Abstract

Medical diagnosis is a complex process which can be attributed to the complexities, uncertainties and vagueness of the symptoms involved, and sometimes also because of their complex relationship with the final diagnosis output. Traditional systems for diagnosis very often incorporate certain inabilities that eventually lead to the vagueness in the result. Besides this, imprecise and incomplete knowledge are difficult for these traditional disease diagnosis expert systems to analyze. The fuzzy logic has carved a niche in medical diagnosis, for its ability to handle the dynamic nature of the disease diagnosis and medication. Various approaches of Fuzzy Logic, namely, Type-1 Fuzzy Logic, Interval Type-2 Fuzzy Logic, and General Type-2 Fuzzy Logic are being used for decision making in medical diagnosis. In this paper, a comparative study of the various parameters of Type-1 Fuzzy Logic and Interval type-2 Fuzzy Logic is conducted to understand their respective advantages in the medical diagnosis. Former, being a standard fuzzy logic methodology has been used widely for diagnosis of almost every disease, and the latter, which is also known as 'Layered Type-1 Fuzzy Logic', is being widely used for the diagnosis of a few diseases only. Type-1 Fuzzy Logic is rather a simple approach
and results in the fast generation of outputs, but Type-2 Fuzzy Logic can provide better results in many cases. A study is conducted on type-2 diabetes and heart related diseases, to understand the disease-specific nature of the two approaches. Type-2 Fuzzy Logic uses Karnik-Mendel (K-M) algorithm for type reduction. The comparison is drawn on the basis of accuracy, rule base and the differences of their outputs. In this way, this analysis helps to understand the advantages and disadvantages of both the approaches in the medical diagnosis.

References


Index Terms

Computer Science Fuzzy Systems

Keywords

Type-1 Fuzzy Logic (T1FL), Interval Type-2 Fuzzy Logic (T2FL), Centroid method, Rule Inference, Type-reduction, Rule aggregation, Apriori algorithm, Karnik-Mendel algorithm, Uncertainty indicator.