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Diabetes diagnosis rule-base reduction based on Topsis method

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Abstract— Diabetes is a group of metabolic disease caused by the imbalance between secreted and needed insulin levels. In the present study, all probabilities were examined considering eight (8) indications of diabetes and these indications binary values construct a rule base. Thanks to Clementine, support, confidence and lift for each rule are measurable, and then by Entropy method the criteria were weighted. Rules were ranked by Topsis method, so there is no need to check all the rules. At the end the rules are tested on test data and the results are given.

Keywords- *diabete; TOPSIS; association rule; expert system*

I. INTRODUCTION

Accurate diagnosis is very essential for medical treatment and decision. Therefore, it is required to find suitable data, to determine data characteristics and to analyze newly obtained data. Physicians process data using various statistical methods when they are to make decision. The huge and complicated structure of the data has increased the need for data processing systems.

In this study, diabetes was tried to be diagnosed considering 8 indications. For the diagnosis of disease, an ES (expert system) program was developed benefiting from the physician experts in their fields, thesis and scientific publications. For the rule bases of the developed ES, reduced-rule bases were used instead of controlling all the indications ($2^8=256$).

The 8 indications were assumed as binary sets through Table.1

II. OTHER WORKS

The first attempts at creating decision support tools for medical diagnosis began with the application of statistical methods for medical diagnosis, initiated by the pioneering efforts of Lipkin, Hardy, and Engle in the 1950s at the Cornell Medical School [1].

It became evident in the early 1970s that statistical tools were unable to deal with very complex clinical problems paving the way for the exploration of the utility or the application of artificial intelligence (AI) principles in medical diagnosis [2].

Pattern recognition methods were the focus of AI applications in medical diagnosis until 1974 when Shortliffe published the first rule based approach for therapy advice in infectious diseases [3]. Rule based programs used the “if-then-rules” in chains of deductions to reach a conclusion, but it was later observed that rule based systems were only good for narrow domains of medicine, because most serious diagnostic problems were so broad and complex that straightforward attempts to chain together larger sets of rules encountered major difficulties, hence such systems lacked the model of the disease or clinical reasoning [4].

In 2011 Uzoka et.al presented Clinical decision support system (DSS) in the diagnosis of malaria by applying fuzzy and AHP method and compared the results [5].

In 2011 Gholami et.al presented a ranked rule base from data mining by MADM method [6].

In 2011 Basciftci and Hatay used minimization method of Boolean Functions (BFs) for constructing reduces rules base. Thanks to this method using reduced-rules in the diagnosis of diabetes instead of 1024 rules brought simplicity to evaluation [7].

So many other works have been done on association rules or TOPSIS, but the combination of them on medical cases has not been developed.