# Domestic Violence Against Women Using Induced Linked Bidirectional Associative Memories (ILBAM)

**Research Article**

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**Abstract:** Domestic violence is an abusive behaviour perpetrated by intimate partner and other members in the family. Traditionally women were expected to married soon and settle down in her life. The family is a place where an individual's seeks love, safety ,food and shelter but at the same time it is also place that creates some of the drastic violence perpetuated against women. Domestic violence against women is a serious obstacle which perpetuates unequal power relations between men and women in the society. It is one of the most pervasive of human rights violations which denies women from equal rights, dignity and fundamental freedom. The aim of this paper targets to find out the factors of domestic violence against women and how this impacts the effects of the children by relating with violence faced by women in the family using model Induced Linked Bidirectional Associative Memories, Section one describes introduction. Section two deals with definitions and method of finding pattern in ILBAM. Section three gives description of the problem and impact of domestic violence on children. Section four deals with the adaptation of the problem. Ultimately section five reveals the conclusion.

**Keywords:** Domestic violence, Children, linked bidirectional associative memories, Induced.

## 1. Introduction

Bidirectional Associative Memories was introduced by Bart kosko in 1988. It consists of neurons arranged in two layers A and B. One layer are fully interconnected to the neurons in the second layer, There is no interconnection among neurons in the same layer. The weight from layer A to layer B is same as the weights from layer B to layer A [13]. Linked Fuzzy Relational Mapping was developed to study the school dropouts with relation to migration of parents and the Induced concept was introduced to determine the stronger factors among the attributes [8]. So far Linked Fuzzy Relational Mapping [7], Induced Linked Fuzzy Relational Mapping [8], Linked Neutrosophic Relational Map [9], Induced Linked Neutrosophic Relational map [10], Linked Neutrosophic equation [9], Induced Cluster Linked Fuzzy relational Map [11] have been introduced Present study reveals the factors which induces Domestic violence against women and effects of the children by relating with violence faced by women in the family using Fuzzy model called Induced Linked Bidirectional Associative Memories.

## 2. Definitions

**Definition 2.1** (Neurons fields). *A group of neurons form a field , Neural network contains many field of neurons $F_x$ denotes a neuron field which contain n neutrons & $F_y$ denotes a neuron field which contains p neurons.*

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**Definition 2.2** (Neuronal Dynamical systems)**.** *The neuronal dynamical system is described by a system of first order differential equations that govern the time evaluation of the neuronal activations or membrane potentials.Suppose t denotes the activation time and $X_1$ and $Y_1$ denote respectively the activation time function of the $i^{th}$ neuron in $X(t)$ and the $j^{th}$ neuron in $Y(t)$. Where*

$$X(t) = (x_1(t), \ldots, x_n(t))$$

$$Y(t) = (y_1(t), \ldots, y_n(t))$$

Define the state of the neurons dynamical systems at time t, Additive bivalent models describe asynchronous and stochastic behavior. At each moment each neuron can randomly decide whether to change state, or whether to omit a new signal given its current activation. The BAM is a non-adaptive additive bivalent neural network.

**Definition 2.3** (Synaptic Connection Matrices)**.** *Let us suppose that the field $F_x$ with n neurons is synaptically connected to the field $F_y$ with p neurons. Let $m_{ij}$ be a synapse where the axon from $i^{th}$ neuron in F terminates, $m_{ij}$ can be positive, negative or zero. The synaptic matrix m is an $n \times p$ matrix of real numbers whose entries are the synaptic efficacies $m_{ij}$. The matrix M describes the forward projections from the neuronal field $F_x$ to the neuronal field $F_y$. Similarly $M^t$, a $p \times n$ synaptic matrix and describes the backward projections $F_y$ to $F_x$.*

**Definition 2.4** (Bidirectional Network)**.** *A network is said to be a bidirectional network if $M = N^T$ and $N = M^T$.*

**Definition 2.5** (Bidirectional Associative Memories)**.** *When the activation dynamics of the neuronal fields $F_x$ and $F_y$ lead to the overall stable behavior, the bidirectional networks are called as Bidirectional associative Memories.*

**Definition 2.6** (Linked Bidirectional Associative Memories)**.** *Two bidirectional associative represented by a relational matrix say $E_1$ of order $m \times n$ and $E_2$ of order $n \times t$ can be linked to form a new relational matrix E of order $m \times t$. There may not have direct relationship between domain space of $E_1$ and Range space of $E_2$ but certainly we could find out the hidden pattern in the linked bidirectional Associative memories.*

**Definition 2.7** (Hidden Pattern)**.** *Consider $D_i R_j R_j$ or $D_i$ is switched ON and if causality flows through the edges of the cycle and if it again causes $R_i$ or $D_j$ we say dynamical system goes round and round. The equilibrium state of this dynamical system is called the hidden pattern.*

**Definition 2.8** (Limit cycle)**.** *If the state vector repeats in the form of $A_1 \rightarrow A_2 \rightarrow A_3 \rightarrow A_1$ then this equilibrium is called limit cycle.*

**Definition 2.9** (Fixed point)**.** *If the equilibrium state of a dynamical system is a unique state vector, then it is called a fixed point.*

## 2.1. Method of finding hidden pattern in Induced Linked Bidirectional Associative memories

**Step 1:** Let $F_1, \ldots, F_m$ and $C_1, \ldots, C_n$ be the nodes of Bidirectional associative memories. And M be the relational matrix of order $m \times n$ which is obtained through eh expert.

**Step 2:** Let us find the hidden pattern when a particular attribute say $F_1$ is kept on state and all other states on off state and pass the vector $F_1$ through relational matrix M.

**Step 3:** Threshold the value by choosing first two highest values to on state and other values to off state as 1 and 0.

**Step 4:** The resultant vector is multiplied with $M^T$ and again threshold it which yields new vector $D_1$.

**Step 5:** This vector $D_1$ is pass through relational matrix M and went under thresholding process by choosing first two highest values as 1 and other values as 0. Follow step 4.

**Step 6:** For each positive entry we get a set of resultant vector and choose maximum number of 1s as $F_2$.

**Step 7:** Suppose of there are two or more vectors with equal numbers of 1s occurs, choose the first one as $C_2$.

**Step 8:** Repeat the procedure till limit cycle is obtained.

This process has been continued for all the vectors separately.

## 3.    Description of the Problem

The United Nations Declaration (1993) defines violence against women as an act of gender based violence that results in or is likely to result in physical, sexual or psychological harm or suffering to women including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or private life [13]. Domestic violence against women is a serious problem concerning human rights violation which is perpetuated by intimate partner and other family members. There are many forms of violence against women including sexual, physical and emotional abuse by intimate partner and also by family members. Traditional practices includes child marriage, dowry related violence and honor killings when women are murdered in the name of family honor. [2] Moreover domestic violence has negative impact on health of women, increases unintended pregnancies, abortions [4]. Husbands consumption of alcohol was the significant factor associated with domestic violence [4, 5]. Even though women are now educated and equally sharing the space with men. Globally 38% of women are murdered by their intimate partner. [15] Various Studies from South countries on domestic violence have identified that certain factors such as age, number of living male children and living extended family [14].

### 3.1.    Impact of Domestic Violence on Children

Family is the best place where children learn love, unity, honesty, respect, responsibility and moral values. Moreover childhood is the most memorable and learning period in every human beings life. When children grow up seeing their father abusing their mother they start to accept such behavior as norm and there is chance of adapting it in their martial life. Some Children think violence as the solution to their problems in home and school which leads to risk of committing criminal acts such as juvenile and some children's may express the stress indifferent ways such as difficulties in sleeping, bedwetting, headaches, behavior problems. Studies show that children who experience or witness violence at home may have long term physical, emotional and social problem and sometimes leads to commit violence in the future [12]. Children who witness violence or threats of violence between the parents are more likely to display harmful drinking patterns later in life [16].

## 4.    Adaptation of ILBAM to the Problem

Various Studies From South countries on domestic violence have identified that certain factors such as age, number of living male children and living extended family [14]. A study by masculinity Intimate partner violence and son preference in India conducted by UNFPA and International Centre for research on women revealed that 52% of the 3,158 women surveyed reported that women had experienced some form of violence during their lifetime. Physical violence (38%), Emotional violence (35%), sexual violence (17%) and economic abuse (16%). 1 in 6 men didn't allow their wives to wear clothes of

their choices, 66% men believed that they have a greater say that their wives taking the important decisions affects them. 75% men expected their partners to agree sex [6]. The following attributes are collected from 300 women in Chennai by using unsupervised method.

To analyze the problem we have chosen three set of attributes. We take the following attributes as a factor which is responsible for domestic violence against women

$F_1$−Low socio economic status: It is measurement of individual's combination of income, education and occupation position in relating with others. When socio economic status was low it creates violence in the family.

$F_2$−Cultural: It includes gender specific socialization, cultural definition of appropriate sex roles, acceptability of violence as a mean to resolve the conflict, values that give men proprietary rights over women and girls [1]

$F_3$−Husband's Alcohol consumption: Alcohol consumption is a direct cause of Intimate partner violence. An frequent drinking habits creates a unhappy, stressful relationship increases the risk of conflict and violence in the family

$F_4$−Dowry: It is illegal practice still prevails in the society. It is common source where the husband and his family demands the money in the name of dowry. Incidents of murder or attempted suicide happens for dowry related problems are the regular items published in the daily newspaper.

$F_5$−Early marriage: Parents use to believe that doing marriage at young age will protect their daughters from physical or sexual assault in the society but it puts women at a higher risk of sexual , physical and psychological violence through their family life.

$F_6$−Not having male child: still the society thinks girl child as a burden to the family and expects that the boy child is the one who will protect and safeguard the family life long.

$F_7$−Belonging to lower caste: women are underestimated on the basis of her caste if she belongs to lower caste.

$F_8$−level of education: The education status of both the partners correlates with domestic violence. When women is uneducated she needs to depend economically and has to stay in inferior position to her husband.

$F_9$−Illegal relationship: In martial life having sex with multiple partners creates the conflicts between the partners in the family.

The list of attributes violence faced by women in the family.

$V_1$−Physical assault: It is traditional practice harmful to women which includes slapping, beating, choking, stabbing and arm twisting.

$V_2$−Stalking: It is pattern of repeated, unwanted harassment that direct or indirectly threats a women. It includes some of the activities harassing the phone calls, following or waiting in certain places and keeping the objects or leaving you message.

$V_3$−Controlling partner decision: Not allowing to take decision on her own and suppress her not to speak against them.

$V_4$−Trafficking: It is an illegal practices which exploits women in the form of physical and sexual activities by husband and his family members for their personal conflicts.

$V_5$−Sexual abuse: women are even sexually coerced by their partner themselves against their will.

$V_6$−Homicide: It is an act of killing of the women by her intimate partner. Globally 38% of women are murdered by their intimate partner [15].

$V_7$−Pregnancy Torture: Tortures during Pregnancy can put mother and unborn baby in danger. Sometimes there is a chance of occurrence of miscarriage, premature birth and death of the baby.

$V_8$−Discrimination in food: It happens when women disobey the words of the husband or by husband's family members when she is dependent on him.

The attributes that impacts of children on violence

$E_1$−Depression: The children feels very sad, hopeless and often unable to live in a normal way.

$E_2-$Drug/Alcohol abuse: Children who witness violence or threats of violence between the parents are more likely to display harmful drinking patterns later in life [16].

$E_3-$Run away from home: The repeated violent behavior in family hurts children and in anger they use to run away from home.

$E_4-$Suicide thoughts: Due to severe depression sometimes children choose to attempt suicide.

$E_5-$Lack of concentration in studies: The occurrence of regular conflicts between parents affects the studies of the children and started to worry about their future..

$E_6-$Low self-esteem: It is debilitating condition that keeps children from releasing their full potential. A children with low self-esteem feels unworthy, incapable and incompetent.

$E_7-$Aggressive Behavior: It causes physical or emotional harm to others, Due to depression they act aggressively when they feel irritated. Some children's lash out due to fear.

$E_1-$physical health problems: It includes bedwetting, stomach aches and headaches

An expert Social worker reveals the following relations between factors and violence faced by women in the families. The expert's opinion is given in form of Relational matrix FV.

$$FV = \begin{array}{c} \\ F_1 \\ F_2 \\ F_3 \\ F_4 \\ F_5 \\ F_6 \\ F_7 \\ F_8 \\ F_9 \end{array} \begin{array}{c} \begin{array}{cccccccc} V_1 & V_2 & V_3 & V_4 & V_5 & V_6 & V_7 & V_8 \end{array} \\ \left[ \begin{array}{cccccccc} 0.8 & 0.5 & 0.8 & 0 & 0.4 & 0 & 0.8 & 0 \\ 0.4 & 0 & 0.8 & 0.5 & 0.8 & 0.3 & 0.4 & 0 \\ 0.7 & 0.7 & 0.8 & 0.2 & 0.8 & 0.6 & 0.8 & 0.6 \\ 0.6 & 0.5 & 0.6 & 0.5 & 0.5 & 0.7 & 0.8 & 0.8 \\ 0.8 & 0.7 & 0.6 & 0.2 & 0.8 & 0.3 & 0.6 & 0.5 \\ 0.7 & 0.3 & 0.7 & 0 & 0.5 & 0.3 & 0.7 & 0.3 \\ 0.5 & 0.4 & 0.6 & 0.7 & 0.4 & 0.8 & 0.8 & 0.6 \\ 0.5 & 0.2 & 0.5 & 0 & 0.6 & 0 & 0.6 & 0 \\ 0.8 & 0.2 & 0.4 & 0.4 & 0.3 & 0.7 & 0.6 & 0.5 \end{array} \right] \end{array}$$

An expert children who studying $8^{\text{th}}$ standard gives the following relations between violence faced by women and effects of children. The expert's opinion is given in the form of Relational matrix VC.

$$VC = \begin{array}{c} \\ V_1 \\ V_2 \\ V_3 \\ V_4 \\ V_5 \\ V_6 \\ V_7 \\ V_8 \end{array} \begin{array}{c} \begin{array}{cccccccc} C_1 & C_2 & C_3 & C_4 & C_5 & C_6 & C_7 & C_8 \end{array} \\ \left[ \begin{array}{cccccccc} 0.8 & 0.4 & 0.6 & 0.6 & 0.7 & 0.6 & 0.8 & 0.6 \\ 0.7 & 0.2 & 0.6 & 0.6 & 0.6 & 0.6 & 0.8 & 0.5 \\ 0.5 & 0.2 & 0.6 & 0.6 & 0.4 & 0.6 & 0.7 & 0.5 \\ 0.7 & 0 & 0.3 & 0.5 & 0.4 & 0.7 & 0.5 & 0.3 \\ 0.6 & 0.4 & 0.7 & 0.5 & 0.8 & 0.7 & 0.8 & 0 \\ 0 & 0.6 & 0 & 0 & 0.8 & 0 & 0 & 0.5 \\ 0.6 & 0 & 0.4 & 0.6 & 0.8 & 0.5 & 0.3 & 0.3 \\ 0.6 & 0.6 & 0.7 & 0.7 & 0.7 & 0.8 & 0.5 & 0.8 \end{array} \right] \end{array}$$

In linked bidirectional associative memories the relation between factors and effects of children attributes are combined to

produce the resultant matrix name it as M.

$$
FV \circ VC = M =
\begin{array}{c}
\\
F_1 \\
F_2 \\
F_3 \\
F_4 \\
F_5 \\
F_6 \\
F_7 \\
F_8 \\
F_9
\end{array}
\begin{array}{c}
\begin{array}{cccccccc}
C_1 & C_2 & C_3 & C_4 & C_5 & C_6 & C_7 & C_8
\end{array} \\
\left[
\begin{array}{cccccccc}
2.11 & 0.74 & 1.86 & 1.94 & 2.14 & 1.94 & 2.16 & 1.37 \\
1.79 & 0.82 & 1.59 & 1.61 & 2.00 & 1.83 & 1.89 & 1.06 \\
2.87 & 1.66 & 2.74 & 2.78 & 3.56 & 2.96 & 3.04 & 2.31 \\
2.58 & 1.56 & 2.40 & 2.56 & 3.32 & 2.76 & 2.59 & 2.29 \\
2.61 & 1.38 & 2.47 & 2.47 & 3.19 & 2.66 & 2.79 & 1.92 \\
1.96 & 1.04 & 1.86 & 1.90 & 2.36 & 1.96 & 2.05 & 1.52 \\
2.43 & 1.40 & 2.13 & 2.35 & 3.25 & 2.55 & 2.35 & 2.13 \\
1.51 & 0.58 & 1.38 & 1.38 & 1.63 & 1.44 & 1.57 & 0.83 \\
2.00 & 1.32 & 1.76 & 1.90 & 2.63 & 2.03 & 1.95 & 1.83
\end{array}
\right]
\end{array}
$$

An Attribute $F_1$ is in ON state and all other nodes are in OFF state.

$$F_1.M = (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0).M$$

$$= (2.11,\ 0.74,\ 1.86,\ 1.94,\ 2.14,\ 1.94,\ 2.16,\ 1.37)$$

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

$$(0\ 0\ 0\ 0\ 1\ 0\ 1\ 0).M^T = (4.30,\ 3.89,\ 6.60,\ 5.91,\ 5.98,\ 4.41,\ 5.60,\ 3.20,\ 4.58)$$

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

The new vectors

$$A^1 = (0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0)$$

$$A^2 = (0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0)$$

$$A^1.M = (2.99,\ 1.66,\ 2.74,\ 2.78,\ 3.56,\ 2.96,\ 3.04,\ 2.31)$$

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

$$(0\ 0\ 0\ 0\ 1\ 0\ 1\ 0).M^T = (4.30,\ 3.89,\ 6.60,\ 5.91,\ 5.98,\ 4.41,\ 5.60,\ 3.20,\ 4.58)$$

$$\hookrightarrow (0\ 0\ 1\ 0\ 1\ 0\ 0\ 0\ 0) = F_3$$

$$A^2.M = (2.71,\ 1.38,\ 2.47,\ 2.47,\ 3.19,\ 2.66,\ 2.79,\ 1.92)$$

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

$$(0\ 0\ 0\ 0\ 1\ 0\ 1\ 0).M^T = (4.30,\ 3.89,\ 6.60,\ 5.91,\ 5.98,\ 4.41,\ 5.60,\ 3.20,\ 4.58)$$

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

$$F_3.M = (0\ 0\ 1\ 0\ 1\ 0\ 0\ 0\ 0).M$$

$$= (5.70,\ 3.04,\ 5.21,\ 5.25,\ 6.75,\ 5.62,\ 5.83,\ 4.23)$$

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

$$(0\ 0\ 0\ 0\ 1\ 0\ 1\ 0).M^T = (4.30,\ 3.89,\ 6.60,\ 5.91,\ 5.98,\ 4.41,\ 5.60,\ 3.20,\ 4.58)$$

$$\hookrightarrow (0\ 0\ 1\ 0\ 1\ 0\ 0\ 0\ 0) = F_3^{'}$$

$$F_3^{'1} = (0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0)$$

$$F_3^{'2} = (0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0)$$

$$F_3^{'1}.M = (2.99,\ 1.66,\ 2.74,\ 2.78,\ 3.56,\ 2.96,\ 3.04,\ 2.31)$$

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

$$(0\ 0\ 0\ 0\ 1\ 0\ 1\ 0).M^T = (4.30,\ 3.89,\ 6.60,\ 5.91,\ 5.98,\ 4.41,\ 5.60,\ 3.20,\ 4.58)$$

$$\hookrightarrow (0\ 0\ 1\ 0\ 1\ 0\ 0\ 0\ 0) = F_3$$

$$F_3^{'2}.M = (2.71,\ 1.38,\ 2.47,\ 2.47,\ 3.19,\ 2.66,\ 2.79,\ 1.92)$$

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

$$(0\ 0\ 0\ 0\ 1\ 0\ 1\ 0).M^T = (4.30,\ 3.89,\ 6.60,\ 5.91,\ 5.98,\ 4.41,\ 5.60,\ 3.20,\ 4.58)$$

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

Therefore the binary pair (0 0 0 0 1 0 1 0), (0 0 1 0 1 0 0 0 0) represents the fixed point.

| Attributes | Triggering pattern |
|---|---|
| $F_1$ | $F_1 \Rightarrow F_3 \Rightarrow F_3$ |
| $F_2$ | $F_2 \Rightarrow F_3 \Rightarrow F_3$ |
| $F_3$ | $F_3 \Rightarrow F_3 \Rightarrow F_3$ |
| $F_4$ | $F_4 \Rightarrow F_3 \Rightarrow F_3$ |
| $F_5$ | $F_5 \Rightarrow F_3 \Rightarrow F_3$ |
| $F_6$ | $F_6 \Rightarrow F_3 \Rightarrow F_3$ |
| $F_7$ | $F_7 \Rightarrow F_3 \Rightarrow F_3$ |
| $F_8$ | $F_8 \Rightarrow F_3 \Rightarrow F_3$ |
| $F_9$ | $F_9 \Rightarrow F_3 \Rightarrow F_3$ |

**Table 1.** **Triggering pattern for other input vectors.**
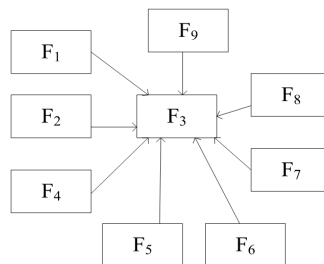


**Figure 1.** **Induced path on a merged graph**

The interrelationship between the attributes utters that $F_3$ (Husband's Alcohol Consumption) is the factor which plays major role in Domestic violence against women. The limit points corresponding to $F_3$ ((0 0 1 0 1 0 0 0 0), (0 0 0 0 1 0 1 0) highlights the factors $F_3$ (Husband's Alcohol consumption), $F_5$ (Early Marriage) and effects of the children are $C_5$ (Lack of concentration in studies) and $C_7$ (Aggressive Behaviour).

## 5.   Conclusions

Domestic violence is endemic and widespread predominantly against women in the society. It is not taken as a serious problem because domestic violence is viewed as a personal issue which is to be resolved privately with in the family. In marital conflicts

society puts burden on women as she is the one who needs to build strong bonding by tolerating and maintaining the peace in the family. It is responsible for every individuals to provide safety to women in her own environment because safety is one of the parameter which evaluates the development of the country.

## Acknowledgement

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