Analysis of Reasons for Stress on College Students using Combined Disjoint Block Fuzzy Cognitive Maps (CDBFCM)

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ABSTRACT

College students experience stress because of various reasons. Caused by many reasons, the stress is present whether one is in their first year of college or their last. However, most seniors have an easier time dealing with stress because they have experience handling it. Most of the reasons for so much stress fall into one of three categories: academic stress, that is, anything to do with studying for classes, financial stress, which has to do with paying for college, and personal stress, which is stress associated with personal problems in college. In this paper the main reasons for stress on college students is analyzed using Combined Disjoint Block Fuzzy Cognitive Maps (CDBFCM). This method is introduced by W.B. Vasantha Kandasamy and A.Victor Devadoss is analyzed in this paper.The Combined Disjoint Block FCM is defined in this method becomes effective when the number of concepts can be grouped and are large in number. In this paper we analyzed the problems and find out the main reasons for stress on college students using neutrosophic tool. This paper has five sections. First section gives the information about the development of Fuzzy Cognitive Maps and about the reasons for stress on college students. Second section gives the preliminaries of Fuzzy Cognitive Maps and Combined Disjoint Block Fuzzy Cognitive Maps. In section three we explain the method of determining the hidden pattern. In the fourth section, we give the concepts of problem. Final section gives the conclusion based on our study.

Keywords— Combined disjoint Fuzzy Cognitive Maps, Stress, college students

1. INTRODUCTION

In 1965 L.A. Zadeh has introduced a mathematical model called Fuzzy Cognitive Maps. After a decade in the year 1976, Political scientist R.Axelord[10] used this Fuzzy model to study decision making in social and political systems. Then B.Kosko [4],[5],[6] enhanced the power of cognitive maps considering fuzzy values for the concepts of the cognitive maps and fuzzy degrees of interrelationships between concepts. 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 behavior of any system. It is a very convenient simple and powerful tool, which is used in numerous fields such as social, economic, Medical etc. Stress, a common problem is one of the leading causes to effect College students. Going through college is stressful for everybody. Caused by many reasons, the stress is present whether one is in their first year of college or their last. However, most seniors have an easier time dealing with stress because they have experience handling it. Most of the reasons for so much stress fall into one of three categories: academic stress, that is, anything to do with studying for classes, financial stress, which has to do with paying for College, and personal stress, which is stress associated with personal problems in college. When most students stress over college it is usually because of something to do with academics. Whether it is reading five chapters before going to their 12 o` clock class, or studying for that test that makes or breaks your grade, this kind of stress is accountable for the bags under the eyes and the 5lbs of weight gained over the weekend when studying for midterms. Of course not all students go through this stress; there are often students that have no worries about

their grades or future. Then there is the rare group of people that are so smart that they don`t have to worry about their grades. Although academic stress occurs more often, financial stress is often harder to deal with. Most financial stress occurs when a college says they pay a certain amount but don`t pay it for some injudicious reason, leaving the student with no way to pay the money. Another reason could be that a college threatens to kick a student out because the student has to pay for a bill. Of course not all students have financial stress. The students fortunate enough to get financial aid or students that are born rich have no worries in this department. Finally, the most over-rated stress is personal stress. In most cases, the stress factors for personal stress are trivial things that students put too much importance on. One of the biggest issues is having a boyfriend/girlfriend that causes stress. The purpose of study is to identify the risk groups. In this paper, various reasons for stress on college students are discussed and finally the major reasons are identified.

2. PRELIMINARIES

Fuzzy Cognitive Maps (FCMs) are more applicable when the data in the first place is an unsupervised one. The FCMs work on the opinion of experts. FCMs model the world as a collection of classes and casual relations between classes.

2.1 Definition

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

2.2 Definition

FCMs with edge weights or casualities from the set -1,0,1 are called simple FCMs. .

2.3 Definition

An FCMs is a directed graph with concepts like policies,events etc, as nodes and casualities as edges. It represents casual relationships between concepts.

2.4 Definition

Consider the nodes/concepts C_1, C_2,…, C_n of the FCM. Suppose the directed graph is drawn using edge weight $e_{ij} \in$ {-1, 0, 1}. The matrix E be defined by E = (e_{ij}) where e_{ij} is the weight of the directed edge C_iC_j. E is called the adjacency matrix of 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.

2.5 Definition

Let $C_1, C_2, \dots, C_n$ *be the* be the nodes of an FCM. A= (a_1,, a_2,…,a_n) where

$e_{ij} \in$ {-1, 0, 1}. 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 a_i = 1 if a_i is on for i = 1, 2,…, n.

2.6 Definition

Let $C_1, C_2, \dots, C_n$ *be the* be the nodes of an FCM. Let $\overline{C_1C_2}$, $\overline{C_2C_3}$, $\overline{C_3C_4}$,…,$\overline{C_iC_j}$ be the edges of the FCM(i ≠ 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 possesses any directed cycle.

2.7 Definition

An FCM is said to be cyclic is said to have a feedback.

2.8 Definition

When there is a feedback in an FCM, , i.e, when the casual relations flow through a cycle in a revolutionary way, the FCM is called a dynamical system.

2.9 Definition

Let $\overline{C_1C_2}$, $\overline{C_2C_3}$, $\overline{C_3C_4}$,…,$\overline{C_{n-1}C_n}$ be a cycle. When C_i is switched on and if the casuality 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,…,n. The equilibrium state for this dynamical system is called the hidden pattern.

2.10 Definition

If the equilibrium state of a dynamical system is a unique state vector, then it is called a fixed point. Consider an FCM with $C_1, C_2, \dots, C_n$ 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., in the state vector remains as$(1,0,0, \dots 0)$*is* called fixed point.

2.11 Definition

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

2.12 Definition

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

2.13 Definition

Let $C_1, C_2, \ldots, C_n$ be n distinct attributes of a problem n very large and a non prime. If we divide n in to k equal classes i.e., k/n = t which are disjoint and if we find the directed graph of each of these k classes of attributes with t attributes each, then their corresponding connection matrices are formed and these connection matrices are joined as blocks to form a n×n matrix. This n×n connection matrix forms the combined disjoint block FCM of unequal classes/size.

2.14 Definition

Suppose A = $(a_1, a_2, \ldots, a_n)$ is a vector which is passed in to a dynamical system E. Then AE = $(a_1', a_2', \ldots, a_n')$ after thresholding and updating the vector suppose we get $(b_1, b_2, \ldots, b_n)$, we denote that by $(a_1', a_2', \ldots, a_n')$ ┐ $(b_1, b_2, \ldots, b_n)$.Thus the symbol ┐ means the resultant vector has been thresholded and updated. FCMs have several advantages as well as some disadvantages. The main advantage of this method is simple. It functions on expert's opinion. When the data happens to be an unsupervised one the FCM becomes handy. This is the only known fuzzy technique that gives the hidden pattern of the situation. As we have a very well known theory, which states that the strength of the data depends on ,the number of experts opinions. At the same time the disadvantages of the combined FCM is when the weightages are 1 and -1 for the same C_iC_j , we have the sum adding to zero, thus at all times the connection matrices $E_1, E_2, \ldots, E_k$ may not be conformable for addition. Combined conflicting opinions tend to cancel out and assisted by the strong law of large numbers, a consensus emerges as the sample opinion approximates the underlying population opinion. This problem will be easily overcome if the FCM entries are only 0 and 1.

3. METHOD OF DETERMINING THE HIDDEN PATTERN

Let $C_1, C_2, \ldots, C_n$ be the nodes of an FCM,with feedback. Let E be the associated adjacency matrix. Let us find the hidden pattern when C_1 is switched on. When an input is given as the vector A_1 = (1,0,….,0), the data should pass through the relation matrix E. This is done by multiplying A_1 by the matrix E. Let A_1E = $(a_1, a_2, \ldots, a_n)$ with the threshold operation that is by replacing a_i by 1 if $a_i \geq$ k and a_i by 0 if $a_i <$ k (k is a suitable positive integer). 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. Suppose A_1E ┐ A_2 then consider A_2E and repeat the same procedure. This procedure is repeated till we get a limit cycle or a fixed point.

4. CONCEPTS OF THE PROBLEM

Using the linguistic questionnaire and the expert's opinion we have taken the following sixteen attributes $\{A_1, A_2, \ldots, A_{15}, A_{16}\}$.

A_1 –Competition

A_2 - Making future plans

A_3 - Time management

A_4 –Poor eating habits

A_5 – Poor sleeping habits

A_6- Academic pressure

A_7 – New college environment

A_8 –New relationships

A_9- Parental pressure

A_{10}– Family stress

A_{11} – Financial stress

A_{12} - Physical stress

A_{13}- Extra curricular activities

A_{14}- Social life

A_{15} – Not being organized

A_{16}- Overall health

These 16 attributes are divided into 4

classes C_1, C_2, C_3, C_4 with 4 in each class.

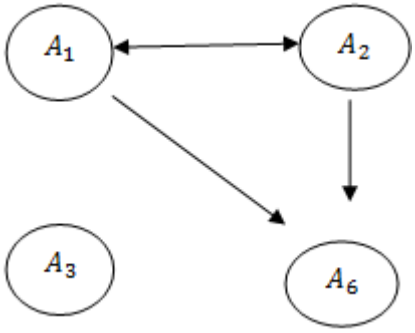
Let $C_1 = \{A_1, A_2, A_3, A_6\}$

$C_2 = \{A_4, A_5, A_{12}, A_{16}\}$

$C_3 = \{A_7, A_8, A_{13}, A_{14}\}$

$C_4 = \{A_9, A_{10}, A_{11}, A_{15}\}$

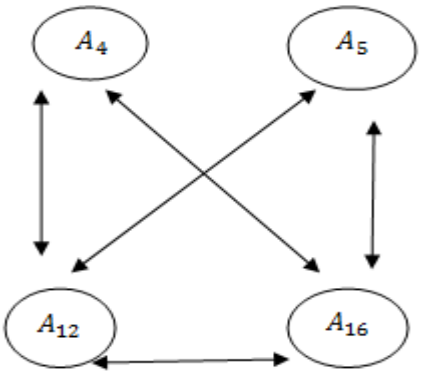
Now we take the expert opinion for each of these classes and take the matrix associated with the combined disjoint block FCMs. The experts opinion for the class $C_1 = \{A_1, A_2, A_3, A_6\}$ is in the form of the directed graph



According to this expert the attribute competition is interrelated with making future plans. The attributes competition and making future plans are the reasons for academic pressure which leads to stress on college students. The related connection matrix M_1 is given below.

$$M_1 = \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

The directed graph is given by the expert on $\{A_4, A_5, A_{12}, A_{16}\}$ which forms the class C_2 .

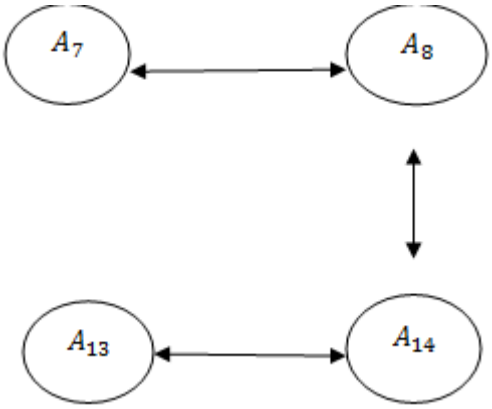


According to this expert the attribute poor eating habits is interrelated with physical stress and overall health. Also the attribute poor sleeping habits is interrelated with physical stress and overall health. The attribute physical stress is interrelated with overall health.

The related connection matrix M_2 is given below.

$$M_2 = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$$

The directed graph is given by the expert on $\{A_7, A_8, A_{13}, A_{14}\}$ which forms the class C_3

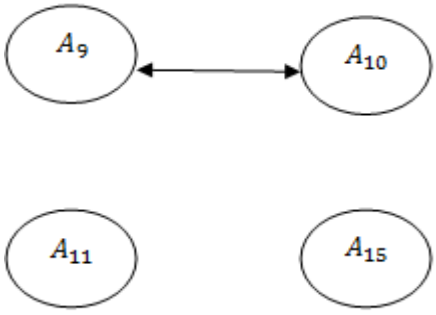


According to this expert the attribute new college is interrelated with new relationships. The attributes new relationships and extra curricular activities are interrelated with social life.

The related connection matrix M_3 is given below.

$$M_3 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$

The directed graph is given by the expert on $\{A_9, A_{10}, A_{11}, A_{15}\}$ which forms the class C_4.



According to this expert the attribute parental pressure is interrelated with family stress.

The related connection matrix M_4 is given below.

$$M_4 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Now the combined disjoint block connection matrix of the fuzzy cognitive maps K is given by

K =

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

Suppose we consider the on state of the attribute competition and all other states are off the effect of

X=

$(1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$ on the CDBFCM is given by

XK¬

$(1\ 1\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) = X_l$ (say)

X_1K¬

$(1\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) = X_2$ (say)

X_2K¬

$(1\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) = X_3 = X_2$

X_2 is a fixed point of the dynamical system. When the state A_1 is on they felt stress because of making future plans. Suppose we consider the on state of the attributes competition, making future plans, new college environment, parental stress, family stress and extra curricular activities and all other nodes are in off state. Now we study the effect of the dynamical system K.

Let T =

$(1\ 1\ 0\ 0\ 0\ 0\ 1\ 0\ 1\ 1\ 0\ 0\ 1\ 0\ 0\ 0)$

be the state vector depicting the on state vector T in to the dynamical system K. .

TK¬

$(1\ 1\ 0\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 0\ 0\ 0\ 1\ 0\ 0) = T_1$ (say)

T_1K¬

$(1\ 1\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 0) = T_2$ (say)

T_2K¬

$(1\ 1\ 0\ 0\ 0\ 0\ 1\ 0\ 1\ 1\ 0\ 0\ 1\ 0\ 0\ 0) = T_3 = T$

Then T is a fixed point of the dynamical system. Thus the attributes $A_1, A_2, A_7, A_9, A_{10}, A_{13}$ are in the on states and the attributes time management, poor eating habits, poor sleeping habits, academic pressure, new relationships, financial stress, physical stress, social life, not being organized and overall health are in the off state all other states become on.

5. CONCLUSION

We analyzed the reasons for stress on college students using CDBFCM model. The limit point of the dynamical system reveals that the attributes $A_1, A_2, A_7, A_9, A_{10}, A_{13}$ are the main reasons for stress on college students. This means competition, making future plans, new college environment, parental pressure, family stress and extracurricular activities are the main reasons for stress on college students and because of these reasons their health and studies are getting effected.

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