

# A Study on Miracles through Holy Bible using Induced Fuzzy Cognitive Maps (IFCMS)

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## ABSTRACT

The Imperative reasons for miracles through Holy Bible using Induced fuzzy cognitive maps (IFCMs) defined by T. Pathinathan is analyzed in this paper. The analysis confirmed that many miracles require “cooperation” between God and people to occur. In other words, it appears that in many cases, God uses a *reciprocal relationship* between Himself and the people, while operating miracles. Basically, God (or Jesus) “initiates” the miracle; but then, people need to “reciprocate” for the miracle to be effective. The paper starts with the Introduction in section one. Section two outlines the definition of fuzzy cognitive maps, induced fuzzy cognitive maps and its properties. Section three is devoted to the adaptation of the induced fuzzy cognitive maps to the miracles in the Bible. In section four, conclusions based on our study are drawn. IFCMs is a fuzzy-graph modeling approach based on experts’ opinion. This is a non-statistical approach to study problems with imprecise information.

**Index Terms**— Fuzzy cognitive maps, Induced FCMS, Unsupervised, Bible.

## 1. INTRODUCTION

Miracle is an event that apparently contradicts known scientific laws and is hence thought to be due to supernatural causes especially, an act of God. Miracles in the new testament had a purpose- miracles were performed to confirm the word (Mark 16:20), create faith in Jesus Christ (John 20:30-31), to demonstrate that God is with Jesus (John 3:2), authenticates that Jesus is the Christ, the Son of God, as prophesied (Matt 8:16-17). The New Testament relates about thirty five miracles performed by Jesus. These miracles can be classified as miracles of nature, miracles of healing, and miracles of resurrection. These miracles are listed below: Calming the storm (Matthew 8:23-27), Feeding the Five thousand (Matthew 14:13-21), Walking on water (Matthew 14:22-33), Feeding the Four thousand (Matthew 15:32-38), Coin in fish’ mouth (Matthew 17:24-27), Fig tree withered (Matthew 21:22), Catch of fish (Luke 5:1-11), Water into wine (John 2:1-11), Another catch of fish (John 21:1-11), Leper (Matthew 8:2-4), Centurion’s servant (Matthew 8:5-13), Peter’s mother-in-law (Matthew 8:14-15) 13. Paralyzed man (Matthew 9:2-8) Woman with hemorrhage (Matthew 9:20-22), Man with withered hand (Matthew 12:10-13). Two blind men (Matthew 9:27-31), Canaanite woman (Matthew 15:21-28), Blind Bartimaeus (Matthew 20:29-34), Blind man at Bethsaida (Mark 8:22-26), Deaf and mute man (Mark 7:32-37), Crippled woman (Luke 13:11-13), Man with dropsy (Luke 14:1-4) lepers mark (17:11-19), Malchus’s ear (Mark 22:50-51), Capernaum official’s son (John 4:46-54), Sick at pool of Bethesda (John 5:1-15), Man blind from birth (John 9:1-4), Many demon possessed (Matthew 8:16-17) Gerasene

demoniac (Matthew 8:28-34), Possessed man (Matthew 9:32-34) Blind, mute, and possessed man (Matthew 12:22-23), Epileptic boy (Matthew 17:14-21), Possessed man (Mark 1:23-26), Widow’s son (Luke 7:11-17), Jairus’s daughter (Matthew 9:18-19) and Lazarus (John 11:1-44). [1] This work is based on expert opinion carried throughout in Chennai. The data assimilated from the people using linguistic questionnaire was transformed into fuzzy data. It is important to note that while doing fuzzy mathematical models, the fuzzy matrix takes its entries from the interval  $[-1,1]$  only then, are they known as Fuzzy Matrices. Hence, Fuzzy tools alone can analyze these concepts. Hence, this method was adopted for the study.

## 2. FCMS and INDUCED FCMS

Basic notions of fuzzy cognitive maps. [2,3,4]

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 worlds as a collection of classes and causal relation between classes.

**Definition 2.1:** An FCM is a directed graph with concepts like policies, events etc. As nodes and causalities as edges. It represents causal relationship between concepts.

**Definition 2.2:** When the nodes of the FCM are fuzzy sets then they are called as fuzzy nodes.

**Definition 2.3:** FCMs with edge weights or causalities from the set  $\{-1,0,1\}$  are simple

**Definition 2.4:** The edges  $e_{ij}$  take values in the fuzzy causal interval  $[-1,1]$ .  $e_{ij} = 0$  indicates no causality  $e_{ij} > 0$  indicates causal increase  $C_j$  increases as  $C_i$  increases (Or  $C_j$  Decreases as  $C_i$  Decreases).  $E < 0$  indicates causal decrease or negative causality.  $C$  Decreases as  $C$  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. Simple FCMs provide a quick first approximation to an expert stand or printed causal knowledge. If increase (or decrease) in one concept leads to increase (or decrease) in another, Then we give the value 1. If there exists to relation between the two concepts, The value 0 is given. If increase (or decrease) in one concept decreases (or increases) another, then we give the value -1. Thus FCMs are described in this way. Consider the concepts  $C_1, \dots, C_n$  of the FCM. Suppose the directed graph is drawn using edge weight  $e_{ij} \in \{0,1,-1\}$ . The matrix  $E$  be defined by  $E = (e_{ij})$ , where the  $e_{ij}$  is the weight of the directed edge  $C_i, C_j$ .  $E$  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.

**Definition 2.5:** 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

$$\begin{aligned} a_i &= 0 & \text{if } a_i \text{ is off} \\ a_i &= 1 & \text{if } a_i \text{ is on, where } i = 1, 2, \dots, n. \end{aligned}$$

**Definition 2.6:** Let  $C_1, C_2, \dots, C_n$  be the nodes of an FCM. Let  $C_1 C_2, C_2 C_3, \dots, C_i C_j$  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 a cyclic if it does not possess any directed cycle.

**Definition 2.7:** An FCM with cycles is said to have a feedback.

**Definition 2.8:** Where there is a feedback in an FCM, i.e., when the causal relations flow through a cycle in a revolutionary way. The FCM is called a dynamical system.

**Definition 2.9:** Let  $C_1 C_2, C_2 C_3, \dots, C_i C_j$  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  $i = 1, 2, \dots, n$ . The equilibrium state for this dynamical system is called the hidden pattern.

**Definition 2.10:** If the equilibrium state of a dynamical system is a unique state vector, Then it is called a fixed point. Consider a FCM with  $C_1, C_2, \dots, C_N$  as nodes. For example let us start the dynamical system by switching on  $C$ . 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.

**Definition 2.11:** If the FCM settles down with a state vector repeating in the form  $A_1 \rightarrow A_2 \rightarrow \dots A_1 \rightarrow A_1$ . Then this equilibrium is called limit cycle.

**Definition 2.12:** Finite number of FCMs can be combined together to produce the joint effect of all the FCMs. Let  $E_1, E_2, \dots, E_p$  be adjacency matrices of the FCMs with nodes  $C_1, C_2, \dots, C_n$ . Then the combined FCM [5,6,7] is got by adding all the adjacency matrices  $E_1, \dots, E_p$ . We denote the combined FCM adjacency matrix by  $E = E_1 + E_2 + \dots + E_p$

**Definition: 2.13:** Let  $P$  be the problem under investigation. Let  $\{C_1, C_2, \dots, C_n\}$  be  $n$  concepts associated with  $p$  ( $n$  very large). Now divide the number of concepts  $\{C_1, C_2, \dots, C_n\}$  into classes  $S_1, \dots, S_t$  where classes are such that

- (1)  $S_i \cap S_{i+1} \neq \Phi$  where ( $i=1,2,\dots, t-1$ )
- (2)  $\cup S_i = (c_1, \dots, c_n)$
- (3)  $(s_i) \neq s_j$  if  $i \neq j$  in general

Now we obtain the FCM associated with each of the classes  $S_1, \dots, S_t$ . We determine the relational matrix associated with each  $S$ . Using theses matrices we obtain a  $n \times n$  matrix. This  $n \times n$  matrix is the matrix associated with the combined overlap block FCM (COBFCM) of blocks of same sizes.

**Definition 2.14:** Suppose  $A = (a_1, \dots, a_n)$  is a vector which is passed into a dynamical system  $E$ . Then  $AE = (a'_1, \dots, a'_n)$ . After thresholding and updating the vectors suppose we get

$(b_1, \dots, b_n)$ . We denote that by  $(a'_1, a'_2, \dots, a'_n) \rightarrow (b_1, b_2, \dots, b_n)$ . Thus the symbol  $\rightarrow$  means that the resultant vector has been thresholded and updated. FCMs have several advantages as well as some disadvantages. The main advantage of this method it is simple. It functions on experts opinion's, when the data happens to be an unsupervised one the FCM comes 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 we can use combined FCMs with several experts opinions. At the same time the disadvantage of the combined FCM is when the weightages are 1 and -1 for the same  $C_i C_j$ . We have the sum adding to zero thus at all times the connection matrices  $E_1, \dots, E_k$  may not be comfortable for addition. This problem will be easily overcome if the FCM entries are only 0 and 1.

**Definition 2.15:** Algorithmic approach in induced fuzzy cognitive maps (IFCMs). [5]

Even though IFCM is an advancement of FCM it follows the foundation of FCM. It has a slight modification only in Algorithmic approach. To derive an optimistic solution to the problem with an unsupervised data, the following steps to be followed [6,7]

**Step-1** For the given model (problem) collect the unsupervised data that is in determinant factors called nodes.

**Step-2** According to the expert opinion ,draw the directed graph

**Step-3** Obtain the connection matrix , $M$ ,from the directed graph(FCM)Here the number of rows in the given matrix = number of steps to be performed

**Step-4** Consider the state vector  $C_1$  which is in On position. Find  $C_1 \cdot M$ .  
The stage vector is updated and threshold at each stage.

**Step-5** Threshold value is calculated by assigning 1 for the values  $>1$  and 0 for the values  $<0$ . The symbol represents the threshold value for the product of the result.

**Step-6** Now each component in the  $C_1$  vector is taken separately and the product of the given matrix is calculated. The vector which has maximum number of one's is found. The vector which maximum number of one's which occurs first is considered as  $C_2$ .

**Step-7** When the same threshold value occurs twice.The value is considered as the fixed point.the iteration gets terminated.

### 3. ADAPTATION OF INDUCED FCMS TO THE MIRACLES

Now we illustrate the dynamical system using a very simple model for the reasons for miracles from the Bible. In the first stage, we have taken the following nine arbitrary attributes  $(C_1, C_2, \dots, C_9)$ . It is not that only nine attributes be considered but one can increase or decrease the number of attributes according to needs .The following attributes were taken as the main nodes for study.

For that, using linguistic questionnaire and the expert's opinion we have taken the following eleven concepts  $\{C_1, C_2, \dots, C_9\}$

The following concepts are taken as the main nodes for our problem.[9]

Release of miracles through the power of Jesus

- C<sub>1</sub>- Endurance through prayer
- C<sub>2</sub>- Faith
- C<sub>3</sub>- Humility
- C<sub>4</sub>- Repentance
- C<sub>5</sub>- Obedience
- C<sub>6</sub>- Hearing the word of god
- C<sub>7</sub>- Authority in the spiritual realm
- C<sub>8</sub>- God's Compassion
- C<sub>9</sub>- Love

#### C<sub>1</sub> - Perseverance through prayer

Perserverance is anything undertaking continued pursuit or prosecution of any business or enterprise begin, in theology, persistence means continuance in a state of grace to a state of glory.

#### C<sub>2</sub>-Faith

Faith refers to the trust one puts in god at all times. It is total surrender to god with full belief without any need for logical proof or material evidence, faith makes us to encounter god directly, it demands to place our full trust in god.

#### C<sub>3</sub>-Humility

Humility is the prerequisite for honor ([Prov 15:33](#); [18:12](#); [22:4](#); [29:23](#)) and physical blessing ([Psalm 37:11](#) ; [Matt 5:5](#)). Intimately associated with the fear of the Lord ([Psalms 25:9](#) [Psalms 25:12-14](#); [Prov 15:33](#)), it may provide the key to wealth and life ([Prov 22:4](#)); but even when blessings are postponed, a humble spirit is necessary ([Prov 16:18-19](#); cf. [Romans 12:14](#) [Romans 12:16-17](#) ). It is the gateway to eternal life ([Matt 5:3](#) ; [18:1-4](#)), not necessarily physical reward (5:10-12).

#### C<sub>4</sub>-Repentance

Repentance is a change of heart repentance infuses a deep sense of humility in people repentance brings about inner healing, it takes up the broken chains of communication with god and with one another on a sound footing.

#### C<sub>5</sub>- Obedience

Obedience refers to being ready to subject ourselves to the commands, wishes and guidelines of others. Obedience teaches us to deny ourselves it prompts to act in accordance with another wish .obedience gives moral and spiritual power and strength to command the more one obeys the more one rule.

#### C<sub>6</sub>- Hearing the word of god

The Bible claims to be the Word of God and by staking this claim the Bible simply but plainly declares its divine authority, complete infallibility and absolute sufficiency.

#### C<sub>7</sub>.Authority in the spiritual realm

The authority that the lord gives to his church-spiritual authority(not in the natural realm but spiritual).

#### C<sub>8</sub>- God's compassion

It simply says that compassion means sympathetic consciousness of others' distress along with a desire to alleviate it.

#### C<sub>9</sub>-Love

Love urges us to diffuse its fragrance on others, love triggers off an emotional response leading to action.

### 3.1 The Directed Graph related to miracles

#### Adaptation of Induced Fuzzy Cognitive Maps to the study on miracles

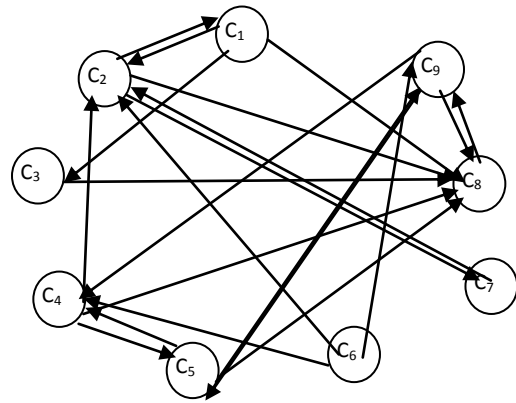


Figure 3.1: Directed Graph

### 3.2 Implementation of IFCMs Model to the Study

Based on the expert's opinion, the directed diagram is drawn and corresponding matrix M is given as

(M)	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>	C <sub>9</sub>
C <sub>1</sub>	0	1	1	0	0	0	0	1	0
C <sub>2</sub>	1	0	0	0	0	0	1	1	0
C <sub>3</sub>	0	0	0	0	0	0	0	1	0
C <sub>4</sub>	0	1	0	0	1	0	0	1	0
C <sub>5</sub>	0	0	0	1	0	0	0	1	1
C <sub>6</sub>	0	1	0	1	0	0	0	0	1
C <sub>7</sub>	0	1	0	0	0	0	0	0	0
C <sub>8</sub>	0	0	0	0	0	0	0	0	1
C <sub>9</sub>	0	0	0	1	1	0	0	1	0

Now using the matrix M , We determine our study. Let the initial input vector be C<sub>1</sub>={ 0 1 0 0 0 0 0 0 0 }.

Product of C<sub>1</sub> and M is calculated

$$C_1 M = (1 \ 0 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0) = C_1'$$

$$C_1' = (1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0)$$

Thershold value is calculated by assigning 1 for the values > 1 and 0 for the values < 0. The symbol represents the threshold value for the product of the result.

Now as per Induced Fuzzy Cognitive Map methodology, each component in the C<sub>1</sub>' vector is taken separately and product of the given matrix is calculated. The vector which has the maximum number of one's which occurs first is considered as C<sub>2</sub>.

The symbol denotes the calculation performed with the respective vector, here  $C_1'$ .

$C_1' * M = (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) * M \rightarrow (0\ 1\ 1\ 0\ 0\ 0\ 0\ 1\ 0)$   
 $C_1' * M = (0\ 1\ 0\ 0\ 0\ 0\ 1\ 1\ 0) * M \rightarrow (1\ 0\ 0\ 0\ 0\ 0\ 1\ 1\ 0)$   
 $C_1' * M = (0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0) * M \rightarrow (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$   
 $C_1' * M = (0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0) * M \rightarrow (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1)$   
 $C_2 = (0\ 1\ 1\ 0\ 0\ 0\ 0\ 1\ 0)$   
 $C_2 * M = (1\ 0\ 0\ 0\ 0\ 0\ 1\ 2\ 1) \rightarrow (1\ 0\ 0\ 0\ 0\ 0\ 1\ 2\ 1)$   
 $C_2' = (1\ 1\ 1\ 0\ 0\ 0\ 1\ 1\ 1)$   
 $C_2' * M = (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0) * M \rightarrow (0\ 1\ 1\ 0\ 0\ 0\ 0\ 1\ 0)$   
 $C_2' * M = (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0) * M \rightarrow (1\ 0\ 0\ 0\ 0\ 0\ 1\ 1\ 0)$   
 $C_2' * M = (0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0) * M \rightarrow (0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0)$   
 $C_2' * M = (0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0) * M \rightarrow (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$   
 $C_2' * M = (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0) * M \rightarrow (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1)$   
 $C_2' * M = (0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1) * M \rightarrow (0\ 0\ 0\ 1\ 1\ 0\ 0\ 1\ 0)$   
 $C_3 = (0\ 1\ 1\ 0\ 0\ 0\ 0\ 1\ 0)$   
 $C_3 = C_2$

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

## 4. CONCLUSION

In this section, the major findings were summarized using IFCMs and interviews data. While analyzing with IFCMs, it was observed that when faith is taken as the ON state, the resultant vector is (0 1 1 0 0 0 0 1 0)

While analyzing with IFCMs we observe that Faith, Humility, God's compassion leads to get miracles in the Holy Bible. Some explanation from the Bible given as follows

### (1) Faith

Faith is the substance of hope Heb 11:1  
 Faith is the foundation of our hope: Rom 8:24,25  
 Faith is the "title-deed" our pledge to things hope Heb 3:14  
 Faith is the conviction of things not seen Heb 11:3  
 Faith accepts even that which appears unreasonable Rom 4:17

- Few examples given faith leads the people to get miracles
- Cleansing a Leper Mark (1:40-45)
- Healing a Centurion's Servant Mathew (8:5-13)
- Healing a Woman's Hemorrhage Mark 5:25-34
- Restoring Sight to Two Blind Men Mathew 9:27-31
- Restoring a Woman Crippled for Eighteen Years Luke(13-10-17)

### (2) Humility

A personal quality in which an individual shows dependence on God and respect for other persons.  
 A recognition of one's sinfulness before a holy God obedience to God and submission to God  
[\(Psalms 51:17; Micah 6:8\)](#) [\(Isaiah 6:5\)](#) [\(Deuteronomy 8:2\)](#) [\(2 Kings 22:19; 2 Chronicles 34:37\)](#).

few examples humility leads to get miracles

- Healing a Centurion's Servant Mathew (8:5-13)
- Healing a Man at the Pool of Bethesda in Jerusalem John 5:2-47

- Healing a Royal Official's Son at Cana John 4 :46-54
- Giving Sight to a Blind Man at Bethsaida

### (3) Compassion

To feel passion with someone, to enter sympathetically into their sorrow and pain.

[\(Philippians 1:8\)](#), Compassion finds its source in God's compassion [\(James 5:11\)](#). In compassion He has provided salvation and forgiveness [\(Luke 1:78\)](#).

few examples of God's compassion leads to miracles

- Raising from the Dead ,a Widow's Son at Nain
- Raising from the Dead of the Daughter of Jairus
- Raising of Lazarus of Bethany from the Dead
- Jesus Heals Many by the Sea of Galilee
- Healing a Slave's Severed Ear

FCMs have advantages as well as some disadvantages. The main advantage of this method is simple. It functions on experts' opinion .When the data happens to be an unsupervised one, the FCM becomes handy. This is the only known technique that gives the hidden pattern of the situation. Although this research is unique ,it has a couple of limitations also. First, the limitations of IFCMs-This model consists of lengthy procedures for calculations with the matrices which has higher number of rows and columns .Secondly, this manual calculation is fully based on the experts' opinion. Hence, it may lead to personal bias. But to deal with an unsupervised data, the IFCM Model predicates the accurate results when comparing with FCM Model. The reason is, the vector yields more number of concepts is considered to be the best vector i.e., the fixed point which is not the case of FCM.

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## 6. FUTURE WORK

Faith will be measured by using fuzzy model.

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