



BRIEFING NOTES

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HOW TO PREPARE DND/CAF FOR FUTURE PUBLIC HEALTH CRISES?

Authors: Bitā Afshar¹ and Kash Khorasani²

1 Graduate student, Department of Electrical and Computer Engineering, Concordia University, Montreal, Canada

2 Professor, Department of Electrical and Computer Engineering, Concordia University, Montreal, Canada.

SUMMARY

- ✚ COVID-19 is one of the today world's biggest concerns and this challenge should be managed promptly because of the high risks of mortality and significant damage to the world's economy.
- ✚ Technology has a remarkable role to combat COVID-19 and more than ever people rely on technology and science. Technology provides solutions to address COVID-19 pandemic in an interconnected world and precise scientific communication and contributions would eventually lead the pandemic under control in time.
- ✚ There are advanced approaches to anticipate and treat the COVID-19 pandemic which are based on data analysis, and artificial intelligence (AI). In this briefing note (BN) a few potential methods are proposed to allow us avoid such catastrophic events in the future.
- ✚ What equipment, training, doctrine, capabilities, among others, would better prepare DND/CAF for future public health crises? How technology can support governments in anticipating, responding, and managing public health crises under the state of contagious diseases such as COVID-19?

CONTEXT

- ✚ Contagious diseases represent as one of the 21st century's major health challenges for humanity. Recently, the COVID-19 pandemic has affected practically all countries and has led to death of several thousands of people and many direct consequences such as economic crisis for industries and countries.
- ✚ While governments have attempted to manage this pandemic, unpredictable cases have come out during the early days of the Coronavirus spread [1], [2]. It could be understood that in addition to mental and physical health risks which are resulting from this urgent situation, Coronavirus outbreak has had significant economic burden to individuals and governments.
- ✚ In this BN, we will investigate the technology's role in enhancement of the country's capabilities and capacities to respond to increasing threat of contagious diseases in the future.
- ✚ Digital technology has a key role at time of the COVID-19 pandemic and more than ever digital infrastructure, including Artificial Intelligence (AI), robotics and data analysis, can help us tackle the COVID-19 crisis [3].
- ✚ For instance, using 3D printers has helped hospitals to overcome certain medical shortages, Apps to monitor oxygen in the blood for monitoring COVID-19 patients at home, robots for ventilation purposes, cleaning and sterilization and serving food and

medicine to decrease human to human contact, AI to diagnose CT scans and patients cough sound among many other vital functions [4].

- ✚ Technology specialists and researchers are investigating and studying this pandemic from various angles and perspectives in order to be able to tackle all kinds of challenges and difficulties that are resulting from this outbreak.
- ✚ One of the significant directions of research has been in developing the most optimal and accurate epidemic patterns. It should be considered that each infectious disease has a special pattern that is achieved by analyzing wide range of related big data. Appropriate data analysis techniques and well-developed methods will lead to accurate mathematical models.
- ✚ In the next step these models are carefully and comprehensively analyzed and simulated to obtain optimum parameters in the models. For instance, one of the prominent compartmental models is Susceptible-Infected Recovered (SIR) model which is categorized into groups of people who are naive to the disease, those with disease and those who are recovered from the disease and now they are immune. From these modeling and simulations, the importance of each parameter is determined such as social distancing measures, local lockdowns and quarantine time duration [5-15].
- ✚ Artificial Intelligence (AI) and Machine Learning (ML) are powerful tools which have a number of applications during COVID-19 pandemic. Some of the main applications are in (a) detecting and diagnosing of the infection in the early stages such as CT image analysis using different techniques such as deep learning by using pre-processing images with convolutional neural networks, (b) monitoring infected patients during treatment, (c) highlighting red spots based on the number of infected people in a specific region, (d) using the available data to forecast the nature of virus, (e) testing medicine and vaccines in real-time, and (f) reducing the workload of healthcare assistants [16-24].

CONSIDERATIONS

- ✚ All the above-mentioned methods investigate various aspects of the COVID-19 pandemic challenges and each of them do provide and suggest unique solutions for this challenge. However, none of them are able to overcome and find a universal unique solution.
- ✚ It should be pointed out that by combining the above different domains of science, namely data analysis and AI/ML one would be able to obtain and determine promising solutions to combat not only the COVID-19 pandemic but also to some of the most advanced biological structures that could put human lives in danger.

NEXT STEPS (If applicable)

- ✚ In case of occurrence of pandemics and contagious diseases, specialists in different fields should be gathered in groups to study and investigate the subject from various points of view.

- ✚ All the above-mentioned approaches discussed earlier in the Context section are to be utilized for prediction and treatment remedies and solutions for the already existing COVID-19 pandemic. Most advanced countries have capabilities to utilize these approaches and methodologies as prediction tools before another pandemic occur.
- ✚ Given that the evolutionary history of viruses is unclear one could study the dynamic changes of their biological structure and explore the effects of weather, temperature, sun light, air pollution, population density and medicine side effects on their structure. Based on information collected from previous viruses one could at least simulate the possible biological structures on novel viruses and bacteria. It should be noted that specialist from different domains are needed in order to pave the way of exploiting these new approaches.

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