Research Paper Medical Science

Fuzzy Based Solution for Prevention of Asthma

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ABSTRACT

The problem of health monitoring has been taken as it is one of the challenging problems in rural areas where people many times do not get proper treatment and are not financially sound to visit doctors in city. Asthma and Tuberculosis are commonly prevalent diseases many lives are lost due to lack of proper treatment which in turn can be saved if proper prognosis is done in time. In this study of neuro fuzzy network, a detailed study has been done on the various schemes and strategies that are part of neural networks.

The world today is not based only on discrete concepts but on fuzzy concepts, which made us research on the world of soft computing and finally a health monitoring system based on neural network is developed. Our objective is to study the various techniques and algorithms of neural network and to find the most efficient technique to implement this problem of health monitoring. The estimation of information about disease is based on the variables that affect its state. The project includes the study of various algorithms like feed forward, back propagation etc. knowing the output we work backwards to reach to the input value and thus find whether the given input is correct or not.

The future scope of our study is that we can implement this system in rural areas to monitor the health of people there and let them know which medicine to take according to the study of different variables of health on the basis of fuzzy concept.

KEYWORDS Fuzzy network, neural networks, discrete concepts, health monitoring system, feed forward, back propagation.

1.Introduction:

ASTHMA- Asthma is a very common disease that may become lethal if remained untreated. An asthma patient must always be alert with their body condition, especially their respiratory and the surroundings they are in. This paper proposes a development of a rule-based asthma system. This system provides advice for patients who would like to know the chances of getting an asthma attack are based on the patient's current asthma condition and surrounding environment. To do so, the patients will answer questionnaire to enable the system to understand their current health condition and the environment they are living in. It will then provide suggestions to avoid the attack, or to hasten asthma recovery, which includes environmental factors. Data regarding asthma was gathered through an interview with doctors and online medical resources. A rule-based algorithm was developed based on the data gathered. With this program, it allows patient's self-management to lead a healthy, asthma-free lifestyle.

Although anyone may have an asthma attack, it most commonly occurs in:

· Children and adolescents ages 5 to 17 years
· Females
· People living in urban communities
· People having high intake of alcohol and smoke

2.Factors affecting asthma:

AGE:

Many people think of asthma as a childhood disease, but it often occurs as a new condition in older adults. Asthma in older adults presents some special concerns because the normal effects of aging can make asthma harder to diagnose.

Unlike young people with asthma, whose main symptom is wheezing, seniors usually have a chronic cough, for this reason; asthma in older adults may be undiagnosed or misdiagnosed as a cold. It also can be hard to distinguish asthma from heart failure, which can cause wheezing, and chronic obstructive pulmonary disease, which in turn can cause a chronic cough.

GENDER:

According to the recently conducted cross sectional nationally representative National Family Health Survey (NFHS)-3, the overall prevalence of asthma among adult men and women in India is similar with 1,696 and 1,627 per 100,000 respectively (IIPS and Macro International 2007). The number of men and women with asthma increases steadily with age. Prevalence of asthma is higher in rural areas (1,719 per 100,000 for women and 1,799 per 100,000 for men) than for urban areas and that it is more common among women than men.

ECONOMIC STATUS:

The economic status of a person directly affects his living conditions, surroundings and environment. Approximately 15 percent of adults with asthma experience occupational asthma. Occupational asthma is a type of asthma caused by exposure to inhaled irritants in the workplace or at home. Occupational asthma is often a reversible condition, which means the symptoms may disappear when the irritants that caused the asthma are avoided. However, permanent damage can result if the person experiences prolonged exposure. Examples of workplace irritants include dusts, gases, fumes and vapors.

ALCOHOL AND SMOKE INTAKE:

The high per unit alcohol and smoke intake by a person per day increases his probability of developing asthma. High consumption of alcohol and smoke causes constriction and irritability of airway muscles, mucus production and swelling in the airways which leads to asthma.

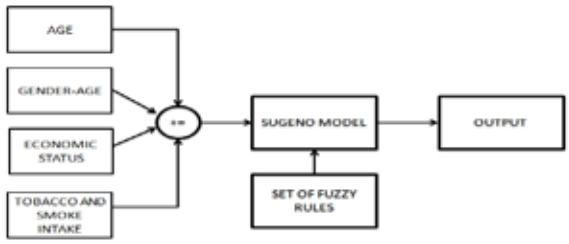


Fig.1 Block diagram of Neuro Fuzzy system for Asthma.

3.Preventing Asthma using Fuzzy Logic:

The fuzziness of a fuzzy membership permits us to handle the problem of disease prognosis , we have defined various membership functions based upon the factors that are responsible for respective diseases. Combining the various research data about the diseases we have laid down linguistic fuzzy rules of the form:

- If (age is young_ones) and (gender_age is female) and (economic_status is low) and (tobacco and smoke is low) then (output is low). If
- (age is young_ones) and (gender_age is female) and (economic_status is high) and (tobacco and smoke is high) then (output is high).
- If (age is young_ones) and (gender_age is male) and (economic_status is low) and (tobacco and smoke is low) then (output is medium).

In the above manner we have laid down 37 rules for asthma.

4.Asthma (FIS EDITOR):

Fig. 2

Membership Function of 'Age'

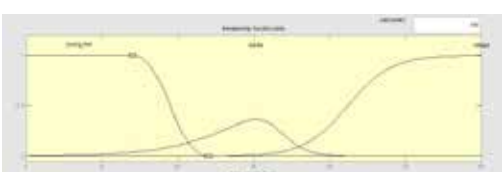


Fig. 3

Membership Function of 'Gender Age'

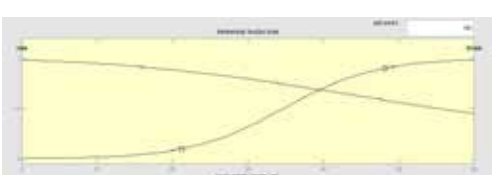


Fig.4

Membership of 'Economic Status'

Fig. 5
Membership Function of 'Alcohol and Smoke Consumption'

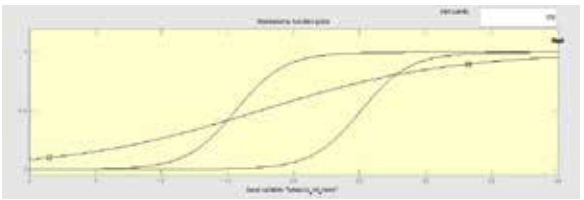


Fig.6

5.Rule Viewer of Asthma:

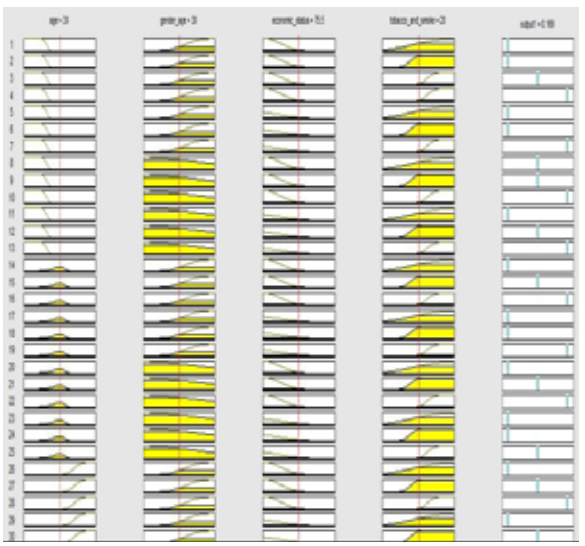


Fig. 7

6.Surface viewer of Training and testing:

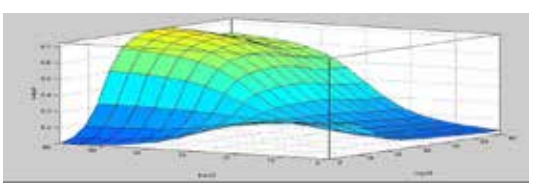


Fig.8 Relationship between 'age' and 'gender age'

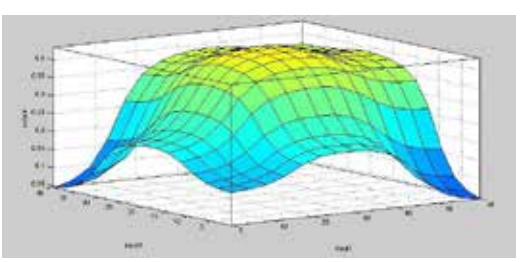


Fig.9 Relationship between 'age' and 'economic status'

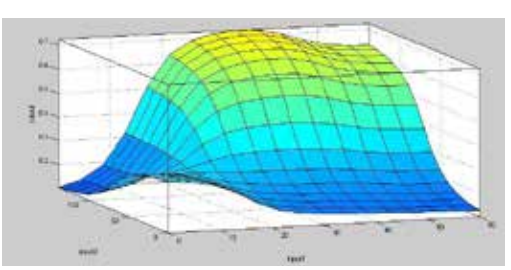


Fig.10 Relationship between 'age' and 'tobacco and smoke consumption'
7.Surface Viewer after training and testing:

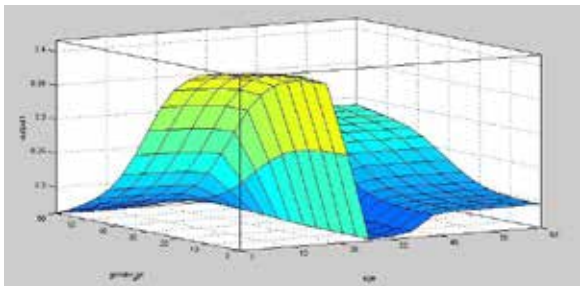


Fig.11 Relationship between 'age' and 'gender age'

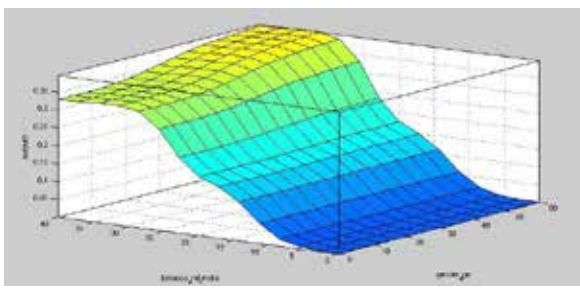


Fig.12 Relationship between 'age' and 'tobacco and smoke '

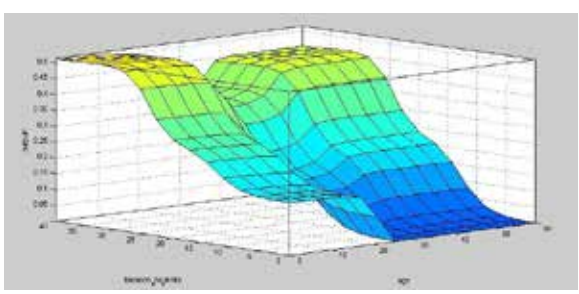
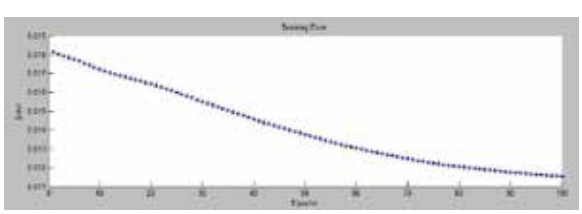


Fig.13 Relationship between 'gender age' and 'tobacco and smoke'

8.Error during Training:



ERROR: 0.011532
Fig.14 Decrement in Training Error

Testing Data

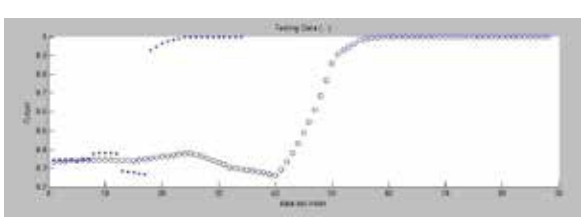


Fig.14 Testing Data

9.Neural Network Model of Asthma in MATLAB software:

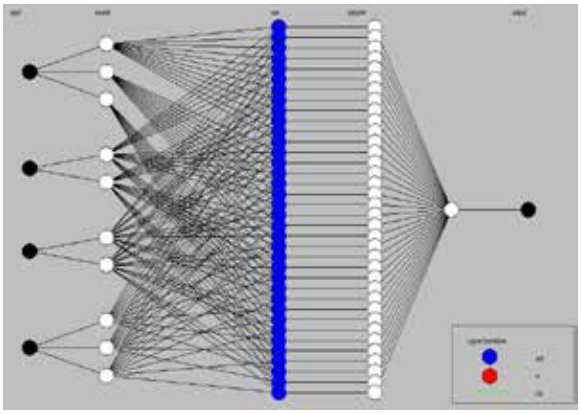


Fig.15 ANN Model of Asthma

10.ANFIS Result on MATLAB command window:
Asthma
ANFIS info:
Number of nodes: 99
Number of linear parameters: 36
Number of nonlinear parameters: 30
Total number of parameters: 66
Number of training data pairs: 88
Number of checking data pairs: 0
Number of fuzzy rules: 36

Start training ANFIS ...
1. 0.0115319
2. 0.0115099
Error: 0.011532

11. Conclusion:
In this project work the detailed analysis of two common diseases in India vis. Asthma and Tuberculosis was carried out considering the various input factors and their symptoms. The analysis was carried out using the Neuro Fuzzy Toolbox of the Matlab program. The input factors considered for Asthma are the Age, Gender, Smoke and Tobacco intake per day and the Economic status of an individual. Based on these input factors a detailed study of Asthma was carried out and a Neuro Fuzzy model was proposed which will help an individual determine his/her probability of acquiring Asthma. The input factors considered for Tuberculosis are the Age, Immunity System, Economic Status, Alcohol intake per day, and the International Connections associated with an individual. Based on these input factors a Neuro Fuzzy model for Tuberculosis was proposed which will help an individual determine his/her probability of acquiring Tuberculosis. The input factors considered in designing of the two models have been chosen with extreme care based on a detailed study of the origin of these two diseases has been done. The data has been collected from the online sources and all possible efforts have been made to make these models effective. This analysis of these two common diseases in India will help the unprivileged and the rural section of the Indian Society overcome the burden of unnecessary tests and medicines associated with these diseases. This work will prove to be helpful for all those people who cannot afford to consult the expert doctors owing to their high fees and unavailability in the rural areas. This project work has a promising future in the field of the Neural Network and Fuzzy Logic in the designing of a complete model comprising of the analysis of a number of common diseases in India. Once globalized, this study will help reduce the global burden of Asthma and Tuberculosis.

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