

## Chapter 22

# Virtual Communities, Machine Learning and IoT: Opportunities and Challenges in Mental Health Research

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### **ABSTRACT**

*Mental health challenges such as stress, anxiety and depression are on the rise worldwide. Health virtual communities (VCs) is a rising paradigm that has proven to be efficient and effective in delivering mental health interventions that address self-management, diagnosis and treatment targeting people facing mental health challenges. However, current Health VCs have limited application; they lack the ability to provide access to coordinated services and to continuously collect and integrate data originating from different devices in a streamlined manner. The Internet of Things (IoT) and machine learning represent a unique opportunity to expand the Health Virtual Community applications in the mental health domain; however, they represent a unique situation where challenges arise. This article will discuss the opportunities and challenges that virtual communities, machine learning and IoT represent for mental health research.*

### **INTRODUCTION**

Health informatics is at the verge of a profound technological change that will have a deep impact on the healthcare system in term of processes, policies and jobs. This article aims to explore the impact of Machine Learning, the Internet of Things and Virtual Communities on Mental Health research.

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## **MENTAL HEALTH: A GLOBAL EPIDEMIC**

Mental health is a global crisis with over 80% of people suffering from mental-health disorders living in the Global South (Ngui et al., 2010). The World Health Organization (WHO) considers depression as a global crisis (2018). In 2015, a study from the Canadian Mental Health Association showed that roughly one out of every five Canadians (at some point in their lives) will be diagnosed with a mental disorder, usually in the form of an anxiety disorder or depression (Canadian Mental Health Association, 2016). In the USA, 31% of college students experience mental health challenges (American College Health Association, 2009) and the numbers are similar in Europe (World Health Organization, 2014). The total economic cost of mental health in Canada amounts to more than \$14 Billion per year (Stephens & Joubert, 2001). In 2013, the United States spent around \$201 billion on mental disorders (e.g. stress, anxiety, depression). One cannot underestimate the need to provide continuity of care, including a myriad of related social services, to the people with mental illness.

## **THE ROLE OF INFORMATICS**

While non-medical based therapeutic interventions, such as mindfulness, Acceptance and Commitment Therapy (ACT) (Caset et al., 2018; Hoffmann et al., 2018; Ostergaard et al., 2018), and Problem Solving Treatment (Gojani et al., 2018; Ghasemi et al., 2017), exist and can address mental illnesses (e.g. anxiety, stress), they cannot be provided in face-to-face manner for every person in need for them for the simple reason of lack of large specialized professional body; besides, face-to-face solutions can be extremely costly. Informatics can play an important role in scaling up mental health intervention for the provision of professional mental health care, set management of mental illness, and mental health promotion and prevention.

Moreover, individuals with mental illness, do not only need health professional care but also associated social services. Indeed, people face social economic barriers when dealing with mental health; some of these barriers are related to accessibility, lack of financial and professional resources, and social stigma (Perlick et al., 2010), lack of available services (Kaur et al., 2018), help seeking avoidance (VanHeerwaarden et al., 2018), and cultural barriers (Leong & Kailbatseva, 2011). Hence, the need for technology-based solutions to overcome economic and social barriers in relation to mental illnesses is high. Indeed, technology can be built to be accessible, provide ability to reach remote services, allows discovery of available services in a certain geographic location, encourages overcoming cultural barriers and stigma by connecting people from the privacy of their rooms to online services, and it support a sense of anonymity and privacy (Morr et al., 2017). Hence, technology-based programs open the door for alternative solutions to provide therapy targeting those who would otherwise not have the ability to seek out or receive services.

## **HEALTH VIRTUAL COMMUNITIES: A RISING PARADIGM**

Virtual Communities or online communities are a group of people with shared interests and goal, specific roles, and connected through an information system and a myriad of devices (Rheingold, 2000; Nonnecke et al., 2006; Preece, 2000). When the members are connected through a mobile technology then

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