Artificial Intelligence in the Covid-19 Pandemic

Artificial intelligence (AI) was originally designed to solve simple problems but has since evolved into something with much greater potential to transform society. Since its inception, it has become far less expensive to develop and much more efficient at solving problems. In recent years, AI has produced great benefits for the healthcare field.[1] However, with this rapid development, concerns have been raised about the ethics and application of AI.[2] With the onset of the Covid-19 Pandemic, new challenges in healthcare present an opportunity for AI application. This report will review current uses of AI in response to the coronavirus, its potential benefits, and drawbacks.

AI in Healthcare

Implications for pandemics

AI can help detect pandemics before they start by identifying early warning signs, predicting, and detecting outbreaks. It can help quickly mitigate outbreaks by monitoring and analyzing disease spread, helping determine effective treatments, and completing pathogen analysis.[3] By analyzing big data satellite imaging, such as seeing places where cars were crowded, can help determine localized outbreaks.[4] AI reduces the human-hours, and thus cost, required to analyze drug discoveries and perform clinical trials by preforming these tasks itself. For example, the AI system BenevolentAI was used to search medical information about drugs that may work to reduce the symptoms of and treat COVID-19. That AI search led to the discovery that the drug baricitinib can have antiviral effects.[5]

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[1] Sathian Dananjayan and Gerard Marshall Raj, "Artificial Intelligence during a pandemic: The COVID-19 example," *International Journal of Health Planning Management* 35, no. 5 (May 2020): 1260, https://doi.org.10.1002/hpm.2987.

[2] Carmel Shachar, Sara Gerke, and Eli Y. Adashi, "AI Surveillance during Pandemics: Ethical Implementation Imperatives," *The Hastings Report* 50, no. 3, (Summer 2020): 18-21.

[3] Dananjayan and Raj, "Artificial Intelligence during a pandemic: The COVID-

AI can also help monitor the news, social media, and healthcare reports in multiple languages across the world to assess the possibility of pandemics and the risk of spread. It can also

Boston Children's Hospital's AI system HealthMap was the first to notify the world about COVID-

antigenic regions in the viral membrane protein of SARS-CoV, vital to quickly and inexpensively produce vaccines.[34]

AI and Mental Health

A growing public health concern is mental health and suicide prevention. About 800,000 people per year die from suicide, globally, a number that increased due to the pandemic.[35] Machine learning approaches are being used to improve suicide care and better predict the risk that individuals face from self-harm. Machine learning (ML) is an algorithm that is a subset of AI that can

> detect patterns from huge complex datasets to become more precise and accurate as they interact with training data, allowing humans to gain unprecedented insights into early detection of diseases, drug discovery, diagnostics, healthcare processes, treatment variability, and patient outcomes.[36]

The main goal of ML in this situation is to "develop modalities that simulate aspects of human intelligence such as planning, reasoning, pattern recognition and problem-solving" through ML that recognizes patterns or features through an algorithm.[37] This method can be used to determine risk, predict suicide outbreaks, and identify at-risk populations, as well as help develop technologies that can monitor suicide risk in real time and help individuals in crisis.[38] ML has been used to assess social media and develop "social media-based suicide interventions and therapeutic conversation agents," which can be of particular use with youth.[39] It is important to note that this technology is best used in conjunction with clinical expertise, and not as an isolated diagnosis.[40]

Mental health has been of particular concern during the pandemic, especially among frontline healthcare workers. Healthcare workers have experienced elevated anxiety, depression, posttraumatic stress disorder and suicidal behavior due to the stress of the COVID-19 pandemic, particularly those working with ill or quarantined patients and experience chronic fatigue and overworking.[41] This can be exacerbated by personality or pre-existing mental health issues, such as "low overall stress resilience and have other vulnerability factors, such as the general propensity to psychological distress and low self-control."[42] AI systems can help predict

and assess mental health disorders through algorithms identifying patterns in data sets including

> various psychometric scales or mood rating scales, brain imaging data, genomics, blood biomarkers, data based on novel monitoring systems (e.g., smartphones), data scraped from social media platforms, speech and language data, facial data, dynamics of the coulometric system, attention assessment based on eye-gaze data, as well as various features based on the analysis of peripheral physiological signals, e.g., respiratory sinus arrhythmia, startle reactivity, etc.[43]

Using this data, AI systems can detect early warnings of mental health conditions. It is more reliable than using only self-report predictor variables because it uses neuro-physiological features such as speed features and biomarkers. While the literature focuses on healthcare workers, it can be extended to anyone experiencing high stress levels due to the COVID-19 pandemic.[44]

AI Healthcare in Vermont

A new Vermont startup, Biocogniv, utilizes data from electronic health records to make predictive suggestions to health care providers.[45] In response to COVID-19, Biocogniv trained its AI to analyze bloodwork from both positive and negative COVID-19 patients to identify patterns. The machine learning software could then predict, from bloodwork, when someone was quite unlikely to have Covid-19 or if the result was inconclusive.[46] Training and testing of accuracy conducted by scientists of the company concluded the machine learning software demonstrated "high rule-out accuracy for COVID-19 status, and might inform selective use of [polymerase chain reaction (PCR)]-based testing.[47]

Issues with the use of AI

There are ethical issues that arise with the use of AI. The algorithms may be difficult to understand as many AIs now develop their own algorithms through learning and mimicry, making them both smarter and harder to understand.[48]

One issue is that data must be openly shared and widespread, because "a predictive model is only as good as the data it is based on"; poor communication between national governments or international institutions can lead to poor predictive modeling.[49] During the 2013-2016 Ebola

virus outbreak, clearer communication between the World Health Organization and national governments would've provided better data to model the virus's spread.[50]