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# Reasoning Techniques for Diabetics Expert Systems

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**Abstract**

The field of reasoning methodologies is very important in the area of knowledge computing and engineering. Reasoning methodologies has been one of the standard and improving techniques with strong methods for health expert systems industry. Reasoning techniques has provided greatest support for predicting diagnosing and treatment of disease with correct case of results. Diabetes needs greatest support of reasoning techniques for diagnosis and treatment. This paper focus on the main technical characteristics of four reasoning methodologies which are commonly used in developing diabetic expert systems, namely; reasoning with production rules, fuzzy reasoning, case-based reasoning, and ontological-case based reasoning. In addition, this paper proposes the best reasoning technique for diabetic expert systems. The main result of this study covers a variety of four reasoning methodologies, which reveals that case based reasoning paradigm is the best reasoning technique methodology regarding to the issues of maintenance ,powerful and knowledge representations .



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*Keywords:* Diabetes;Rule based reasoning;case based reasoning; fuzzy reasoning; ontological reasoning; medical expert systems;

## 1. Introduction

Studies in the field of medical decision support systems have been established and due to the high success rate of these studies, interest in this field is increasing every day. These systems frequently use various artificial intelligence techniques. Reasoning techniques is one of major branches of artificial intelligence and, indeed, it is one of the most rapidly developing subfields of AI research.

Reasoning techniques were from the very beginning designed and used to analyse medical data sets. Today reasoning techniques provides several indispensible tools for intelligent data analysis. Especially in the last few years and in particular there is a lot of work done in medical diagnosis in small specialized diagnostic problems.


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There is a greater interest in the study of diseases that are common throughout the world. Diabetes is one of them [1].

Diabetes mellitus is a syndrome with disordered metabolism and inappropriate hyperglycemia due to either a deficiency of insulin secretion or to combination of insulin resistance and inadequate insulin secretion to compensate. Fortunately, diabetes can be managed very effectively through healthy lifestyle choices, primarily diet and exercise. Mostly, Type 2 diabetes is strongly connected with obesity, age, and physical inactivity [2]. Most medical resources reported that 90 to 95% of diabetic is diagnosed as type-2. Simply, in these cases the pancreas is not able to produce enough insulin to keep the blood sugar level within normal ranges. In addition, the majority of this type diabetics do not know they are suffering from it. Over 80-90% of Type 2 diabetes is overweight. Therefore, reducing daily carbohydrates and fats intake and the commitment to a healthy diet with a simple waling keeps your glucose within normal ranges and help dropping those extra pounds [3]. Reasoning techniques has been an excellent support for making prediction of a particular from the data which is provided. Reasoning techniques in recent years have been the evolving, reliable and supporting tool in medical domain. Automatic learning has fetched a greater amount of interest in medical domain due to less amount of time for detection and less interaction with patient, saving time for patients care. There are many methods used in the reasoning technique rule based, case based ontology case based and fuzzy based. Among these methods, the case based is widely used. On the other hand, the development of computer technology and tools has provided a valuable assistance for Medicare [4].

An expert system is a computer program that provides expert advice as if a real person had been consulted where this advice can be decisions, recommendations or solutions [5]. The intention of our research is to provide self-monitor for patient of type 2 diabetes to get proper amount of daily calories with list of proper diet satisfy the amount of the calories. In this paper we propose the comparison results using reasoning techniques in diabetes exert systems. The paper goes through the reasoning techniques identifications, related works, comparison, discussion, results and conclusion.

## 2. Reasoning techniques in expert systems

The abilities of inference, reasoning, and learning are the main features of any expert system. The research area in this field covers a variety of reasoning methodologies, e.g.; automated reasoning, case-based reasoning, commonsense reasoning, multi-model reasoning, fuzzy reasoning, geometric reasoning, non-monotonic reasoning, model-based reasoning, probabilistic reasoning, causal reasoning, qualitative reasoning, spatial reasoning and temporal reasoning [6,7]. In this section we focus our discussion about the main characteristics of three of the reasoning methodologies which are commonly used in developing diabetic expert systems, namely; reasoning with production rules, fuzzy-rules, and case-based reasoning.

### *2.1 Reasoning with Production Rules*

Production rules are the most commonly technique used in developing the inference engine of expert system. Forward chaining can be used to produce new facts (hence the term “production” rules), and backward chaining can deduce whether statements are true or not. Rule-based systems were one of the first large-scale commercial successes of artificial intelligence research. An expert system or knowledge-based system is the common term used to describe a rule-based processing system. It consists of three major elements, a knowledge base (the set of if-then rules and known facts), a working memory or database of derived facts and data, and an inference engine, which contains the reasoning logic used to process the rules and data[8,9].

Rule-based systems solve problems by taking an input specification and then “chaining” together the appropriate set of rules from the rule base to arrive at a solution. Given the same exact problem situation, the system will go through exactly the same amount of work to come up with the solution. In other words rule-based systems don’t inherently learn. In addition, given a problem that is outside the system’s original scope, the system often can’t