A COGITATIVE MEASURE ON HYPERCONNECTED SPACES AND NEUTROSOPHIC HYPERCONNECTED SPACES HOLDING DISPARATE CLASS OF SETS

Thesis submitted to the Bharathiar University for the award of the degree of

DOCTOR OF PHILOSOPHY IN MATHEMATICS

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Chapter 6

An expert system design to diagnose coronary heart disease using softsets

6.1 Introduction

Several theories have been proposed to deal with uncertainties effectively in recent years. Intelligent systems supported by mathematical theories have turned out to be the best in diagnosis process of identifying the disease. Molodstov coined the term soft set theory. An expert system based on "soft set theory" and "fuzzy set theory" named as soft expert system has been utilized here to describe a new mathematical tool to deal with uncertainties that occurs in diagnosis process.

In this chapter, we have used a medical data set of few patients to create the Soft Expert System(SES) as a prediction system to ascertain coronary artery disease. We have assessed the risk created by the disease by utilizing both fuzzy sets and soft sets by using input variables like age, blood sugar, HDL, LDL, HbA1c, uric acid and blood pressure. This methodology has been used to create a soft expert system with the major procedures: input data, fuzzification, converting fuzzy sets into soft sets, parameter reduction of soft sets, obtaining soft rules and output data. This system helps the medical practitioner improve his/her performance.

6.2 Methodology

Every year, Coronary artery disease affects millions of people around the world. This disease has been proven to be the top cause of death in both men and women, particularly in developed countries.The illness is caused by the build-up of fat and cholesterol in the main arteries of the heart, which causes a blockage (known as plaque) that leads to a heart attack and death. With the aid of fuzzy sets and soft sets, this work attempts to identify coronary artery disease by using the following major components, which is depicted in the following diagram.

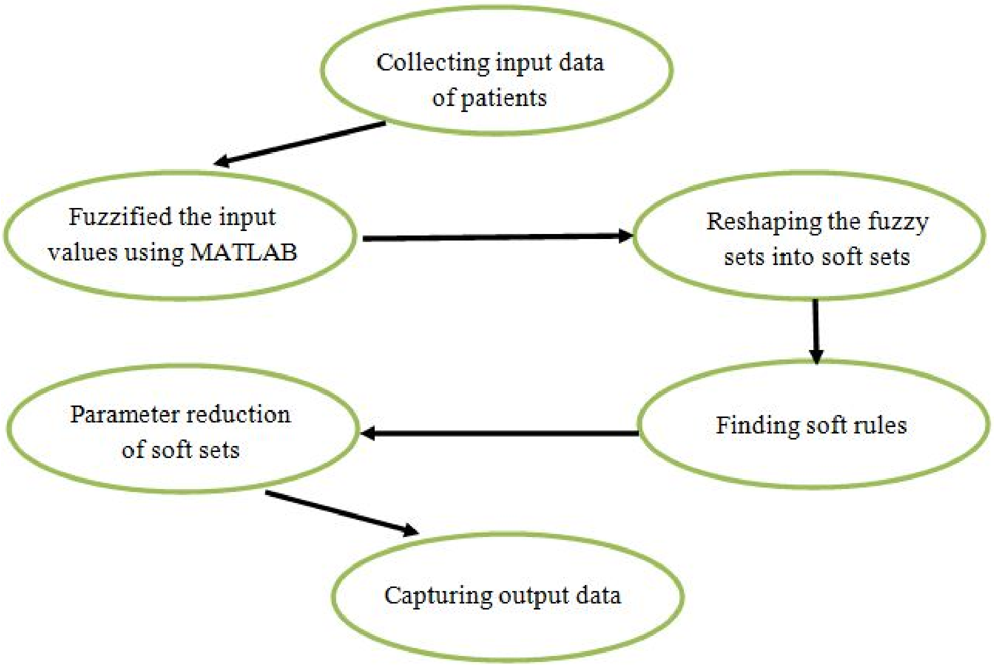

Figure 6.1: Structure of the soft expert system

Using this methodology, we aim to eliminate the imprecision in the health care system which ultimately improves the medical practitioner to determine the exact risk level of coronary heart disease.

6.2.1 Data Set

We have initially started the process by converting the raw data into fuzzy sets. MATLAB software has been used to facilitate the calculations. The details of a total of 60 patients have been changed into fuzzy values using the membership function. This function has been used to segregate the patients based on their ages into two groups – young as 20 to 45 while older people belong to the age group of 45 to 90. These fuzzy values have been demonstrated using the graph below.

Table 6.1: Input values of 60 patients

Patients	Age	Blood Sugar (F)	HDL	LDL	HbA1c	Uric Acid	Blood Pressure
P_1	48	91	40	84	7.00%	4.7	110
P_2	21	70	35	89	5.20%	3.1	100
P_3	59	200	44	157.2	9.30%	4.9	160
P_4	44	100	40	122	6.50%	4	150
P_5	62	80	46	107	6.50%	5	100
P_6	55	50	20	88	4.00%	2.5	160
P_7	40	100	52	104	6.80%	5.4	110
P_8	38	140	62	122	7.00%	5.7	190
P_9	68	115	50	122	6.70%	5.7	130
P_{10}	34	89	50	95	7.00%	5.4	100
P_{11}	45	173	49	147	9.00%	9.2	200
P_{12}	33	124	46	178	6.80%	6.8	150
P_{13}	26	54	32	88	5.50%	1.9	80
P_{14}	23	93	37	104	6.90%	5.4	90
P_{15}	44	102	39	95	6.60%	3.3	100
P_{16}	39	86	42	121	6.70%	5.5	110
P_{17}	58	115	45	143	7.00%	6.2	130
P_{18}	22	72	38	102	6.00%	3.5	110
P_{19}	58	109	44	124	7.10%	7	100

P_{20}	66	152	56	164	9.10%	8.6	200
P_{21}	25	81	40	115	6.50%	3.9	110
P_{22}	44	124	57	153	7.20%	5.8	150
P_{23}	53	95	38	100	6.50%	5.3	100
P_{24}	33	72	36	99	6.20%	6.4	130
P_{25}	35	54	30	90	5.60%	1.5	80
P_{26}	79	192	55	177	9.10%	8.1	200
P_{27}	65	183	48	173	7.00%	6.1	190
P_{28}	35	65	32	97	5.90%	2.5	100
P_{29}	27	83	44	108	6.50%	6.6	100
P_{30}	34	105	47	126	6.90%	5.3	130
P_{31}	69	183	53	167	7.80%	6.1	190
P_{32}	54	115	43	140	7.20%	7.5	150
P_{33}	33	43	35	80	5.10%	2.4	80
P_{34}	41	93	45	103	6.50%	5.1	100
P_{35}	66	110	40	125	7.00%	7	100
P_{36}	30	71	35	99	6.00%	2.6	90
P_{37}	44	116	44	146	7.10%	5.9	100
P_{38}	31	95	38	88	6.80%	4.8	110
P_{39}	33	74	36	88	6.50%	3.1	100
P_{40}	66	132	46	137	6.90%	7.2	190
P_{41}	71	101	46	79	7.00%	5.5	110
P_{42}	41	123	50	124	7.10%	7.6	190
P_{43}	32	85	39	82	6.90%	5.4	100
P_{44}	63	143	53	161	8.10%	7.9	150
P_{45}	28	94	39	107	6.60%	5.2	100
P_{46}	34	73	39	96	6.10%	2.7	90
P_{47}	29	66	36	93	6.00%	2.6	100
P_{48}	31	84	41	113	6.60%	6.7	100

P_{49}	54	106	47	127	7.00%	5.4	130
P_{50}	68	185	53	165	7.60%	6.2	190
P_{51}	77	118	50	136	7.30%	7.6	150
P_{52}	23	45	33	82	5.20%	2.5	80
P_{53}	54	128	56	154	9.00%	5.9	150
P_{54}	28	96	38	102	6.60%	5.4	100
P_{55}	23	73	38	97	6.30%	6.5	130
P_{56}	25	58	29	94	5.20%	1.6	80
P_{57}	66	193	57	176	9.90%	8.2	200
P_{58}	73	185	59	163	8.20%	6.2	190
P_{59}	52	82	43	111	6.60%	5.1	100
P_{60}	26	51	28	82	4.10%	2.6	80

6.2.2 Fuzzification of Data Set

Primarily, the raw data is converted into fuzzy sets as the raw data cannot be studied properly. So the process of fuzzification of data set by employing membership function for every variable under this study is carried out.

6.2.3 Membership Function for Age

Different age group end up showing different risks according to their age. The raw data obtained from the medical reports of sixty patients has been used to proceed with the method. The values can be assessed based on the classification of two age groups – young (20 to 45) and old (45 to 90). This classification has been done through the usage of membership functions as mentioned.

- 20-45 Young
- 45-90 Old

$$\eta_{Young}(x) = \begin{cases} 0, & x < 20 \\ \frac{x-20}{15}, & 20 \leq x \leq 35 \\ \frac{x-35}{10}, & 35 \leq x \leq 45 \\ 0, & x > 45 \end{cases}$$

$$\eta_{Old}(x) = \begin{cases} 0, & x < 44 \\ \frac{x-45}{25}, & 45 \leq x \leq 70 \\ \frac{x-70}{20}, & 70 \leq x \leq 90 \\ 0, & x > 90 \end{cases}$$

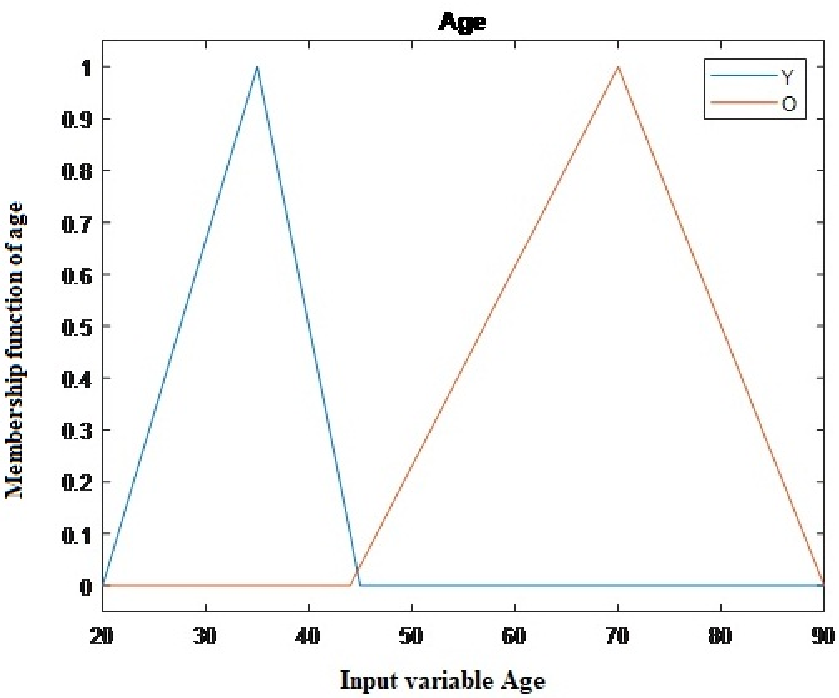

Figure 6.2: Graph of the function η_{Young}, η_{Old}

6.2.4 Membership function for Blood Sugar (Fasting)

Blood Sugar(Fasting) level has salient effect on the results. The data of people has been classified according to the levels of sugar in the patients' blood samples as follows: Level 40 to 100 is low, Level 100 to 150 is considered medium, and Level 150 to 200 is considered high, and the membership function is used accordingly.

* 40-100 Low
* 100-150 Medium
* 150-200 High

$$\eta_{Low}(x) = \begin{cases} 0, & x < 40 \\ \frac{x-40}{30}, & 40 \leq x \leq 70 \\ \frac{x-70}{30}, & 70 \leq x \leq 100 \\ 0, & x > 100 \end{cases}$$

$$\eta_{Medium}(x) = \begin{cases} 0, & x < 100 \\ \frac{x-100}{25}, & 100 \leq x \leq 125 \\ \frac{x-125}{25}, & 125 \leq x \leq 150 \\ 0, & x > 150 \end{cases}$$

$$\eta_{High}(x) = \begin{cases} 0, & x < 150 \\ \frac{x-150}{25}, & 150 \leq x \leq 175 \\ \frac{x-175}{25}, & 175 \leq x \leq 200 \\ 0, & x > 200 \end{cases}$$

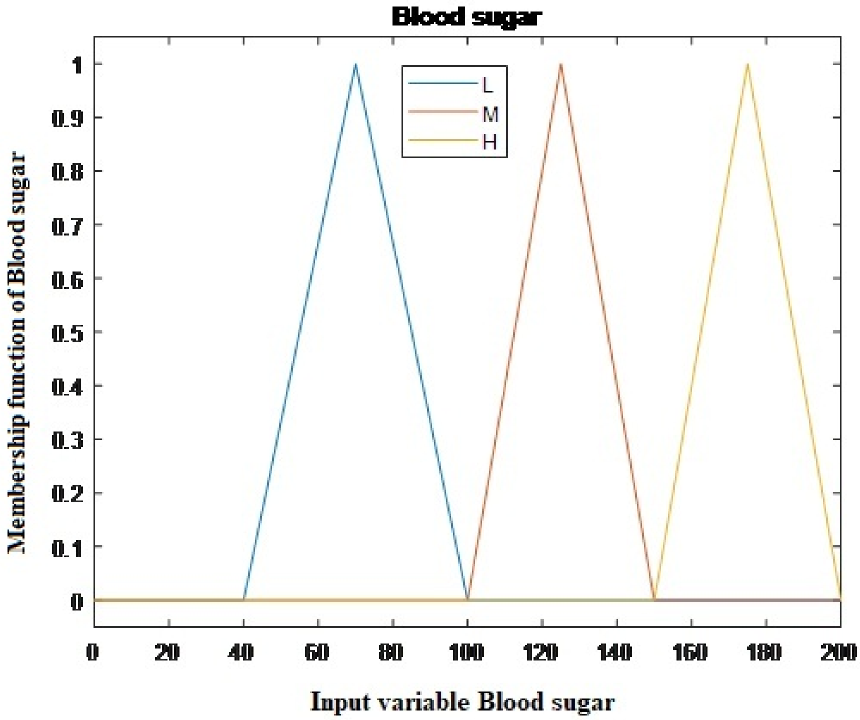

Figure 6.3: Graph of the function η_{Low}, η_{Medium} and η_{High}

6.2.5 Membership function for LDL cholestral

LDL Cholesterol is an important attribute considered in this process. The LDL Cholesterol is divided into 3 categories: Low, Medium and High. Level 0 to 100 is low, 100 to 160 is considered medium level and 160 to 200 is considered as high level, and the membership function is used accordingly.

* 0-100 Low
* 100-160 Medium
* 160-200 High

$$\eta_{Low}(x) = \begin{cases} 0, & x < 50 \\ \frac{x-50}{30}, & 50 \leq x \leq 80 \\ \frac{x-80}{20}, & 80 \leq x \leq 100 \\ 0, & x > 100 \end{cases}$$

$$\eta_{Medium}(x) = \begin{cases} 0, & x < 100 \\ \frac{x-100}{30}, & 100 \leq x \leq 130 \\ \frac{x-130}{30}, & 130 \leq x \leq 160 \\ 0, & x > 160 \end{cases}$$

$$\eta_{High}(x) = \begin{cases} 0, & x < 160 \\ \frac{x-160}{20}, & 160 \leq x \leq 180 \\ \frac{x-180}{20}, & 180 \leq x \leq 200 \\ 0, & x > 200 \end{cases}$$

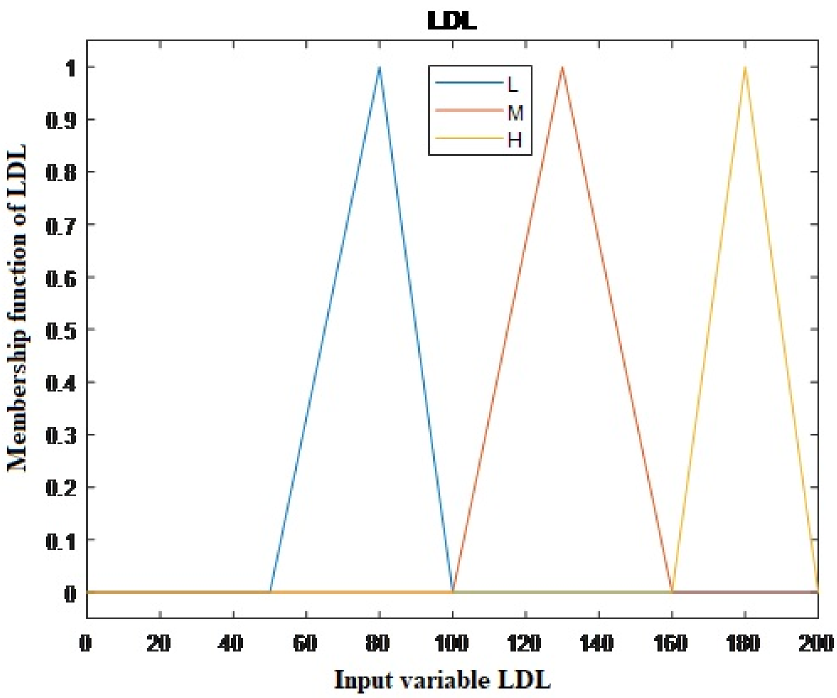

Figure 6.4: Graph of the function η_{Low}, η_{Medium} and η_{High}

6.2.6 Membership function for HDL

HDL Cholesterol is also a significant attribute in this process. The levels of HDL have been split using the membership function into three categories: Low, Border and Good. HDL value lesser than 40 is called low while values ranging from 40 to 45 are in the border level and values above 45 are considered good.

- < 40 Low
- $40 - 45$ Border
- > 45 Good

$$\eta_{Low}(x) = \begin{cases} 0, & x < 20 \\ \frac{x-20}{10}, & 20 \leq x \leq 30 \\ \frac{x-30}{10}, & 30 \leq x \leq 40 \\ 0, & x > 40 \end{cases}$$

$$\eta_{Border}(x) = \begin{cases} 0, & x < 40 \\ \frac{x-40}{5}, & 40 \leq x \leq 45 \\ 0, & x > 45 \end{cases}$$

$$\eta_{Good}(x) = \begin{cases} 0, & x < 45 \\ \frac{x-45}{25}, & 45 \leq x \leq 70 \\ 0, & x > 70 \end{cases}$$

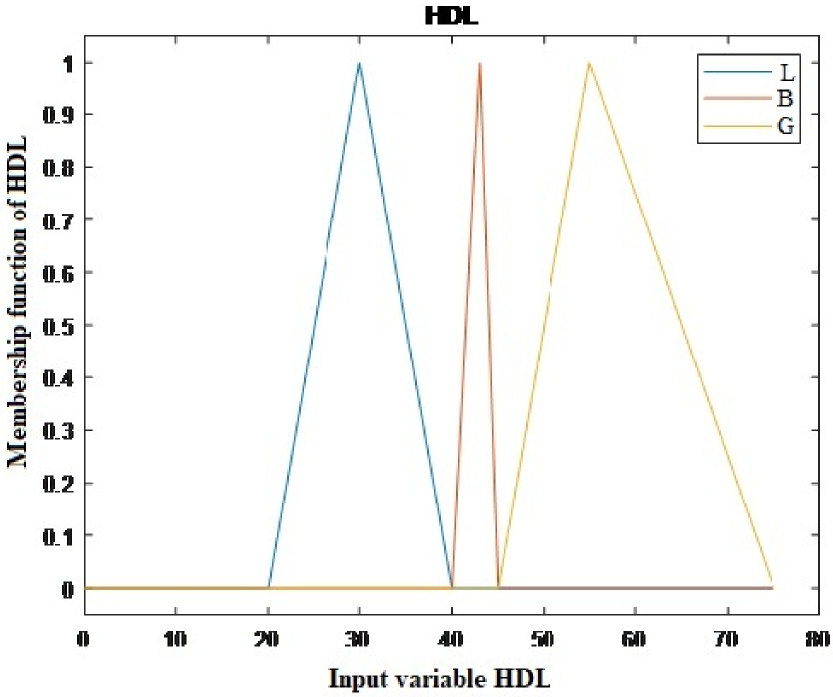

Figure 6.5: Graph of the function η_{Low}, η_{Border} and η_{Good}

6.2.7 Membership function for HbA1c

Haemoglobin A1c level plays a significant role here.The levels of HbA1c have been assessed in the form of percentages through membership functions. If the level is lesser than 6%, it is considered normal. If the percentage ranges from 6 to 6.4, it is diagnosed as prediabetes while a value higher than 6.5% is termed as diabetes.

* $< 6\%$ Normal
* $6\% - 6.4\%$ Prediabetes
* $> 6.5\%$ Diabetes

$$\eta_{Normal}(x) = \begin{cases} 0, & x < 4\% \\ \frac{x-4}{2}, & 4\% \leq x \leq 6\% \\ 0, & x > 6\% \end{cases}$$

$$\eta_{Prediab}(x) = \begin{cases} 0, & x < 6\% \\ \frac{x-6}{0.4}, & 6\% \leq x \leq 6.4\% \\ 0, & x > 6.4\% \end{cases}$$

$$\eta_{Diabetes}(x) = \begin{cases} 0, & x < 6.4\% \\ \frac{x-6.4}{0.6}, & 6.4\% \leq x \leq 7\% \\ \frac{x-7}{3}, & 7\% \leq x \leq 10\% \\ 0, & x > 10\% \end{cases}$$

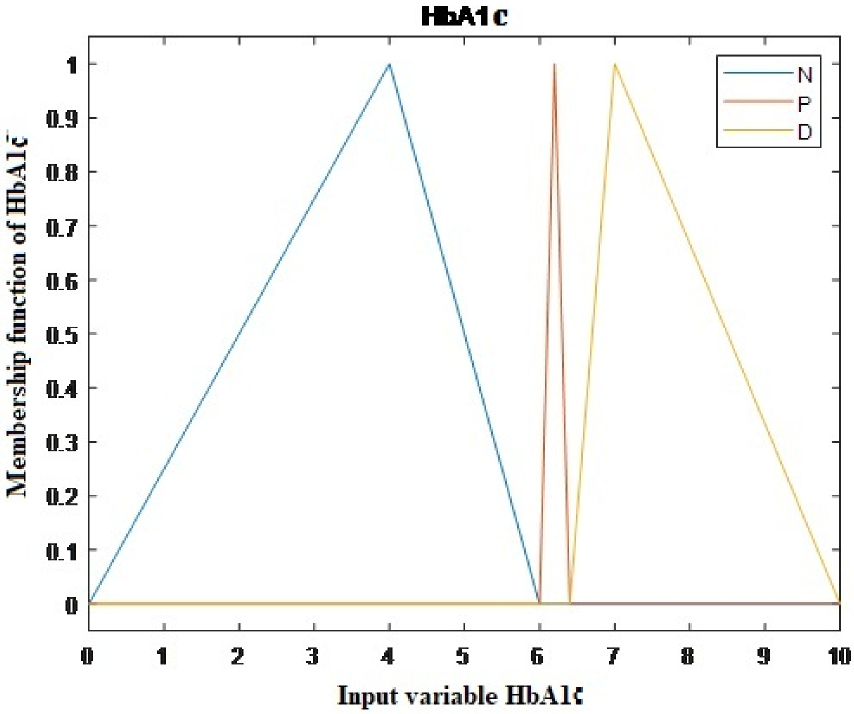

Figure 6.6: Graph of the function η_{Normal}, $\eta_{Prediabetes}$ and $\eta_{Diabetes}$

6.2.8 Membership function for Uric acid in blood

The levels of uric acid in the blood of 60 patients have been assessed using the membership function. A low level of uric acid is diagnosed when the value ranges from 0 to 4. A range of 4 to 9 is medium while a value greater than 9 is pronounced high.

* 0-4 Low

* 4-9 Medium
* >9 High

$$\eta_{Low}(x) = \begin{cases} 0, & x < 1 \\ \frac{x-1}{2}, & 1 \leq x \leq 3 \\ \frac{x-3}{1}, & 3 \leq x \leq 4 \\ 0, & x > 4 \end{cases}$$

$$\eta_{Medium}(x) = \begin{cases} 0, & x < 4 \\ \frac{x-4}{3}, & 4 \leq x \leq 7 \\ \frac{x-7}{2}, & 7 \leq x \leq 9 \\ 0, & x > 9 \end{cases}$$

$$\eta_{High}(x) = \begin{cases} 0, & x < 8.5 \\ \frac{x-8.5}{1}, & 8.5 \leq x \leq 9.5 \\ 0, & x > 9.5 \end{cases}$$

6.2.9 Membership Function for Blood Pressure

A Patient's blood pressure level can easily alter the results. The blood pressure levels of patients have been calculated using the membership function and the patients are catagorized into three ranges. The three ranges are– normal, hypertension stage 1, and hypertension stage 2. Normal values belong to the range 80-120 while 120-140 denotes hypertension 1 and 140-200 denotes hypertension 2.

* 80-120 Normal
* 120-140 Hypertension stage 1
* 140-200 Hypertension stage 2

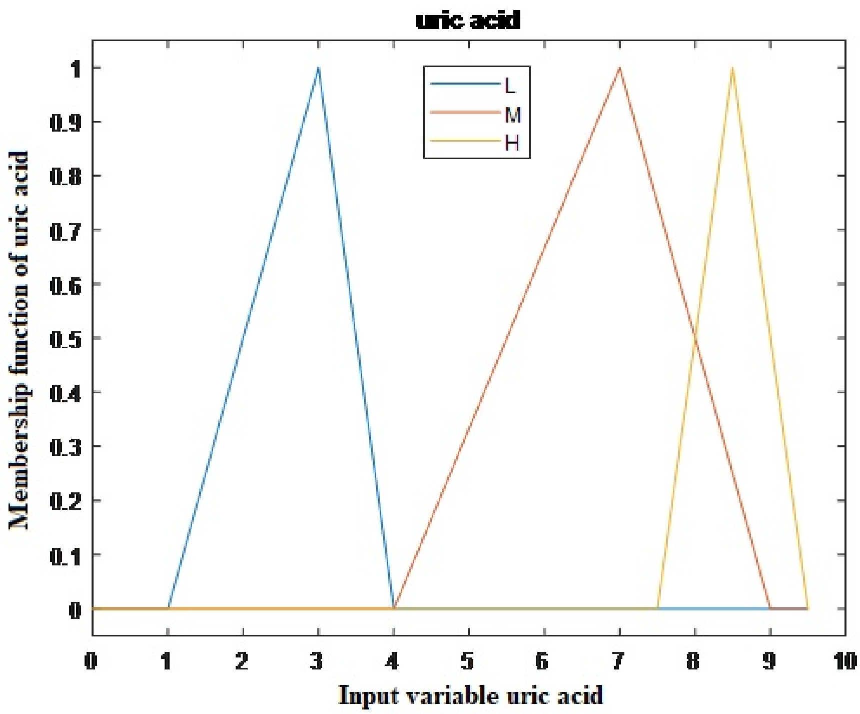

Figure 6.7: Graph of the function η_{Low}, η_{Medium} and η_{High}

$$\eta_{Normal}(x) = \begin{cases} 0, & x < 80 \\ \frac{x-80}{20}, & 80 \leq x \leq 100 \\ \frac{x-100}{20}, & 100 \leq x \leq 120 \\ 0, & x > 120 \end{cases}$$

$$\eta_{Stage1}(x) = \begin{cases} 0, & x < 120 \\ \frac{x-120}{20}, & 120 \leq x \leq 140 \\ 0, & x > 140 \end{cases}$$

$$\eta_{Stage2}(x) = \begin{cases} 0, & x < 140 \\ \frac{x-140}{30}, & 140 \leq x \leq 170 \\ \frac{x-170}{30}, & 170 \leq x \leq 200 \\ 0, & x > 200 \end{cases}$$

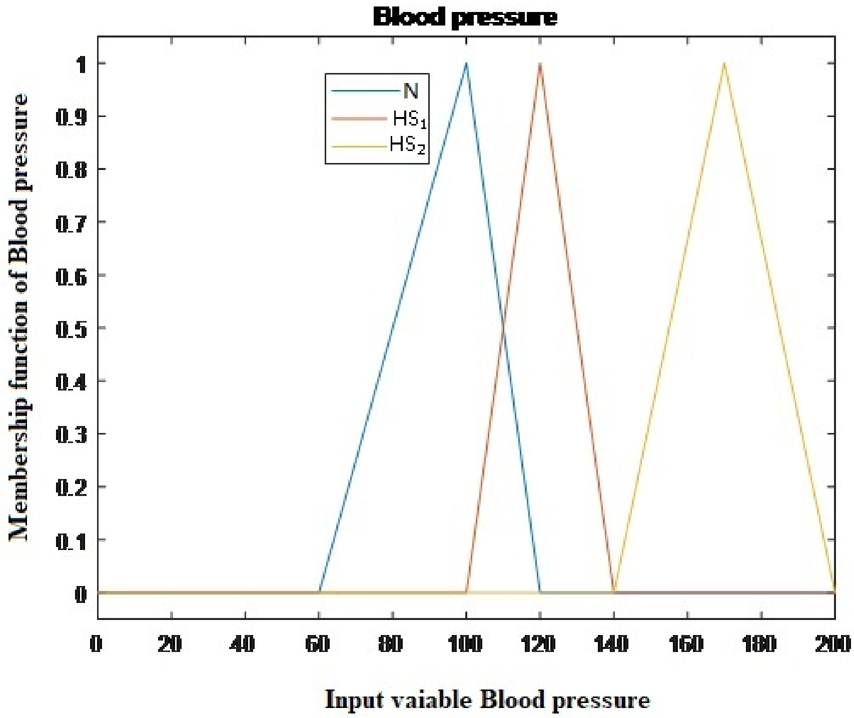

Figure 6.8: Graph of the function η_{Normal}, η_{Stage1} and η_{Stage2}

6.2.10 Fuzzy Output Value

Fuzzification of data set using the membership function helped to derive the values as shown in Table 6.2. The fuzzified values have been obtained using MATLAB software. The table below highlights the fuzzified values that have been derived using the calculations.

Table 6.2: The fuzzy membership values of inputs

P	Age	Blood Sugar	Blood Pressure	HDL	LDL	HbA1c	Uric Acid
P_1	0.15,O	0.3,L	0.5,N	0,L	0.8,L	1, D	0.23, M
P_2	0.07, Y	1, L	1, N	0.5, L	0.55, L	0.4, N	0.9,L
P_3	0.58, O	0, H	0.67, S2	0.5, M	0.09, M	023, D	0.3,M
P_4	0, O	0, L	0.33, S2	0, L	0.73, M	0.17, D	0, M
P_5	0.69,O	0.66,L	0.75, N	0.1, H	0.23, M	0.17,D	0.33, M

P_6	0.42, O	0.33,L	0, N	0, L	0.6, L	1, N	0.75, L
P_7	0, O	0, L	0.75, N	0.7, H	0.13, M	0.67, D	0.47, M
P_8	0, O	0.4, M	0.33, S2	0.65, H	0.73, M	1, D	0.57, M
P_9	0.92, O	0.6, M	0.5, S1	0.5, H	0.73, M	0.5, D	0.57, M
P_{10}	0.93, Y	0.37, L	1, N	0.5,H	0.25, L	1, D	0.47, M
P_{11}	0.04, O	0.92, H	0, S2	0.4, H	0.43, M	0.33, D	0.3, H
P_{12}	0.87, Y	0.96, M	0.33, S2	0.1, H	0.9, H	0.67, D	0.93, M
P_{13}	0.4,Y	0.47, L	0, N	0.8, L	0.6, L	0.25, N	0.45, L
P_{14}	0.2, Y	0.23, L	0.25, N	0.3, L	0.13, M	0.83, D	0.47, M
P_{15}	0, O	0.08, M	1, N	0.1, L	0.25, L	0.33, D	0.7, L
P_{16}	0, O	0.47, L	0.75, N	0.67, M	0.7, M	0.5, D	0.5 , M
P_{17}	0.54, O	0.6, M	0.5, S1	0, M	0.57, M	1, D	0.73, M
P_{18}	0.13, Y	0.93, L	0.75, N	0.2, L	0.07, M	0.5, P	0.5, L
P_{19}	0.54, O	0.36, M	1, N	0.5, M	0.8, M	0.97, D	1, M
P_{20}	0.85, O	0.08, H	0, S2	0.95, H	0.2, H	0.3, D	0.2, M
P_{21}	0.33, Y	0.63, L	0.75, N	0, L	0.5, M	0.17, D	D, 0.1, L
P_{22}	0, O	0.96, M	0.33, S2	0.9, H	0.23, M	0.93, D	0.6, M
P_{23}	0.35, O	0.17, L	0.75, N	0.2, L	0, M	0.17, D	0.43, M
P_{24}	0.87, Y	0.93, L	0.5, S1	0.4, L	0.05, L	0.5, P	0.8, M
P_{25}	1, Y	0.47, L	0, N	1, L	0.5, L	0.2, N	0.25, L
P_{26}	0.55, O	0.32, H	0, S2	1, H	0.85, H	0.3, D	0.45, M
P_{27}	0.81, O	0.68, H	0.33, S2	0.3, H	0.65, H	1, D	0.7, M
P_{28}	1, Y	0.83, L	1, N	0.8, L	0.15, L	0.05, N	0.75, L
P_{29}	0.47, Y	0.57, L	0.75, N	0.5, M	0.27, M	0.17, D	0.87, M
P_{30}	0.94, Y	0.2, M	0.5, S1	0.2, H	0.87, M	0.84, D	0.43, M
P_{31}	0.96, O	0.68, H	0.33,S2	0.8, H	0.35, H	0.73, D	0.7, M
P_{32}	0.38, O	0.6, M	0.33, S2	1, M	0.67, M	0.93, D	0.75, M
P_{33}	0.87, Y	0.1, L	0, N	0.5, L	1, L	0.45, N	0.7, L
P_{34}	0, O	0.23, L	1, N	0, M	0.1, M	0.17, D	0.37, M

P_{35}	0.85, O	0.4, M	0.75, N	0, L	0.83 ,M	1, D	1, M
P_{36}	0.67 ,Y	0.97, L	0.25, N	0.5, L	0.05, L	0.5, P	0.8, L
P_{37}	0, O	0.64, M	0.25, N	0.5, M	0.47, M	0.97, D	0.63, M
P_{38}	0.73, Y	0.17, L	0.5, N	0.2, L	0.6, L	0.67, D	0.27, M
P_{39}	0.87,Y	0.87, L	1, N	0.4, L	0.6, L	0.17, D	0.9, L
P_{40}	0.85, O	0.72, M	0.33, S2	0.1, H	0.77, M	0.84, D	0.9, M
P_{41}	0.95, O	0.04, M	0.5, N	0.1,H	0.97, L	1, D	0.5, M
P_{42}	0, O	0.92, M	0.33, S2	0.5, H	0.8, M	0.97, D	0.7, M
P_{43}	0.8, Y	0.5, L	0.25, N	0.1, L	0.9, L	0.83, D	0.47, M
P_{44}	0.73, O	0.28, M	0.33, S2	0.8, H	0.05, H	0.63, D	0.55, M
P_{45}	0.53, Y	0.2, L	1, N	0.1, L	0.23, M	0.33, D	0.4, M
P_{46}	0.93, Y	0.9, L	0.25, N	0.1, L	0.2, L	0.5, P	0.85, L
P_{47}	0.6, Y	0.87, L	1, N	0.4, L	0.35, L	0.5, P	0.8, L
P_{48}	0.73, Y	0.53, L	0.75, N	0.33, M	0.43, M	0.33, D	0.9, M
P_{49}	0.38, O	0.24, M	0.5, S1	0.2, H	0.9, M	1, D	0.47, M
P_{50}	0.92, O	0.6, H	0.33, S2	0.8, H	0.25, H	0.8, D	0.73, M
P_{51}	0.65, O	0.72, M	0.33, S2	0.5, H	0.8, M	0.9, D	0.7, M
P_{52}	0.2, Y	0.17, L	0, N	0.7, L	0.9, L	0.4, N	0.75, L
P_{53}	0.38, O	0.88, M	0.33, S2	0.95, H	0.2, M	0.33, D	0.63, M
P_{54}	0.53, Y	0.13, L	0.75, N	0.2, L	0.07, M	0.33, D	0.47, M
P_{55}	0.2, Y	0.9, L	0.5, S1	0.2, L	0.15, L	0.50, P	0.83, M
P_{56}	0.33, Y	0.6, L	0, N	0.9, L	0.3, L	0.4, N	0.3, L
P_{57}	0.85, O	0.28, H	0, S2	0.9, H	0.8, H	0.03, D	0.4, M
P_{58}	0.85, O	0.6, H	0.33, S	0.8, H	0.15, H	0.6, D	0.73, M
P_{59}	0.31, O	0.6, L	0.75, N	1, M	0.37, M	0.33, D	0.37, M
P_{60}	0.4, Y	0.37, L	0, N	0.8, L	0.9, L	0.95, N	0.8, L

6.2.11 Reshaping the fuzzy sets into soft sets

Fuzzy sets contain raw data that cannot be exactly used. Hence, they have been converted into soft sets. This conversion is made possible using the method called α-cut sets as follows:

$$P : \{P_1, P_2, P_3, \ldots\ldots P_{60}\}$$

Here P denotes the set of patients, and Q denotes the set of parameters. The set of the parameters is different for each part of the input variable. Age $Q = \{0, 0.2, 0.4, 0.6, 0.8, 1\}$

$R(Age, 0) = \{P_1, P_2, P_3, \ldots\ldots P_{60}\}$

$R(Age, 0.2) = \{P_3, P_5, P_6, P_9, P_{10}, P_{12}, P_{13}, P_{14}, P_{17}, P_{19}, P_{20}, P_{21}, P_{23}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{35}, P_{36}, P_{38}, P_{39}, P_{40}, P_{41}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{56}, P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(Age, 0.4) = \{P_3, P_5, P_6, P_9, P_{10}, P_{12}, P_{13}, P_{17}, P_{19}, P_{20}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{33}, P_{35}, P_{36}, P_{38}, P_{39}, P_{40}, P_{41}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{50}, P_{51}, P_{54}, P_{57}, P_{58}, P_{60}\}$

$R(Age, 0.6) = \{P_5, P_9, P_{10}, P_{12}, P_{20}, P_{24}, P_{25}, P_{27}, P_{28}, P_{30}, P_{31}, P_{33}, P_{35}, P_{36}, P_{38}, P_{39}, P_{40}, P_{41}, P_{43}, P_{44}, P_{46}, P_{47}, P_{48}, P_{50}, P_{51}, P_{57}, P_{58}\}$

$R(Age, 0.8) = \{P_9, P_{10}, P_{12}, P_{20}, P_{24}, P_{25}, P_{27}, P_{28}, P_{30}, P_{31}, P_{33}, P_{35}, P_{39}, P_{40}, P_{41}, P_{43}, P_{46}, P_{50}, P_{57}, P_{58}\}$

$R(Age, 1) = \{P_{25}, P_{28}\}$ $Q = \{0.3, 0.6, 0.9, 1\}$

$R(BloodSugar, 0) = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{15}, P_{16}, P_{17}, P_{18}, P_{19}, P_{20}, P_{21}, P_{22}, P_{23}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{34}, P_{35}, P_{36}, P_{37}, P_{38}, P_{39}, P_{40}, P_{41}, P_{42}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{56}, P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(BloodSugar, 0.3) = \{P_1, P_2, P_5, P_6, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{16}, P_{17}, P_{18}, P_{19}, P_{21}, P_{22}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{31}, P_{32}, P_{35}, P_{36}, P_{37}, P_{39}, P_{40}, P_{42}, P_{43}, P_{46}, P_{47}, P_{48}, P_{50}, P_{51}, P_{53}, P_{55}, P_{56}, P_{58}, P_{59}, P_{60}\}$

$R(BloodSugar, 0.6) = \{P_5, P_9, P_{10}, P_{11}, P_{12}, P_{17}, P_{18}, P_{21}, P_{22}, P_{24}, P_{27}, P_{28}, P_{31}, P_{32}, P_{36}, P_{37}, P_{39}, P_{40}, P_{42}, P_{46}, P_{47}, P_{50}, P_{51}, P_{53}, P_{55}, P_{56}, P_{58}, P_{59}, \}$

$R(BloodSugar, 0.9) = \{P_2, P_{11}, P_{12}, P_{13}, P_{22}, P_{24}, P_{36}, P_{42}, P_{46}, P_{55}\}$

$R(BloodSugar, 1) = \{P_2\}$

$Q = \{0.25, 0.5, 0.75, 1\}$

$R(BloodPressure, 0) = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{15}, P_{16},$
$P_{17}, P_{18}, P_{19}, P_{20}, P_{21}, P_{22}, P_{23}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{34}, P_{35}, P_{36},$
$P_{37}, P_{38}, P_{39}, P_{40}, P_{41}, P_{42}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{56},$
$P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(BloodPressure, 0.25) = \{P_1, P_2, P_3, P_4, P_5, P_7, P_8, P_9, P_{10}, P_{12}, P_{14}, P_{15}, P_{16}, P_{17}, P_{18}, P_{19},$
$P_{21}, P_{22}, P_{23}, P_{24}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{34}, P_{35}, P_{36}, P_{37}, P_{38}, P_{39}, P_{40}, P_{41}, P_{42}, P_{43}, P_{44},$
$P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{53}, P_{54}, P_{55}, P_{58}, P_{59}\}$

$R(BloodPressure, 0.5) = \{P_1, P_2, P_3, P_5, P_7, P_8, P_9, P_{10}, P_{15}, P_{16}, P_{17}, P_{18}, P_{19}, P_{21}, P_{22}, P_{24},$
$P_{28}, P_{29}, P_{30}, P_{34}, P_{35}, P_{38}, P_{39}, P_{41}, P_{45}, P_{47}, P_{48}, P_{49}, P_{54}, P_{55}, P_{59}\}$

$R(BloodPressure, 0.75) = \{P_2, P_5, P_7, P_{10}, P_{15}, P_{16}, P_{18}, P_{19}, P_{21}, P_{23}, P_{28}, P_{29}, P_{34}, P_{35},$
$P_{39}, P_{45}, P_{47}, P_{48}, P_{54}, P_{59}\}$

$R(BloodPressure, 1) = \{P_2, P_{10}, P_{15}, P_{19}, P_{28}, P_{34}, P_{39}, P_{45}, P_{47}\}$

$Q = \{0.2, 0.4, 0.6, 0.8, 1\}$

$R(HDL, 0) = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{15}, P_{16}, P_{17}, P_{18}, P_{19},$
$P_{20}, P_{21}, P_{22}, P_{23}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{34}, P_{35}, P_{36}, P_{37}, P_{38}, P_{39}, P_{40},$
$P_{41}, P_{42}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{56}, P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(HDL, 0.2) = \{P_2, P_3, P_7, P_8, P_9, P_{10}, P_{11}, P_{13}, P_{14}, P_{16}, P_{18}, P_{19}, P_{20}, P_{22}, P_{23}, P_{24}, P_{25},$
$P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{36}, P_{37}, P_{38}, P_{39}, P_{42}, P_{44}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52},$
$P_{53}, P_{54}, P_{55}, P_{56}, P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(HDL, 0.4) = \{P_2, P_3, P_7, P_8, P_9, P_{10}, P_{11}, P_{13}, P_{16}, P_{19}, P_{20}, P_{22}, P_{24}, P_{25}, P_{26}, P_{28},$
$P_{29}, P_{31}, P_{32}, P_{33}, P_{36}, P_{37}, P_{38}, P_{39}, P_{42}, P_{44}, P_{47}, P_{50}, P_{51}, P_{52}, P_{53}, P_{56}, P_{57},$
$P_{58}, P_{59}, P_{60}\}$

$R(HDL, 0.6) = \{P_7, P_8, P_{13}, P_{16}, P_{20}, P_{22}, P_{28}, P_{31}, P_{32}, P_{44}, P_{50}, P_{52}, P_{53}, P_{56}, P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(HDL, 0.8) = \{P_{13}, P_{20}, P_{22}, P_{25}, P_{26}, P_{28}, P_{31}, P_{32}, P_{44}, P_{50}, P_{53}, P_{56}, P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(HDL, 1) = \{P_{25}, P_{26}, P_{32}, P_{59}\}$

$Q = \{0.25, 0.5, 0.75, 1\}$

$R(LDL, 0) = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{15}, P_{16}, P_{17}, P_{18}, P_{19},$
$P_{20}, P_{21}, P_{22}, P_{23}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{34}, P_{35}, P_{36}, P_{37}, P_{38}, P_{39}, P_{40},$

$P_{41}, P_{42}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{56}, P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(LDL, 0.25) = \{P_1, P_2, P_4, P_6, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{15}, P_{16}, P_{17}, P_{19}, P_{21}, P_{25}, P_{26},$

$P_{27}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{35}, P_{37}, P_{38}, P_{39}, P_{40}, P_{41}, P_{42}, P_{43}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52},$

$P_{56}, P_{57}, P_{59}, P_{60}\}$

$R(LDL, 0.5) = \{P_1, P_2, P_4, P_6, P_8, P_9, P_{12}, P_{13}, P_{16}, P_{17}, P_{19}, P_{21}, P_{25}, P_{26},$

$P_{27}, P_{30}, P_{32}, P_{33}, P_{35}, P_{38}, P_{39}, P_{40}, P_{41}, P_{42}, P_{43}$

$P_{49}, P_{51}, P_{52}, P_{57}, P_{60}\}$

$R(LDL, 0.75) = \{P_1, P_{12}, P_{19}, P_{26}, P_{30}, P_{33}, P_{35}, P_{40}, P_{41}, P_{42}, P_{48}, P_{49}, P_{51}, P_{52}, P_{57}, P_{60}\}$

$R(LDL, 1) = \{P_{33}\}$

$Q = \{0, 0.2, 0.4, 0.6, 0.8, 1\}$

$R(HbA1c, 0) = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{15}, P_{16}, P_{17},$

$P_{18}, P_{19}, P_{20}, P_{21}, P_{22}, P_{23}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{34}, P_{35}, P_{36},$

$P_{37}, P_{38}, P_{39}, P_{40}, P_{41}, P_{42}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55},$

$P_{56}, P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(HbA1c, 0.2) = \{P_1, P_2, P_3, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{15}, P_{16}, P_{17}, P_{18},$

$P_{19}, P_{20}, P_{22}, P_{24}, P_{25}, P_{26}, P_{27}, P_{30}, P_{31}, P_{32}, P_{33}, P_{35}, P_{36}, P_{37}, P_{38}, P_{40}, P_{41}, P_{42}, P_{43}, P_{44},$

$P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{56}, P_{58}, P_{59}, P_{60}\}$

$R(HbA1c, 0.4) = \{P_1 P_2, P_6, P_7, P_8, P_9, P_{10}, P_{12}, P_{14}, P_{16}, P_{17}, P_{18}, P_{19}, P_{22}, P_{24}, P_{27},$

$P_{30}, P_{31}, P_{32}, P_{33}, P_{35}, P_{36}, , P_{37}, P_{38}, P_{40}, P_{41}, , P_{42}, P_{43}, P_{44}, P_{46} P_{47}, P_{49}, P_{50}, P_{51},$

$P_{52}, P_{53}, P_{56}, P_{58}, P_{60}\}$

$R(HbA1c, 0.6) = \{P_1, P_6, P_7, P_8, P_{10}, P_{12}, P_{14}, P_{17}, P_{18}, P_{19}, P_{22}, P_{24}, P_{27}, P_{30}, P_{31},$

$P_{32}, P_{35}, P_{36}, P_{37}, P_{38}, P_{40}, P_{41}, P_{42}, P_{43}, P_{44}, P_{46}, P_{47}, P_{49}, P_{50}, P_{51}, P_{55}, P_{58}, P_{60}\}$

$R(HbA1c, 0.8) = \{P_1, P_6, P_8, P_{14}, P_{18}, P_{19}, P_{22}, P_{24}, P_{30}, P_{32}, P_{35}, P_{36}, P_{37}, P_{40}, P_{41},$

$P_{42}, P_{43}, P_{46}, P_{47}, P_{49}, P_{50}, P_{51}, P_{55}, P_{60}\}$

$R(HbA1c, 1) = \{P_1, P_6, P_8, P_{10}, P_{17}, P_{18}, P_{24}, P_{27}, P_{35}, P_{36}, P_{41}, P_{46}, P_{47}, P_{49}, P_{55}\}$

$Q = \{0, 0.2, 0.4, 0.6, 0.8, 1\}$

$R(Uricacid, 0) = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{15}, P_{16}, P_{17},$

$P_{18}, P_{19}, P_{20}, P_{21}, P_{22}, P_{23}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{34}, P_{35}, P_{36}, P_{37},$

$P_{38}, P_{39}, P_{40}, P_{41}, P_{42}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{56}, P_{57}, P_{58},$

$P_{59}, P_{60}\}$

$R(Uricacid, 0.2) = \{P_1, P_2, P_3, P_5, P_6, P_7, P_8, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{15}, P_{16}, P_{17}, P_{18},$
$P_{19}, P_{20}, P_{22}, P_{23}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{34}, P_{35}, P_{36}, P_{37}, P_{38}, P_{39},$
$P_{40}, P_{41}, P_{42}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{56}, P_{57},$
$P_{58}, P_{59}, P_{60}\}$
$R(Uricacid, 0.4) = \{P_2, P_6, P_7, P_8, P_9, P_{10}, P_{12}, P_{13}, P_{14}, P_{15}, P_{16}, P_{17}, P_{18}, P_{19}, P_{22}, P_{23}, P_{24},$
$P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{35}, P_{36}, P_{37}, P_{39}, P_{40}, P_{41}, P_{42}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48},$
$P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{57}, P_{58}, P_{60}\}$
$R(Uricacid, 0.6) = \{P_2, P_6, P_{12}, P_{15}, P_{17}, P_{19}, P_{22}, P_{24}, P_{27}, P_{28}, P_{29}, P_{31}, P_{32}, P_{33}, P_{35}, P_{36},$
$P_{37}, P_{39}, P_{40}, P_{42}, P_{46}, P_{47}, P_{48}, P_{50}, P_{51}, P_{52}, P_{53}, P_{55}, P_{58}, P_{60}\}$
$R(Uricacid, 0.8) = \{P_2, P_{47}, P_{48}, P_{55}, P_{60}\}$
$R(Uricacid, 1) = \{19, 35\}$

6.3 Parameter Reduction of Soft Sets

The derived soft sets are magnanimous in length. The data is complicated as it is initially obtained on a higher level.Thus the rules have been used to reduce their size so that the data can be properly used to work.

Here, we using the following parameters to obtain the reduced soft sets for age, Blood Sugar, Blood Pressure, HDL, LDL, HbA1c and Uric acid respectively.

i.,e For Age $Q = \{0.2, 0.4, 0.6, 0.8, 1\}$

Blood Sugar $Q = \{0.3, 0.6, 0.9, 1\}$

Blood Pressure $Q = \{0.25, 0.5, 0.75, 1\}$

HDL $Q = \{0.2, 0.4, 0.6, 0.8, 1\}$

LDL $Q = \{0.25, 0.5, 0.75, 1\}$

HbA1c $Q = \{0.2, 0.4, 0.6, 0.8, 1\}$

Uric Acid $Q = \{0.2, 0.4, 0.6, 0.8, 1\}$

Example

$Q = \{0.2, 0.4, 0.6, 0.8, 1\}$

$R(Age, 0.2) = \{P_3, P_5, P_6, P_9, P_{10}, P_{12}, P_{13}, P_{14}, P_{17}, P_{19}, P_{20}, P_{21}, P_{23}, P_{24}, P_{25},$
$P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{32}, P_{33}, P_{35}, P_{36}, P_{38}, P_{39}, P_{40}, P_{41}, P_{43}, P_{44}, P_{45}, P_{46},$

$P_{47}, P_{48}, P_{49}, P_{50}, P_{51}, P_{52}, P_{53}, P_{54}, P_{55}, P_{56}, P_{57}, P_{58}, P_{59}, P_{60}\}$

$R(Age, 0.4) = \{P_3, P_5, P_6, P_9, P_{10}, P_{12}, P_{13}, P_{17}, P_{19}, P_{20}, P_{24}, P_{25}, P_{26}, P_{27}, P_{28}, P_{29}, P_{30}, P_{31}, P_{33}, P_{35}, P_{36}, P_{38}, P_{39}, P_{40}, P_{41}, P_{43}, P_{44}, P_{45}, P_{46}, P_{47}, P_{48}, P_{50}, P_{51}, P_{54}, P_{57}, P_{58}, P_{60}\}$

$R(Age, 0.6) = \{P_5, P_9, P_{10}, P_{12}, P_{20}, P_{24}, P_{25}, P_{27}, P_{28}, P_{30}, P_{31}, P_{33}, P_{35}, P_{36}, P_{38}, P_{39}, P_{40}, P_{41}, P_{43}, P_{44}, P_{46}, P_{47}, P_{48}, P_{50}, P_{51}, P_{57}, P_{58}\}$

$R(Age, 0.8) = \{P_9, P_{10}, P_{12}, P_{20}, P_{24}, P_{25}, P_{27}, P_{28}, P_{30}, P_{31}, P_{33}, P_{35}, P_{39}, P_{40}, P_{41}, P_{43}, P_{46}, P_{50}, P_{57}, P_{58}\}$

$R(Age, 1) = \{P_{25}, P_{28}\}$

6.4 Finding Soft Rules

The methods mentioned above have been devised to create soft rules. However, about 80,000 soft rules have been derived from this specific combination. A few significant rules have been shown below:

1. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 0.2) = \{9, 10, 27, 31, 39, 48, 50, 51, 59\}$
2. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 0.4) = \{9, 10, 27, 31, 47, 48, 50, 51\}$
3. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 0.6) = \{27, 31, 47, 48, 50, 51\}$
4. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 0.8) = \{47, 48\}$
5. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 1) = \{\emptyset\}$
6. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.4) \wedge R(UA, 0.2) = \{9, 10, 27, 31, 47, 50, 51\}$
7. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge$

$R(HB, 0.4) \wedge R(UA, 0.4) = \{9, 10, 27, 31, 47, 50, 51\}$

8. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.4) \wedge R(UA, 0.6) = \{27, 31, 47, 50, 51\}$
9. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.4) \wedge R(UA, 0.8) = \{47\}$
10. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.4) \wedge R(UA, 1) = \{\emptyset\}$
11. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.5) \wedge R(HB, 1) \wedge R(UA, 0.4) = \{27\}$
12. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 0.75) \wedge R(HB, 0.4) \wedge R(UA, 0.6) = \{19, 51\}$
13. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.2) \wedge R(LDL, 1) \wedge R(HB, 0.6) \wedge R(UA, 0.4) = \{\emptyset\}$
14. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.4) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 0.2) = \{9, 10, 19, 31, 32, 47, 50, 51, 59\}$
15. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.4) \wedge R(LDL, 0.25) \wedge R(HB, 0.4) \wedge R(UA, 1) = \{19\}$
16. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.4) \wedge R(LDL, 0.25) \wedge R(HB, 0.8) \wedge R(UA, 0.2) = \{19, 32, 47, 50, 51\}$
17. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.4) \wedge R(LDL, 0.5) \wedge R(HB, 0.2) \wedge R(UA, 0.6) = \{19, 32, 51\}$
18. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.4) \wedge R(LDL, 0.75) \wedge R(HB, 0.6) \wedge R(UA, 0.4) = \{19, 51\}$
19. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.4) \wedge R(LDL, 0.75) \wedge R(HB, 1) \wedge R(UA, 0.2) = \{\emptyset\}$
20. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.6) \wedge R(LDL, 0.25) \wedge R(HB, 0.4) \wedge R(UA, 0.6) = \{31, 32, 50\}$
21. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.6) \wedge R(LDL, 0.25) \wedge R(HB, 0.8) \wedge R(UA, 0.2) = \{32, 50\}$

22. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.6) \wedge R(LDL, 0.5) \wedge R(HB, 0.4) \wedge R(UA, 0.2) = \{32\}$
23. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.8) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 0.2) = \{31, 32, 50, 59\}$
24. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 0.8) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 0.6) = \{31, 32, 50\}$
25. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 1) \wedge R(LDL, 0.5) \wedge R(HB, 0.8) \wedge R(UA, 0.8) = \{\emptyset\}$
26. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.25) \wedge R(HDL, 1) \wedge R(LDL, 0.75) \wedge R(HB, 0.2) \wedge R(UA, 0.8) = \{\emptyset\}$
27. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.5) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 0.2) = \{9, 10, 19, 47, 48, 59\}$
28. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.5) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.2) \wedge R(UA, 0.8) = \{19, 47, 48\}$
29. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.5) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.4) \wedge R(UA, 0.4) = \{9, 10, 19, 47\}$
30. $R(A, 0.2) \wedge R(BS, 0.3) \wedge R(BP, 0.2) \wedge R(HDL, 0.2) \wedge R(LDL, 0.25) \wedge R(HB, 0.4) \wedge R(UA, 1) = \{19\}$

6.5 Output Data

The risk percentage can be calculated using the formula

$$\text{Risk \%} = \frac{\text{No. of rules present}}{\text{Total no. of rules}} \times 100$$

For example: If P_1 is present in the output of 4000 rules,the risk percentage is calculated using the formula

$$\text{Risk \%} = \frac{4000}{80000} \times 100 = 5\%$$

Using a computer coding programme,the risk percentage for 60 patients as shown in Table 6.3 :

Table 6.3: Risk % of patients

Patient	Risk %	Patient	Risk %
P_1	0	P_{31}	0.36
P_2	0	P_{32}	0.30
P_3	0	P_{33}	0
P_4	0	P_{34}	0
P_5	0	P_{35}	0
P_6	0	P_{36}	0
P_7	0	P_{37}	0
P_8	0	P_{38}	0
P_9	0.32	P_{39}	0
P_{10}	0.32	P_{40}	0
P_{11}	0	P_{41}	0
P_{12}	0	P_{42}	0
P_{13}	0	P_{43}	0
P_{14}	0	P_{44}	0
P_{15}	0	P_{45}	0
P_{16}	0	P_{46}	0
P_{17}	0	P_{47}	1.20
P_{18}	0	P_{48}	0.045
P_{19}	1.20	P_{49}	0
P_{20}	0	P_{50}	0.48
P_{21}	0	P_{51}	0.54
P_{22}	0	P_{52}	0
P_{23}	0	P_{53}	0
P_{24}	0	P_{54}	0
P_{25}	0	P_{55}	0
P_{26}	0	P_{56}	0

P_{27}	0.24	P_{57}	0
P_{28}	0	P_{58}	0
P_{29}	0	P_{59}	0.0375
P_{30}	0	P_{60}	0

The risk percentage posed to the young and old patients are different. The risk posed to the group of 20 to 45 is three patients while the risk posed to the older group of 45 to 90 is eight patients. But we obtain the risk percentage of P_{47} of age 29 is 1.20 and P_{19} of age 58 is also 1.20. It can be concluded that the disease does not affect people based on their ages. People, irrespective of whether they are young or old, are prone to this serious health issue. As youngsters are also affected by this disease, it is advised that people should make themselves aware of the impacts it can have on one's health. It is good to remember that prevention is better than cure.The data obtained is accurate and can reduce the threats posed to the health of patients.

6.6 Conclusion

The main goal of this paper is to help a healthcare professional scrutinize a patient medically. Any ambiguity and doubt can be eliminated in this procedure. This paper is an attempt to analyze coronary heart disease. The basic purpose of this work lies in ascertaining the negative impacts of the disease. It is evident that mathematics has been a key element to gather more information and the threats posed by the disease. The execution of the procedure is precise and can be used to diagnose a patient's state of health.