Perspectives on the Information Technologies Being Used in the Battle Against COVID-19

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Information technology (IT) has been paramount in the battle against COVID-19. This paper reports the initial findings of a review of 212 research articles on IT-based technologies that were used to help aid in the battle against COVID-19. The study systematically identified 212 research articles and evaluated the technologies that each article reported on. The analysis found 78 unique technologies. Subsequently, the 78 technologies were categorized into five groups. This paper discusses these five groups of technologies and offers perspective on what studies need to be conducted to better guide the use of IT in the fight against COVID-19 and future pandemics.

Keywords: technology and COVID-19, contact tracing, IT and pandemics, information technology and disease

INTRODUCTION

Since the 1970s, IT has been used to help stop the spread of disease. The outbreak of COVID-19 in the spring of 2020 has put the spotlight ITs role in stopping the spread of the disease. IT has played a pivotal role in the battle against COVID-19, as IT has provided information and insight that has been instrumental to helping to curb the spread of the disease. Although there is consensus that IT has been instrumental in helping to minimize the spread of COVID-19, little is known on the types of technologies being implored and their impact.

This study aimed to provide an overview the technologies that have been implored in the battle against COVID-19. To study this, we systematically reviewed 212 academic articles that looked how technology is being used to fend off the pandemic. Our study surfaced 78 different technologies that are being used to aid in the battle against COVID-19. We grouped these technologies into five areas: 1) artificial intelligence (AI); 2) Geographic Information Systems (GIS); 3) tracking and surveillance; 4) drones and robotics; and 5) wearable and online resources.

The purpose of this paper is to overview our initial results and provide perspective on the technologies that are being used and what their impact has been. Below is an overview of the technologies being used and the highlights of some of the notable studies that have looked at each group of technologies. The last section discusses some of these technologies' drawbacks and the research that needs to be conducted on ITs use in the fight against COVID-19 and future pandemics.

TECHNOLOGIES

AI

Artificial Intelligence is using computers (aka machines) to mimic cognitive functions. In the last five years, IT has been broadly applied in healthcare to identify causes of disease, cures for disease, track experiments, and track patient histories. All these uses are being applied in the battle against COVID-19. For example, Vaishya et al., showed how artificial intelligence (AI) can detect clusters of infected people and predict COVID-19 activity. In China, AI-based facial recognition technologies are being used to track infected patients. China is using AI to guide the disinfection of areas exposed to COVID-19. AI is also being used to automate medical imaging and identify the potential of existing drugs for treating COVID-19 patients. Closely related, Internet of Things (IoT) is useful for patients to recognize the early symptoms of COVID-19.

GIS

Geographic Information Systems (GIS) are being used to map the spatial and temporal distribution of COVID-19 cases and predict the risk of infection. For example, a geo-social app and public service platform was developed in China to enable users to check if they have been in contact with infected patients. GIS technologies have also been applied for disease incidence rate analysis in the USA. In Melbourne, GIS has been used to identify vulnerable urban neighborhoods based on age, disability, and access to healthcare.

Tracking and Surveillance

Numerous applications have been developed to track and survey COVID-19 outbreaks. For example, Dong et al. (2020) developed a web-based dashboard to track the COVID-19 cases worldwide. The dashboard is free, interactive and regularly updated. Xu et al. used a similar approach in developing a web-based dashboard for tracking the COVID-19 pandemic. The spreading of the virus in China was tracked by using mobile phone data. The government used mobile geopositioning in Taiwan to track potential contacts between the local population and passengers from the Diamond Princess ship that disembarked in Taiwan. Mavragani used online search traffic data from Google to understand the spreading of COVID-19 across the most effected European countries. The US and UK used rapid online surveying to access the knowledge and perceptions about the virus.

Drones and Robotics

Drones and robots are being used at scale to help minimize human contact and to increase efficiency of tasks related to fending off COVID-19. For example, drones have proven to be effective in delivering medical equipment and disinfecting areas. The Chinese government has over 50,000 drones that it has been using for these purposes. In addition to drones, Mazzoleni et al., examined the use of Robots in delivering medical interventions and found that they are highly effective and help minimize the spread of the disease. Similarly, Virk et al., found that Robots are an effective solution for distancing patients and medical workers.

Wearable Sensing and Online Resources

Wearable technologies are being used to help monitor populations. For example, Chung et al., used the HEARThermo wearable device to continuously monitor the body surface temperature and heart rate of selected groups in Taiwan, and this data proved effective at catching COVID-19 outbreaks. Pérez Sust looked at mobile health apps, health web portals, and online videoconferencing systems. Their results suggest that these online tools helped in education and early diagnosis of the disease. Similarly, Portnoy shows that telemedicine is having a significant impact on early diagnosis of COVID-19. Online learning materials have also proven effective in educating workers and the public. For example, the World Health Organization developed a free course called ‘Emerging respiratory viruses, including COVID-19: methods for detection, prevention, response, and control,’ this course has been viewed over 30 million times.

TECHNOLOGY DRAWBACKS

Although it is too early to determine the impact of these technologies, it is evident that IT has a positive impact in the fight against COVID-19. However, there are some drawbacks relating to the technologies that are being used. For example, many of these technologies infringe on personal privacy. This is especially true in countries with extensive surveillance systems, and it has proved challenging for governments to balance data privacy and public health.

Another major drawback is the cost of the technology. It is estimated that $30B has been spent on IT to prevent the spread of COVID-19. Cost has been a challenge for poorer countries that do not have the capital to invest in advanced technologies. Curbing the spread of the disease is even more important in poorer countries because they do not have the healthcare resources to properly treat it. Consensus is growing that a multilateral collaboration is needed to help provide the most impactful technologies to poor countries because it will help curb the spread of the disease all around the world. However, as of October 2020, little aid has been sent to poor countries to implement IT to fend off COVID-19. Moreover, it will take longer for poorer countries to implement COVID-19 fighting technologies because they do not have the knowledge or infrastructure to implement advanced technologies.

PUBLIC HEALTH CONCLUSION

The purpose of this article was to provide an overview of the initial findings from our review of the technologies being used in the fight against COVID-19. Our preliminary findings show that IT is being broadly applied in the fight against COVID-19 and looks to be having a major impact. However, much more research relating to IT and its use against COVID-19 needs to be conducted. For example, considering the limited resources available to fight off the disease, studies need to compare the impact of different technologies to determine which ones deserve the most funding. In addition, studies need to look at the most effective combination of technologies for fending off pandemics. Studies also need to examine the cost-benefit analysis of funding IT in poorer countries.

In summary, our initial study has provided perspective on the technologies being used and their positive impact in the fight against COVID-19. It has provided perspectives for future studies to examine the topic.

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