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Analysis of the Problems of Female Sports Persons Using Induced Fuzzy Associative Memory Models

Research Article*

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Abstract: In this paper, we use Fuzzy Associative Memories (FAM), Induced Fuzzy Associative Memories (IFAM) model to analyse the problems of female sports persons and derived some conclusions. And also we use the method of thresholding to clarify the problems faced by the female sports persons which we mentioned. Through this paper we have explained how female sports persons come to know to manage the problems and to give the best performance.

Keywords: Fuzzy Associative Memories (FAM), Induced Fuzzy Associative Memories (IFAM), Fixed point, Limit cycle.
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1. Introduction

Research on FAM models originated in the early 1990's with the advent of Kosko's FAM Like many other associative memory models, Kosko's FAM consists of a single-layer feedforward FNN that stores the fuzzy rule "If x is X_k then y is Y_k" using a fuzzy Hebbian learning rule in terms of max-min or max-product compositions for the synthesis of its weight matrix W. Despite successful applications of Kosko's FAMs to problems such as backing up a truck and trailer, target tracking, and voice cell control in ATMnetworks, Kosko's FAM suffers from an extremely low storage capacity of one rule per FAM matrix. Therefore, Kosko's overall fuzzy system comprises several FAM matrices. Given a fuzzy input, the FAM matrices generate fuzzy outputs which are then combined to yield the final result. To overcome the original FAMs severe limitations in storage capacity, several researchers have developed improved FAM versions that are capable of storing multiple pairs of fuzzy patterns For example, Chung and Lee generalized Kosko's model by proposing a max-t composition for the synthesis of a FAM matrix. Chung and Lee showed that all fuzzy rules can be perfectly recalled by means of a single FAM matrix using max-t composition provided that the input patterns satisfy certain orthogonality conditions. Junbo et al. had previously presented an improved learning algorithm for Kosko's max-min FAM model. Liu modified the Junbo's FAM et al. by adding a threshold activation function to each node of the network.

1.1. Preliminaries

Definition 1.1 (n-dimensional unit hypercube). *The n-dimensional unit hypercube is denoted by* $I^n = [0,1]^n = [0,1] \times \ldots \times [0,1]$. *A fuzzy set defines a point in the cube* I^n *and the vertices of the cube* I^n *are non-fuzzy sets. The n-dimensional unit*

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hypercube I^n houses all the fuzzy subsets of the form $X = \{x_1, x_2, \ldots, x_n\}$. Here we are interested in the distance between points within the unit hypercube.

2. Adaptation of FAM to Problem

Suppose that there are n attributes, say $X_1, X_2, \ldots, X_n$ where n is finite, associated with the youngsters and let $Y_1, \ldots, Y_n$ be the attributes associated with parents and public. The connection matrix M of order n × p is obtained through the expert. Let C_1 be the initial input vector 1 × n. A particular component, say C_1 kept on ON state and all other components on OFF state and pass the state vector C_1 through the connection matrix M.

We use Min-max principle, to convert the resultant vector into a signal function, choose the first two highest values to ON state and other values to OFF state with 1 and 0 respectively. Denote this process by the symbol $\hookrightarrow$. The resulting vector is multiplied with M^T and thresholding yields a new vector C_2.

Denote the attribute facing female sports persons as S_1, S_2, S_3, S_4, S_5 and S_6 and let denote the attributes associated with the methods of using family and socity as P_1, P_2, P_3, P_4, P_5, P_6 and $P_7$the data collected from the female sports persons the reasons for not being a female sports person are divided as the following attributes.

The attributes related to female sports persons

S_1 – Wearing of dress.

S_2 – Friendship with gents.

S_3 – Boarding and lodging.

S_4 – Travelling alone.

S_5 – Practice without co-player.

S_6 – Natural problem as a women.

The attributes related to family and socity

P_1 – Lack of maintanance of children.

P_2 – Worry by parents.

P_3 – Anonimous talking by neighbours.

P_4 – Moral down by socity.

P_5 – Unnecessary raising questions by media.

P_6 – Publicity drawback.

P_7 – Self decision making without family.

The expert's opinion is given in the form a matrix M.

$$M = \begin{array}{c} \\ S_1 \\ S_2 \\ S_3 \\ S_4 \\ S_5 \\ S_6 \end{array} \begin{array}{c} \begin{array}{ccccccc} P_1 & P_2 & P_3 & P_4 & P_5 & P_6 & P_7 \end{array} \\ \begin{bmatrix} 0.7 & 0.6 & 0.5 & 0.0 & 0.4 & 0.3 & 0.2 \\ 0.5 & 0.3 & 0.4 & 0.5 & 0.2 & 0.6 & 0.2 \\ 0.6 & 0.7 & 0.0 & 0.3 & 0.2 & 0.1 & 0.4 \\ 0.5 & 0.0 & 0.4 & 0.2 & 0.1 & 0.3 & 0.5 \\ 0.4 & 0.3 & 0.2 & 0.5 & 0.0 & 0.1 & 0.2 \\ 0.8 & 0.6 & 0.5 & 0.3 & 0.2 & 0.0 & 0.2 \end{bmatrix} \end{array}$$

Analyzing using FAM

Let the initial state vector be $C_1 = (1\ 0\ 0\ 0\ 0\ 0)$. The effect of C_1 in dynamical system M is

C_1M = (0.7 0.6 0.5 0.0 0.4 0.3 0.2)

$\hookrightarrow$ (1 1 0 0 0 0 0) = A_1

The result $A_1 \times M^T$ of order 1×6 is

(0.7 0.5 0.7 0.5 0.4 0.8)

$\hookrightarrow$ (1 0 1 0 0 1) = C_2

Now $C_1 \neq C_2$. Hence we proceed further to get the limit point as follows. The effect of C_2 in dynamical system M is

C_2M = (0.8 0.7 0.5 0.3 0.4 0.3 0.4)

$\hookrightarrow$ (1 1 0 0 0 0 0) = A_2

The result $A_2 \times M^T$ of order 1×6 is

(0.7 0.5 0.7 0.5 0.4 0.8)

$\hookrightarrow$ (1 0 1 0 0 1) = C_3

Now $C_3 = C_2$. Hence the pair of limit point is

(1 1 0 0 0 0 0) = (1 0 1 0 0 1)

The set of limit points corresponding to different input vectors are given in the following table. The various limit points for different inputs are given in the following table.

S.No	Input vector	Limit point
1	(1 0 0 0 0 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))
2	(0 1 0 0 0 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))
3	(0 0 1 0 0 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))
4	(0 0 0 1 0 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))
5	(0 0 0 0 1 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))
6	(0 0 0 0 0 1)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))

Let the input vector be C_1 = (1 0 0 0 0 0)

(1 0 0 0 0 0) M = (0.7 0.6 0.5 0.0 0.4 0.3 0.2)

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

(1 1 0 0 0 0 0) M^T = (0.7 0.5 0.7 0.5 0.4 0.8)

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

The new vectors are

$$C_1^{(1)} = (100000)$$

$$C_1^{(2)} = (001000)$$

$$C_1^{(3)} = (000001)$$

Case (i):

$C_1{}^{(1)}M$ = (1 0 0 0 0 0) M = (0.7 0.6 0.5 0.0 0.4 0.3 0.2)

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

(1 1 0 0 0 0 0) M^T = (0.7 0.5 0.7 0.5 0.4 0.8)

$\hookrightarrow$ (1 0 1 0 0 1) Row sum is 3

Case (ii):

$C_1{}^{(2)}M$ = (0 0 1 0 0 0) M = (0.6 0.7 0.0 0.3 0.2 0.1 0.4)

$\hookrightarrow$ (1100000)

(1 1 0 0 0 0 0) M^T = (0.7 0.5 0.7 0.5 0.4 0.8)

$\hookrightarrow$ (1 0 1 0 0 1) Row sum is 3

Case (iii):

$C_1^{(3)}M = (0\ 0\ 0\ 0\ 0\ 1)\ M = (0.8\ 0.6\ 0.5\ 0.3\ 0.2\ 0.0\ 0.2)$

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

$(1\ 1\ 0\ 0\ 0\ 0\ 0)\ M^T = (0.7\ 0.5\ 0.7\ 0.5\ 0.4\ 0.8)$

$\hookrightarrow$ (1 0 1 0 0 1) Row sum is 3

Therefore the new input vector C_2 to be multiplied with M is: (1 0 1 0 0 1).

Now $C_2M = (1\ 0\ 1\ 0\ 0\ 1)\ M = (0.8\ 0.7\ 0.5\ 0.3\ 0.4\ 0.3\ 0.4)$

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

$(1\ 1\ 0\ 0\ 0\ 0\ 0)\ M^T = (0.7\ 0.5\ 0.7\ 0.5\ 0.4\ 0.8)$

$\hookrightarrow (1\ 0\ 1\ 0\ 0\ 1) = C_2' = C_1'$

Now $C_2' = C_1'$. Hence the pair of limit point is ((1 1 0 0 0 0 0) (1 0 1 0 0 1))

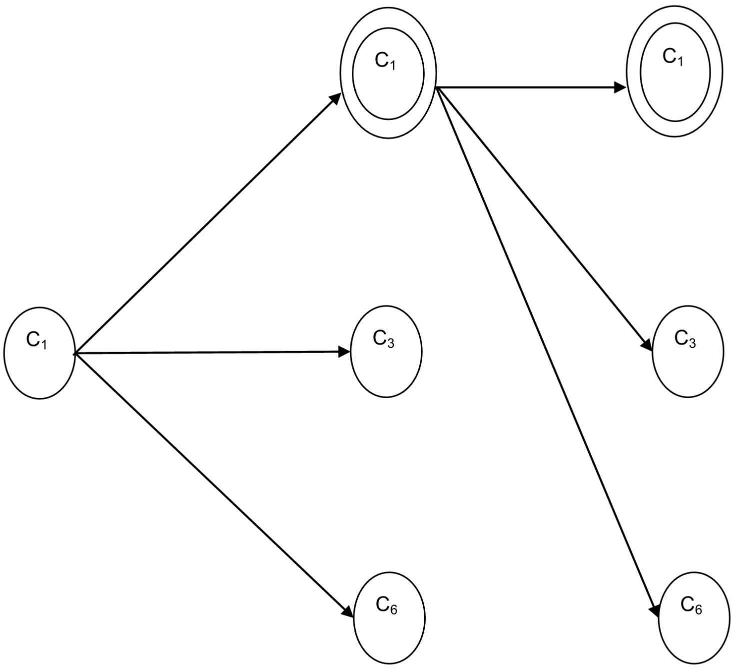

Figure 1. **The graph for triggering patterns of IFAM**

For various input vectors, we get different triggering patterns and all these triggering patterns are given in the following table.

S.No	Input vector	Limit point	Tiggering pattern
1	(1 0 0 0 0 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))	$C_1 \Rightarrow C_1 \Rightarrow C_1$
2	(0 1 0 0 0 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))	$C_2 \Rightarrow C_1 \Rightarrow C_1$
3	(0 0 1 0 0 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))	$C_3 \Rightarrow C_1 \Rightarrow C_1$
4	(0 0 0 1 0 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))	$C_4 \Rightarrow C_1 \Rightarrow C_1$
5	(0 0 0 0 1 0)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))	$C_5 \Rightarrow C_1 \Rightarrow C_1$
6	(0 0 0 0 0 1)	((1 1 0 0 0 0 0) (1 0 1 0 0 1))	$C_6 \Rightarrow C_1 \Rightarrow C_1$

The triggering patterns for these limit points are shown in figure 1. The merged graph is shown in figure 2. Since the IFAM gives a gradation, we are able to get the triggering pattern between the attributes which causes the problems.

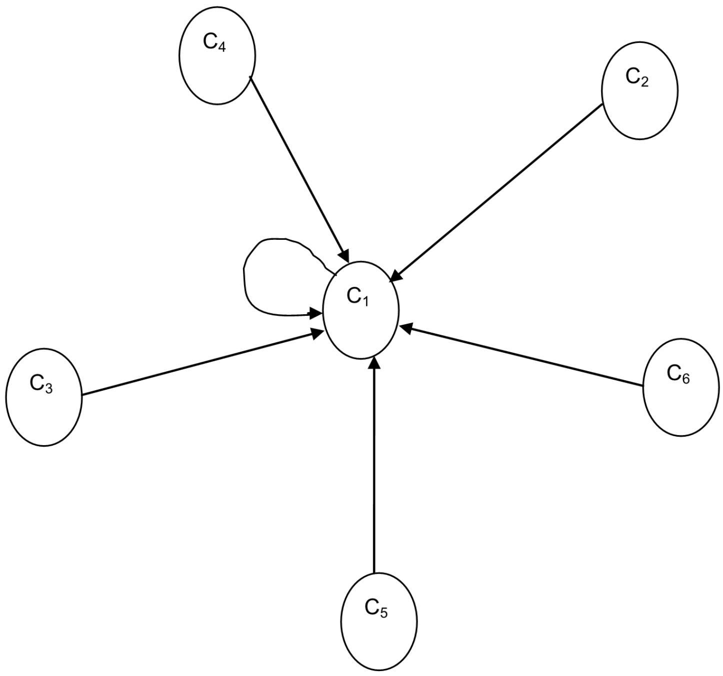

Figure 2. **The merged graph of triggering pattern**

3. Conclusion

We analyzed the problems of female sports persons using IFAM model and we identified the following attributes S_1, S_3 and $S_6$are the causes for not being the female sports person. That is, wearing of dress, boarding and lodging, natural problem as a women. The attributes P_1, P_2 are highlighted and which related to lack of maintanance of children, worry by parents.

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