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Applying Fuzzy Rules to the Analysis of Lung Infection

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Abstract: *Soft computing is a collection of interrelated approaches that enable decision-making based on trustworthy information or the experience of experts. These days, the medical field makes extensive use of a variety of soft computing approaches, including neural networks, fuzzy logic, genetic algorithms, and hybrid systems. An algorithm for analyzing lung infections is described in this research. Developing the system architecture to determine the likely disease stage that a patient may have is the primary goal. The rule-based method is used to determine the disease's severity level. To calculate an infection level, the algorithm utilizes a Rulebase output that the user has entered.*

Keywords: *Rulebase diagnosis, Decision support system, Medical support system*

I. Introduction

One of the most significant problems in healthcare is medical diagnosis. For the medical field to evaluate information impartially, new engineering technologies are needed. One sector that needs innovative technical tools to objectively access ambiguous information is the medical field. Modern intelligent computing approaches, such as computer-aided research, computer-aided photography, and critical care units, have made significant strides in science medical and engineering and other control fields. Utilizing data mining, information processing, and artificial intelligence offers novel approaches to approximation inference [1].

The human mind is essentially the role of soft computing. According to Prof. Lofti Zahed's 1942 description [2], the fundamental idea of soft computing is to use tolerance for imprecision, and partial truth to achieve tractability, resilience, and low solution cost. The correct diagnosis helps ensure the appropriate course of treatment and, ultimately, the disease's recovery. Because computational intelligence can handle the complexity of the human mind, partial truth, approximate inference, and uncertainty, it has been widely applied in recent years to tackle many complicated problems.

Each of these methods complements the others and offers a solution in one form or another. It is extensively used in medical research applications because of its adaptable information processing capabilities for decision-making systems, including expert systems and pattern categorization systems [3]. Information is incomplete, ambiguous, and imprecise in real-world computer environments, making it challenging to make informed decisions. Artificial intelligence has been used to build a variety of decision assistance systems. Medical professionals have frequently found these systems to be quite helpful in quickly reaching a diagnosis [4]. A variety of clinical decision-making units that can conduct computation as a human expert in specific domain problems can be built thanks to the arrival of technology and computerization in the healthcare unit.

II. Knowledge Based Clinical Decision

Certain patterns are described by a collection of If then rules found in the knowledge-based healthcare system. Observed data is gathered and used to evaluate rules. The pattern is found and the issue related to it is assessed after the specified sets of rules are logically satisfied. For instance, a warning pattern is produced if the amount of discomfort is surpassed.

Every single issue has a different approach. The three primary components of the clinical decision based on knowledge support system are the fuzzification component, the inference engine, and the knowledge base component. The knowledge base unit includes a database and rule base that specify the fuzzy set membership functions used in fuzzy rules. The process of shifting crisp values into the form of fuzzy quantities is carried out by the inference unit. Input values are converted into fuzzified values using a fuzzification unit [5].

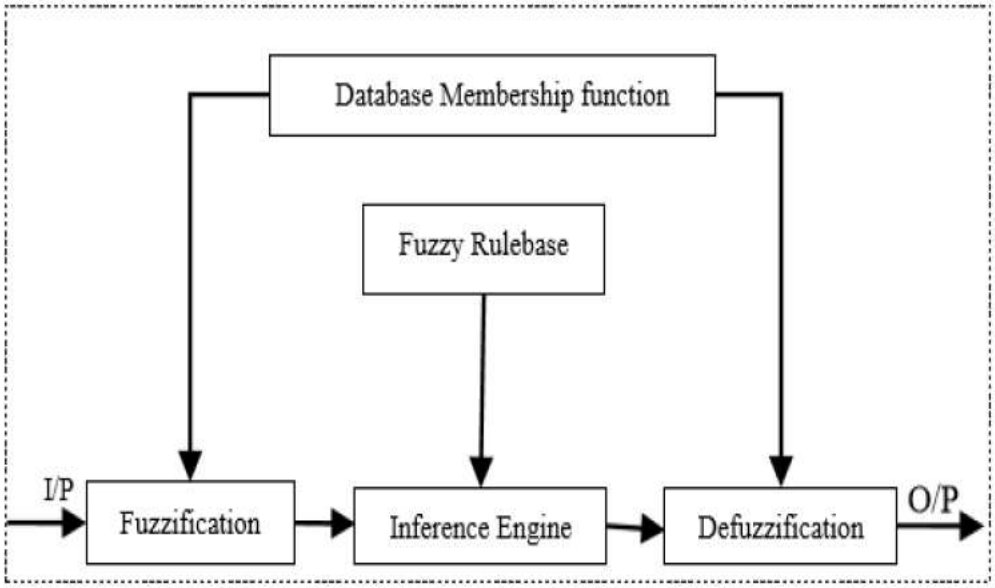

Fig 1: Fuzzy system frame work

III. Modelling and Functioning of the System

The system's algorithm for figuring out the real output was developed using fuzzy logic. Researchers will be able to categorize the severity of each symptom using fuzzy logic in accordance with the descriptions provided by pulmonary doctors. The MATLAB software tool, created by MathWorks Inc., is used to perform the medical diagnosis system on the fuzzy logic model in this simulation-based article. "Figure 2" displays the MATLAB software's command window, where we can create commands to carry out a specified set of programming rules.

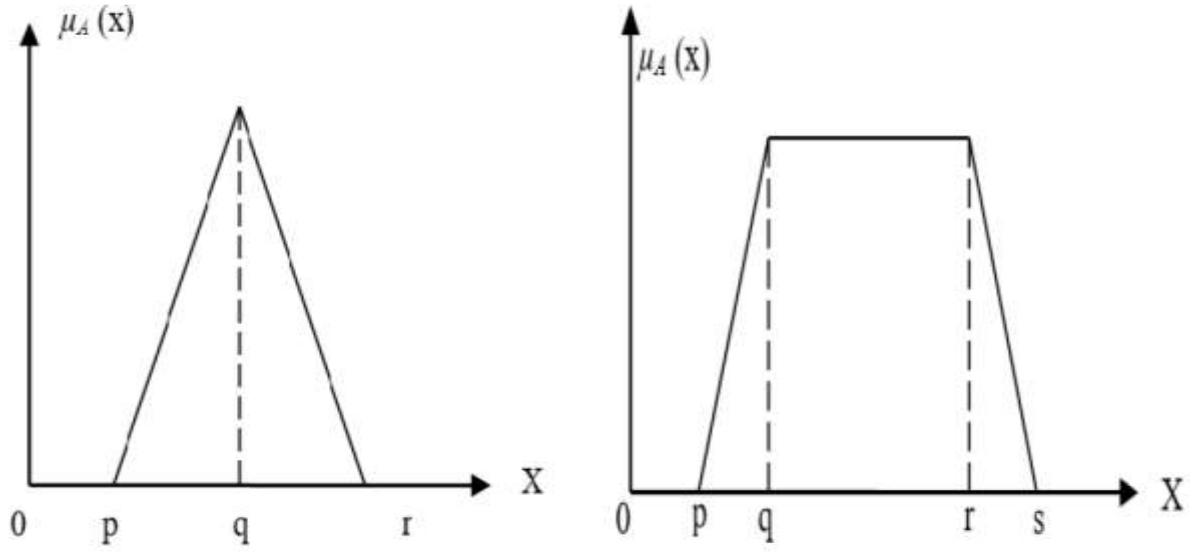

Fig 2: Triangular and Trapezoidal Membership

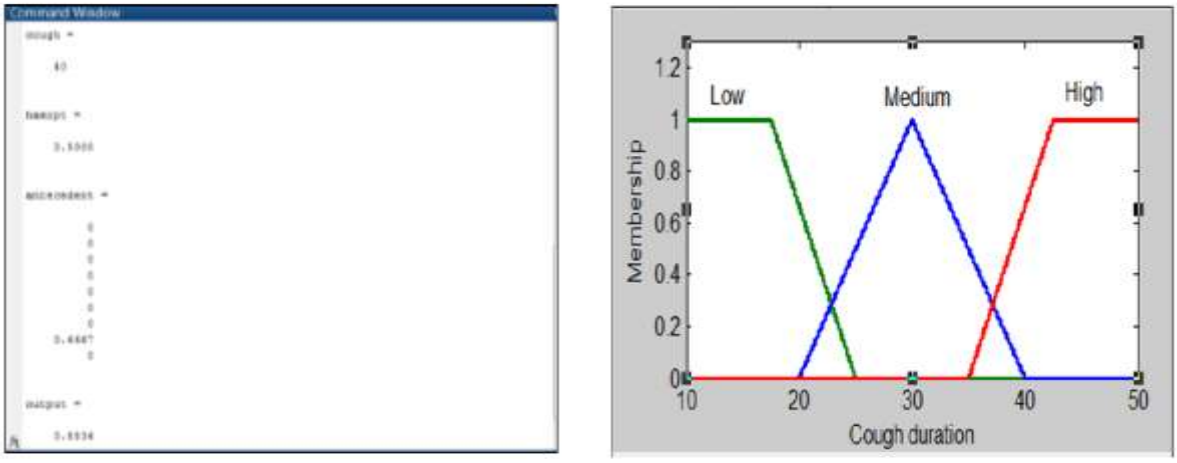

Fig 3: Command window plot view

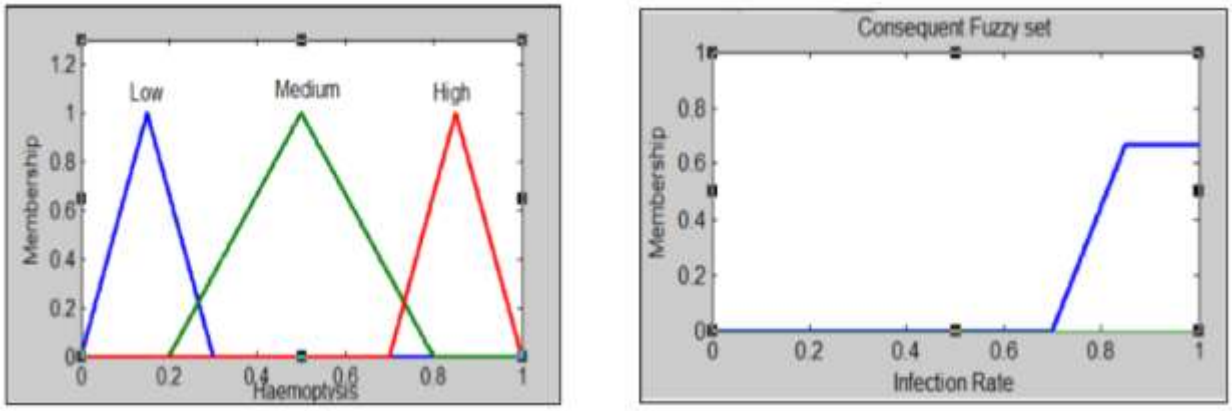

Fig 4: Fine-tuned membership plot of Haemoptysis

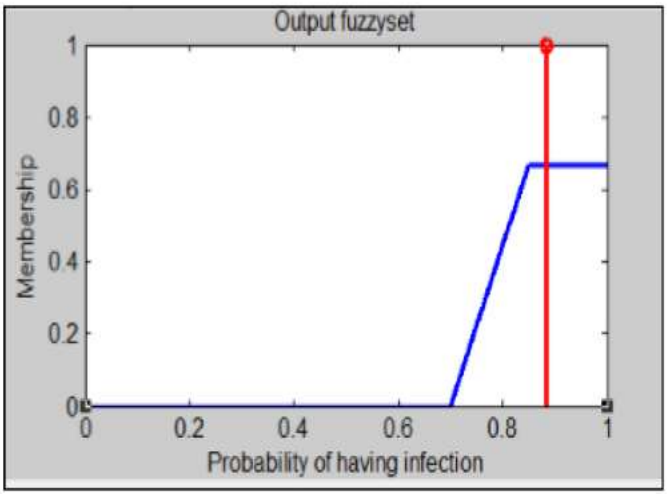

Fig 5: Defuzzied value

IV. Conclusion

This study presents a framework for prioritizing test cases based on TF-IDF, the naïve bayes classifier method, and the back propagation algorithm of artificial neural networks. The framework with embedded methodologies produced positive outcomes and validated our initial expectations and concepts. The algorithm is tested on a variety of publications. The framework was incredibly dependable and stable. Tests have shown that the implemented algorithm is sensitive. The number of unusable words in a document has a major impact on its classification, according to the content analysis, so improving document preparation is important to get better results. To quickly identify the highest and lowest priority words in a document, classification is crucial.

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