Relationship Between Diseases and Symptom of the Agricultural Labourers Who Are Suffering from Health Hazards.

M.Suganya[#1], Dr.S.Subramaniam[*2]

[#1]M.Phil (Scholar)& Mathematics & PRIST University
Vallam, Thanjavur, Tamilnadu, India.
[*2]M.Phil., PhD., Asst.Prof & M.Phil (Mathematics) & PRIST University
Vallam, Thanjavur, Tamilnadu, India.

Abstract— *Fuzzy Models demonstrated by using many function from fuzzy logic, along the standard mathematical function in real world collected data. We plan to show how fuzzy model can be used to represent a real system or process. Fuzzy models are used in many fields such a traffic control system, collecting a statistical data, personality of women's etc. In this project the real data collected from the agriculture labourers suffering from the health hazards due to chemical pollutions are studied using fuzzy matrix model. Using fuzzy models we estimate the maximum age group of the agriculture having cardio vascular problem due to chemical pollution.*

Keywords — *Fuzzy Models, health hazards, diseases and symptom.*

I. INTRODUCTION

The Fuzzy Matrix Theory is a finite set of fuzzy relations that form an algorithm for determining the output of a process from some finite number of past inputs and outputs. There are various types of fuzzy models. In this title we seen that a relationship between diseases and symptom of the agricultural labourers who are suffering from health hazards. Fuzzy Models demonstrated by using many function from fuzzy logic, along the standard mathematical function in real world collected data. We plan to show how fuzzy model can be used to represent a real system or process. Fuzzy models are used in many fields such a traffic control system, collecting a statistical data, personality of women's etc. In this project the real data collected from the agriculture labourers suffering from the health hazards due to chemical pollutions are studied using fuzzy matrix model. Using fuzzy models we estimate the maximum age group of the agriculture having cardio vascular problem due to chemical pollution.

II. BASIC DEFINITIONS AND EXAMPLES

Definition: 2.1

A membership function for a fuzzy set A on the universe of X is defined as $\mu_A : X \rightarrow [0, 1]$. Where each element of X is mapped to a value between 0 and 1. μ_A is called membership value or degree of membership, quantifies the grade of membership of the element in X to the fuzzy set A.

Definition: 2.2

If X is a collection of objects generically denoted by X then, " a Fuzzy Set " A in X is a set of all ordered pair. A= $\{(X, \mu_A (X))\}; x \in X\}$. Where μ_A **(X)** be the membership function or grade of Membership of X in A. This maps the membership space M. When M contains only two points 0 and 1. A is Non – Fuzzy and μ_A **(X)** is identical to the characteristic function of a crisp.

Definition: 2.3

In a classical set theory, can element either belongs to or does not belongs to a set. Such set are formed as crisp set.

Definition: 2.4

An $n \times n$ Matrix $A = (a_{ij})$ with all a_{ij} in [0, 1] is called Fuzzy Matrix.

Note: 1.1

A Fuzzy Matrix $A = [a_{ij}]$ **n×n** , $B = [b_{ij}]$ **n×p** and $C = [c_{ij}]$ **n×p** the following are defined by $B + C = [\ b_{ij} + c_{ij}\ ]$. Where $b_{ij} + c_{ij} = \text{Max}\ (b_{ij} + c_{ij})$

AB = [aij] **n×n** [bij] **n×p**

Where $a_{ik}\, b_{kj}$ = Min ($a_{ik}\, b_{kj}$)

Definition: 2.5

The transpose of 'A' is denoted by AT , Then AT = $[a_{ij}]$.

Definition: 2.6

The identity of matrix 'A' is denoted by AO = In.

Note: 1.2

$B \le C$ if $b_{ij} \le c_{ij}$

Example: 1.1

Let $A = \begin{bmatrix} 0.5 & 0.3 & 0.8 \\ 0.6 & 0.2 & 0.9 \\ 0.0 & 0.7 & 0.4 \end{bmatrix}$ and

$$B = \begin{bmatrix} 0.7 & 0.2 & 0.0 \\ 0.8 & 0.3 & 0.4 \\ 0.5 & 0.6 & 0.9 \end{bmatrix}$$

Find A + B and AB.

Solution:

To find A + B by definition, A + B = [$a_{ij} + b_{ij}$] , Where $a_{ij} + b_{ij}$ = Max (a_{ij} , b_{ij})

$$\Rightarrow A + B = \begin{bmatrix} 0.5 & 0.3 & 0.8 \\ 0.6 & 0.2 & 0.9 \\ 0.0 & 0.7 & 0.4 \end{bmatrix} + \begin{bmatrix} 0.7 & 0.2 & 0.0 \\ 0.8 & 0.3 & 0.4 \\ 0.5 & 0.6 & 0.9 \end{bmatrix}$$

$$= \begin{bmatrix} \max(0.5, 0.7) & \max(0.3, 0.2) & \max(0.8, 0.0) \\ \max(0.6, 0.8) & \max(0.2, 0.3) & \max(0.9, 0.4) \\ \max(0.0, 0.5) & \max(0.7, 0.6) & \max(0.4, 0.9) \end{bmatrix}$$

$$= \begin{bmatrix} 0.7 & 0.3 & 0.8 \\ 0.8 & 0.3 & 0.9 \\ 0.5 & 0.7 & 0.9 \end{bmatrix}$$

AB = AB = $[a_{ij}]$ **n×n** $[b_{ij}]$ **n×p,** Where $a_{ik}\, b_{kj}$ = Min ($a_{ik}\, b_{kj}$)

$$AB = \begin{bmatrix} 0.5 & 0.3 & 0.8 \\ 0.6 & 0.2 & 0.9 \\ 0.0 & 0.7 & 0.4 \end{bmatrix} \begin{bmatrix} 0.7 & 0.2 & 0.0 \\ 0.8 & 0.3 & 0.4 \\ 0.5 & 0.6 & 0.9 \end{bmatrix}$$

AB = [max {min(0.5, 0.7), min(0.3,0.8) , min(0.8,0.5)}
max {min(0.5, 0.2), min(0.3,0.3) , min(0.8,0.6)}
max {min(0.5, 0.0), min(0.3,0.4) , min(0.8,0.9)}
max {min(0.6, 0.7), min(0.2,0.8) , min(0.9,0.5)}
max {min(0.6, 0.2), min(0.2,0.3) , min(0.9,0.6)}
max {min(0.6, 0.0), min(0.2,0.4) , min(0.9,0.9)}
max {min(0.0, 0.7), min(0.7,0.8) , min(0.4,0.5)}
max {min(0.0, 0.2), min(0.7,0.3) , min(0.4,0.6)}
max {min(0.0, 0.0), min(0.7,0.4) , min(0.4,0.9)}**]**

AB = **[**max {0.5, 0.3, 0.5}, max {0.2, 0.3, 0.6}, max {0.0, 0.3, 0.8}
max {0.6, 0.2, 0.5}, max {0.2, 0.2, 0.6}, max {0.0, 0.2, 0.9}
max {0.0, 0.7, 0.4}, max {0.0, 0.3, 0.4}, max {0.0, 0.4, 0.4}**]**

$$AB = \begin{bmatrix} 0.5 & 0.6 & 0.8 \\ 0.6 & 0.6 & 0.9 \\ 0.7 & 0.4 & 0.4 \end{bmatrix}$$

Definition: 1.7

Let "A" be an n × n fuzzy matrix. Then "A" is said to be symmetric if and only if A = AT.

Example: 1.2

Show that A is symmetric, (i.e.) to show that A = AT.

Solution:

Let $A = \begin{bmatrix} 1.0 & 0.4 & 0.2 \\ 0.4 & 1.0 & 0.3 \\ 0.2 & 0.3 & 1.0 \end{bmatrix}$

To Prove : $A = A^T$.

$$A^T = \begin{bmatrix} 1.0 & 0.4 & 0.2 \\ 0.4 & 1.0 & 0.3 \\ 0.2 & 0.3 & 1.0 \end{bmatrix}$$

$$A = A^T$$

Hence "A" is symmetric.

Definition: 1.8

Let "A" be an $n \times n$ fuzzy matrix. Then " A" is said to be reflexive if and only if $A \geq In$.

Example: 1.3

Let $\mathbf{A} = \begin{bmatrix} 1.0 & 0.6 & 0.4 \\ 0.3 & 1.0 & 0.7 \\ 0.8 & 0.9 & 1.0 \end{bmatrix}$

Now we have to prove that, $A \geq In$.

$$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Hence, $A \geq I_3$.

Definition: 1.9

Let "A" be an $n \times n$ fuzzy matrix. Then " A" is said to be transitive if and only if $A2 \geq A$.

Example: 1.4

Show that A is Transitive,

Solution:

It is enough to show that $A2 \geq A$.

Let $A = \begin{bmatrix} 0.5 & 0.3 & 0.8 \\ 0.6 & 0.2 & 0.9 \\ 0.0 & 0.7 & 0.4 \end{bmatrix}$

$A^2 = A.A$

A^2 = [max {min(0.5, 0.5), min(0.3,0.6) , min(0.8, 0.0)}

Max {min(0.5, 0.3), min(0.3, 0.2) , min(0.8, 0.7)}

Max {min(0.5, 0.8), min(0.3, 0.9) , min(0.8, 0.4)}

Max {min(0.6, 0.5), min(0.2, 0.6) , min(0.9, 0.0)}

Max {min(0.6, 0.3), min(0.2, 0.2) , min(0.9, 0.7)}

Max {min(0.6, 0.8), min(0.2, 0.9) , min(0.9, 0.4)}

Max {min(0.0, 0.5), min(0.7, 0.6) , min(0.4, 0.0)}

Max {min(0.0, 0.3), min(0.7, 0.2) , min(0.4, 0.7)}

Max {min(0.0, 0.8), min(0.7, 0.9) , min(0.4, 0.4)}]

A^2 =max {0.5, 0.3, 0.0}, max {0.3, 0.2, 0.7}, max {0.5, 0.3, 0.4}

Max {0.5, 0.2, 0.0}, max {0.3, 0.2, 0.7}, max {0.6, 0.2, 0.4}

Max {0.0, 0.6, 0.0}, max {0.0, 0.2, 0.4}, max {0.0, 0.7, 0.4}.

$$A^2 = \begin{bmatrix} 0.5 & 0.7 & 0.5 \\ 0.5 & 0.7 & 0.6 \\ 0.6 & 0.4 & 0.7 \end{bmatrix}$$

Hence A is Transitive.

Definition: 1.10

An $n \times n$ fuzzy matrix $A = (a_{ij})$ is said to be constant if $a_{ik} = a_{ij}$ for all i, j, k.

(i.e.) its rows are equal to each other.

Example: 1.5

Let $A = \begin{bmatrix} 0.1 & 0.2 & 0.3 \\ 0.1 & 0.2 & 0.3 \\ 0.1 & 0.2 & 0.3 \end{bmatrix}$

Since $a_{ik} = a_{ij}$

Here

$a_{11} = a_{21} = a_{31} = 0.1$

$a_{12} = a_{22} = a_{32} = 0.2$

$a_{13} = a_{23} = a_{33} = 0.3$

Here all the rows are equal to each other. Hence A is Constant.

Definition: 1.11

Let A = (a_{ij}) be an n × n fuzzy matrix.

1. "A" is lower triangular if $a_{ij} = 0$ for all i < j
2. "A" is upper triangular if $a_{ij} = 0$ for all i > j
3. "A" is triangular if it is either lower triangular or an upper triangular.

Example: 1.6

$$\text{Let} \quad A = \begin{bmatrix} 0.1 & 0.4 & 0.2 \\ 0.4 & 0.1 & 0.4 \\ 0.2 & 0.4 & 0.1 \end{bmatrix}$$

$$\text{Lower triangular matrix of} \quad A = \begin{bmatrix} 0 & 0 & 0 \\ 0.4 & 0 & 0 \\ 0.2 & 0.4 & 0 \end{bmatrix}$$

Since $a_{ij} = 0$ for all i < j

$$\text{Upper triangular matrix of} \quad A = \begin{bmatrix} 0 & 0.4 & 0.2 \\ 0 & 0 & 0.4 \\ 0 & 0 & 0 \end{bmatrix}$$

Since $a_{ij} = 0$ for all i > j

Definition: 1.12

The symmetric group on a finite set X is the group whose element are bijective functions from X to X and whose group operation is that of function composition. For finite sets "Permutations" and "bijective function" refer to the same operation namely rearrangement. The symmetric group of degree n is the symmetric group on the set X = {1, 2, 3, …..n}.

Definition: 1.13

All possible arrangement of a collection of things, where the order is important is called permutation.

Example: 1.7

You want to visit the homes of three friends Alex ("a") Bell ("b") and Cameron ("c") but have to decide in which order.

What choice do you have?

Solution:

{a,b,c} {a,c,b} {b,a,c} {b,c,a} {c,a,b} {c,b,a} If the order doesn't matter.It is combination.

Definition: 1.14

An indices is a number with a power, for example an 'a' is called the base and m is the power. The power is also often referred to as "the index" or "the exponent".

EXAMPLE: 1.8

$$\text{Let} \quad A = \begin{bmatrix} 0.5 & 0.3 & 0.8 \\ 0.6 & 0.2 & 0.9 \\ 0.0 & 0.7 & 0.4 \end{bmatrix}$$

$$|A| = 0.5 \begin{vmatrix} 0.2 & 0.9 \\ 0.7 & 0.4 \end{vmatrix} + 0.3 \begin{vmatrix} 0.6 & 0.9 \\ 0.0 & 0.4 \end{vmatrix} + 0.8 \begin{vmatrix} 0.6 & 0.2 \\ 0.0 & 0.7 \end{vmatrix}$$

= 0.5 [max {min (0.2, 0.4), min (0.7, 0.9)}]

0.3 [max {min (0.6, 0.4), min (0.0, 0.9)}]

0.8 [max {min (0.6, 0.7), min (0.0, 0.2)}]

= 0.5 (0.7) + 0.3 (0.4) + 0.8 (0.6)

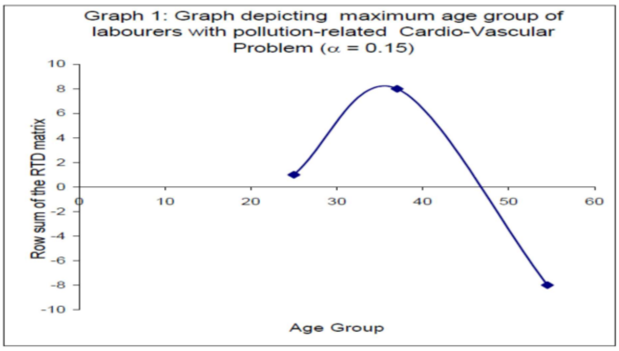
= min (0.5, 0.7) + min (0.3, 0.4) + min (0.0, 0.6)

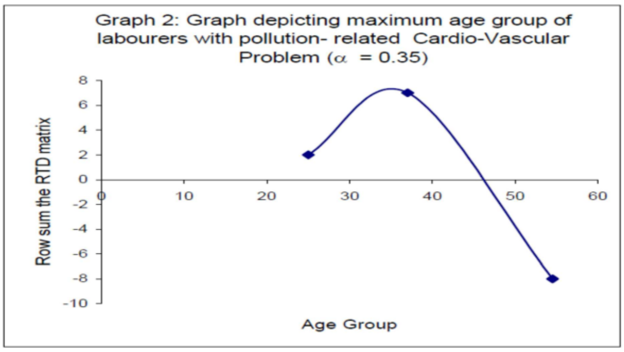
= 0.5 + 0.3 + 0.6

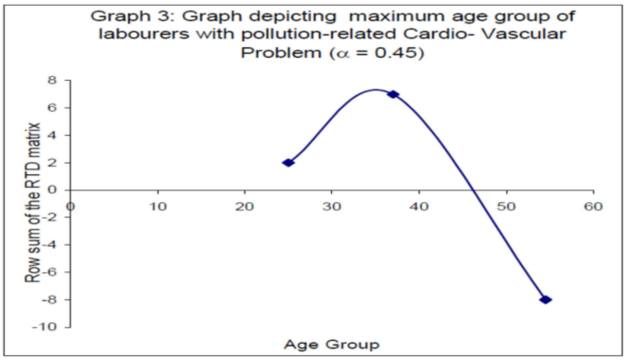
= Max {0.5, 0.3, 0.6}

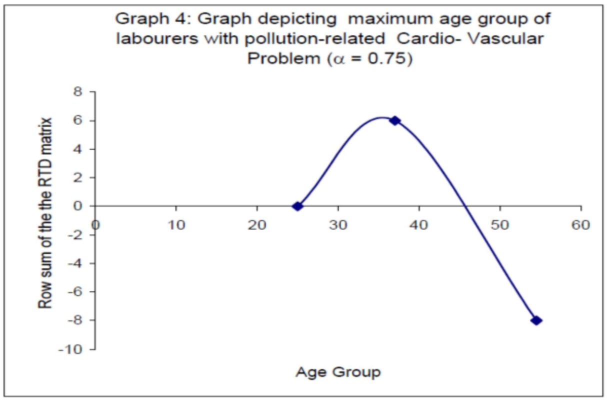
Hence $|A| = 0.6$

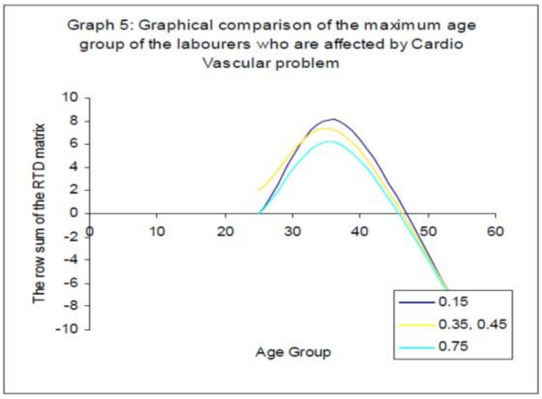
III. HEALTH HAZARDS











From the above analysis, we observe that the maximum age group getting cardio vascular problem has not changed in the value of the parameter 0 to 1. The mathematical inference is that the maximum age group of agricultural labourer to have cardio vascular problem is 35 to 37.

Combined Effective Time Dependent Data [CETD] matrix

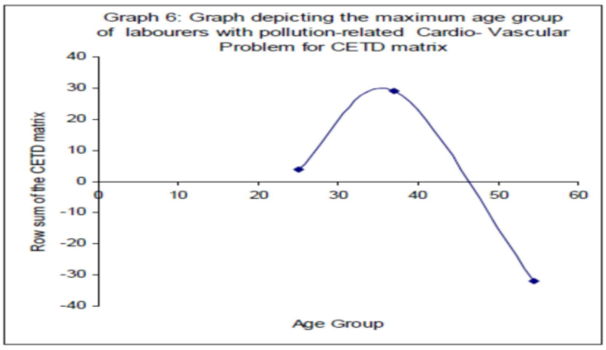
The Combined Effective Time Dependent Data Matrix also confirms the same result.

CETD Matrix

$$\begin{bmatrix} 0 & 0 & 1 & -1 & 3 & 0 & -1 & 3 \\ 4 & 4 & 4 & 4 & 3 & 4 & 4 & 1 \\ -4 & -4 & -4 & -4 & -4 & -4 & -4 & -4 \end{bmatrix}$$

Row Sum Matrix

$$\begin{bmatrix} 5 \\ 28 \\ -32 \end{bmatrix}$$



IV. CONCLUSIONS

First contrary to the natural happening that a person after 40 has more chances of getting the cardio vascular disease, we see in a case of these agricultural labourers who tail in the sum from day to dawn and who have no other mental tensions or hyper tensions becomes victims of all types of cardio vascular symptoms mainly due to the evil effects of chemicals used as the pesticides and insecticides. It is unfortunate to state that the most of agricultural labour suffer symptom of cardio vascular disease in the very early age group of 35 to 37 which is surprising. For there is no natural rhyme or reason for it for even after work hours they do not have traces of tensions or humiliations to be more precise they after a long days physical labour can be have a peaceful sleep but on the country they suffer serious symptoms like B.P., Chest Pain, Burning Heart /chest etc. of the 110 agricultural labourers interviewed we saw 83 of them suffered from the cardio vascular symptom of which 38 of them were from the age group 31 to 43. It is unfortunate to state that the most of agricultural labour suffer symptom of cardio vascular disease in the very early age group of 35 to 37 which is surprising. As a people who live after sixty are 2% and in fifties are less than the 10% we see people suffering from cardio vascular disease and the symptom in the age group forms the migrants due to agricultural failure they are saved from the clutches of the chemical pollution. This is easily seen from the graphs.

REFERENCES

[1] W.B. Vasantha kandasamy with K. Ilanthenral by Elementary Fuzzy Matrix Theory and Fuzzy Models for Social Scientists [2007]. Los Angeles Publications USA. ISBN : 1-59973-0057.

[2] K. Amal by Super Fuzzy Matrices and Super Fuzzy Models for Social Scientists [2008]. Info Learn Quest Ann Arbor Publications USA. ISBN : 1-59973-027-8.

[3] David A.Thomas with Peter W.Eklund by Fuzzy Matrices : An Applications in Agriculture [1995]. World Scientific Publications Singapore. ISBN : 1-00765-0769.