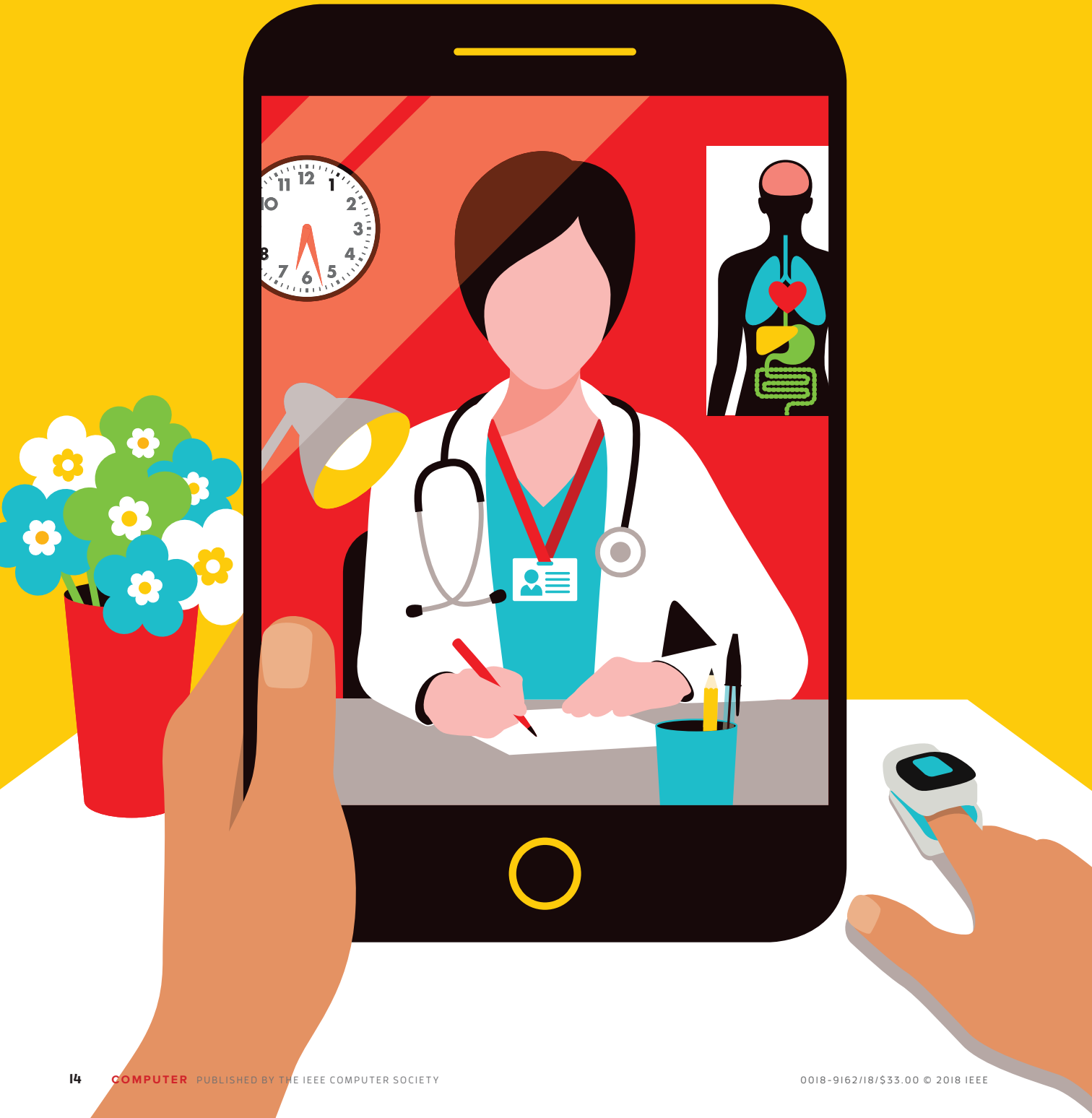


M-Coaching:



Towards the Next Generation of Mobile-Driven Healthcare Support Services

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Smartphones are revolutionizing the way people perceive and interact with both physical and cyber worlds. Mobile coaching (m-coaching) is expected to become a crucial contributor to such a revolution by enabling a new way of providing and receiving personalized healthcare.

How important are smartphones in your life? You may have asked this question yourself or have been asked this question by someone you know. The short answer for most people is “very.” And the trend seems to grow toward an even greater dependency.

Is this bad?

Well, in general terms, as long as dependency does not translate into addiction, smartphone users will mostly encounter benefits. This positive perception certainly explains the significant adoption of smartphones in recent years,¹ which has increased dramatically, irrespective of gender, age, or social background. As a consequence, smartphones have helped—and they continue to do so—to

democratize and accelerate the provision of many services that would otherwise be difficult to obtain. Healthcare is perhaps the most necessary and relevant of such services, and smartphones are helping to pave the way to a new generation of care.

While there are several relevant applications of smartphones in healthcare,² such as remote diagnosis, training for workers, or epidemic outbreak tracking, in this issue we particularly focus on the use of smartphones as a potential enabler of a recent emerging scientific area termed e-coaching. As we introduced in an earlier issue,³ e-coaching exploits the enormous possibilities offered by modern smart systems to persuade people toward a given goal via personalized education

and guidance. E-coaches are virtual entities that implement human skills such as observation, questioning, reasoning, or advising to provide tailored and effective assistance to individuals. Smartphones are instrumented by default with a myriad of multimodal sensing, machine learning, and multimedia communication and interaction capabilities that make them particularly suited to embody e-coaching solutions.

Multimodal sensing. The vast majority of smartphones implement a variety of physical sensors such as accelerometers, gyroscopes, or magnetometers that were originally intended to support basic operations such as screen rotation. These sensors are now



used in several commercial applications to estimate the user's activity levels or to track their mobility patterns. Other communication-based sensors such as Bluetooth or Wi-Fi, which are primarily used for interfaces between smartphones and other devices and networks, are now being considered for their ability to detect social cues such as isolation and loneliness.⁴ Virtual sensors such as experience sampling methods are also being used for collecting user's self-perceptions to measure, for example, cognitive functioning.⁵

Machine learning. Until recently, mobile healthcare applications were mostly constrained in their functionalities by the limited CPU and memory capabilities of regular mobile devices. With the advent of more powerful smartphones, and APIs that allow developers to harness all the capabilities of the hardware, it is now much more feasible to run sophisticated machine learning algorithms on smartphones. That is the case of modern, computationally demanding strategies such as deep learning, which have shown spectacular results while operating on either servers or powerful workstations, and which are just lately becoming a real option on smartphones too.⁶

Multimedia communication and interaction. There is a clear trend towards mobile health, as smartphones and tablets are gradually becoming the preferred terminals and interface for the interactions between healthcare services providers and end users. Smartphones implement a myriad of communication means, such as messaging, audio, or video, which are of particular interest when it comes to

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advising users with potential disabilities. More advanced interfaces such as augmented and virtual reality can also be rendered in most smartphones, and as such, they are exciting options for building virtual scenarios and coaches to assist people. Novel concepts involving multiparty e-coaching are also exploring the use of distributed virtual agents over different interfaces to increase adherence and engagement.⁷

M-coaching, as it happens to occur alongside its alter ego, e-coaching, is still in its infancy. The enormous possibilities that m-coaching could bring to our current healthcare system could fairly be extrapolated to other relevant domains such as education, government, or industry. Committing to innovation in m-coaching demands a holistic and multidisciplinary approach, where people from different backgrounds and expertise join efforts to build the next generation of mobile-driven healthcare support services. Do you want to join?

IN THIS ISSUE

This special issue features three articles that address important technical and social aspects of m-coaching systems for healthcare applications.

In "Using eMMA to Manage Medication," Mauro Tschanz, Tim Lucas Dorner, Jürgen Holm, and Kerstin Denecke present a mobile-based electronic medication management assistant to empower patients in handling drug consumption, food interactions and relevance of taking their medication. Their system uses a chatbot, a technology increasingly available in multiple customer support services, to let the patient ask questions relating to their medication. In this manner, users can be coached with respect to their medication, reducing double prescription and medication misuse, and avoiding contraindications and medication errors. Not only does the system have an informative nature, however, it also gathers information on intake compliance via the user-mobile



conversation. Participants found the system easy to use and learn.

In “Social Media-based Conversational Agents for Health Management and Interventions,” Haolin Wang, Qingpeng Zhang, Mary Ip, and Joseph Tak Fai Lau also explore the use of mobile-hosted conversational bots, here to manage and facilitate smoking cessation. Through this intervention the authors found out the more conversations a participant becomes involved in, the less likely they would smoke in the same week. The authors also report on the challenges for the wide adoption of dialog systems in reality despite the advances in conversational agents, which can be lowered by switching human experts and agents.

In “Mobile Decision Support and Data Provisioning for Low Back Pain,” Simo Hosio, Jaro Karppinen, Niels van Berkel, Jonas Oppenlaender, and Jorge Goncalves describe a mobile application that offers crowd-based decision support for discovering treatments in addition to lifelog harvesting resources to facilitate low back pain research. The authors elaborate on the willingness of people to donate mobile sensor data, which turns out to be fairly related to users’ levels of savviness. The authors highlight the importance of including both expert and non-expert knowledge in the tool, in an effort to increase the interest and acceptance of users. The authors also elaborate on the importance of providing relevant incentives to scale up participation.

These three articles provide a unique insight into the groundbreaking work being undertaken in the m-coaching field. The opportunities that m-coaching will bring to healthcare and other domains are yet

to be explored, however, now more than ever we are prepared to embrace this amazing challenge. **■**

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