AI in Pandemics: An Effective Tool Jeopardizing Privacy?

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It was December 31st, 2019, when BlueDot detected a spike of unusual pneumonia cases in Wuhan, revealing humankind's new enemy to epidemiologists, nine days before the official announcement from the World Health Organization [1]. BlueDot's machine learning (ML) model predicts outbreaks of infectious diseases and their dispersion by processing a broad range of media reports. For instance, BlueDot successfully predicted the 2016 outbreak of the Zika virus in Florida, six months before officials did, by analysing social media posts and news articles [2]. A wave of crisis and disaster was about to plague humanity worldwide. Could artificial intelligence (AI) become humanity's helping hand in the quest to end the pandemic?

The collapse of systems and economies caused by the coronavirus pandemic has exposed humanity's vulnerabilities. World leaders, scientists, and the general population alike were desperate for information. Therefore, a scientific approach was taken: understand, predict, contain. However, the stream of collected data on the pathogen and its behaviour is too overwhelming for human brains to process. The data processing capabilities of AI could be the revolutionary tool to understand and curb the pandemic, but there are also many concerns from wider civil society leading to a reluctance to fully utilize it at the expense of personal privacy.

AI's Role in Understanding the Pandemic

From forecasting the spread, suggesting efficient regulations, to identifying those most at risk, AI has played a vital role in helping us understand the the pandemic. Furthermore, cutting-edge AI technologies aided the development of mathematical models such as Susceptible, Infectious and Recovered (SIR), Global Epidemic and Mobility (GLEaM) and Transportation Analysis and Mobility (TRANSIMS) models. From the SIR model, the number of positive cases and the rate of transmission can be predicted helping government officials take swift action. The latter two models use physical contact patterns based on travel to predict the dispersion of COVID-19 as well as other viruses [3,4]. AI also identifies those at higher risk of complications and in turn recommends measures they can take to protect themselves. For example, ClosedLoop, an AI-startup, has created a vulnerability index, 'C-19 Index', with its predictive model based on a patient's medical history [5].

Invasive AI Applications

Over the past year, highly invasive surveillance technology has proven itself effective for pandemic management. For instance, China's problematic 'Social Credit System' assesses the "trustworthiness" of each individual and assigns citizens 'social credit scores' based on their actions [6]. This system arguably violates the right to privacy but has been successfully adapted to curb the pandemic. Biometric scanners have been enforced at exits of apartment complexes to track individuals leaving their homes. A network of 200 million surveillance cameras then tracks them throughout their day in public spaces [7]. Big Data is crunched by ML algorithms that calculate the amount of potential social interactions. Furthermore, the mobile app WeChat has been key in gathering extra data,

from goods purchased to aiding in contact tracing based on messages. If AI detects unusual actions like a citizen purchasing fever medication, that person may be subject to medical investigation. Based on the data from these authoritarian AI applications individuals are assigned a mobility level (green, amber or red), limiting their freedom of movement [8].

Less Invasive AI Applications

In the Western world, where privacy is an inalienable right, AI has been implemented in less invasive and less effective technologies to contain the pandemic. Examples are AI-enabled COVID-19 screening methods such as cough recordings. The Massachusetts Institute of Technology has been most successful with this method and created the largest cough dataset. They trained an existing ML model with four neural networks with labelled data. Its strength lies with asymptomatic case detection where the model is 100% accurate. This proves that there are no truly asymptomatic patients. In the future, this method could be a simple and free pre-screening test performed each morning [9]. Deep learning (DL) algorithms are also detecting lung abnormalities from chest x-rays as well as computed tomography scans caused by the novel virus. This has helped to massively reduce the workload burdening radiologists [10].

In Australia, AI monitors patients remotely with the use of wearable devices. AI analyses the data and alerts doctors if the conditions have worsened [11]. In hospitals, AI-enabled robots protect health workers and save precious time by serving food and medicine to contagious patients and disinfecting rooms [12]. Furthermore, ML-based frameworks identified potential treatments like baricitinib and DL systems predicted targetable protein structures within weeks which aided vaccine development [13,14]. This is an example of how AI can aid in critical aspects of pandemic management without posing a threat to privacy.

Limitations and Ethical Concerns

The accuracy of the information fed to AI systems depends immensely on the amount of monitoring the population is willing to undergo. In liberal countries, the implementation of AI has not been as effective as in China due to strict privacy laws. The fact that positive cases have occurred almost 1,000 times more frequently per capita in the United Kingdom than they have in China reflects the difference AI-enabled surveillance can make in pandemic management [15]. Many European nations have attempted a soft version of contact tracing, inquiring quarantined people about their recent contacts as well as by gathering data on crowd movements using anonymised mobile-phone GPS records [16]. These and other attempts, like introducing obligatory registration at restaurants, were implemented temporarily in some regions in Europe to prevent potential corona clusters [17]. However, these highly bureaucratic measures were often unsuccessful and proved inefficient compared to the consistent surveillance undertaken by AI models employed in China.

On the other hand, the Chinese population is immersed in a network of surveillance that continuously gathers sensitive data, without explicit consent. Concerns have been raised about the possible abuse of data by government entities or corporations [18]. Another concern is that these "intrusive measures" may be institutionalised and become a normal part of daily life even after the pandemic has been overcome [19]. Governments and corporations might argue that these technologies can predict and prevent future pandemics and therefore these measures will likely be kept in place.

This leaves us grappling with a tricky ethical dilemma, a question that lies at the heart of pandemic management. Should we sacrifice our individual freedom in favour of efficient virus containment? As shown above, AI is not only capable but also very suitable for analysing the pandemic. It provides a multitude of functions vital for scientific advancements to halt COVID-19. But to unleash its full potential, AI must be trained and consistently provided with accurate and diverse data. This advanced feature selection can only be acquired through a process of thorough screening and tracking of citizens, which clashes with most liberal nations' tradition of handling private information with utmost discretion. Most of the population doesn't feel comfortable with the idea of handing over personal data for AI companies to process. At

present, the concerns involving the abuse of disclosed data seem to outweigh the possible benefit of saving numerous lives. However, even the most sophisticated algorithms cannot predict how peoples' priorities will change in the future. If mankind decides to sacrifice its privacy and provide AI with the necessary information, thus making use of its full potential, a future devoid of severe pandemics could be within reach.

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