

Intelligent Technologies and Methodologies for Medical Knowledge Engineering

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Abstract. Medical Intelligent Systems (MISs) are concerned with the construction of intelligent software that performs diagnosis and makes therapy recommendations. Unlike other medical applications based on other programming methods such as purely statistical methods, MISs are based on symbolic models of disease and their relationship to patient factors. Many types of MISs exist today and are applied to different medical tasks, e.g. generation alerts and reminders, diagnosis assistance, and education. In the last years various intelligent technologies and methodologies (ITM) have been proposed by the researchers in order to develop efficient MISs for different tasks. ITM offer robust computational methods for accumulating, changing, and updating knowledge (i.e. knowledge engineering) in intelligent systems. In particular they enable users with learning mechanisms that help to induce knowledge from raw data. ITM provide methods, techniques, and tools that can help solving diagnostic and prognostic problems in a variety of medical domains. ITM are used for the analysis of the importance of clinical parameters and their combinations for prognosis, e.g. prediction of disease progression; the extraction of medical knowledge of outcomes research; therapy planning and support; overall patient management.

This paper presents some of the intelligent methodologies for managing and engineering knowledge in medical knowledge-based systems. Some of the results of the research that has been carried out by the author and his colleagues at the Medical Informatics and Knowledge Engineering Research Unit, Computer Science Department, Faculty of Computer and Information Sciences, Ain Shams University, Cairo, are discussed as well. The paper covers the following topics: (a) knowledge representation techniques from the knowledge engineering point of view; (b) expert systems methodologies, rule-based and case-based reasoning; (c) producing knowledge with intelligent data mining methodology; and (d) ontological engineering approach.