EDITORIAL

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Focus on:

New trends, challenges and perspectives on healthcare cognitive computing: from information extraction to healthcare analytics

The focus of this special issue is cognitive computing in healthcare, due to the ever-increasing interest it is gaining for both research purposes and clinical applications. Indeed, cognitive computing is a challenging technology in many fields of application (Banavar, 2016) such as, e.g., medicine, education or economics (Coccoli *et al.*, 2016) especially for the management of huge quantities of information where cognitive computing techniques push applications based on the use of big data (Coccoli *et al.*, 2017). An unprecedented amount of data is made available from a heterogeneous variety of sources and this is true also in the case of health data, which can be exploited in many ways by means of sophisticated cognitive computing solutions and related technologies, such as, e.g., information extraction, natural language processing, and analytics. Also, from the point of view of programming they set challenging issues (see, e.g., Coccoli *et al.*, 2015). In fact, the amount of healthcare that is now available and, potentially useful to care teams, reached 150 Exabytes worldwide and about 80% of this huge volume of data is in an unstructured form, being thus somehow invisible to systems. Hence, it is clear that cognitive computing and data analytics are the two key factors we have for make use – at least partially – of such a big volume of data. This can lead to personalized health solutions and healthcare systems that are more reliable, effective and efficient also reducing their expenditures.

Healthcare will have a big impact on industry and research. However, this field, which seems to be a new era for our society, requires many scientific endeavours. Just to name a few, you need to create a hybrid and secure cloud to guarantee the security and confidentiality of health data, especially when smartphones or similar devices are used with specific app (see, e.g., Mazurczyk & Caviglione, 2015). Beside the cloud, you also need to consider novel architectures and data platforms that shall be different from the existing ones,

because 90% of health and biomedical data are images and also because 80% of health data in the world is not available on the Web.

This special issue wants to review state-of-the-art of issues and solutions of cognitive computing, focusing also on the current challenges and perspectives and includes a heterogeneous collection of papers covering the following topics: information extraction in healthcare applications, semantic analysis in medicine, data analytics in healthcare, machine learning and cognitive computing, data architecture for healthcare, data platform for healthcare, hybrid cloud for healthcare.

The remainder of this number is organized as follows:

Baya Naouel Barigou, **Fatiha Barigou** and **Baghdad Atmani**, in their paper "*Handling Negation to Improve Information Retrieval from French Clinical Reports*" take into account the problem of information extraction from electronical medical reports. In particular, in the French context, they face the problem of identifying negations and improve performances in current automated information retrieval systems.

Luca Canensi, **Giorgio Leonardi**, **Stefania Montani** and **Paolo Terenziani**, in the paper "*A Context Aware Miner for Medical Processes*" propose a novel approach to medical process mining that operates in a context-aware fashion. In particular, they show on a set of critical examples how the proposed solution is able to cope with a wide range of issues.

Antonella Carbonaro, **Filippo Piccinini** and **Roberto Reda**, in their paper "*Integrating Heterogeneous Data of Healthcare Devices to enable Domain Data Management*" seek to face semantic interoperability among diverse IoT fitness and wellness devices. To this aim, they present a novel framework based on an ontology developed ad hoc for the specific healthcare domain of fitness and wellness applications and a mapping system based on the RML language to facilitate data integration and sharing among the devices.

Mauro Coccoli and **Paolo Maresca**, in their paper "*Adopting Cognitive Computing Solutions in Healthcare*" present the possible motivations to adopt cognitive computing based solutions in the field of healthcare and survey experiences already done, through an overview of challenging research topics that showcase the main results already achieved in this field, where both academics and industries are making big efforts to improve the performances of current systems and to propose novel solutions based on the profitable exploitation of big data.

Andrea Damiani *et al.*, in their paper "*Preliminary Data Analysis in Healthcare Multicentric Data Mining: a Privacy-preserving Distributed Approach*" highlight the importance of shared ontologies in the era of cognitive healthcare systems. They present a privacy-preserving distributed approach as a preliminary data analysis tool to identify possible compliance issues and heterogeneity from the agreed multi-institutional research protocol before training a clinical prediction model.

In conclusion, in this issue we will describe some healthcare scenarios in which the use of cognitive system is giving great benefits.

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