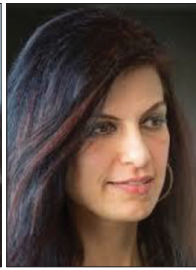


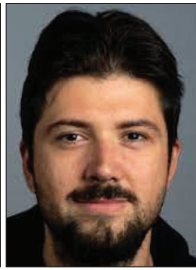
NETWORKING TECHNOLOGIES TO COMBAT THE COVID-19 PANDEMIC



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In late 2019, a new virus was discovered, namely SARS-CoV-2. This strain causes severe acute respiratory syndrome coronavirus 2, defined as COVID-19. The disease soon spread all over the world, thus becoming a pandemic. It has been almost two years since worldwide restrictions on our lives started, and the traditional way people live and work has completely changed.

In order to reduce the number of infected cases, contact tracking techniques have been widely deployed. To this end, Information and Communications Technologies (ICT) are playing a major role in supporting our new lifestyle, involving self-quarantine, working from home, virtual conferencing, online education, etc.

This Feature Topic (FT) presents new advances in technological solutions to contrast and fight the global COVID-19 pandemic, and use such techniques to face upcoming diseases in the future. ICT-based approaches represent an effective technological tool, not only to enhance the quality of our lives during the pandemic (e.g., by means of new solutions for eLearning, eHealth and patient monitoring), but especially to forecast pandemic outbreaks, monitor and limit social contacts. Such objectives have been deeply addressed in the papers collected in this FT; specifically, five articles have been selected for publication.

The first article, entitled “Quickest Detection and Forecast of Pandemic Outbreaks: Analysis of COVID-19 Waves”, illustrates how it is possible to detect and forecast pandemic outbreaks by means of signal processing techniques. In this article, Soldi *et al.* present a threefold-objective integrated framework, aiming to (i) detect the behavior of an exponential growth of the contagion, (ii) estimate, and (iii) forecast COVID-19 pandemic waves, by exploiting publicly available data from the United States.

The article “Personal Devices for Contact Tracing: Smartphones and Wearables to Fight Covid-19” by Ng *et al.* reviews current digital contact tracing solutions, based on both smartphones and wearable devices. The authors investigate the sensing feature available on such devices to detect the proximity between a couple of users.

An alternative and interesting solution to contrast social gatherings is presented by Giuliano *et al.* in the article “Integration of Video and Radio Technologies for Social Distancing”. The authors describe a system that can be used to maintain social distancing in public spaces. It is based on the integration

of computer vision techniques for rapidly detecting the presence of gatherings in the area and local radio technologies to identify and alert people in case of gatherings.

The article “5G and Beyond for Contact Tracing” deals with the use of ICT solutions for contact tracing. As known, today there are many device-to-device applications based on short range proximity technologies, such as Bluetooth, but they show inadequacy and uselessness. The solution proposed by Giustiniano *et al.* is based on the 5G RAN and core network architecture. The 5G network has shown to be suitable for contact tracing and people flow monitoring, thanks also to a massive deployment of cellular networks, a high security level and the increasing support for efficient localization facilities.

Finally, the article “Network-Based Contact Tracing for Detection of Covid19 Contagions: A Privacy-Preserving Approach” by Andreoletti *et al.* presents a privacy-preserving protocol for network-based contact tracing, based on existing privacy-enhancing strategies. Furthermore, this kind of solution exploits geolocalization in next generation networks (e.g. 5G) and can be adopted by mobile operators to passively trace users’ mobility and contacts, with localization error lower than 1 m.

The guest editorial team would like to thank all the authors of the 41 papers submitted to this feature topic. We also thank the reviewers who provided thorough and timely reviews, and Prof. Tarek El-Bawab, Editor-in-Chief (EIC), for his strong support and continuous overview, as well as the *IEEE Communications Magazine* staff for their support in the preparation of this timely FT.

BIOGRAPHIES

ANNA MARIA VEGNI [SM] has been a tenure-track assistant professor in the Department of Engineering at Roma Tre University (Italy), since 2020. She received the Ph.D. degree in biomedical engineering, electromagnetics and telecommunications from the Department of Applied Electronics, Roma Tre University, in 2010. She received the M.Sc. degree cum laude in electronics engineering from Roma Tre University in 2006. In 2009, she was a visiting researcher in the Multimedia Communication Laboratory, directed by Prof. Little, in the Department of Electrical and Computer Engineering, Boston University, Boston, MA, working on vehicular networking supported by heterogeneous wireless networks. In 2021, she received the Italian Habilitation (Abilitazione Scientifica Nazionale) for a Full Professorship in telecommunication engineering. She is involved in the organization of several IEEE and ACM international conferences and is a member of the editorial board of *IEEE Communications Magazine*, *JCN*, *Ad Hoc Networks*, *JNCA* Elsevier journals, and *ETT Wiley journal*.

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