Sociotechnical Synthesis

STS 4600

Spring 2021

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Bachelor of Science in Computer Science

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Approved _____ Date _____

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In today's modern world full of state-of-the-art technological innovations, it is natural for society to be increasingly globalized and interconnected. Technology giant Facebook boasts 2.8 billion monthly active users, while 5.4 billion searches are processed by Google every day. It is estimated that 2.5 quintillion bytes (2.5 * 10^9 GB) of data are created every day, of which a large portion is served over the internet, stored in databases and cloud data centers, and fed into analytical models. Almost every aspect of human life is being integrated with technologies, specifically those dealing with storing data to make informed decisions and connect people in the real world.

Surprisingly, big data did not predict the extent to which the Covid-19 pandemic would cause chaos. Ironically, it was the connectiveness of the planet – rapid circulation of people, goods, and animals – that contributed to SARS-CoV-2 making its way across global borders and subsequently forcing humans to quarantine. Scientists believe the virus originated in a zoonotic spillover involving an animal population - most likely the horseshoe bat – and a currently unknown intermediary animal host, which spread the virus to humans. The coronavirus was contracted by humans and carried, along with 380 trillion other viruses that every human carries, back to public where it began spreading to other humans. Ideally, this would have been detected and contained before becoming an outbreak, epidemic, or pandemic. However, infrastructure to deal with or prevent situations like this were not in place.

By April 2021, 134 million cases of COVID-19 occurred across the world, of which 2.9 million people died. Around 1.7% of the global population of 7.9 billion people is estimated to have been infected, assuming each confirmed case is a different person. The spread of the virus was not uniform across the globe and accumulated in certain regions, such as the United States. By April 2021, 9.45% of

Americans contracted the virus, of which 22% died. The virus did not just kill; it contributed to massive social, political, and economic disruptions.

When an outbreak reaches this scale of magnitude, it is necessary to think about how it can be prevented in the future. When such a catastrophe cannot be prevented, it is necessary to at least have measures in place to mitigate potential damages. In the future it will be vital for countries to utilize technology-powered disease reconnaissance and surveillance systems, robust outbreak investigation systems, and plans crafted for making swift, science-based public health decisions. At the same time, privacy of individuals must be maintained. Managing the propagation of a virus through a population has historically been a challenging task because health information is incredibly sensitive.

A valuable tool for limiting the spread of a disease is contact tracing: a process of determining who has a disease and who they may have given it to. If all infected individuals and contacts are identified and quarantined, a disease cannot spread. In theory, this method significantly aids in limiting disease spread if executed properly, but due to an assortment of socio-technical, privacy, and ethical issues this is hard. However, like in many other fields, technological innovations present new ways of implementing contact tracing systems. It is essential to explore the applications, ethics, and pitfalls of such technologies, which can help minimize impacts of future global health crises.

The idea of Digital Contact Tracing (DCT) is to use smartphones to keep track of encounters where people are likely to transmit diseases, rather than relying on human “contact tracers” to investigate all contacts of an infected individual. Although theory and practice are the same in theory, in practice, they are not. While automation in many fields is enticing due to potential benefits in terms of money, time, and other metrics of efficiency, it usually takes a long time to implement and perfect. The STS Research paper investigates how DCT effectiveness is limited by privacy concerns and misconceptions, technical capabilities, and public health policy and infrastructure.