A Super Fuzzy Cognitive Study Of Poverty In Pandemic Scenario In Tamilnadu, India.

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Abstract

In the pandemic situation there are several kinds of status of people are living with struggles. The one kind of people who struggling every day to run their life peacefully known as poor people who living below poverty line. They are living in a group of house, earning eager amount daily or in some days. In this paper we have interviewed 695 poor people in Tamilnadu using a linguistic questionnaire. As the problems faced by them to improve their life at large involve so much of feeling, uncertainties and unpredictability's. I felt that it deem fit to use fuzzy theory in general and a new fuzzy model in particular called Average Super Fuzzy Cognitive Maps (ASFCM), to study the problems faced by poor people. ASFCM is the best suitable tool where the data is an unsupervised one. Further the ASFCM is much powerful to identify the main development factor of poor people.

This paper has four sections. In section one introduction of ASFCM is given. In section two, describe the ASFCM to identify the major problem of poor people. In section three, apply these factors to the ASFCM and section four derive the conclusions.

Key words: FCM, ASFCM.

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1. Introduction

We make use of a new fuzzy model called Average Super Fuzzy Cognitive Maps (ASFCM) in this paper, to study the problems faced by poor people.

This model becomes very needy for the group of expert opinions associated with the analysis of poor people's problem happen to vary widely as they are all from different places where the cost of living index vary. This model involves many kinds of poor needy, social worker, NGO's, common people, etc., taken together. These expert's opinions vary according to their status. So this new technique, which we have introduced, is found to be a relevant tool in the analysis of the problem under investigation.

This chapter has four sections. Section one introduce the nature of the poor people. The section two deals the working process of Average Super Fuzzy Cognitive Maps (ASFCMs).In section three we apply ASFCMs new technique to the problems of poor people. The final section gives the conclusion.

2. Working process of Average Super Fuzzy Cognitive Maps (ASFCM).

Here we introduce the new mathematical tool ASFCMs. Fuzzy Cognitive Maps (FCM) is the best-known fuzzy tool when one is interested in getting the hidden pattern or when the data under study/analysis is an unsupervised one. The problems faced by gypsies are varying with individuals and there cannot be a fixed reason. For, it involves a lot of uncertainty and unpredictability. So after the study of the problem, by taking interviews with several of the poor people and expert's using linguistic questionnaire, they use ASFCM as the best-suited tool for such analysis.

Here we for the first time introduce the new fuzzy mathematical tool Average Super Fuzzy Cognitive Maps (ASFCMs). Using the Combined Super FCMs, we define ASFCMs as follows:

Let the CSFCM matrix be denoted by $T = (c_{ij})$.Suppose the CSFCM is got by using n group of experts say.

Then we define the ASFCM=N, as $N=(c_{ij / n})$. Thus the entries of the ASFCM matrix take values only from the interval [-1, 1].We unlike, in the SFCM or CSFCM defined the operation as a min-max operation

Suppose $P= (p_1, p_2, \dots , p_n)$ is a state vector with $p_i \in [0, 1]$ we can find PN. We repeat this process until we get a limit cycle or a fixed point. This resultant vector P_i is the hidden pattern of the ASFCM. The entries in P_i can take any value between 0 and 1 (including 0 and 1). Thus the matrix M gives the gradations of preferences.

3. Effectiveness of SFCMs

ASFCMs are the best known fuzzy tool when one is interested in getting the hidden pattern with gradations further when the data under study is an unsupervised one. The cause of being a poor family and the problems faced by them is varying with individuals and group of experts. There cannot be a fixed reason for it involves a lot of unpredictability and uncertainty. So after the study of the problem, by taking interviews with the different kinds of poor people, using linguistic questionnaire, we form ASFCM which is the best suited tool for such analysis.

Using the expert's opinion and linguistic questionnaire, we have taken the following ten attributes related to the problem of poor people.

The First Expert Group wishes to work with the following four nodes

M_1^1 - Unemployment
M_2^1 - Not Owners of any land/Property
M_3^1 - Government indifference
M_4^1 - Inheritor Property

The Second Expert Group wishes to work with the following three nodes.

M_1^2 - Roll of reservation
M_2^2 - Living Condition/Health Condition is Poor
M_3^2 - Child Labour

The Third Expert Group wishes to work with the following three nodes.

M_1^3 - Poor Awareness
M_2^3 - Poor treatment of Society.
M_3^3 - Poor Education

Now, we obtain the opinion of three experts and get the related matrices M_1, M_2 and M_3. Using these three matrices we obtain the combined SFCM;

(i.e) $M = M_1 + M_2 + M_3$.
The ASFCM matrix $N = M/3$ is found.

The Super Fuzzy Cognitive matrix M_1 is given by the first expert group is as follows:

	M_1^1	M_2^1	M_3^1	M_4^1	M_1^2	M_2^2	M_3^2	M_1^3	M_2^3	M_3^3
M_1^1	0	0	1	0						
M_2^1	0	0	0	0		(0)			(0)	
M_3^1	1	0	0	0						
M_4^1	0	0	0	0						
M_1^2					0	0	1			
M_2^2		(0)			0	0	0		(0)	
M_3^2					1	1	0			
M_1^3								0	0	1
M_2^3		(0)				(0)		1	0	0
M_3^3								1	1	0

The Super Fuzzy Cognitive matrix M_2 is given by the second expert group is as follows:

	M_1^1	M_2^1	M_3^1	M_4^1	M_1^2	M_2^2	M_3^2	M_1^3	M_2^3	M_3^3
M_1^1	0	0	1	1						
M_2^1	1	0	0	0		(0)			(0)	
M_3^1	1	0	0	0						
M_4^1	0	1	0	0						
M_1^2					0	1	1			
M_2^2		(0)			1	0	1		(0)	
M_3^2					1	1	0			
M_1^3								0	0	1
M_2^3		(0)				(0)		1	0	1
M_3^3								1	1	0

The Super Fuzzy Cognitive matrix M_3 is given by the third expert group is as follows:

	M_1^1	M_2^1	M_3^1	M_4^1	M_1^2	M_2^2	M_3^2	M_1^3	M_2^3	M_3^3
M_1^1	0	1	1	1						
M_2^1	0	0	0	1		(0)			(0)	
M_3^1	1	0	0	0						
A_4^1	1	1	1	0						
M_1^2					0	1	0			
M_2^2		(0)			0	0	1		(0)	
M_3^2					1	1	0			
M_1^3								0	0	0
M_2^3		(0)				(0)		0	0	1
M_3^3								1	0	0

Now using M_1, M_2 and M_3 we obtain the combined super Fuzzy Cognitive Maps matrix $M = M_1 + M_2 + M_3$

	M_1^1	M_2^1	M_3^1	M_4^1	M_1^2	M_2^2	M_3^2	M_1^3	M_2^3	M_3^3
M_1^1	0	1	3	2						
M_2^1	1	0	0	1		(0)			(0)	
M_3^1	3	0	0	0						
M_4^1	1	2	1	0						
M_1^2					0	2	2			
M_2^2		(0)			1	0	2		(0)	
M_3^2					3	3	0			
M_1^3								0	0	2
M_2^3		(0)				(0)		2	0	2
M_3^3								3	2	0

ASFCM matrix N is got by dividing every entry of M by 3.

	M_1^1	M_2^1	M_3^1	M_4^1	M_1^2	M_2^2	M_3^2	M_1^3	M_2^3	M_3^3
M_1^1	0	0.33	1	0.67						
M_2^1	0.33	0	0	0.33			(0)			(0)
M_3^1	1	0	0	0						
M_4^1	0.33	0.67	0.33	0						
M_1^2					0	0.67	0.67			
M_2^2		(0)			0.33	0	0.67		(0)	
M_3^2					1	1	0			
M_1^3								0	0	0.67
M_2^3		(0)				(0)		0.67	0	0.67
M_3^3								1	0.67	0

The effect of P on the dynamical system N is given by using the 'max-min' operation

$P = [(1\ 1\ 0\ 0) | (0\ 0\ 1) | (0\ 1\ 0)]$

$PN = [(0.33\ 0.33\ 1\ 1) | (1\ 1\ 0) | (0.67\ 0\ 0.67)]$

$\hookrightarrow [(1\ 1\ 1\ 1) | (1\ 1\ 1) | (0.67\ 0\ 0.67)]$

$= P_1$

$P_1N = [(1\ 1\ 1\ 1) | (1\ 1\ 1) | (1\ 0.44\ 1)]$

$\hookrightarrow [(1\ 1\ 1\ 1) | (1\ 1\ 1) | (1\ 1\ 1)]$

$= P_2$

$P_2N = [(1\ 1\ 1\ 1) | (1\ 1\ 1) | (1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 1\ 1\ 1) | (1\ 1\ 1) | (1\ 1\ 1)]$

$= P_3$

P_3 is a fixed point (The updated value is 1 if $a_i \geq 0.5$ and 0 if $a_i < 0.5$).

Let us consider another input vector

$Q = [(0\ 1\ 0\ 1) | (0\ 1\ 0) | (1\ 0\ 1)]$

$QN = [(0.66\ 0.67\ 0.33\ 0.33) | (0.33\ 0\ 0.67) | (1\ 0.67\ 0.67)]$

$\hookrightarrow [(0.66\ 1\ 0.33\ 1) | (0.33\ 1\ 0.67) | (1\ 0.67\ 1)]$

$= Q_1$

$Q_1N = [(0.99\ 0.83\ 1\ 0.77) | (1\ 0.88\ 0.88) | (1\ 0.67\ 1)]$

$\hookrightarrow [(0.99\ 1\ 1\ 1) | (1\ 1\ 0.88) | (1\ 0.67\ 1)]$

$= Q_2$

$Q_2N = [(1\ 1\ 1\ 1) | (1\ 1\ 1) | (1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 1\ 1\ 1) | (1\ 1\ 1) | (1\ 0.67\ 1)]$

$= Q_3$

$Q_3N = [(1\ 1\ 1\ 1) | (1\ 1\ 1) | (1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 1\ 1\ 1) | (1\ 1\ 1) | (1\ 0.67\ 1)]$

$= Q_4$

Q_4 is a fixed point, the updated value is 1 if $a_i \geq 0.5$ and 0 if $a_i < 0.5$.

Let us consider another input vector

$R = [(1\ 0\ 1\ 0)|(0\ 0\ 1)|(1\ 0\ 1)]$

$RN = [(1\ 0.33\ 1\ 0.67)|(1\ 1\ 0)|(1\ 0.67\ 0.67)]$

$\hookrightarrow [(1\ 0.33\ 1\ 0.67)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$= R_1$

$R_1N = [(1\ 0.77\ 1\ 0.77)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 0.77\ 1\ 0.77)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$= R_2$

$R_2N = [(1\ 0.84\ 1\ 0.92)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 0.84\ 1\ 0.92)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$= R_3$

$R_3N = [(1\ 0.94\ 1\ 0.94)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 0.94\ 1\ 0.94)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$= R_4$

$R_4N = [(1\ 0.95\ 1\ 0.98)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 0.95\ 1\ 0.98)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$= R_5$

$R_5N = [(1\ 1\ 1\ 0.98)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 1\ 1\ 0.98)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$= R_6$

$R_6N = [(1\ 1\ 1\ 1)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 1\ 1\ 1)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$= R_7$

$R_6N = [(1\ 1\ 1\ 1)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$\hookrightarrow [(1\ 1\ 1\ 1)|(1\ 1\ 1)|(1\ 0.67\ 1)]$

$= R_8$

R_8 is a fixed point, the updated value is 1 if $a_i \geq 0.5$ and 0 if $a_i < 0.5$.

4. Conclusion

i) While analyzing ASFCMs when M_1^1, M_2^1, M_3^2 and M_2^3 are ON state, we see that all other nodes are ON state.

ii) When M_2^1, M_4^1, M_2^2, M_1^3, and M_3^3 ON state, the poor treat of society is having poor state.

iii) When M_1^1, M_3^1, M_3^2, M_1^3, and M_3^3 are ON state this also makes the poor treatment of society is poor.

iv) When we take different kind of input vector, we get that M_2^3 node is poor state.

v) When we input any group of state vectors its effect can be analysed in a fuzzy environment.

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