FUZZY MATHEMATICAL APPROACH TO ANALYSE PROBLEMS FACED BY DROPOUTS USING IFCM

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ABSTRACT : In this paper we study the major causes faced by dropouts of high school education in village of Tamilnadu using IFCM(induced fuzzy cognitive maps) and it suited as a best tool when the data is an unsupervised one.

KEYWORDS - Fuzzy cognitive map, Induced fuzzy cognitive maps, directed graph , unsupervised .

I. INTRODUCTION

The study of dropouts faced in villages of Tamilnadu happens to be an alarming one as they are unaware of the seriousness of the situation. When we say dropout problems , this include physical and mental problems. These children came into the society as unpaid servants. Most of them are below 16yrs old.

They came out due to various factors and became a troublers to our society and to them itself. They have no permanent shelter, no one to care, no proper guidance, lack of money, illegal activities by the neighbours, no motivation by the teachers in school , Quarrel at home/ ill treatment.

We have collected data of 200 school dropouts from villupuram surrounding village regions. Since problems like psychological problem, social problem leading to school dropouts and other problems which cannot be measured as statistical data, we overcome this with adaptation of FCM, to study their problems.

The causes for school dropouts which ultimately lead to child labour have been studied in the literature [(1)]Balasangu et al 2007,2009, 2011, [(2)]Pathinathan.T, Thirusangu.k and Mary John(2005) on causes for school dropouts, [(3)]Thirusangu.K, P.Elumalai and A.Praveen prakash in a new bidirectional associative fuzzy cognitive dynamical system.

II. PRELIMINARIES

Def 2.1:

Fuzzy Cognitive maps can be described by a directed graph. The concepts are taken as nodes.If there is a relationship between the attributes we draw an edge between them in the following way. The directed edge e_{ij} from casual concept c_i to c_j measures how much c_i causes c_j. The time varying concept function $c_i(t)$ measures the non- negative occurrence of some fuzzy event, perhaps the strength of a political sentiment, historical trend or military objective. If increase (or decrease) in one concept leads to increase (or decrease) in another, then we give the value

1. If there exist no relation between two concepts the value 0 is given, If increases (or decrease) in one concept decreases (or increases) another then we give the value -1.

Def: 2.2

When the nodes of the FCM are fuzzy sets then they are called as fuzzy nodes .

The FCMS with edge weights or casualities from the set { -1, 0 , 1} are called Simple FCMS.

Def : 2.3

Consider the nodes/ concepts $c_1, c_2, \ldots C_n$ of the FCM. Suppose the directed graph is drawn using edge weight $e_{ij} \in \{0,1,-1\}$. The Matrix m be defined by M = (e_{ij}) where e_{ij} is the weight of the directed edge c_ic_j. m is called the adjacency matrix of the FCM, also known as the connection matrix of the FCM. It is important to note that all matrices associated with an FCM are always square matrices with diagonal entries as zero.

Let $c_1, c_2, \ldots c_n$ be the nodes of an FCM. A= ($a_1, a_2, \ldots a_n$) where $a_i \in \{0,1\}$. The vector A is called the instantaneous state vector and it denotes the ON-OFF position of the node at an instant.

$a_i = \{ 0 \; if \; a_i \; is \; OFF and \; 1 \; if \; a_i \; is \; ON \; , for \; i = 1,2, \ldots . , n$

III. METHODOLOGY

Here we adapt Induced Fuzzy Cognitive maps to the problems faced by school dropouts.

The seven major concepts relating to the school dropouts as C_4 – No permanent shelter, C_2- No one to care, C_3- No proper guidance, C_1- lack of money , C_5- illegal activities by the neighbours,c_6 – No motivation by the teacher in school, C_7- Quarrel at home/ill treatment.

$$\begin{array}{c} \\ c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \\ c_6 \\ c_7 \end{array} \begin{array}{c} \begin{array}{ccccccc} c_1 & c_2 & c_3 & c_4 & c_5 & c_6 & c_7 \end{array} \\ \begin{pmatrix} 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \end{array}$$

Let us start No permanent shelter is taken as ON state and all other as OFF state.

K_1 = (1,0,0,0,0,0,0), the product of K_1 and M is calculated.

$K_1M \sim (1,0,0,0,0,0,0)M \hookrightarrow (0,1,1,0,0,1,0)$
$K_1{}^1M \sim (0,1,0,0,0,0,0)M \hookrightarrow (1,0,0,1,1,1,0)$
$K_1{}^1M \sim (0,0,1,0,0,0,0)M \hookrightarrow (0,0,0,0,0,1,0)$
$K_1{}^1M \sim (0,0,0,0,0,1,0)M \hookrightarrow (1,0,0,1,1,0,0)$
$K_2 = (1,0,0,1,1,1,0)$
$K_2M = (1,2,1,1,1,1,0) \sim (1,1,1,1,1,1,0) = K_2{}'$
$K_2{}^1M \sim (1,0,0,0,0,0,0)M \hookrightarrow (0,1,1,0,0,1,0)$
$K_2{}'M \sim (0,1,0,0,0,0,0)M \hookrightarrow (1,0,0,1,1,1,0)$
$K_2{}^1M \sim (0,0,1,0,0,0,0)M \hookrightarrow (0,0,0,0,0,1,0)$
$K_2{}^1M \sim (0,0,0,1,0,0,0)M \hookrightarrow (0,0,0,0,0,0,0)$
$K_2{}^1M \sim (0,0,0,0,0,1,0)M \hookrightarrow (1,0,0,1,1,0,0)$
$\Rightarrow K_3 = (1,0,0,1,1,1,0) = K_2$
Therefore fixed point is $K_3 = (1,0,0,1,1,1,0)$

(i) $\mathcal{K}_1 = (1,0,0,0,0,0,0,0)M = (0,1,1,0,0,1,0) \sim (1,1,1,0,0,1,0) = \mathcal{K}_1{}'$
Thereshold value is calculated by assigning 1 for values > 1 and 0 for the values < 0. The symbols $' \hookrightarrow '$ represents the threshold value for the product of the result.

Now as per induced FCM methodology each component in the $K_1{}'$ vector is taken separately and product of the given matrix is calculated. The vector which has the max no.of one's which occurs first is considered as C_2 .

The symbol ~ denotes the calculation peformed with recpective vector here $K_1{}'$

When the same threshold value occurs twice , the value is considered as fixed point. The iteration gets terminated and calculation gets terminated.

Likewise any state vector can be taken and its effect can be analysed.

IV. CONCLUSION

While analyzing with IFCM's we observe that when lack of money is taken as ON state, the resultant vector is (1,0,0,1,1,1,0)

While analyzing with IFCM we observe that Lack of money,No permanent shelter, illegal activities, No motivation are the major problems to the dropouts.

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