Life science and its implications for society— (in addition to COVID-19)

ISTAS21 Special Session on Friday October 29th, 2021, 9:15-10:45am (EDT)

Session Presenters

Sameer Antani
IEEE Computer Society

Carole Carey
IEEE Engineering in Medicine and Biology Society/Standards

Nahum Gershon
IEEE LSTC/Consumer Technology Society

Mohamad Sawan
IEEE Circuits and Systems Society, VP Publications

Chair/Moderator

Luis Kun
IEEE Society of Social Implications of Technology

Scribe

Thenusha Satsoruban
University of Waterloo

Program Description—**This multidisciplinary panel of experts in medicine considers the applications and impacts of technological innovations like Artificial Intelligence, automation, and the Internet of Things, focusing especially on addressing global health challenges, particularly for the post-COVID-19 pandemic era, including in developing nations and underserved populations. Panelists will discuss the opportunities and challenges of telemedicine, cybercare, homecare, treating noncommunicable diseases and preventing communicable diseases, as well as the development of reliable policy and standards for privacy and security of digital innovations.**

Keywords—*Telemedicine, telehealth, infrastructure, machine learning, artificial intelligence, COVID-19*

Kun opened the discussion with a look at current infrastructures interdependencies, running the gamut of banking, government, wastewater, emergency response, oil, electricity, transportation and telecom. He then delved into the challenges faced by the health sector and defined relationships between global risks and infrastructure challenges. A significant challenge among them facing healthcare delivery is that the world population between 1950 and 2020 has gone from 2.5 billion to 7.8 billion inhabitants, while life expectancy went from 45.5 years to 72.3. As the population density increases, so does the possibility of spread of communicable (infectious) diseases. In addition, thanks to advancements in science and technology, we live longer, and parts of our bodies require fixing or replacement. These translate into unsustainable increases in the cost of healthcare. How does our system accommodate for this growth? And how can it be sustainable for countries with aging populations that often require more frequent care as they grow older (chronics), and the nature of that care becomes more specialized.

Next, speaker Sameer Antani invited the group to look at data intelligent clinical image processing as it relates to diagnostic decision making. Antani considered the role of machine learning and artificial intelligence (ML/AI) in clinical research in the post-pandemic era. He emphasized that ML/AI serves as an augmentation of human decision making and not as a direct replacement. ML/AI models are, of course, data driven. However, in a post-pandemic world, where clinical expertise is at a low, the data on which such models are built may be limited or incomplete.

Carole C. Carey then shifted the discussion to the IEEE standards on and projects to support telemedicine. She defined telemedicine to be a subset of telehealth, referring to remote clinical services. And she defined telehealth as the use of "communications technology in health care delivery, information and education" across distances. After a discussion of telehealth applications, Carey spoke of the effects of COVID-19 on health care research and the challenge of sharing analytics in remote environments. To mitigate this challenge, the IEEE has proposed standard P2795, an analytic exchange protocol, which aims to identify the requirements for using shared analytics over secured and unsecured networks, including for telehealth, across disparate applications and domains without breaking rules of privacy.

Third to speak, Nahum Gershon opened with a discussion of accuracy in fitness and health monitoring devices like the Fitbit and the Apple Watch. He spoke of an experiment he conducted on himself, in which he wore these devices in various configurations on the body and observed differences in their accuracy, finding that there was a margin for error depending on how and where they were attached to the body. Based on this and on the fact that there are things that are mainly visible during face-to-face interactions, he suggested that telemedicine should never entirely replace in- person medical care, though it could offer a helpful alternative.

The final speaker, Mohamad Sawan, addressed COVID-19 detection techniques that involve smart devices and biosensors to receive faster and more accurate test results. COVID-19 poses timeframe difficulties in that the virus hibernates for fourteen days and easily mutates. This results in lab and clinical limitations such as lack of space, staff availability, clean environments, a lack of accuracy in temperature and a lack of specificity in antibody detection. Though these challenges pose difficulty in obtaining rapid and accurate results, Sawan's team offered hope by achieving new detection technique and experimental validation currently in clinical phase collecting samples and begin the detection process on-site using the virus' signature.