Computing in Telemedicine

Joanna F. DeFranco, The Pennsylvania State University

Digital Object Identifier 10.1109/MC.2023.3286957
Date of current version: 23 August 2023

Telemedicine has been evolving for over 100 years. In this special issue, we include five innovative and exciting contributions related to telemedicine.

Although not originally called telemedicine, it has been around for more than 100 years, beginning when the electrical heart signal of a patient was recorded remotely for the first time. Telemedicine literally means healing at a distance. In fact, many think the term only refers to remotely delivering patient care. In reality, technology advances have expanded telemedicine to include much more. Telemedicine has disrupted the healthcare industry as it has significantly changed the way businesses, industries, and consumers function.

Technology has advanced the design of medical devices, robotic-assisted surgery, and remote treatment and monitoring, making healthcare more flexible, adaptable, and accessible and thus changing the way the healthcare industry operates.

Treatment plans and patient control over their own conditions have also been greatly improved by telemedicine. In addition, telemedicine advances have improved early diagnoses, treatment, and monitoring both at home and in healthcare facilities. The goal of this special issue is to discuss the state of the art for computing in telemedicine.

ABOUT THIS ISSUE

In this issue, we include five telemedicine articles presenting innovative and exciting contributions relating to computing in telemedicine. The first article[A1] proposes an architecture to process thousands of simultaneous incoming streams of data to address the limitations of using a single cloud for heart patient monitoring. This issue occurs for patients who need heart monitoring in real time but who often do not have a consistent Internet connection. Thus, this architecture would allow batch processing when offline patients connect online.

Our next article[A2] presents the evolution of intraoperative neurophysiological monitoring (IONM). Technology advancements have improved IONM, a service provided during surgical procedures that pose a risk to a patient's nervous system. Previously, this service was limited due to a lack of funds and personnel. Technology advancement has increased the efficiency, availability, and safety, making this a standard of care.

The next article[A3] discusses the challenges of healthcare deserts (i.e.,

APPENDIX: RELATED ARTICLES

A1. S. Ristov et al., "Serverless electrocardiogram stream processing in federated clouds with Lambda architecture," *Computer*, vol. 56, no. 9, pp. 18–27, Sep. 2023, doi: 10.1109/MC.2023.3281873.

A2. J. R. Balzer, J. Caviness, and D. Krieger, "The evolution of real-time remote intraoperative neurophysiological monitoring," *Computer*, vol. 56, no. 9, pp. 28–38, Sep. 2023, doi: 10.1109/MC.2023.3283851.

A3. P. Kathiravelu et al., "The telehealth dilemma—Health-care deserts meet the Internet's remote regions," *Computer*, vol. 56, no. 9, pp. 39–49, Sep. 2023, doi: 10.1109/MC.2023.3252945.

A4. N. Grayson et al., "Mitigating privacy and cybersecurity risks affecting telehealth remote patient monitoring ecosystems," *Computer*, vol. 56, no. 9, pp. 50–61, Sep. 2023, doi: 10.1109/MC.2023.3253044.

A5. T. Watanabe, C. Xia, K. Fujita, and Y. Sugiura, "Screening for carpal tunnel syndrome using daily behavior on mobile devices," *Computer*, vol. 56, no. 9, pp. 62–70, Sep. 2023, doi: 10.1109/MC.2023.3259001.

geographic areas with limited access to healthcare services). These areas also have limited access to the Internet, thus limiting access to telehealth options. This article addresses these telehealth limitations with other connectivity options that can be leveraged to gain the benefits of telehealth in remote regions of the world.

The fourth article[A4] provides guidance to mitigate the privacy and security challenges in telehealth patient monitoring for patients with chronic conditions. Key observations, findings, and mitigations from the National Institute of Standards and Technology's SP 1800-30 "Securing Telehealth Remote Patient Monitoring Ecosystem" are presented. The guidance adheres to the National Cybersecurity Center of Excellence's common methodology in examining architecture, performing risk assessments, reviewing common use cases for a system, and applying appropriate mitigating controls derived from the analysis.

The final article[A5] in this special issue on computing in telemedicine describes a novel way to screen for disorders using mobile devices. A second special issue is scheduled for October 2023, with other articles on computing in telemedicine. We hope that you will enjoy reading this issue as much as we have enjoyed working with the immensely talented set of authors to bring them to you!

ABOUT THE AUTHOR

JOANNA F. DEFRANCO is an associate professor of software engineering at The Pennsylvania State University, Malvern, PA 19355 USA, as well as the associate director of the doctor of engineering degree program. She also has a faculty appointment in the Computer Security Division, National Institute of Standards and Technology, Gaithersburg, MD 20899 USA. Contact her at jfd104@psu.edu.

Digital Object Identifier 10.1109/MC.2023.3297454