International Journal of Engineering Research and General Science Volume 3, Issue 5, September-October, 2015
ISSN 2091-2730

MEDICAL DECISION SUPPORT SYSTEM FOR TYPHOID DIAGNOSIS

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Abstract- This paper defines an intelligent decision support system for diagnostics for typhoid fever. Typhoid fever has numerous variables involved in identification of the disease. These variable are transformed into membership functions and passed onto the Fuzzy Logic System. The fuzzy logic System consists of the following stages fuzzification which converts the crisp data into variable data, Hidden layers which performs logical functions and using firing rules from the fuzzy data, lastly the defuzzification stage involves in transforming the fuzzy data into crisp data for analysis and identification of the disease.This decision support system works parallel with the centralized server for easy utilization of the application in different units.

Keywords: Diagnostic, Typhoid fever, Fuzzification

Introduction

Typhoid Fever (TF) remains a major public health quandary in developing countries. Despite the availability of a few medications throughout the years for the treatment of TF there has dependably had Intolerable horribleness and mortality in developing countries nations. There are several variables involved in TF analysis and management, making it complex to make a diagnosis.

Expert System (ES) is PC based choice apparatus that uses actualities and standards to take care of reasoning so as to test genuine issues and taking into account the information procured from one or more human master in an individual field. An expert system is a computer system that emulates the decision-making ability of a human expert with intelligent user interactive interfaces [1].

Fluffy Logic (FL) has been perceived as a noteworthy delicate figuring device that is utilized to speak to the learning of a specialist in a computer is like human master. The execution of ESs is finished by widely utilizing FL as a part of the field of solution because of its capacity in taking care of the imprecision and vulnerability innate in therapeutic records. Fuzzy expert framework coordinates segments of FL which manages steady, precise, and convenient results [2].

The enrollment capacities are one of the key components of fuzzy frameworks as it quantitatively characterizes the phonetic marks or the variables included in the diagnostics for typhoid malady, by which frameworks generally set aside more time to outline and tune to adjust new circumstances or cases. Since neural system has the accompanying abilities: self-learning, self-tuning, and can be utilized to naturally produce enrollment capacities for fuzzy frameworks [3][4].

We propose a WBDSS driven by a Neuro-fluffy methodology for the finding and administration of TF in light of the standards and practices of restorative analysis. The framework was produced with the point of giving a choice bolster stage to medicinal professionals, TF scientists, and human services suppliers in creating nations of the world.

Methodology

- Fuzzification

The fuzzification procedure includes the change of crude info variables (estimations of signs, side effects, and research facility tests) by the use of given function:

- Hidden Layer -1(μ)

  In this equation, ' μ x' is the membership of the crisp input 'x' to the triangular fuzzy set 'A', 'ac' is the base of the triangle, and 'b' is its midpoint

  $$\mu_x(A) = \Delta(x; a, b, c)$$

- Hidden Layer -2

  AND operation is performed here

- Hidden Layer -3

  The method, by which firing strengths (FS) of a particular rule has been computed. In this equation, ' μ_{x1}, μ_{x2}, ..., μ_{xn} ' are the membership values of the crisp inputs to the triangular fuzzy sets 'A1, A2,. . ., An'.

  $$\mathrm{FS} = \min(\mu_{x1}(A1), \mu_{x2}(A2), \ldots \mu_{xn}(An)$$

- Defuzzification

The defuzzification procedure deciphers the derivation's yield motor into fresh values which is for the most part needed by medicinal specialists for legitimate investigation and translation utilizes the Centroid of Area (CoA) system for its defuzzification.

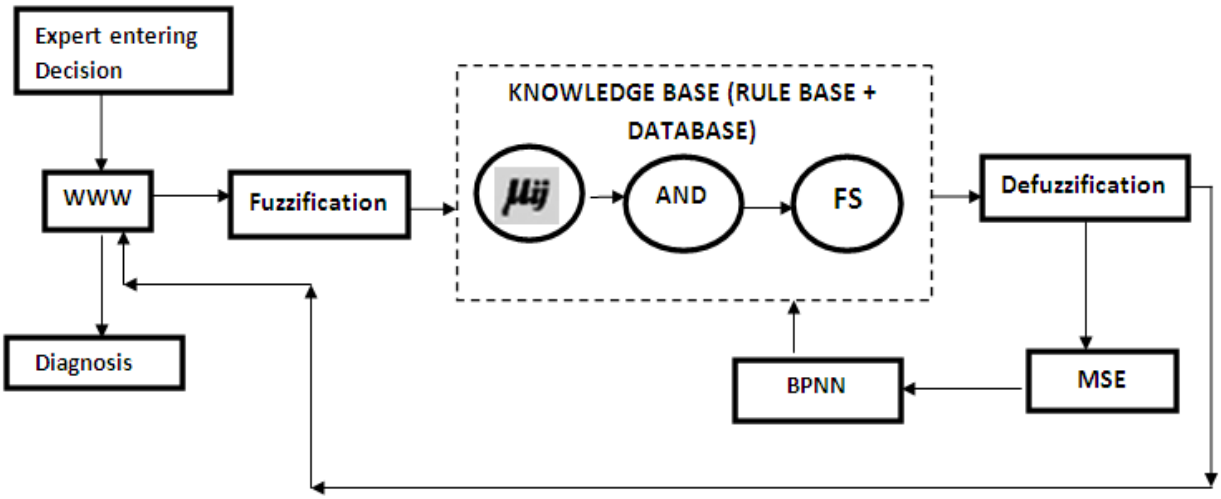
$$O_f = \frac{\sum_{i=1}^{p} \mathrm{FA}_j \times cn_i}{\sum_{j=1}^{p} \mathrm{FA}_j}$$

- BPNN

The error could be further minimized using BPNN by iteratively updating the weight vectors. The training is said to be completed when the minimum MSE value is obtained

Results and Discussion

Architecture: Proposed system with performance metrics



The building design includes interface by means of which the restorative master gives qualities speaking to signs, side effects, and research facility examinations of a specific patient amid the determination process. The www segment makes it feasible for the proposed framework to be gotten to remotely from any piece of the world. The KB is comprised of the Database and Rule Base (RB). The database stores quiet bio-information, innate information, force of signs, indications, lab examination results, restorative

conclusion result, and therapeutic master's points of interest while the RB is made out of an arrangement of IF-THEN proclamations that speaks to the learning utilized by medicinal specialists when diagnosing TF patients.

Inputs and the yield are discretionarily appointed class marks – 'mild ('m')', 'moderate ('M')', and 'severe ('s')' with some numeric range.

The input is passed on to the fuzzification unit i.e., calculation of membership values using TMFD (Triangular membership function distribution) in the first layer. The AND operations are performed in the second layer. The FS (firing strength) has to be computed in the third layer according to the production rules defined by the domain experts.

The predicted output is then compared with the target output for each case and Mean Squared Error (MSE) is then computed. Finally, weights are updated during back propagating with the error and the training is said to be completed when the minimum MSE value is obtained.

Performance metrics

To measure the performance of this Web based neuro fuzzy medical decision support system we use its sensitivity (Sn),specificity (Sp), precision (Pr), and average accuracy (Acc). All values are expressed in %.

$$S_n = \frac{tp}{p} \times 100$$

$$S_p = \frac{tn}{n} \times 100$$

$$P_r = \frac{tp}{tp + fp} \times 100$$

$$A_{cc} = \left[S_n \times \frac{p}{N} + S_p \times \frac{N}{N+P} \right] \times 100$$

In these equations 'p' and 'n' denote total positive and negative cases; 'tp' and 'np' are true and false positive cases and 'N' is the total number of cases.

We propose an online choice emotionally supportive network for the determination of TF. The framework is driven by neuro fuzzy procedure and has the capacity to keep running on the Internet. The framework can be utilized by therapeutic specialists and prepared medicinal services work force to give an exact and auspicious analysis of TF paying little mind to the restorative's area faculty. The framework will help supplement the deficient quantities of medicinal specialists in creating nations and in the end diminish the

tremendous expense connected with patient conclusion. Since the KB of the proposed framework is unified, it has the ability of lodging gigantic measure of data from which valuable learning and examples that could help choice making can be mined.

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