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Fuzzy Clustering of the Domestic Violence for the Degree of Suicide thought based on Married Women Perception

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ABSTRACT

Intimate partner violence against women is seen in all cultures. It has wide-ranging effects on the physical and psychological health of women and it is associated with the attempted suicide women. Suicide is one of the leading causes of death in the world. An imperative reason for suicide in the Domestic Violence, a twenty attributes of domestic violence have been chosen, which stimulate suicide thought. In this study, the perception of married women is captures in a 10-point rating scale regarding the degree of variation in the level of frustration at the chosen the attributes of domestic violence in Chennai city. The average rating scale is using to cluster the attributes using Fuzzy c-means clustering and classify them as low, medium and high level of frustration due to domestic violence and it can be classified proactively to ensure that suicide thought do not occur, the advantage of fuzzy clustering is that a attributes may be part of more than one cluster to a varying degree and this gives a better picture about the attributes of domestic violence.

Keywords – C-means clustering, Domestic Violence, Suicide, Women

I. INTRODUCTION

Violence against women constitutes a violation of the rights and fundamental freedom of women. The United Nation defines violence against women as "Any act of gender based violence that results in, or is likely in physical sexual or psychological hare or suffering to women, including threats of such acts, coercion in public or in private life" [5]. (It is predominately women who experience such abuse and men who perpetrate this violence). Partner violence has wide-ranging effects on the physical and psychological health of women. Domestic violence is strongly associated with attempted suicide women. The cause of such a thought is analyzed and indentified the twenty attributes of domestic violence have been chosen such as accused them of being unfaithful, insulted them in front of other, which stimulate them to attempt suicide. It is qualitative in nature and is non-measurable yet observable. In order to quantify the degree of twenty attributes, recording the women perception is a good method. This study aims to capture the women perception about the level of Frustrations at a set of attribute of domestic violence and then classify the attributes based on fuzzy c-means clustering. Fuzzy clustering is more appropriate for perception based data since perceptions are always a matter of varying degree. This article organized as follows: this section gives the methodology of our study and Basic notion of clustering and fuzzy clustering while in section three. Section four derives results and discussion and final section gives the conclusion and scope of our future study.

II. METHODOLOGY

The classification of domestic violence which stimulates suicide thought is done based on married women perception to select the attributes of domestic violence. The following twenty attributes of domestic violence is chosen by interviewing the married women in Chennai at the different ages.

1. Did not permit to meet/ interact with female friends.
2. Restricted interaction with family members.
3. Did not permit to handle money.
4. Did not permit choose/buy things.
5. Irritated/suspicious/angry if they talked to other man.
6. Accused them of being unfaithful.
7. Insisted on knowing where they were, always.
8. Treated them like a servant.
9. Did not allow them to partake in decision making.
10. He kept away from home for days or weeks without informing them/giving money.
11. Chocked them or inflicted burns on them.
12. Enforcement of dowry.
13. Threatened to harm them physically/insulted them in front of others.
14. Slapped them/beat them on other body parts.
15. Twisted their arm/ pulled their hair.
16. Kicked them/dragged them.
17. Attacked them with knife or some other weapon.
18. Ignored them purposely, by not having sexual intercourse with them for weeks
19. Had sexual intercourse with them forcibly, when they were not interested.
20. He was unfaithful to them/had a extra-marital relationship.

Three attributes which best define the characteristic of each segment have been selected to be

rated by respondents. Fuzzy c-means clustering is done using the algorithm (4.1).

III. PRELIMINARIES

3.1 HARD CLUSTERING

In **Hard Clustering** we make a hard partition of the data set **Z**. In other words, we divide them into $c \geq 2$ clusters. With a partition, we mean that

$$\bigcup_{i=1}^{c} A_i = Z \text{ and } A_i \bigcap A_j = \phi, \ \forall\ i \neq j \qquad (1)$$

Also, none of the sets, A_i may be empty. To indicate a portioning, we make use of **membership functions** $\mu_k(x)$. If $\mu_k(x) = 1$, then object x is in cluster k. Based on the membership functions, we can assemble the **Partition Matrix U**, of which $\mu_k(x)$ are the elements. Finally there is a rule that

$$\forall x \quad \sum_{i=1}^{c} \mu_k(x) = 1 \qquad (2)$$

In other words, every object is only part of one cluster.

3.2 FUZZY CLUSTERING

Hard clustering has a downside. When an object roughly falls between two clusters A_i and A_j, it has to be put into one of these clusters. Also, outliers have to be put in some cluster. This is undesirable. But it can be fixed by fuzzy clustering.

In **Fuzzy clustering**, we make a **Fuzzy partition** of the data. Now, the membership function $\mu_k(x)$ can be any value between 0 and 1. This means that an object z_k can be for 0.2 parts in A_i and for 0.8 part in A_j. However, requirement (2) still applies. So, the sum of the membership functions still has to be 1. The set of all fuzzy partitions that can be formed in this way is denoted by M_{fc}. Fuzzy partitioning again has a downside. When we have an **outlier** in the data (being an object that doesn't really belong to any cluster), we still have to assign it to clusters. That is, the sum of its membership functions still must equal one.

3.4 FUZZY C-MEANS CLUSTERING

In fuzzy clustering, each point has a degree of belonging to clusters, as in fuzzy logic, rather than belonging completely to just one cluster. Thus, points on the edge of a cluster, may be in a cluster to a lesser degree than points in the center of cluster for each point x there is no coefficient giving the degree of being in the k^{th} cluster $\mu_k(x) = 1$. Usually, the sum of those coefficients is defined to be 1.

$$\forall x \quad \sum_{n=1}^{num.cluster} \mu_x(x) = 1 \qquad (3)$$

with fuzzy c-means, the centroid of a cluster is the mean of all points, weighted by their degree of belonging to the cluster

$$center_k = \frac{\sum_x \mu_k(x)^m x}{\sum_x \mu_k(x)^m} \qquad (4)$$

The degree of belonging is related to the inverse of the distance to the cluster

$$\mu_k(x) = \frac{1}{d(center_k, x)'} \qquad (5)$$

then the coefficients are normalized and fuzzy field with a real parameter $m > 1$ so that their sum is 1. So

$$\mu_k(x) = \frac{1}{\sum_j \left(\frac{d(center_k, x)}{d(center_j, x)} \right)^{2/(m-1)}} \qquad (6)$$

For m equal to 2, this is equivalent to normalizing the coefficient linearly to make their sum 1. When m is close to 1, then cluster center closes to the point is given much more weight than the others, and the algorithm is similar to *k*-means.

IV. RESULTS AND DISCUSSION

We have interviewed 100 married women in Chennai city to find what stimulated suicide thought in domestic violence, for that twenty attributes of has been chosen and the respondents had related the attributes of domestic violence engendered high level frustration on a 10-point rating scale and the results of the average rating scale and the results of the average rating are shown in Fig.1 13th and 20th attributes is rated highest by the respondents with an average rating of 7.8 and 7.9 respectively on a 10-point scale. This means that, when we compare to other attributes 13th and 20th engendered high level frustration, which stimulate suicide thought and the 4th attribute rating average 2.8 which engendered low level of frustration.

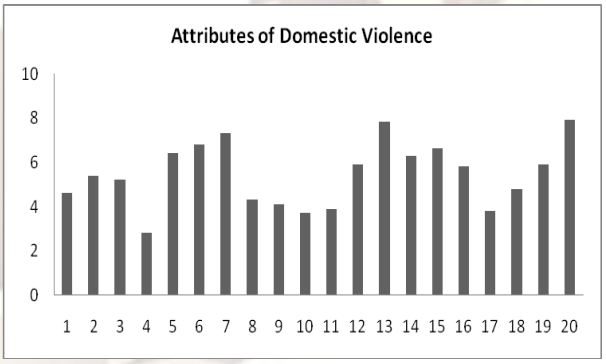

Fig.1 Mean rating of frustration level at the domestic violence.

The ratings and the Standard Deviation of the attributes of domestic violence against married women engendered high level frustration have been subjected to fuzzy c-means clustering using the algorithm(1) and the following results shown in Table :I have been obtained for a 3-cluster combination. The first cluster comprises of the attributes with average rating from 2.8 to 5.9 with a mid value 4.35. The second cluster range is from 3.5 to 7.5 with a mid valued 5.5 and the third cluster has a range of 6.5 to 10 with a mid value 8.25.

The first cluster range indicates violence against women, which engendered LOW level frustration. Second and third clusters range shows that MODERATE and HIGH level of frustration respectively. There is Over-lapping ranges as in characteristic of a fuzzy based cluster.

Table: I
3-Cluster Range of Level of Frustration

	Cluster 1	Cluster 2	Cluster 3
Range	2.8-5.9	3.5-7.5	6.5-10
Mid Value	4.35	5.5	8.25
Classification	LOW	MODERATE	HIGH

4.1 ALGORITHM TO FIND A MEMBERSHIP VALUES FOR THE ATTRIBUTES

Step: 1 Start
Step: 2 Fix, the values of 20 attributes on a 10-point rating scale in a set D (say)
Step: 3 Fix the clusters, which is defined as Cluster 1 = LOW, whose range beginning with 2.8 (bv_1) End with 5.9 (ev_1). Cluster 2 = MODERATE, whose range beginning with 3.7 (bv_2) end with 7.5(ev_2). Cluster 3 = HIGH, whose range beginning with 6.5 (bv_3) end with 10 (ev_3).
Step: 4 Choose en element x in D
Step: 5 If $x < ev_1$, Go to Step: 6, else Go to Step: 8
Step: 6 If $x > bv_2$, then x lies in cluster 1 and cluster 2 whose membership value is defined as $\mu_k(x) = ev_1\text{-}x: x\text{-} bv_2$, Go to Step: 12, else Go to Step:7.
Step: 7 x lies in cluster 1 only, the membership value is $\mu_k(x) = 1$ Go to Step: 12
Step: 8 If $x < ev_2$ Go to Step: 9, else Go to Step: 11
Step: 9 If $x > bv_3$, then x lies in cluster 2 and cluster 3, whose membership value is defined as $\mu_k(x) = ev_2\text{-}x: x\text{-}bv_3$,Go to step 12, else Go to Step: 10
Step: 10 x lies in cluster 2 only, the membership value is $\mu_k(x) = 1$ else Go to Step: 11
Step: 11 x lies in cluster 3 only, the membership value is $\mu_k(x) = 1$
Step: 12 Go to Step: 4, until all the values in D have been checked
Step: 13 Stop

Degree of membership of the attributes of Domestic violence is found using the above algorithm is shown in Table: II. Attribute 4 with a mean rating 2.8 is entirely (100 percentage) with a membership value of 1in cluster 1. Attribute 1 belongs to 54 per in cluster 1 and 46 per in cluster 2. This indicate that, when women face this violence, their frustrations level 60 per to a low degree and 40 per to a moderate degree. Similarly, at attribute 15 belongs 91 per cluster 2 and 9 per to cluster 3. Based on Table II it can be identified that at attributes 1 and 17, women do not get HIGH level frustration. At the attributes 12, 14 and 19 their frustration level will be MODERATE and at the attributes 13, 20 their frustration level will be HIGH. All other attributes are not purely a member of one cluster alone but are members of at-least two clusters. Based on Table II the following attributes 1, 9, 10, 11 and 17 engendered LOW level frustrations. A woman gets MODERATE level of frustration at the attributes 2,3,5,6,8,12,14,15,16 and 19. The attributes 7, 13 and 20 are also member of cluster 3 with a High level of frustration.

Table: II
Degree of Membership of the Attributes

S.No.	Mean	LOW	MODERATE	HIGH
1.	4.6	0.54	0.46	0
2.	5.4	0.21	0.79	0
3.	5.2	0.29	0.71	0
4.	2.8	1	0	0
5.	6.4	0	0.91	0.09
6.	6.8	0	0.91	0.09
7.	7.3	0	0.2	0.8
8.	4.3	0.34	0.6	0
9.	4.1	0.75	0.25	0
10.	3.7	0.91	0.09	0
11.	3.9	0.83	0.17	0
12.	5.9	0	1	0
13.	7.8	0	0	1
14.	6.3	0	1	0
15.	6.61	0	0.89	0.11
16.	5.8	0.04	0.96	0
17.	3.8	1	0	0
18.	4.8	0.46	0.54	0
19.	5.9	0	1	0.09
20.	7.9	0	0	1

V. CONCLUSION

In Crisp Clustering, where a attributes is a member of one cluster only, the fuzzy clustering process permits a attributes to be a member of more than one cluster although to a varying degree. This helps us to find out where women get more frustrated and which stimulate suicide thought in them so that we can give remedial to their spouse. From our study we conclude that women were insisted on knowing where they were always; their spouse was unfaithful to them/had extra-marital relationship and enforcement of dowry which stimulate suicide thought in them very high. In this article, we observed that the effect of domestic violence not only leads suicide thought but also divorce between the couple which will be our main scope of study in the future to analyze the causes of divorce.

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