An Analysis on Youth Unemployment and Underemployment in India using Neutrosophic Associative Triangular Fuzzy Cognitive Map model (NT_rFCM)

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Abstract: *Unemployment is one of the main problems in India and place a mark on people face. It destroys the individual's economical status. In spite of the fact that, education level in the recent years has enhanced. India has the biggest population of youth in the planet. Around 65% population of India is younger than 35, so the effect of declining financial market and deficit of job opportunities has a large impact in India. This paper discusses the problems of unemployment and underemployment among youngsters. Neutrosophic Cognitive Maps (NCM_s), the generalization of Fuzzy Cognitive Maps (FCM_s) represents the human expert's knowledge and mainly deals with unsupervised data. The tool Triangular Fuzzy Cognitive Map (T_r FCM), extension of Fuzzy Cognitive Map to get better clarity of results in the real world problems. In this Paper, the concept of Neutrosophy and T_r FCM has been combined and frame a new concept called Neutrosophic Associative Triangular Fuzzy Cognitive Map model (NT_rFCM).*

Keywords: Impact of unemployment, Neutrosophy, Uncertainity, Cognitive thinking.

1. Introduction

GDP (Gross domestic Product) of India is constantly developed in comparison with other world nations. India has a third bigger economical status. Even though the unemployment rate is very high. The major reason for unemployment in India is having a substantial work power and also India is the second youngest nation in the world. The expectancy level of employers is comparatively high with expertise of fresh young graduates. Therefore a vast hole existing between skill abilities and employment [1]. For the Present scenario, the requirements to change the current education system are essential. In this paper, briefly discuss the recent case studies and societal, economical impact of unemployment among youngsters.

Cognitive Maps and Fuzzy Cognitive Maps are widely used method to imitate the human expert knowledge. The structure of Cognitive Maps (CM_s) is first proposed by Robert Axelord (1976). It mainly focused on two main elements: Concepts and Causal relationships. That causal relationship represents the positive and negative relationship of the concepts. Based on the structure of Cognitive Map, Bart Kosko (1986) pioneered the notion, namely Fuzzy Cognitive Maps (FCM_s). The extension is mainly focuses on fuzzified causal relationships between the concepts/nodes [3]. Advancement of FCM is Neutrosophic Cognitive Map which was introduced by Florentine Samarandache. The special characteristic of NCM is to deal with the new concept of indeterminacy in relation between the concepts/nodes [4]. In FCM, the prioritization of the concepts/factors can be analyzed. But in Triangylar Fuzzy Cognitive Map, the weightage of the attributes based on the ranking for the causes/impacts of the problem is identified [5].

2. Degrees of the Triangular Fuzzy Cognitive Map

Linguistic values of the Triangular Fuzzy numbers are

Very Low	[0,0,0.25]
Below average	[0,0.25,0.50]
Average	[0.25,0.50,0.75]
Above average	[0.50,0.75,1]
Very high	[0.75,1,1]

3. Proposed Neutrosophic Associative Triangular Fuzzy Cognitive Map.

Neutrosophic associative Memories (NAM) was proposed by Vasantha Kandasamy and Florentin Samarandache [6] to study the indeterminate case for the concepts/nodes.Thirusangu et.al pioneered Bidirectional Associative Fuzzy Cognitive Map [7].Victor devadoss and Felix developed Bidirectional Associative Neutrosophic Cognitive Map to analyze the youngsters violence by combining the two models Neutrosophic Cognitive Map and Bidirectional Associative Memories [8].In this Paper, a new model Neutrosophic Associative Triangular Fuzzy cognitive map was proposed to analyze the factors and societal problems of unemployment & underemployment among youngsters by combining the concepts NAM and T_rFCM due to the occurrence of indeterminacy in NAM.In an unsupervised way,two sets of attributes are collected from two different experts for the problem of unemployment among youngsters.The one set of attributes indicates the Neutrosophic associative dynamical system which consists of indeterminacy among the factors with the concepts of Triangular Fuzzy Cognitive Map which consists of weightage of the concepts/nodes of the problem.The other set relates the Fuzzy Cognitive Map algorithm.

Algorithm

Step 1: Let us consider M_1 and M_2 be the connection matrices of NTrFCM which consists of NAM and TrFCM properties.

Step 2: Let A_1 be the initial input vectors, Kept in ON position and all the other components are in OFF position.

Step 3: Pass the state vector A_1 through the connection matrices M_1 and M_2 by using Max-Min Principle.

Step 4: Threshold value is assigned for the two highest values in NAM as taken as 1 and all other values are taken as 0.

Step 5: Obtained the resulting vector in NAM is multiplied with M_1^T and thresholding the new vector A_2.

Step 6: The above process has been repeated for all the other factors individually.

Step 7: The Domain space in NAM consists of attributes related to factors of unemployment & underemployment among youngsters, denoted as C_1 ,…..,C_5 . The Range space denotes as P_1,….., P_5 consists of societal impact of unemployment. FCM consists of main attributes are denoted as E_1,……, E_6.

4. Concepts of the problem

Factors of Unemployment and Underemployment (C_1)

- Distraction of social media.
- Caste discrimination in recruitment.
- Lack of awareness about searching of job opportunities.
- Issues regarding immobility of the work force to other states/countries.
- Not being the goal oriented persons.

Societal Factors (P_1)

- Insufficient education system.
- Political Instability.
- Slow growth of Industrialization.
- Exploitation of labor force due to technical advancements.
- Lack of adequate self employment planning.

Economical impact on unemployment (E_1)

- Corruption
- Make the individual feel very depressed.
- Slow economic growth.
- Increase in population.
- Decreased production in the country/Decline of Manufacturing.
- Backward method of Agriculture.

The Expert's opinion is given in the form Linguistics Values

		C1	C2	C3	C4	C5
	P1	Ab.Avg	Avg	V.High	Ab.Avg	Ab.Avg
	P2	Bl.Avg	V.High	Ab.Avg	Avg	Ab.Avg
M_1 =	P3	V.High	I	V.High	V.High	Ab.Avg
	P4	Ab. Avg	I	V. High	Ab. Avg	V. High
	P5	V.High	V.High	V.High	V.High	V.High

The Linguistics values can be converted into an Triangular Fuzzy Numbers (adjacency matrices) M_1 and M_2

		C1	C2	C3	C4	C5
	P1	(0.5,0.75,1)	(0.25,0.50,0.75)	(0.75,1,1)	(0.5,0.75,1)	(0.5,0.75,1)
	P2	(0,0.25,0.50)	(0.75,1,1)	(0.5,0.75,1)	(0.25,0.50,0.75)	(0.5,0.75,1)
M_1 =	P3	(0.75,1,1)	I	(0.75,1,1)	(0.75,1,1)	(0.5,0.75,1)
	P4	(0.5,0.75,1)	I	(0.75,1,1)	(0.5,0.75,1)	(0.75,1,1)
	P5	(0.75,1,1)	(0.75,1,1)	(0.75,1,1)	(0.75,1,1)	(0.75,1,1)

$$M_2 = \begin{array}{c} \\ E1 \\ E2 \\ E3 \\ E4 \\ E5 \\ E6 \end{array} \begin{pmatrix} E1 & E2 & E3 & E4 & E5 & E6 \\ - & 0.1 & 0.98 & 0 & 0.81 & 0.75 \\ 1 & - & 0.89 & 0.45 & 0.79 & 0.8 \\ 1 & 0.75 & - & 0.81 & 0.91 & 0.85 \\ 1 & 0.86 & 0.98 & - & 0.95 & 0.61 \\ 0.96 & 0.9 & 0.95 & 0.93 & - & 1 \\ 0.87 & 0.45 & 0.9 & 0.1 & 0.92 & - \end{pmatrix}$$

5. Calculation

Step 1:

Let $A_1 = (1\ 0\ 0\ 0\ 0) \cup (1\ 0\ 0\ 0\ 0\ 0)$

$A_1 \times M = (0.75\ 0.5\ 0.92\ 0.75\ 0.75) \cup (0\ 1\ 0.98\ 0\ 0.81\ 0.75)$

$\rightarrow (1\ 0\ 1\ 1\ 1) \cup (1\ 1\ 1\ 0\ 1\ 1)$

$(1\ 0\ 1\ 1\ 1).M_1^T \cup (1\ 1\ 1\ 0\ 1\ 1).M_2$

$(0.92\ 0.75\ 0.92\ 0.92\ 0.92) \cup (1\ 1\ 1\ 1\ 1\ 1)$

$\rightarrow$ **(1 0 1 1 1) ∪ (1 1 1 1 1 1) = A_2**

$A_2 \times M_1 . M_2 = (1\ I\ 1\ 1\ 1) \cup (1\ 1\ 1\ 1\ 1\ 1)$

$\rightarrow (1\ I\ 1\ 1\ 1) \cup (1\ 1\ 1\ 1\ 1\ 1)$

$(1\ I\ 1\ 1\ 1).M_1^T \cup (1\ 1\ 1\ 1\ 1\ 1).M_2$

$\rightarrow$ **(1 1 I I 1) ∪ (1 1 1 1 1 1) = A_3**

$A_3 \times M_1 . M_2 = (1\ 1\ I\ I\ 1) . M_1 \cup (1\ 1\ 1\ 1\ 1\ 1) . M_2$

$\rightarrow (1\ I\ 1\ 1\ 1) \cup (1\ 1\ 1\ 1\ 1\ 1)$

$(1\ I\ 1\ 1\ 1).M_1^T \cup (1\ 1\ 1\ 1\ 1\ 1).M_2$

$\rightarrow$ **(1 1 I I 1) ∪ (1 1 1 1 1 1) = A_4**

Hence the limt point is, (1 1 I I 1), (1 I 1 1 1) ∪ (1 1 1 1 1 1)

The set of all limit points for different state vectors

Input Vectors	Limit Points
(1 0 0 0 0)	(1 1 I I 1), (1 I 1 1 1) ∪ (1 1 1 1 1 1)
(0 1 0 0 0)	(1 1 I I 1), (1 I 1 1 1) ∪ (1 1 1 1 1 1)
(0 0 1 0 0)	(1 1 I I 1), (1 I 1 1 1) ∪ (1 1 1 1 1 1)
(0 0 0 1 0)	(1 1 I I 1), (1 I 1 1 1) ∪ (1 1 1 1 1 1)
(0 0 0 0 1)	(1 1 I I 1), (1 I 1 1 1) ∪ (1 1 1 1 1 1)

6. Conclusion

By Utilizing and combining the concepts of Neutrosophy and Triangular Fuzzy Cognitive Map,the impact on unemployment and underemployment among youth in India are analyzed and it highlights that the factors such as P1 (Insufficient education system),P2 (Political Instability), P5 (Lack of adequate self employment planning) and the Societal factors are C1 (distraction of social media),C3 (Lack of awareness about searching of job opportunities),C4 (Issues regarding immobility of the workforce to other states/countries),C5 (Not being the goal oriented persons) while P3 (Slow growth of Industrialization) , P4 (Exploitation of labor force due to technical advancements) and C2 (Caste discrimination) are indeterminate case. Switching ON each factors (P1,….,P5) the same fixed point has been obtained, which reveals that, the above factors are interrelated with one another.The result is that the factors E1,….,E6 are the impactful factors for the present study.

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