

Chapter 11

Multi-Criteria Decision Making Semantic for Mental Healthcare

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ABSTRACT

Healthcare systems play an important role in the well-being of patients; however, the diagnostic process generates a very large and varied types of data which makes the process of analyzing this data very complicated. More precisely, depression, which is one of the most common psychological disorders, contains a taxonomy of different symptoms, heterogeneous, and varied by data criteria, as confronted by clinicians to predict the degree of the disorder in patients with the aim of selecting the best treatment. To this end, the authors propose a decision architecture based on an approach that combines method ontologies, the Analytic Hierarchy Process, in the context of the prevention and monitoring of depression trends in patients.

INTRODUCTION

In the health sector, the volume of data collected for each patient is very varied and important ; however, clinicians usually face problems with analyzing this data and extracting the criteria relevant for a diagnosis. On the one hand, and more specifically, in the field of mental health, depression is one of the main causes of mental illness (American Psychiatric Association, 2015); indeed, it is one of the most common psychological disorders. In fact, the World Health Organization (WHO) (2018) predicts

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that depression will become the main cause of mental illness in the next 15 years. According to WHO, depression is one of the priority pathologies targeted by the Mental Health Gap Action Program (mh-GAP) (WHO, 2018). The purpose of this program is to help countries expand services for people with mental disorders. On the other hand, at public health institutions, like the University Hospital Center Mohammed VI in Marrakech "(CHU)," cancer patients require permanent support and follow up during their oncology care, because they face major constraints while suffering and undergoing treatment, and other psychopathological reactions and symptoms that are identical to depression. Indeed the problem is defined: how can clinicians decide and select in a solid and automatic way the symptoms of depression, compared to other psychopathological reactions of the cancer disease? Due to the large number of patients, it is difficult to consider all these parameters to develop a relevant prevention system. In addition, the constraint of missing, unstructured, and noisy data adds more challenges ; therefore, the selection of relevant and personalized criteria (symptoms) for each patient remains an arduous task. Indeed, the major challenge facing clinicians is the problem of analysis of knowledge at the patient level. Moreover, to the multitude of diagnostic protocols, because they are diverse criteria, therefore the degree of uncertainty among clinicians increases.

In recent years, decision-making in medicine has taken a very important place in the science of medical informatics; indeed many approaches and methods stemming from Artificial Intelligence, assistance systems to decision-making, and mathematical modeling techniques, are gradually being introduced into mental health (Brunelli, 2014), in order to help decision-makers and health professionals make informed decisions based on solid foundations (Aoki, Uehara, Kato, & Hirahara, 2016). It is in this context we adopted the multi-criteria decision method of the Analytic Hierarchy Process (AHP), which is an analytical approach to support decision-making according to a multi-criteria approach. Developed by Thomas Saaty, it is basically based on complex calculations (Aoki et al., 2016), in order to extract the relevant diagnostic criteria. In addition, we proposed a hierarchical ontological model based on domain ontology, in order to exploit the preferences of each user (extracted by the diagnostic sheet and the test), and to be able to promote the integration of heterogeneous knowledge. The ontologies represent a very reliable and structured source of knowledge, and are robust means to represent and exploit the data and the knowledge of a field, and, more particularly, that of the medical field. Our case study is the modeling of the pathologies of depression based on the opinions of clinical experts and the DSM (American Psychiatric Association, 2015). In this context, this paper presents the intelligent decision framework to automatically monitor and predict the level of depression in cancer patients, so that clinicians can make the best decision to ensure better patient monitoring and reduce the impact of their suffering from the disease on their psychology.

This document is organized as follows: Section 2 describes some related work; Section 3 describes the methods used in this study. In Section 4, we present in detail the proposed system, the experimentation, and the results obtained.

RELATED WORK

In a world whose complexity is rapidly growing, making the best decisions becomes an increasingly demanding task (Brunelli, 2014). Indeed, optimal and relevant decision-making is a difficult task in all areas, especially in the health field. Physicians face several challenges ; however, many intelligent

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