

Foreword

A popular vision of future technology is to make things smart – from homes to cities and phones to cars. The current buzz is all about smart health. But what does it mean to make health smart? Ever more sensing and tracking of body data? But for what reason? From one perspective, it is about raising awareness about people's health and well-being so they can be better informed and be able to act and make intelligent decisions. From society's perspective, it is about accumulating increasing amounts of knowledge about people's health and habits in order to provide better health policies, guidance, and medical care.

While technology has been developed and used for many years to help improve healthcare in hospitals, medical centers, and in the home, we are now witnessing the dawn of a new digital health-tech revolution. Mobile apps and a diversity of sensing devices are becoming more commonplace – placed in and on our bodies to track, monitor, and detect patterns, anomalies, and deviations about how parts of us are behaving. Not only can it tell us more about our blood, urine, and sugar levels but it can also give us fresh insights into our moods, mental states, and motivations. Multiple streams of data are being collated, mined, analyzed, and visualized in new ways to provide new insights into what goes on under the skin. Not only doctors, but also the general public are starting to learn and understand more about how their fitness levels, their illnesses, and their well-being change over time.

A central question this smart health revolution raises, however, is whether it can be put to good use so that people are truly empowered to act upon the knowledge rather than become obsessively concerned about their data or frightened when discovering new patterns in it. How can we design new tools and interfaces so that individuals can be reassured about their data that is being collected, monitored, and aggregated over time and space?

Being smart about health data is not straightforward. There are many questions that need to be addressed from whether to automate or hand over more control to patients to care for themselves; whether to let people know what diseases they are genetically prone to, and so on. Smart health has the potential to enable more people to manage their own health, and in doing so become more aware and better informed. But it also raises a host of moral questions. Who owns the health data being collected? Who is willing to share their health data? Where do the new streams of health data end up? This book is all about how smart health can change society's lives for the better.

Preface

Health costs worldwide are rapidly increasing. Demographic structures are dramatically changing. Technological advances are tremendously increasing. The invariable need for quality remains.

Advances in Biomedical Informatics and Biomedical Engineering provide the foundations for our modern and future patient-centered medical and healthcare solutions, biomedical systems, technologies, and techniques.

The majority of computer-supported healthcare solutions of the last decades focused on the support of caregivers and medical professionals; this changed dramatically with the introduction of ubiquitous computing technologies and the enormous success of mobile computing: in particular, smart phones with multi-touch interaction along with sophisticated sensor networks. Future smart technologies using the power of grid computers and supercomputing – driven by examples including IBM Watson and Apple Siri – will enable that a new concept of smart health provides support for a more diverse end user group to enable individualized medicine, i.e., the P4-medicine (preventive, participatory, predictive, personalized).

However, all these advances produce enormous amounts of data and one of the grand challenges in our networked world are the large and high-dimensional datasets, and the massive amounts of unstructured information. To keep pace with these growing amounts of complex data, smart hospital approaches are a commandment of the future, necessitating context-aware computing along with advanced interaction paradigms in new physical-digital ecosystems. In such a smart hospital the medical doctors are supported by smart technologies. At the same time people at home can be supported by their technological health assistants to facilitate an overall healthier life, wellness and well-being – and the circle of P4-medicine is closed.

The very successful synergistic combination of methodologies and approaches from two areas offer ideal conditions toward solving the aforementioned problems: Human-Computer Interaction (HCI) and Knowledge Discovery and Data Mining (KDD). The vision is to support human intelligence with machine learning.

Consequently, the objective is to combine the best of both worlds: HCI, with the emphasis on human issues including perception, cognition, interaction, reasoning, decision making, human learning, and human intelligence; and KDD, encompassing the wide range of artificial intelligence. Whatever we do, issues of privacy, data-protection, safety, and security are mandatory in the medicine and health domains.

Volume 8700 of the Springer Lecture Notes in Computer Science is a State-of-the-Art Volume focusing on hot topics on smart health. Each paper describes the state-of-the-art and focuses on open problems and future challenges in order to provide a research agenda to stimulate further research and progress.

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