

Affect and Wellbeing: Introduction to Special Section

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THERE is still so much we do not know regarding how our emotional lives play out in digital experiences and how the design of systems, interfaces and interaction shape our emotions. How can technology support psychological wellbeing? How can we at least make sure that it does not hinder it? The majority of the research trying to address these questions seems to focus on identifying the problems that new technologies create or might create [1], [2] yet Human-Computer Interaction researchers, and particularly those in affective computing are paying increased attention to how new technologies can be used to support wellbeing.

Computers can afford multiple forms of transformational experiences. Some of these experiences can be purposely designed, for example, to detect and regulate students' affective states to improve aspects of their learning experiences [3]. They can also be used in computer-based psychological interventions that treat psychological illness or that preventively promote wellbeing, healthy lifestyles, and mental health [4], [5].

The application domain, so far referred to as 'positive computing' [6], [7] 'positive technologies' [8], [9], and 'positive design' [10], draws on ideas from positive psychology, and particularly from the extensive research on developing human strengths and wellbeing [11].

Specifically, Keyes and Haidt [12] argued that positive functioning is a combination of three types of well-being: 1) high emotional well-being; 2) high psychological well-being; and 3) high social well-being. In other words, positive psychology identifies three characteristics of our personal experience [12]—*affective quality*, *engagement/actualization*, and *social connectedness*—that serve to promote personal well-being. From this perspective, affective computing has the potential to improve our quality of life experience by 1) perceiving, understanding, and offering options to change the affective quality of our personal experience [8], [7]; 2) building relational digital artifacts that increase users' engagement and flow [4]; and by designing technology that enhances social and emotional connectedness.

This special section aims to contribute ideas, methods and case studies for how affective computing can move toward the goal of promoting wellbeing. The papers spread across some of the multiple modalities and techniques used to perceive and detect affect from text, physiology facial expressions, and gaze, and some of the approaches to

analyze the expression of sentiments shared via online communities by depressed patients.

We use computers in everyday life, to work, learn or communicate with others. We can also use them to seek and offer help, so it is no surprise that the papers in this issue, and the field of affective computing as a whole, are exploring a wide range of applications. It is important we study the multiple ways in which we use computers to communicate with and seek help from others, as well as to discover new ways to support those with mental and physical health problems like autism and depression.

The articles in this special section discuss how information that computers collect about our behaviour, cognition—and particularly affect—can be used in the further understanding, nurturing or development of wellbeing and human strengths: e.g. self-understanding, empathy, intrinsic motivation toward wellbeing healthy lifestyles.

Language, particularly text (e.g. blog posts, Facebook updates, Tweets, etc.) is one of the modalities often used for people to seek connectedness, and for computers to detect emotions and sentiments. There is already a wealth of support groups for mental health and wellness and there is strong evidence that they help people manage their disease and live better lives. What people write in these communities can help researchers understand how different problems are expressed, and what language patterns can be used to recognize other people with similar problems. Identifying communities and individuals suffering from depression is an important first step towards being able to help them. In "Affective and Content Analysis of Online Depression Communities", Nguyen, Phung, Dao, Venkatesh and Berk study the language characteristics of online peer-support groups and how they differ to those of other online communities. They describe techniques that show how different emotions are expressed in the different communities using ANEW [13] as emotional thesaurus and the features produced by the Linguistic Inquiry and Word Count LIWC [14].

Although language is so pervasive and a key aspect of our communication, emotions are often better recognized from their embodied expressions and from the facial expressions most often displayed. Anna Gruebler and Kenji Suzuki innovate in their use of EMG signals to detect these expressions. The collection of facial EMG is generally too uncomfortable for general use but their ergonomic wearable device, described in "Design of a Wearable Device for Reading Positive Expressions from Facial EMG Signals" optimizes the tradeoff between comfort and accuracy. The authors then discuss how the device could be used in therapy, or to support patients with Autism Spectrum Disorder or depression.

Attention, or the lack of it (also referred to as mind-wandering), have significant impact on a person's wellbeing.

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When our mind wanders, we are more likely to feel negative emotions [15]. Yet we do not know much about detecting what we are focusing our attention on, so it is hard to move forward and consider interventions that could reduce mind-wandering. A common approach to recognizing emotions, attention and mind-wandering is to use an eye-tracker and virtual humans to provide a platform for evaluating these recognition techniques in controlled environments. "Joint Attention Simulation using Eye-Tracking and Virtual Humans" by Matthieu Courgeon, Gilles Rautureau, Jean-Claude Martin and Ouriel Grynszpan shows that users only have partial awareness of controlling gaze-contingent displays, and explores some of the challenges of detecting the user's focus of attention.

Another approach also recognizes that emotions are embodied, and that this embodiment means that sensor systems or body area network (BAN) can be used to automatically detect emotions. These systems can collect data on the autonomic nervous system (ANS) closely related to the emotional state of a person. Katarzyna Wac and Christiana Tsiourti introduce the concept of a BAN and its features, and review 173 publications studying emotion activation in "Ambulatory Assessment of Affect: Survey of Sensor Systems for Monitoring of Autonomic Nervous System's Activation in Emotion".

While systems such as those discussed in the articles above are addressing very specific ways of supporting well-being, we believe that a new era in computing, one that aims directly at improving people's psychological wellbeing will only be possible when *all* digital experience takes well-being into account.

More, the design goal of achieving positive affective technologies requires an interdisciplinary approach, integrating knowledge and ideas from disciplines such as artificial intelligence, neuroscience, social and cognitive psychology, multi-sensory perception, cognition, multimedia development, telecom engineering, and healthcare. In order to build technologies which can effectively improve our quality of life, it will be necessary to incorporate and integrate ongoing insights from these fields into next-generation research for advanced, multi-sensory services and novel telecommunications architectures.

We envision new technologies such as social and collaborative platforms that go beyond improving productivity, by fostering socio-emotional skills like empathy, or new tools that recognize mind-wandering and support flow [16].

We hope that this new breed of artifacts will build on the work described in this special section.

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