Analysis of Covid 19 on Fuzzy Logic and Decisionmaking using Matlab

SathyapriyaS[1] , Priyadharshini M[2], Bharani M[3], Selvapriya K[4], Jesintha S[5]

[1] *Assistant Professor*

[2,3,4,5] *PG Scholar, Sri Krishna Arts and Science College,Coimbatore.*

[1]*sathyapriyas@skasc.ac.in,*[2]*priyadharshinim20mma025@skasc.ac.in,*[3]*bharanim20mma004@skasc.ac.in,*[4]*selvapriyak20mma030@skasc.ac.in,* [5]*jesinthas20mma015@skasc.ac.in*

Abstract

This paper identifies how the concept of fuzzy logic and decision making helps to identify the covid 19 positive cases according to their symptoms and risk factors with these factors and with the help of Matlab we can analyze covid 19 positive Cases.

Keywords: Fuzzy logic, Mamdani method, MATLAB 7.5.0 (R2017B) Version

Introduction

The term Fuzzy logic was introduced by LotfiZadeh.It is the form of many –valued logic in which the truth value of variables may be any real numbers between 0 and 1 both inclusive.

Fuzzy logic plays an major role in medical diagnosis.The attitude of the medical diagnosis has two main components namely symptoms and disease.Using fuzzy logic in medical field diagnosis is a very unique technique which can be easily taking by the required medical knowledge and come up with the correct diagnosis decisions. This present work introduces a simple and successful methodology to develop fuzzy expert systems for medical diagnosis.Fuzzy expert system has proved its functionality in the medical diagnosis for the quantifiable analysis and qualitative evaluation of medical data,achieving the accurateresultsfor COVID19. In this paper we use the symptoms of COVID 19 as inputs and going to analysis the positive results of COVID19 patients.
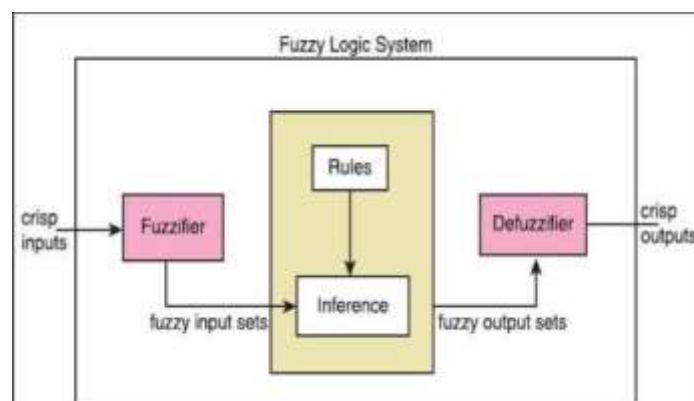
Fuzzy Control System:-

Figure 1-Fuzzy Control System

Fuzzification:-

Fuzzification is the process of decomposing a crisp input value into a fuzzy value.

Defuzzification:-

Defuzzification is the method of

producing a quantifiable result in crisp logic or inverse process of fuzzification where the mapping is done to convert the fuzzy value into crisp values.

Fuzzy Inference System:-

A FIS is a way of mapping an input space into an output space with the help of fuzzy logic. FIS used to make a decision and act accordingly.

Decision Making:-

1.   Determining the set of alternatives,

2.   Evaluating alternatives and

3.   Comparison between alternatives.

Fuzzy Membership Function:-

A membership function (MF) is a curve that defines how each point in the input space is mapped to a membership grade between 0 and 1.

Mamdanis Method:-

Mamdani's method is most commonly used applications, due to its simple structure of the following symptoms Fever, Dry cough, Fatigue, Headache, Shortness of Breath, lack of Appetite, loss of smell, chest pain and Diarrhoea and going to find the COVID 19 positive cases.

Materials and Methods:-

The most significant application of fuzzy system is an uncertain issues of the problems. If there is a dynamic behavior, the problem can be solved using fuzzy logic.

Membership Graphs:- Inputs:-

'minmax'operations. Through defuzzification of rules consequent of crisp result is obtained. Mamdani method is using in MISO and MIMO systems

Analysis of Covid 19:-

COVID 19 is an infectious disease. There are many major symptoms in that we are going to take

We design a fuzzy expert system to diagnosis the COVID 19.

•   Detection of COVID 19.

•   Determine the input and output variable.

•   There are 10 input and 1 output.

•   Membership function is associated with fuzzy variable.
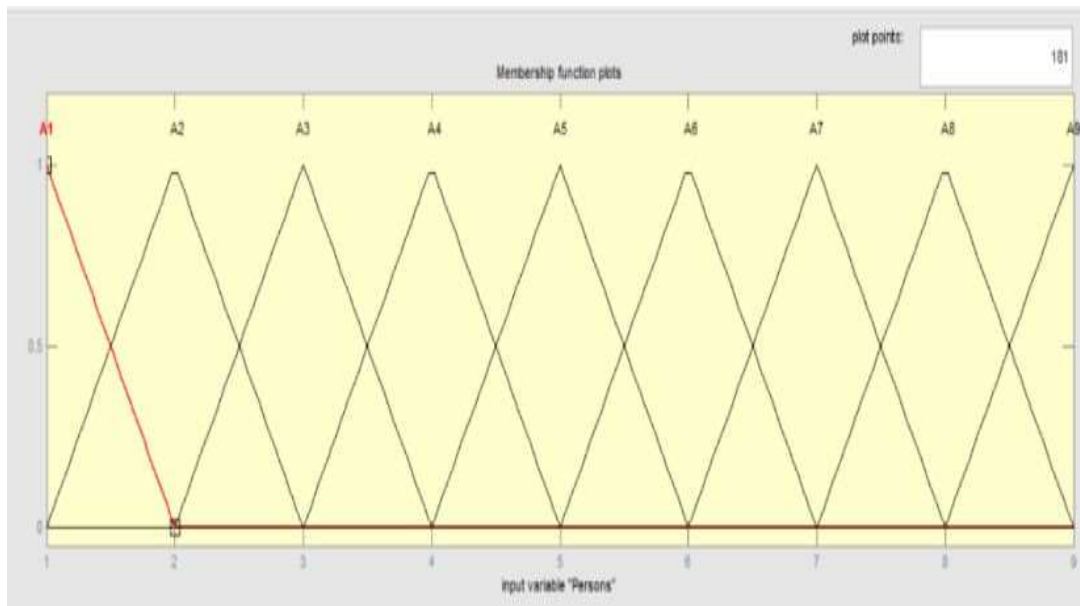
•   Frame rules to the system.

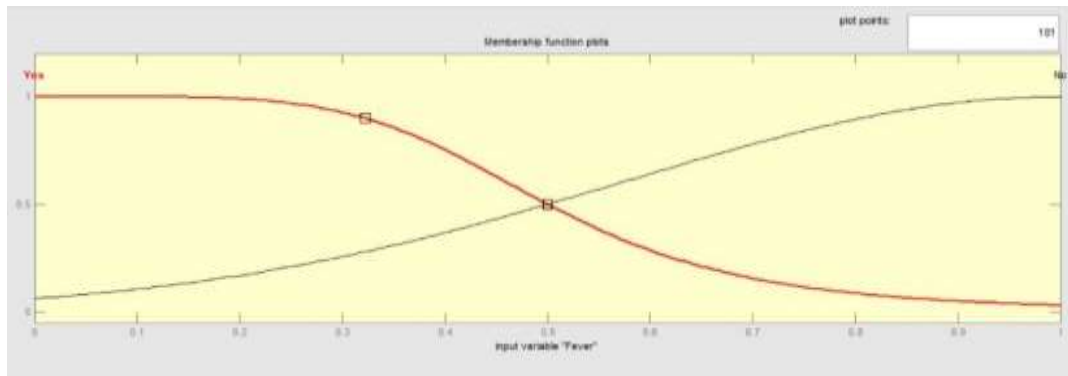Figure 2-Membership Grade of the PERSONS input
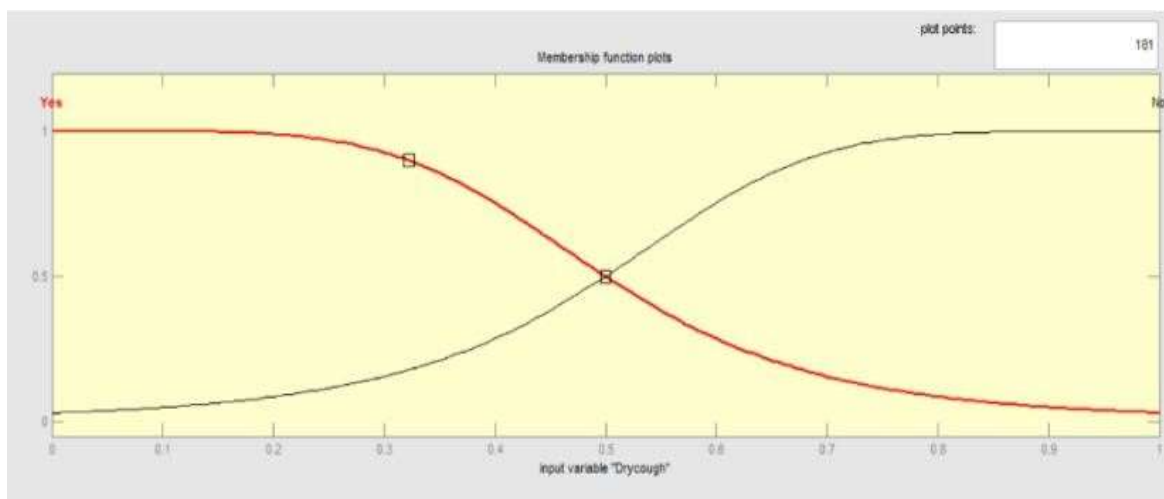

Figure 3-Membership Grade of the FEVER input

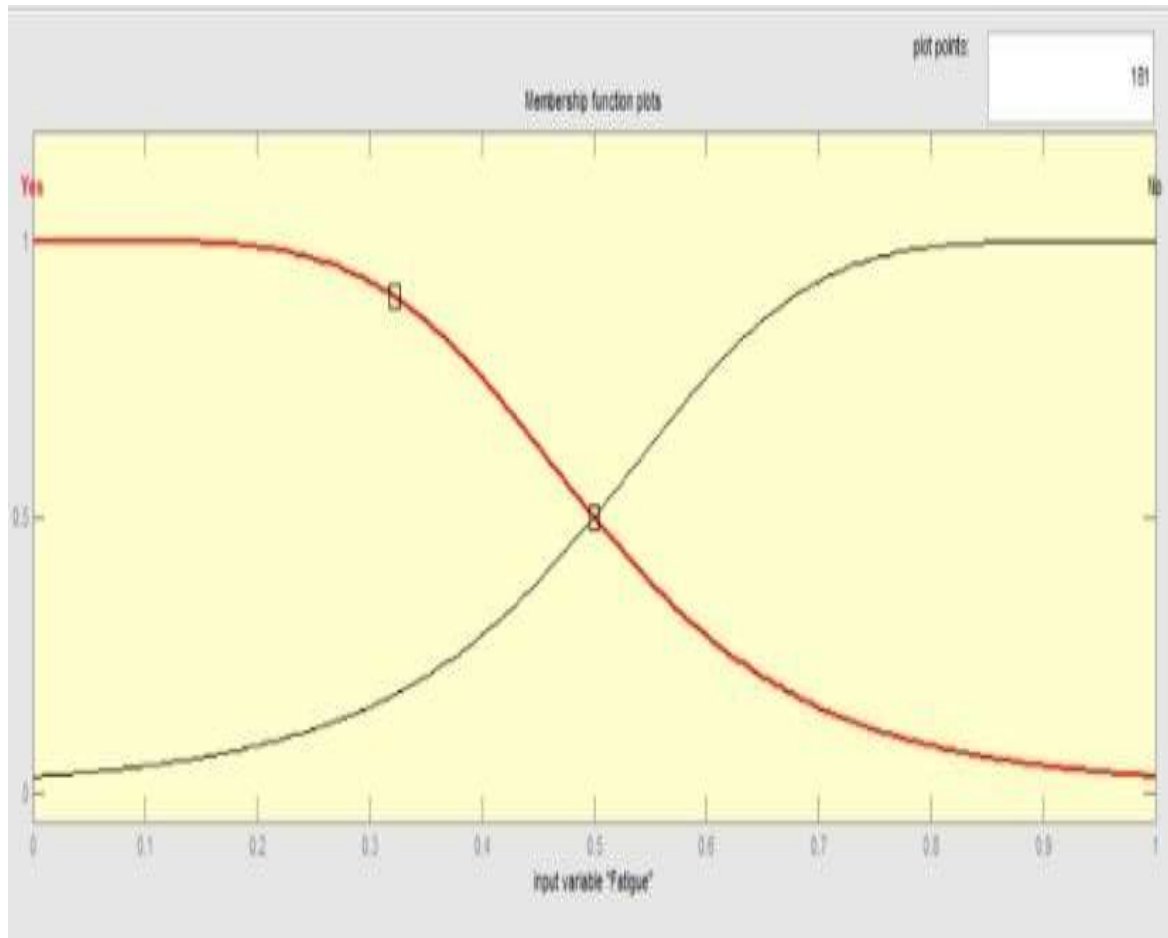Figure 4--Membership grade of the DRY COUGH input

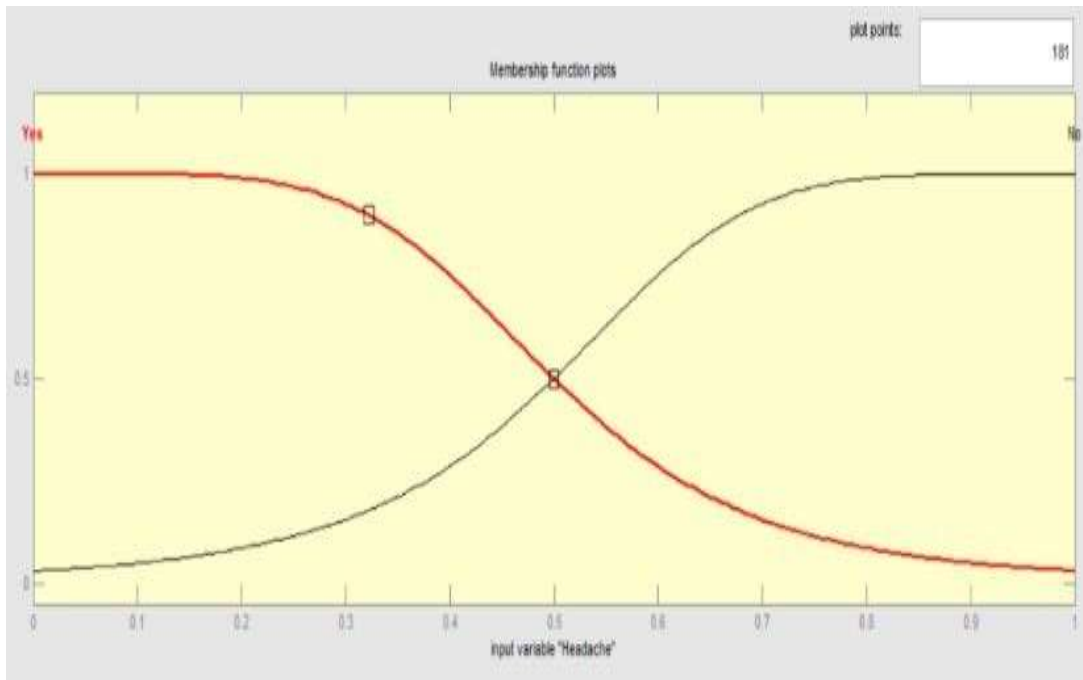Figure 5-Membership grade of the FATIGUE input

Figure 6-Membership grade of the HEADACHE input
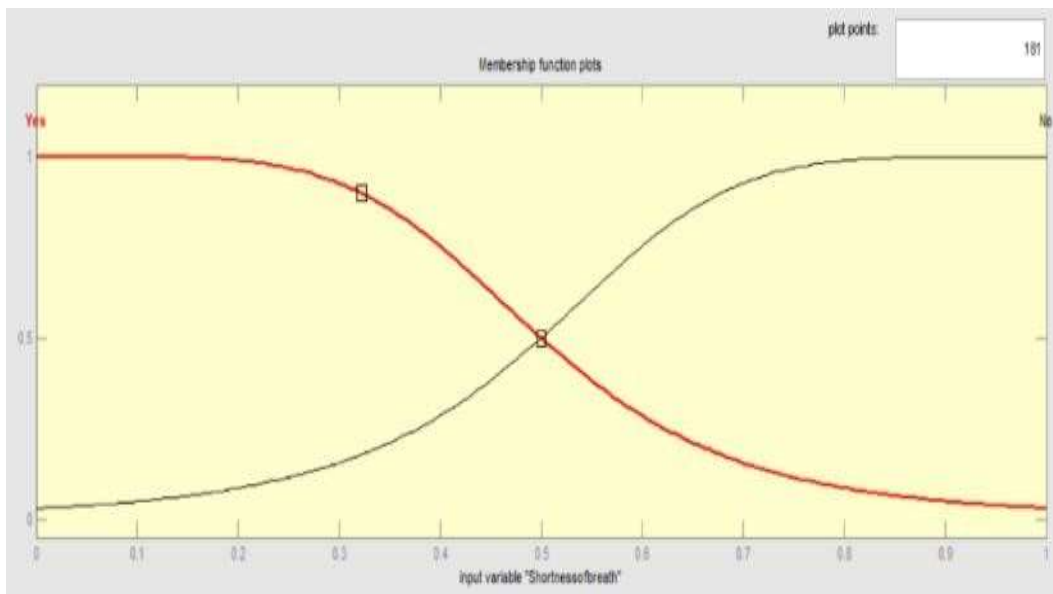

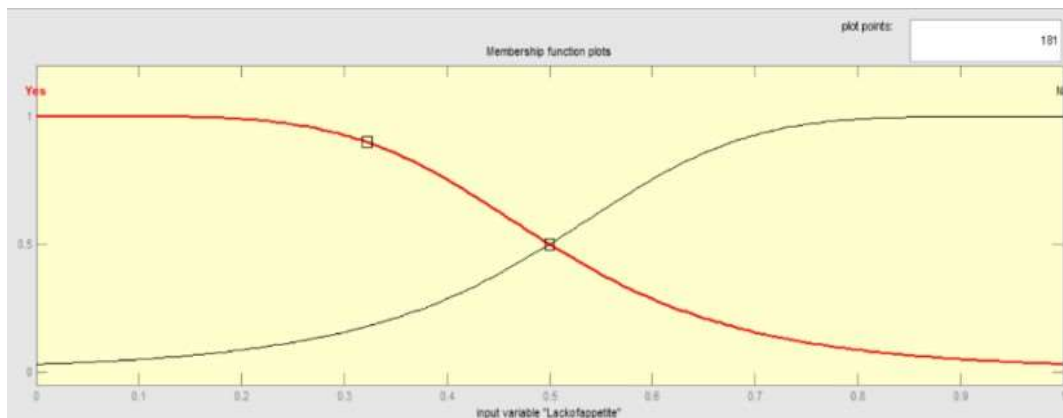Figure 7-Membership grade of the SHORTNESS OF BREATH input

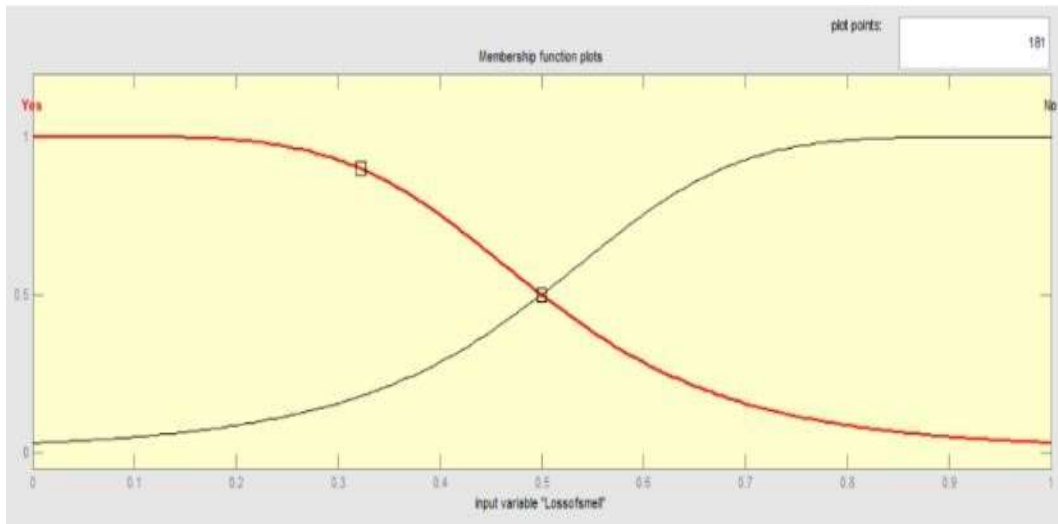Figure 8-Membership grade of the LACK OF APPETITE input

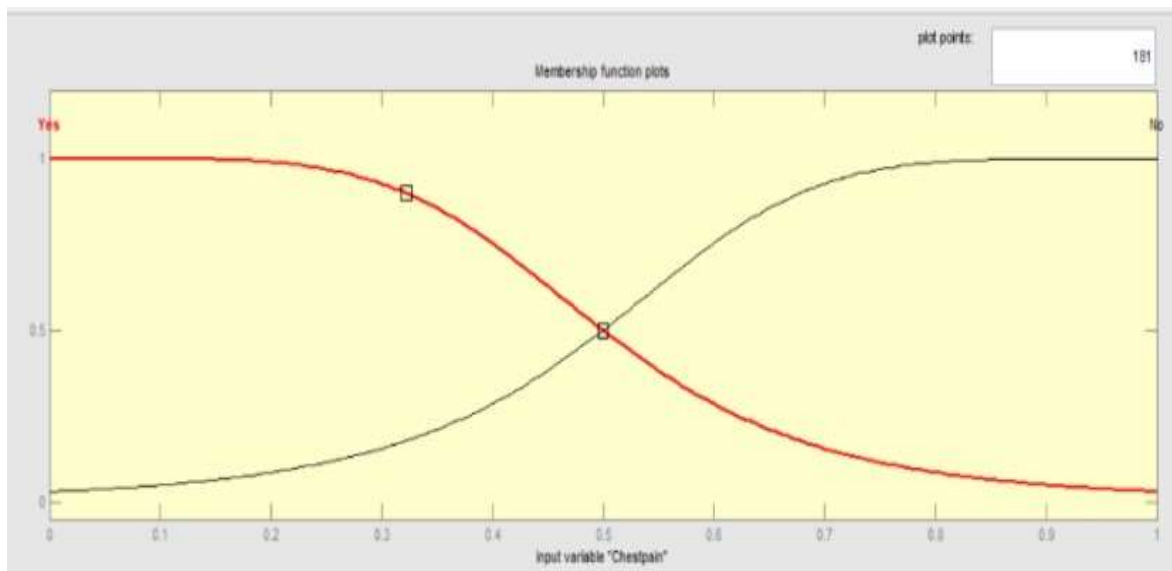Figure 9-Membership grade of the LOSS OF SMELL input

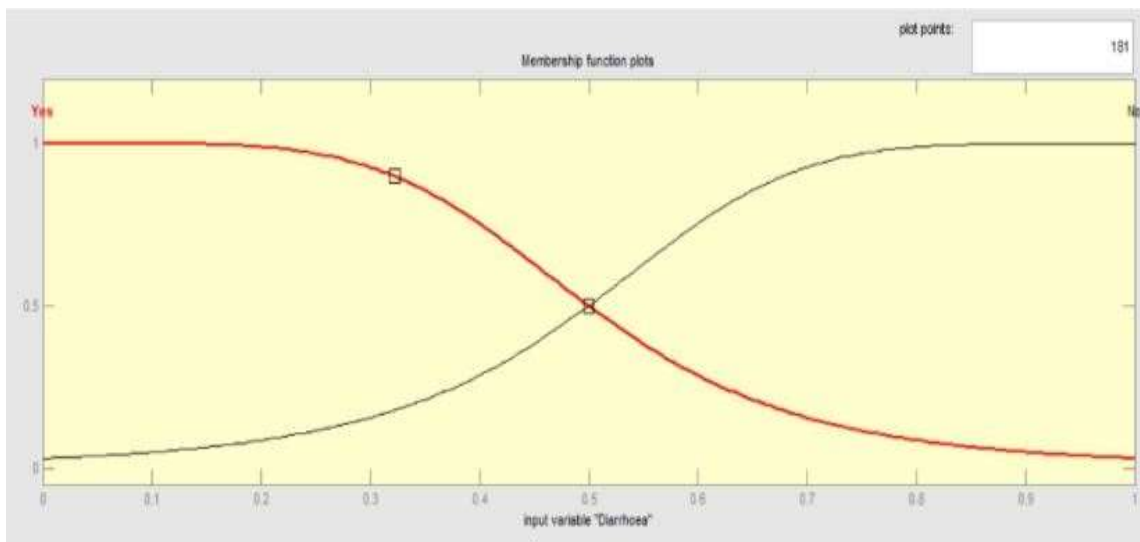Figure 10--Membership grade of the CHEST PAIN input

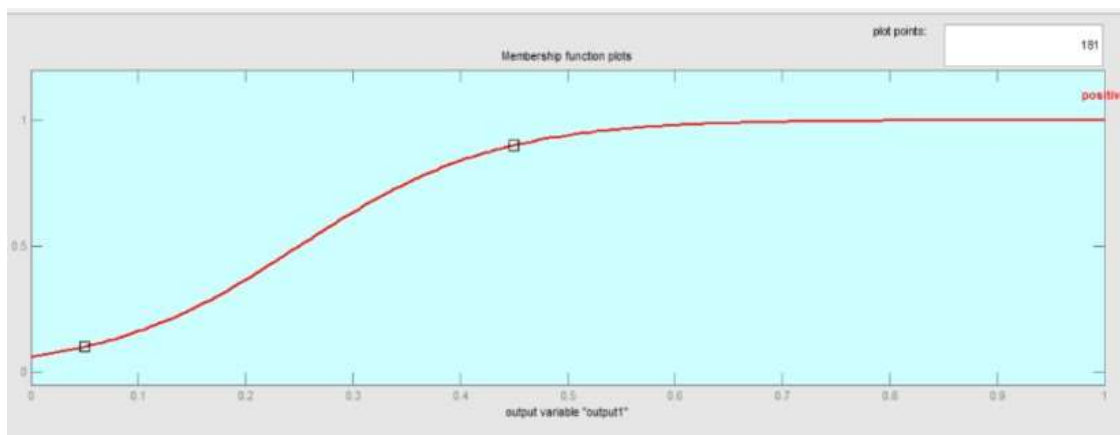Figure 11-Membership grade of the DIARRHOEA input OUTPUT:-

Figure 12-Membership grade of the OUTPUT

Decision Rules:-

Table 1-Decision Rules

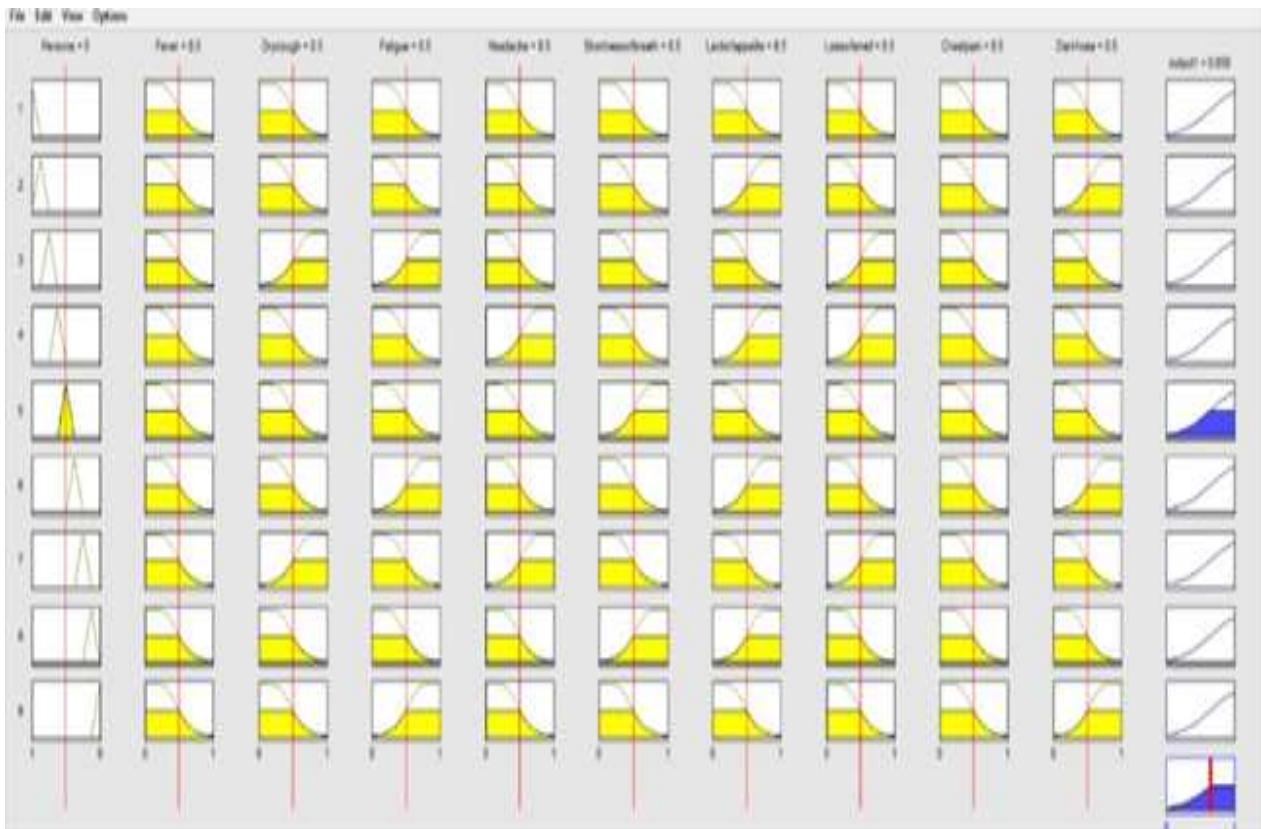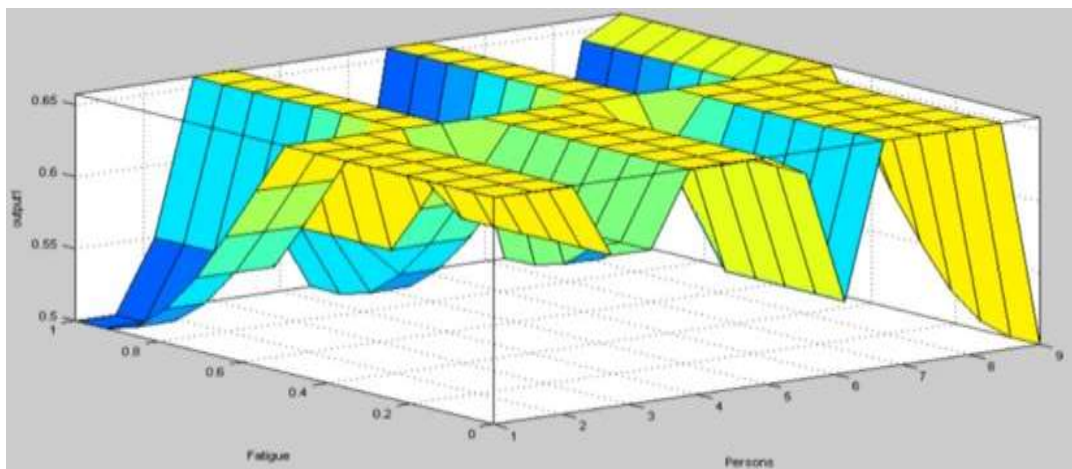| Persons	Fever	Drycough	Fatigue	Headache	Shortness of Breath	Lack of appetite	Loss of smell	Chest pain	Diarrhoea	output
A1	✓	✓	✓	✓	✓	✓	✓	✓	✓	Positive
A2	✓	✓	✓	✓	✓	⃞	✓	✓	⃞	Positive
A3	✓	⃞	⃞	✓	✓	✓	⃞	✓	✓	Positive
A4	✓	✓	✓	⃞	✓	⃞	⃞	✓	✓	Positive
A5	✓	✓	✓	✓	⃞	✓	✓	✓	✓	Positive
A6	✓	✓	⃞	✓	✓	⃞	✓	✓	⃞	Positive
A7	✓	⃞	✓	⃞	✓	✓	⃞	✓	✓	Positive
A8	✓	✓	✓	✓	⃞	⃞	✓	✓	✓	Positive
A9	✓	✓	⃞	✓	✓	✓	✓	✓	⃞	Positive

Figure 13-Result Of Designed System

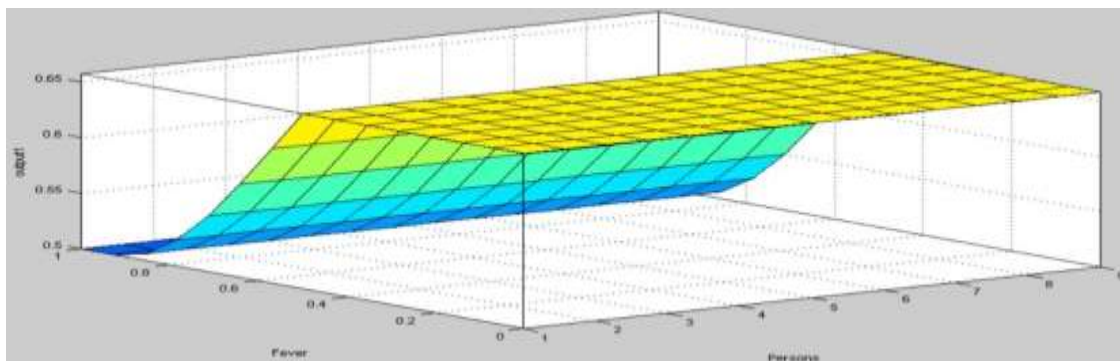Figure 14-Surface Viewer for Persons And Fatigue
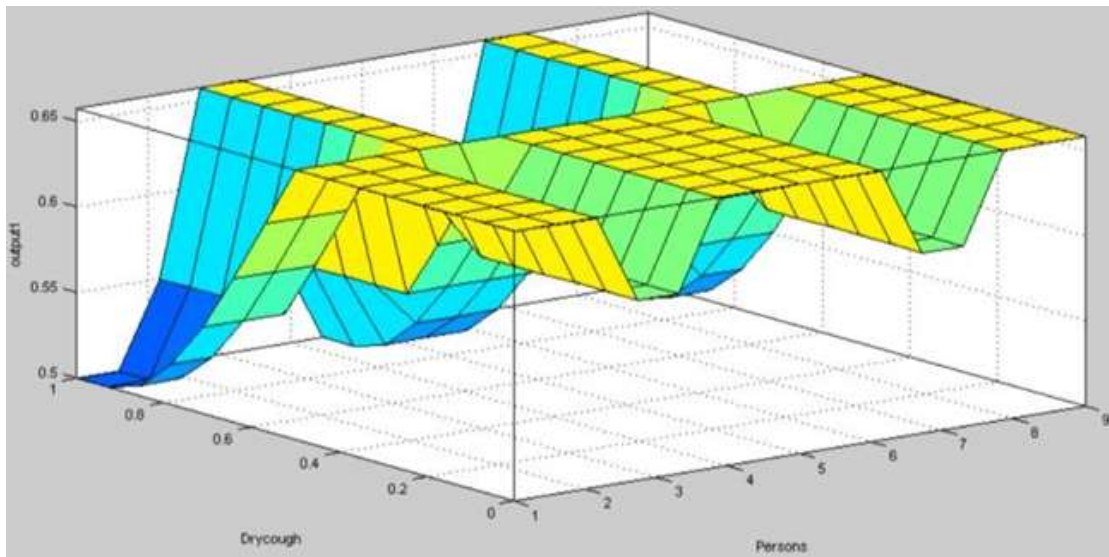
Figure 15-Surface Viewer for Persons And Fever

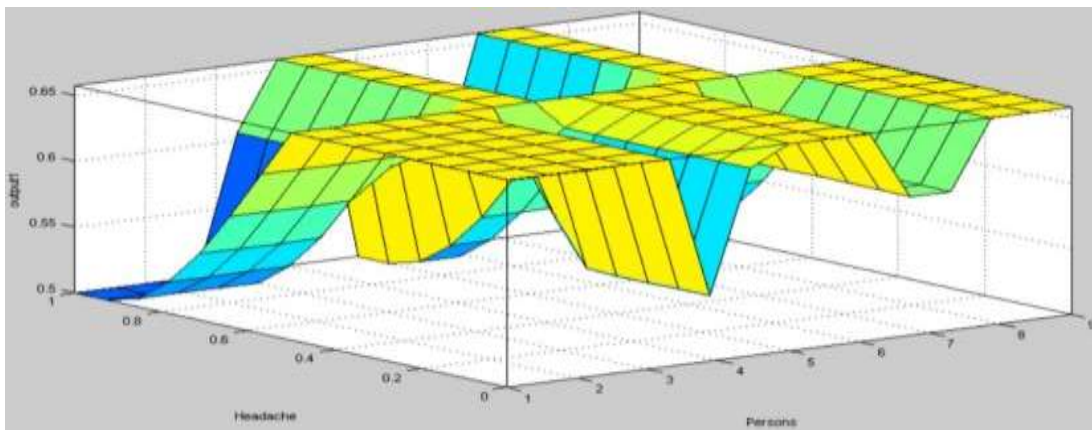Figure 16-Surface Viewer for Persons And Drycough

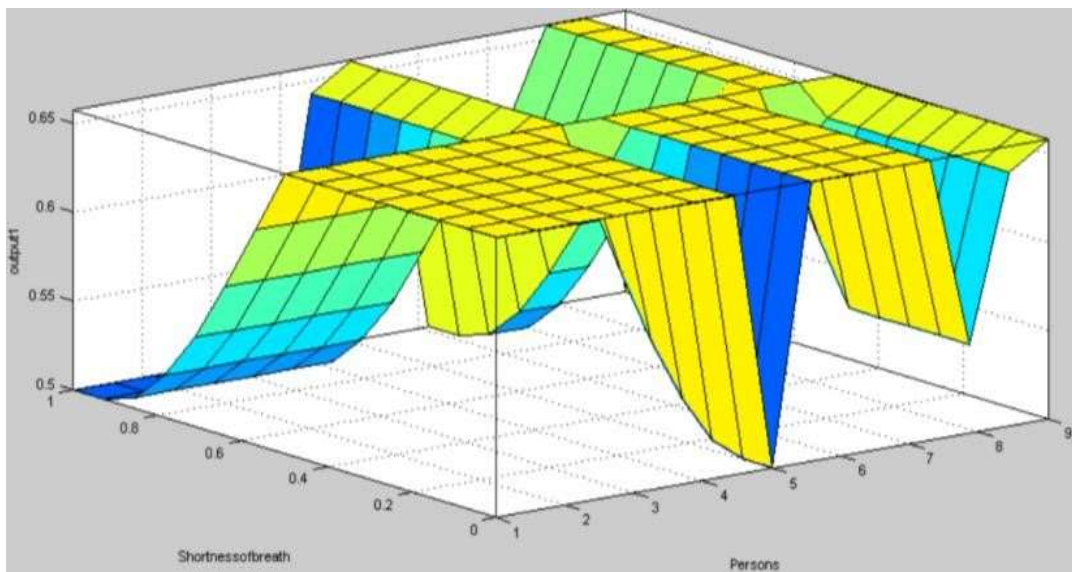Figure 17-Surface Viewer For Persons And Headache

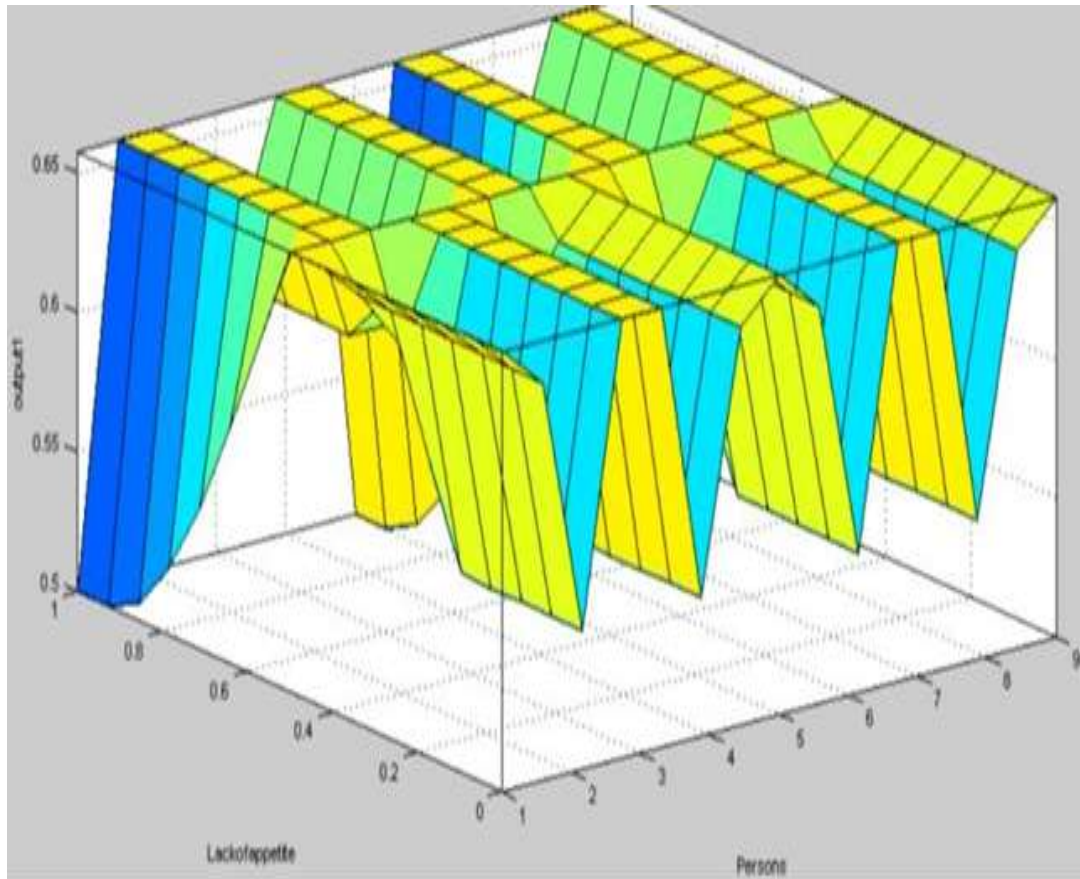Figure 18-Surface Viewer For Persons And Shortness Of Breath

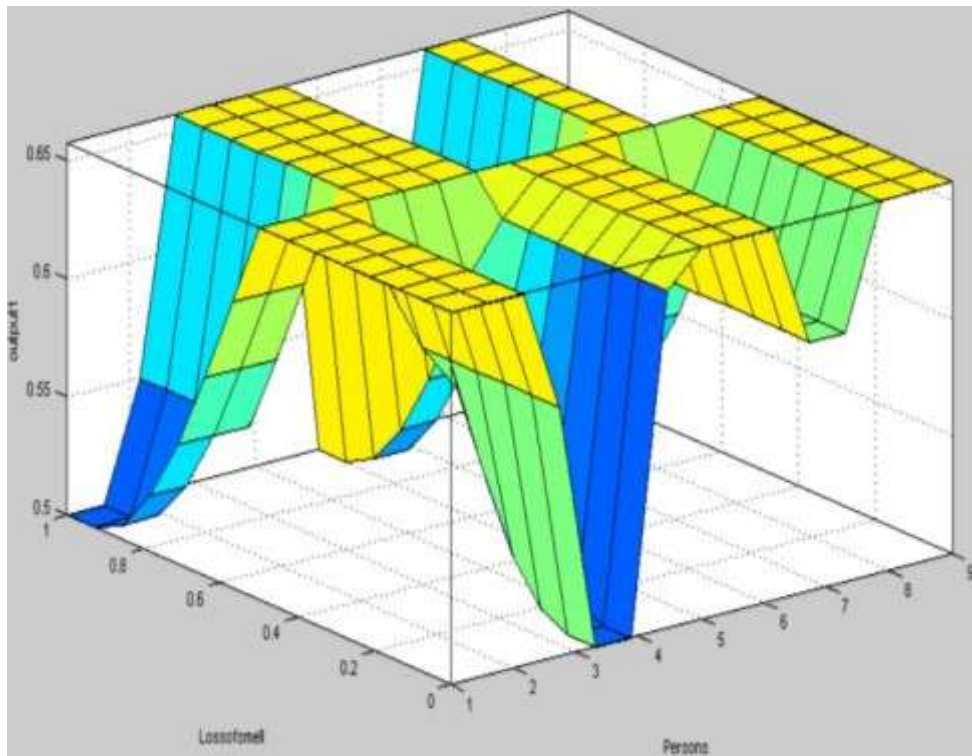Figure19-Surface Viewer For Persons And Lack Of Appetite

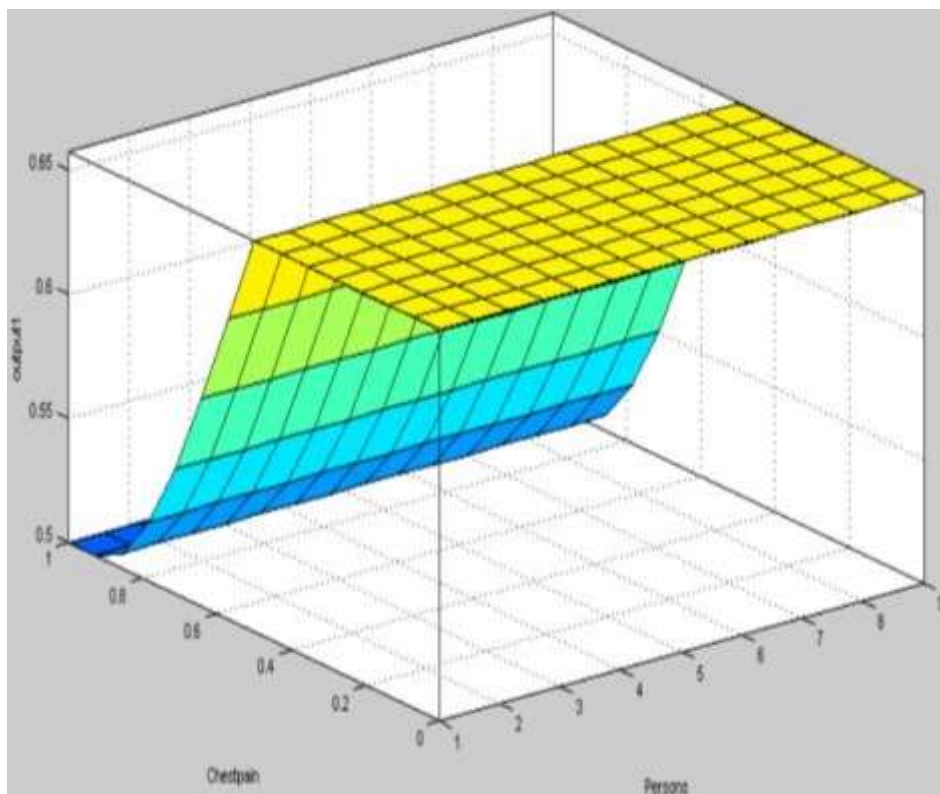Figure 20-Surface Viewer for Persons And Loss Of Smell

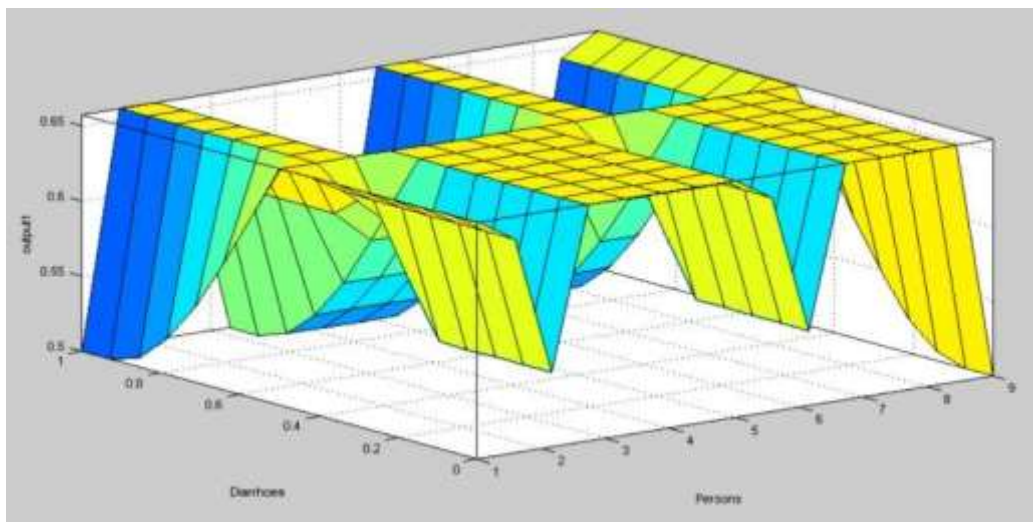Figure 21-Surface Viewer For Persons And Chest Pain

Figure 22-Surface Viewer For Persons And Diarrhoea

Conclusion:-

This paper is a analysis of fuzzy logic that is designed to help in decision making on the most common COVID 19 clinical dilemmas.The decision rules and membership functions are used to predict the symptoms of COVID 19.The functioning of input and output variables and the rule based on fuzzy systems are explained with numerical examples.In addition to this valuable educative tool MATLAB is used to materialize the analysis on decision making.

References

YuemingLuo, Juan Wu, Investigation of COVID-19-related symptoms based on factor analysis.

Centre HPS (2020) Epidemiology of covid 19 in Ireland 4/12/20.

Carole H. Surde, Karla A.Lee4, Symptoms clusters in COVID-19.

S.Sathyapriya, Assistant Professor ,Department of Mathematics, Sri Krishna Arts and Science College, Coimbatore.

M.Priyadharshini, PG Scholar Department of Mathematics,Sri Krishna Arts and Science College,Coimbatore.

M.Bharani , PG Scholar Department of Mathematics,Sri Krishna Arts and Science College,Coimbatore

K.Selvapriya, PG Scholar Department of Mathematics,Sri Krishna Arts and Science College,Coimbatore.

S.Jesintha, PG Scholar Department of Mathematics,Sri Krishna Arts and Science College,Coimbatore.