. 02, 2022. [Online]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK554776/>
- [3] Ramesh AN, Kambhampati C, Monson JRT, and Drew PJ, 'Artificial intelligence in medicine.', *Ann. R. Coll. Surg. Engl.*, vol. 86, no. 5, pp. 334–338, Sep. 2004.
- [4] Chamola V, Hassija V, Gupta V, and Guizani M, 'A Comprehensive Review of the COVID-19 Pandemic and the Role of IoT, Drones, AI, Blockchain, and 5G in Managing its Impact', *IEEE Access*, vol. 8, pp. 90225–90265, 2020.
- [5] Santus E et al., 'Artificial Intelligence–Aided Precision Medicine for COVID-19: Strategic Areas of Research and Development', *J. Med. Internet Res.*, vol. 23, no. 3, p. e22453, Mar. 2021.
- [6] Hamet P and Tremblay J, 'Artificial intelligence in medicine', *Metabolism*, vol. 69, pp. S36–S40, Apr. 2017.
- [7] Ahuja AS, Reddy VP, and Marques O, 'Artificial intelligence and COVID-19: A multidisciplinary approach', *Integr. Med. Res.*, vol. 9, no. 3, p. 100434, Sep. 2020.
- [8] Yang L et al., 'COVID-19: immunopathogenesis and Immunotherapeutics', *Signal Transduct. Target. Ther.*, vol. 5, no. 1, Art. no. 1, Jul. 2020.
- [9] Haleem A, Vaishya R, Javaid M, and Khan IH, 'Artificial Intelligence (AI) applications in orthopaedics: An innovative technology to embrace', *J. Clin. Orthop. Trauma*, vol. 11, no. Suppl 1, pp. S80–S81, Feb. 2020.
- [10] Babady NE, et al., 'Performance of Severe Acute Respiratory Syndrome Coronavirus 2 Real-Time RT-PCR Tests on Oral Rinses and Saliva Samples', *J. Mol. Diagn.*, vol. 23, no. 1, pp. 3–9, Jan. 2021.
- [11] Corman VN, et al., 'Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR', *Eurosurveillance*, vol. 25, no. 3, p. 2000045, Jan. 2020.

- [12] Khandker SS, Nik Hashim NHH, Deris ZZ, et al, 'Diagnostic Accuracy of Rapid Antigen Test Kits for Detecting SARS-CoV-2: A Systematic Review and Meta-Analysis of 17,171 Suspected COVID-19 Patients', *J. Clin. Med.*, vol. 10, no. 16, Art. no. 16, Jan. 2021.
- [13] Pizzo DT and Esteban S, 'IATos: AI-powered pre-screening tool for COVID-19 from cough audio samples', *ArXiv210413247 Cs Eess*, Dec. 2021, Accessed: Jan. 29, 2022. [Online]. Available from: <http://arxiv.org/abs/2104.13247>
- [14] Imran A, et al., 'AI4COVID-19: AI enabled preliminary diagnosis for COVID-19 from cough samples via an app', *Inform. Med. Unlocked*, vol. 20, p. 100378, Jan. 2020.
- [15] Chen N, et al., 'Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study', *The Lancet*, vol. 395, no. 10223, pp. 507–513, Feb. 2020.
- [16] Naudé W, 'Artificial Intelligence Against Covid-19: An Early Review', *Social Science Research Network*, Rochester, NY, SSRN Scholarly Paper ID 3568314, Apr. 2020.
- [17] 'AI exposed Brits ignoring advice to stay home and socially distance', *AI News*, Mar. 27, 2020. Available from: <https://artificialintelligence-news.com/2020/03/27/ai-exposed-brits-ignoring-advice-stay-home-socially-istance/> (accessed Mar. 25, 2022).
- [18] Wang Y, Kang H, Liu X, and Tong Z, 'Combination of RT-qPCR testing and clinical features for diagnosis of COVID-19 facilitates management of SARS-CoV-2 outbreak', *J. Med. Virol.*, vol. 92, no. 6, pp. 538–539, 2020.
- [19] Ai T, et al., 'Correlation of Chest CT and RT-PCR Testing for Coronavirus Disease 2019 (COVID-19) in China: A Report of 1014 Cases', *Radiology*, vol. 296, no. 2, pp. E32–E40, 2020.
- [20] Li X, Li C, and Zhu D, 'COVID-MobileXpert: On-Device COVID-19 Patient Triage and Follow-up using Chest X-rays', *ArXiv200403042 Cs Eess*, Apr. 2020, Accessed: Mar. 14, 2022. [Online]. Available from: <http://arxiv.org/abs/2004.03042>
- [21] Escobar M, et al., 'Smart Pooling: AI-powered COVID-19 testing', *medRxiv*, p. 2020.07.13.20152983, Aug. 05, 2020.
- [22] Sohrabi C, et al., 'World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19)', *Int. J. Surg.*, vol. 76, pp. 71–76, Apr. 2020.
- [23] 'Exposure Notifications: Helping fight COVID-19 - Google', *Exposure Notifications: Helping fight COVID-19-Google*. [https://www.google.com/intl/en\\_us/covid19/exposurenotifications/](https://www.google.com/intl/en_us/covid19/exposurenotifications/) (accessed Mar. 24, 2022).
- [24] Lovett T, Briers M, Charalambides M, et al, 'Inferring proximity from Bluetooth Low Energy RSSI with Unscented Kalman Smoothers', *ArXiv200705057 Cs Eess Stat*, Jul. 2020, Accessed: Mar. 24, 2022. [Online]. Available from: <http://arxiv.org/abs/2007.05057>.
- [25] Rodríguez P, et al., 'A population-based controlled experiment assessing the epidemiological impact of digital contact tracing', *Nat. Commun.*, vol. 12, no. 1, Art. no. 1, Jan. 2021.
- [26] Wymant C, et al., 'The epidemiological impact of the NHS COVID-19 app', *Nature*, vol. 594, no. 7863, Art. no. 7863, Jun. 2021.
- [27] Salathé M, et al., 'Early evidence of effectiveness of digital contact tracing for SARS-CoV-2 in Switzerland', *Swiss Med. Wkly.*, vol. 150, p. w20457, Dec. 2020.
- [28] Burki T, 'China's successful control of COVID-19', *Lancet Infect. Dis.*, vol. 20, no. 11, pp. 1240–1241, Nov. 2020.
- [29] Liang F, 'COVID-19 and Health Code: How Digital Platforms Tackle the Pandemic in China', *Soc. Media Soc.*, vol. 6, no. 3, p. 2056305120947657, Jul. 2020.
- [30] Bragazzi NL, Dai H, Damiani G, et al, 'How Big Data and Artificial Intelligence Can Help Better Manage the COVID-19 Pandemic', *Int. J. Environ. Res. Public. Health*, vol. 17, no. 9, Art. no. 9, Jan. 2020.
- [31] Bo W, Ahmad Z, Alanzi ARA, Abdelwahab, 'The current COVID-19 pandemic in China: An overview and corona data analysis', *Alex. Eng. J.*, vol. 61, no. 2, pp. 1369–1381, Feb. 2022.
- [32] Xiao Y and Torok ME, 'Taking the right measures to control COVID-19', *Lancet Infect. Dis.*, vol. 20, no. 5, pp. 523–524, May 2020.
- [33] McCall B, 'COVID-19 and artificial intelligence: protecting health-care workers and curbing the spread', *Lancet Digit. Health*, vol. 2, no. 4, pp. e166–e167, Apr. 2020.

- [34] Ferretti L et al., 'Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing', *Science*, vol. 368, no. 6491, p. eabb6936, May 2020.
- [35] Engler A, 'A guide to healthy skepticism of artificial intelligence and coronavirus', Brookings, Apr. 02, 2020. Available from: <https://www.brookings.edu/research/a-guide-to-healthy-skepticism-of-artificial-intelligence-and-coronavirus/> (accessed Mar. 19, 2022).
- [36] Sipior JC, 'Considerations for development and use of AI in response to COVID-19', *Int. J. Inf. Manag.*, vol. 55, p. 102170, Dec. 2020.
- [37] Ward PR, 'Improving Access to, Use of, and Outcomes from Public Health Programs: The Importance of Building and Maintaining Trust with Patients/Clients', *Front. Public Health*, vol. 5, 2017, Accessed: Mar. 20, 2022. [Online]. Available from: <https://www.frontiersin.org/article/10.3389/fpubh.2017.00022>
- [38] Ienca M and Vayena E, 'On the responsible use of digital data to tackle the COVID-19 pandemic', *Nat. Med.*, vol. 26, no. 4, Art. no. 4, Apr. 2020.
- [39] Yates DJ, Gulati GJJ, and Weiss JW, 'Understanding the Impact of Policy, Regulation and Governance on Mobile Broadband Diffusion', in 2013 46th Hawaii International Conference on System Sciences, Wailea, HI, USA, Jan. 2013, pp. 2852–2861.
- [40] 'Our weird behavior during the pandemic is messing with AI models', *MIT Technology Review*. Available from: <https://www.technologyreview.com/2020/05/11/1001563/covid-pandemic-broken-ai-machine-learning-amazon-retail-fraud-humans-in-the-loop/>(accessed Mar.21, 2022).