

To Analyze of Social Problems/A Combined Fuzzy Cognitive Maps Approach

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Abstract

In this paper, we analyze the problems of Transgenders using Combined Fuzzy Cognitive Maps (CFCM). This paper consists of five sections. Section one introduces the basic introduction of Fuzzy Cognitive Maps (FCM), Combined FCM and previous research and about Transgenders. In Section two shows the basic definitions of Fuzzy Cognitive Maps (FCM) and Combined Fuzzy Cognitive Maps (CFCM). In the third section gives the Methods to propose is applied to analyze the problems of Transgender using combined FCM. In section five describes the results based on our calculation. The final fifth section gives the conclusions and some suggestions.

AMC Classification: 05C15, 05C40

Key Words: Unsupervised Transgender, Fuzzy sets, Fuzzy Cognitive Maps, Combined Fuzzy Cognitive Maps, Hidden patterns.

1 Introduction to Fuzzy Cognitive Maps

FCM works on unsupervised data. It is a simple and effective tool to analyze, social, economic, political problems. FCMs can successfully represent knowledge and human experience, introduced concepts to represent the essential elements and the cause and effect relationships among the concepts to model the behaviour of any system. FCM nodes represent variable phenomena or fuzzy sets. An FCM node nonlinearly transforms weighted summed inputs into numerical output, again in analogy to a model neuron.

1.1 Previous Research

The idea of fuzzy set was introduced by Zadeh [1] in 1965. Decision making in fuzzy environment is focused as an emerging area of research associated with decision sciences. Kosko.B introduced fuzzy cognitive maps is fuzzy-graph structure for representing causal reasoning. Each are (C_i, C_j) is directed as well as weighted, and represents causal link between concepts, showing how concept C_i causes concept C_j [5]. Axelrod proposed cognitive maps as a formal tool for decision-making [4]. It is a very convenient simple and powerful tool, which is used in numerous fields such as social, economical and medical etc. [7]. Neha Malhotra et al estimated the effects of gold plating we have designed a tool based on fuzzy cognitive maps (FCM). [9]. Chrispen Murungwen et al found that the interactive nature of FCMs reveals hidden knowledge and insights that improve the understanding of the complexity of livelihood systems in a way that is better appreciated by stakeholders [11]. Bing-ru Yang et al proposes this research one kind of Two layer of True-Tree FCM (TTFCM) to model the system with the relational data in the form of E-R schema through analyzing the relational database and the multi-relational characteristic. The TTFCM includes one FCM in high-level and many FCMs in low-level forming a two-level tree [12].

1.2 Transgenders

The nature has given the third gender to the world. In Hinduism these people are treated equal to god. The changes in these people

are due to hormones disorder. Every child by birth will be male or y to female. As they grow up the hormonal changes take place and make them transgender. Transgender people are called Hijras in India and are often discriminated against in jobs forcing them to resort to begging and prostitution meet in Koovagam, a (April/May) for an annual festival which takes place for fifteen days. Tamilnadu an estimated population of 30,000 transgender people. It has made great strides in trying to integrate transgender people into society. This includes welfare schemes initiated by the Government and acceptance of transgender people into the mainstream media and film industry. Parents should realize and accept their feelings. But the parents who accept the physically challenged kids are not ready to accept these kids whole heartedly.

2 Basic Definitions of Fuzzy Cognitive Maps (FCM) and Combined Fuzzy Cognitive Maps (CFCM)

2.1 Fuzzy Cognitive Map

An FCM is a directed graph with concepts like policies, events etc as nodes and causalities as edges. It represents casual relationship between concepts.

2.2 Fuzzy Nodes

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

2.3 Simple -FCM

FCMs with edge weights or causalities from the set $\{-1, 0, 1\}$ are simple -FCMs. The topology of FCM is a following graph in which $C = C_1, C_2 \dots C_n$ are a set of nodes representing concepts. $E = \{< C_1, C_2 > | C_1, C_2 \in C\}$ are oriented arcs denoting the cause and effect relationship that one concept has on the others, $W = W_{ij} | W_{ij}$ is the weight value of the interconnection $< C_i, C_j >$, W_{ij} belongs

to the interval $[-1, 1]$ in FCM is a square matrix of $n \times n$, shown as below.

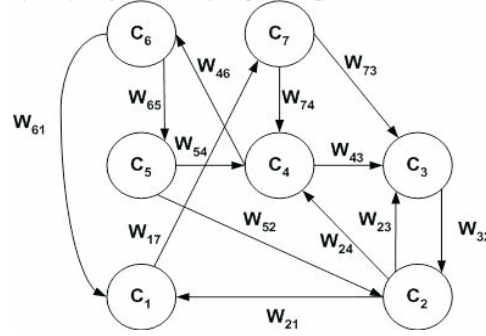


Figure 1: A simple FCM

2.4 Connection matrix of FCM

The edges e_{ij} take values in the fuzzy casual interval $[-1, 1]$. $e_{ij} = 0$ - Indicates no causality, $e_{ij} > 0$ - Indicates casual increase C_j increases as C_i increases and C_j decreases as C_i decreases. $e_{ij} < 0$ - Indicates casual decrease or negative causality. C_j decreases as C_i increases and or C_j increases as C_i decreases.

Simple FCMs have edge values in $\{-1, 0, 1\}$. Then if causality occurs, it occurs to a maximal positive or negative degree.

Matrix 2.1: The weighted matrix of FCM

$$\begin{matrix} C_1 \\ C_2 \\ \vdots \\ C_{n-1} \\ C_n \end{matrix} \begin{bmatrix} 0 & W_{12} & \cdots & \cdots & W_{1n} \\ W_{21} & 0 & \cdots & \cdots & W_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ W_{(n-1)1} & \cdots & \cdots & 0 & W_{(n-1)n} \\ W_{n1} & \cdots & \cdots & W_{n(n-1)} & 0 \end{bmatrix}$$

2.5 Instantaneous state vector

Let $C_1, C_2 \dots C_n$ be the nodes of an FCM. Let $A = (a_1, a_2, \dots a_n)$, where $a_i \in \{0, 1\}$. A is called the Instantaneous state vector and it denoted the on off position of the node at an instant $a_i = 0$ if a_i is off and $a_i = 1$ if a_i is on, where $i = 1, 2, \dots n$.

2.6 Directed cycle

Let $C_1, C_2 \cdots C_n$ be the nodes of an FCM. Let $C_1 \vec{C}_2, C_2 \vec{C}_3, \cdots, C_i \vec{C}_j$, be the edges of the FCM ($i \neq j$). Then, the edges form a directed cycle. An FCM is said to be cyclic if it possesses a directed cycle. An FCM is said to be acyclic if it does not possess any directed cycle.

2.7 Hidden pattern

Let $C_1 \vec{C}_2, C_2 \vec{C}_3, \cdots, C_i \vec{C}_j$, be a cycle when C_i is switched on and if the causality flows through the edges of a cycle and if it again causes C_i , we say that the dynamical system goes round and round. This is true for any node C_i , for $i = 1, 2, \cdots n$. The equilibrium state for this dynamical system is called the Hidden pattern.

2.8 Fixed point

If the equilibrium state of a dynamical system is a unique state vector, then it is called a fixed point. Consider a FCM with $C_1, C_2 \cdots C_n$ as nodes. For example let us start the dynamical system by switching on C_1 . Let us assume that the FCM settles down with C_1 and C_n on i.e., the state vector remains as $(1, 0, 0, \dots, 0, 1)$ this state vector $(1, 0, 0, \dots, 0, 1)$ is called the fixed point.

2.9 Limit Cycle

If the FCM settles down with a state vector repeating in the form $A_1 \rightarrow A_2 \rightarrow \cdots A_1 \rightarrow A_1$. Then this equilibrium is called limit cycle.

2.10 Combined FCM

Finite number of FCMs can be combined together to produce the joint effect of all the FCMs. Let $E_1, E_2 \cdots E_p$ be adjacency matrices of the FCMs with nodes $C_1, C_2 \cdots C_n$. Then the combined FCM is got by adding all the adjacency matrices $E_1, E_2 \cdots E_p$. We denote the combined Connection matrix $E = T + P + N$.

3 Methods to Propose

We have taken the following three concepts and twenty problems. By using linguistic Questionnaire the experts opinion was arrived at NGO Organization, by administering the same to 100 Transgender, 10 parents and three NGO leaders.

Case (i): The following problems are listed based on our interview and survey among the Transgender view:

T_1 - Penury (Poverty)

T_2 - Hormones disorder

T_3 - Sexually biased

T_4 - Public cheating

T_5 - Affected by HIV/AIDS/other health disorder

Case (ii): The following problems are listed based on our interview and survey among the NGO - Leader View:

N_1 - Isolated from public

N_2 - Un awareness

N_3 - Drug addiction

N_4 - Bad companionship

N_5 - Deprived from facilities

N_6 - Forced to beg/deprived inclusion

N_7 - Not allowed in decision making in public forum

Case (iii): The following problems are listed based on our interview and survey among Parents of the transgender:

P_1 - Without parents/deprived entry from parents

P_2 - Away from family

P_3 - suicidal mode

P_4 - resistance syndrome

P_5 - No property

P_6 - Loss of identity

P_7 - Depression/in set of drugs

P_8 - No shelter/arrogant approach

3.1 Method of Determining the Hidden Pattern

Here we follow the seven steps Calculations:

Step 1: Let $C_1, C_2 \cdots C_n$ be the nodes of an FCM, with feedback. Let E be the associated adjacency matrix.

Step 2: Let us find the hidden pattern when C_1 is switched on.

Step 3: When an input is given as the vector $A_1 = (1, 0, 0, \dots, 0)$, the data should pass through the relation matrix E. this is done by multiplying A_1 by the matrix E.

Step 4: Let $A_1 E = (a_1, a_2, \dots, a_n)$ with the threshold operation that is by replacing a_i by 1 if $a_i > k$ and a_i by 0 if $a_i < k$ (k is a suitable positive integer).

Step 5: We update the resulting concept. The concept C_1 is included in the updated vector by making the first coordinate as 1 in the resulting vector.

Step 6: Suppose $A_1 E \rightarrow A_2$ then consider $A_2 E$ and repeat the same procedure.

Step 7: This procedure is repeated till we get a limit cycle or a fixed point.

Case (i): The following is the directed graph obtained based on the first experts (transgender) view:

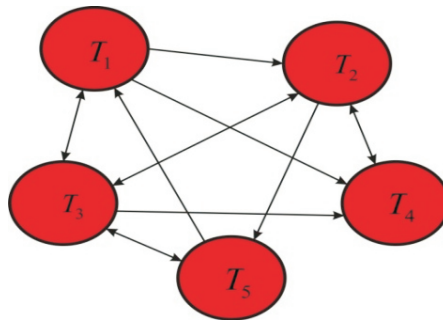


Figure 2: The directed graph

The related connection matrix of T is given below:

Matrix 3.1: Connection matrix of T

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

Case (ii): The following is the directed graph obtained based on the second experts (parents of transgender) view:

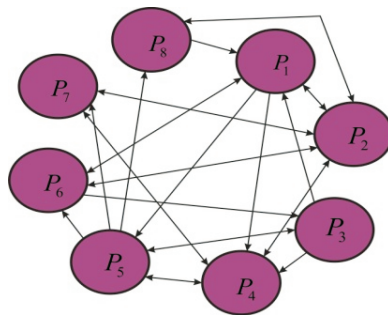


Figure 3: The directed graph

The related connection matrix of P is given below:

Matrix 3.2: The directed matrix of P

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

Case (iii): The following is the directed graph obtained based on the third experts (NGOs of transgender) view: Therefore the directed graph is given below:

The Connection Matrix of N is given below:

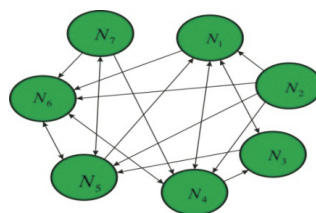


Figure 4: The directed graph

Matrix 3.3: Connection matrix of N

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

Combined FCM $M=T+P+N$ to get the collective opinion of the above three experts we follow the following procedure:

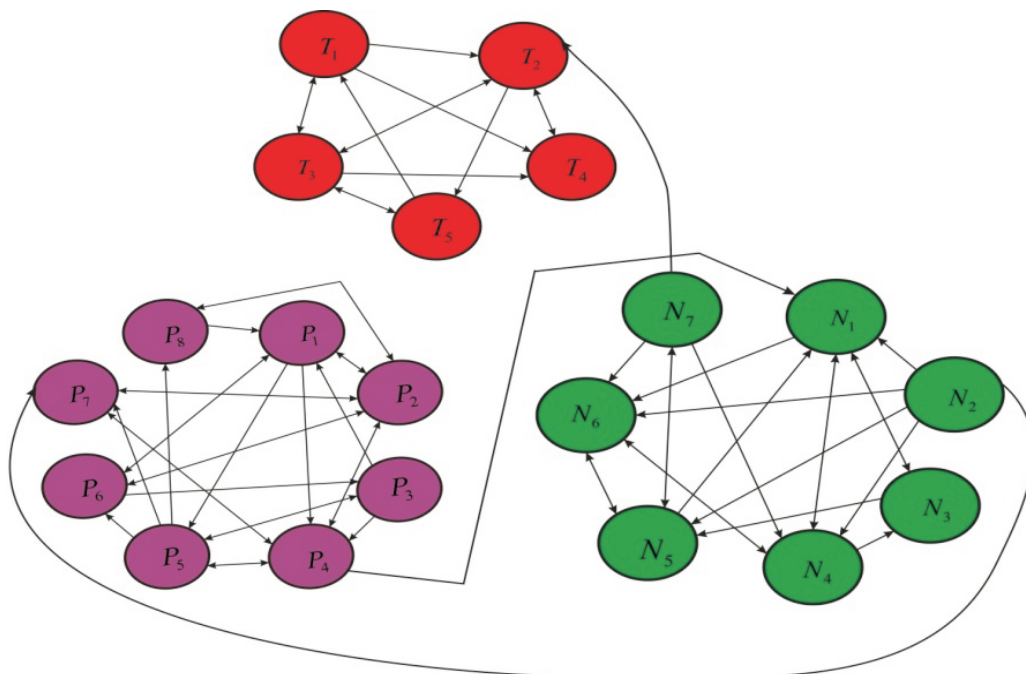


Figure 5: The combined directed graph

The Combined directed graph is below

Matrix 3.4: Combined Connection Matrix $M=T+P+N$

	$E =$																				
	T_1	T_2	T_3	T_4	T_5	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	N_1	N_2	N_3	N_4	N_5	N_6	N_7	
T_1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
T_2	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
T_3	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
T_4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
T_5	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
P_1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	
P_2	0	0	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	
P_3	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	
P_4	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0	
P_5	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	
P_6	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	
P_7	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	
P_8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
N_1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	
N_2	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	1	0	
N_3	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	
N_4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	
N_5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	
N_6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	
N_7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	

Result: $M=T+P+N$

T_2 - Hormones disorder and P_1 - Without parents is ON state, then

$$T = [0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0]$$

$$T \times M = [0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 1 \ 0 \ 1 \ 1 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0]$$

$$\rightarrow [0 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0] = A_2$$

$$T_2 \times M = [2 \ 4 \ 3 \ 3 \ 2 \ 4 \ 5 \ 0 \ 4 \ 5 \ 3 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0]$$

$$\rightarrow [1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0] = A_3$$

$$T_3 \times M = [2 \ 4 \ 3 \ 3 \ 2 \ 4 \ 5 \ 0 \ 4 \ 5 \ 3 \ 1 \ 0 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 0 \ 0]$$

$$\rightarrow [1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 0 \ 0] = A_4$$

$$T_4 \times M = [2 \ 4 \ 3 \ 3 \ 2 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0]$$

$$= [2 \ 4 \ 3 \ 3 \ 2 \ 2 \ 4 \ 2 \ 4 \ 2 \ 4 \ 3 \ 3 \ 4 \ 1 \ 2 \ 3 \ 2 \ 4 \ 1]$$

$$\rightarrow [1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1] = A_5$$

$$T_5 \times M = [2 \ 4 \ 3 \ 3 \ 2 \ 4 \ 5 \ 2 \ 5 \ 3 \ 3 \ 4 \ 3 \ 5 \ 1 \ 2 \ 4 \ 4 \ 5 \ 1]$$

$$\rightarrow [1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1] = A_6$$

$\therefore A_5 = A_6$. The symbol $\rightarrow$ denotes after thresholding and updating.

4 Results of Combined Fuzzy Cognitive Maps (CFCM)

If T_2 - Hormones disorder and P_1 - Without parents is ON state, all the nodes in problems come up to ON state. Hence, it is clearly seen that T_1 - Penury (Poverty), T_3 - Sexually biased, T_4 - Public cheating, T_5 - Affected by HIV/AIDS/other health disorder, N_1 - Isolated from public, N_2 - Un awareness, N_3 - Drug addiction, N_4 - Bad companionship, N_5 - Deprived from facilities, N_6 - Forced to beg/deprived inclusion, N_7 - Not allowed in decision making in public forum, P_2 - Away from family, P_3 - suicidal mode, P_4 - resistance syndrome, P_5 - No property, P_6 - Loss of identity, P_7 - Depression, P_8 - No shelter are also on state.

5 Conclusion

T_2 - Hormones disorder and P_1 - Without parents are the main causes of the problems of the Transgenders using Combined Fuzzy Cognitive Maps (CFCM) Model. Once the Transgender face Hormones disorder and they are pushed out of their own families and live without parents, they face many issues like the ones stated in the study. The family and society should accept them as one among them and look for fulfilling their needs instead of pushing them away from the families and societies.

5.1 Suggestions Based on Combined Fuzzy Cognitive Maps (CFCM)

The Transgender are thus abandoned by their parents at a very early age and so finding no other way they come in contact with other Trans-people. They stay away from their families and are forced to cut all relations from relatives. They are often abused by the society and made to starve for want of food shelter, education and health and allied services. They should be provided with some organization to take of their rights and they should be provided with special quota in jobs, education and health services.

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