Issues/Problems Pertaining to Single Parents- A Mathematical Fuzzy Analysis

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ABSTRACT
Parenting is the multitasked skill where no parent can tell out that he/she is full- fledged in parenting. At times parents feel that parenting is the most difficult task that they experience in life. Parents need to be dedicated and devoted to their responsibility in taking care of children. Children at the present era, having full exposure to the society expects lot of love and affection from their parents. They expect also demand their parents to spend time for them. Added to parenting, single parenting involves more and more extra duties and responsibilities in bringing up their wards. In this paper we discussed about the real life situation problem on the issues/problems pertaining to single parents using Fuzzy Clustering Method. This paper consists of four sections. Section one is introductory in nature that deals with the description of the title. Section two deals with the description of Fuzzy Clustering method. Section three gives the study and analysis of the problem. Section four gives the algorithm worked for the model. Section five gives the conclusion and suggestion based on the study.

Keywords
Hard clustering, Fuzzy clusters, Dominant Cause, responsibilities, parenting and responsibilities.

1. INTRODUCTION
The culture that living together in married life and bringing up well the children by the parents have seen drastic changes from past to the present. Today's technology, media and others play a major role in affecting the normal situation of the life. The impact of technology development though having its own advantages in its side but have equal disadvantages in leading the smooth and calm family life. Most people tell out openly that usage of mobiles to speak with his/her better half before marriage acts as one of the major reasons for both to expect a lot from each other after marriage, that even one situation if one fails to satisfy the other, the effect of it causes a lot which may also lead to the breakup of the family.

Survey has shown most percentage in Chennai have single parenting due to varied reasons. The effect of single parenting affects major in bringing up their children in an acceptable way in the society. Single parenting has its own advantages and disadvantages. The example of one does not suits the other. It varies to each family. Children brought by single parenting have achieved to the top most rather at the other extreme most children lost their life without realizing the importance of living. Both the single parents and their family members are affected a lot in many ways. They struggle hard to live in the society due to many questions raise towards them. They find difficult to tackle the situations that they are undergoing each day. Most people of the society are good at

gossip, they find pleasure in doing so. Single parents of the society should be confident and courageous enough to face the challenges of life both for his/her survival and for bringing up their children too. They have added responsibilities and work in parenting their children. Than others single parents should be very careful and particular about their children at every stage of their development. Their children can be easily affected in psychological point of view. Both the genders of single parents encounter the problems equally.

2. PRILIMINARIES
2.1 Hard Clustering
In Hard Clustering we make a hard partition of the data set Z. In other words, we divide the min to $c \geq 2$ clusters. With a partition, we mean that

$$\bigcup_{i=1}^{c} A_i = Z$$

and $A_i \cap A_j = \phi, \forall i \neq j$ ………(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 μ_k,

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

In other words, every object is only part of one cluster [6].

2.2 Fuzzy Clustering
Hard clustering has a disadvantage. When an object roughly falls between two clusters A_i and A_j, it has to be put into one of the 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 parts 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 MFC. 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 [10,2].

2.3 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 belonging in the kth cluster μ_k (x) = 1. Usually, thesumofthosecoefficientsisdefinedtobe1.

$$\sum_{n=1} mn\ cluster\ \mu_k = 1\ \forall x\ \ \ldots\ldots\ldots\ (3)$$

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

$$Center_k = \frac{\sum_x \mu_k(x)^m x}{\sum_x \mu_k(x)^m}\ \ldots\ldots\ldots\ (4)$$

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

$$\mu_k(x) = \frac{1}{d(Center_k, x)}\ \ldots\ldots\ldots\ldots\ (5)$$

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

$$\mu_k(x) = \frac{1}{\sum_j \left(\frac{Center_k, x}{Center_j, x}\right)^{2/(m-1)}}\ \ldots\ldots\ldots\ (6)$$

Form equation 2, this is equivalent to normalizing the coefficient linearly to make their sum 1.When mis-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 [9].

3. METHODOLOGY FOR RESULTS AND DISCUSSION

Linguistic questionnaire was administered to the single parent of both genders in Chennai. Most problems faced by them to survive in this world were taken as the attributes. Fuzzy c-means clustering was implemented to the study of the problem using (4.1) to classify the problems under three categories viz, low, medium and high.

C1 - Lack of sufficient income.

C2 - Stressed due to excess work both in office and in the house.

C3 - Stressed and traumatized when the society around look with suspicion on her fidelity.

C4 - Unable to answer the queries raised by the child about father.

C5 - Hard to cope up with sexual urge.

C6 - Health problem due to over work & stress.

C7 - Children suffer emotional behaviour problems.

C8 - Children become independent and hard working.

C9 - Children involved in decision making unlike the children of duel parents.

C10 - Children behave naughty / disobedient.

C11 - Mother is stricter unlike in normal families

C12 - Mother feels inferiority complex with regard to child care

C13 - Deserted father lives in disciplined suicidal life.

The respondents were invited to express their viewpoints. The following figure and tables show the result of our analysis. The analysis is carried on a 10-point rating scale.

The ratings and the Standard Deviation of the attributes for the causes of failures in mathematics by engineering students have been subjected to fuzzy c-means clustering using algorithm (4.1) and the following results are shown in Table1 according to the expert's opinion. The following table gives the 3-cluster combination.

The first cluster comprises of the attributes with average rating from 2 to 5.5 with a mid-value 3.25. The second cluster range is from 3.5 to 7.5 with a mid-value 5.5 and the third cluster has a range of 6.5- 10 with a mid-value 8.25.

The first , second and third clusters range indicates the problems faced by the single parents of Chennai show the low, moderate and high level of weightage. There is over-lapping ranges as in characteristic of a fuzzy based cluster.

For the 3-cluster Range of level of Dominant Cause (i.e) [1,3,4]

Tabele 1: 3-Cluster Range of Level of Dominant Cause

	Cluster 1	Cluster 2	Cluster 3
Range	2.0-5.5	3.5-7.5	6.5-10
Mid Value	3.75	5.5	8.25
Classification	LOW	MEDIUM	HIGH

Mean Rating of the dominant problems faced by the single parents in Chennai
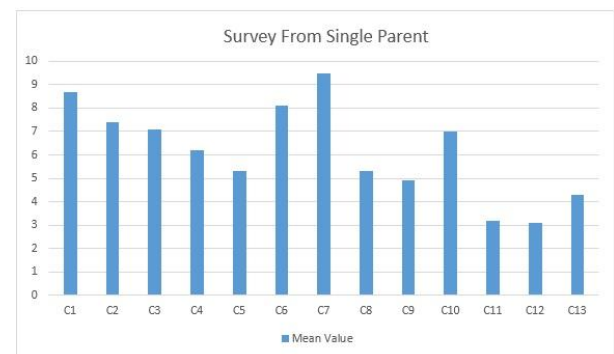
Fig 1 : Survey from Single Parent

4. ALGORITHM

4.1 Algorithm to Find a Membership Values for the Attributes

STEP 1: Start

STEP 2: Fix, the values of 25 attributes on a 10-point rating scale in a set D (say)

STEP 3: Fix the cluster, which is defined as Cluster 1 = LOW, whose range beginning with 2 (bv1) End with 5 (ev1). Cluster 2 = MODERATE, whose range beginning with 3 (bv2) end with 8 (ev2). Cluster 3 = HIGH, whose range beginning with 7 (bv3) end with 10 (ev3).

STEP 4: Choose en element x in D

STEP 5: If x < ev1, Go to **STEP 6**, else Go to **STEP 8**

STEP 6: If x > bv2, then x lies in cluster 1 and cluster 2 whose membership value is defined as μk(x) = ev1-x: x- bv2, Go to **STEP 12**, else Go to **STEP 7**.

STEP 7: Then x lies in cluster 1 only, the membership value is μk(x) =1 Go to **STEP 12**

STEP 8: If x < ev2 Go to **STEP 9**, else Go to **STEP 11**

STEP 9: If x > bv3, then x lies in cluster 2 and cluster 3, whose membership value is defined as μk(x) = ev2-x: x-bv3, Go to **STEP 12**, else Go to **STEP10**

STEP 10: Then x lies in cluster 2 only, the membership value is μk(x) =1 else Go to **STEP11**

STEP 11: Then x lies in cluster 3 only, the membership value is μk(x) =1

STEP 12: Go to **STEP 4**, until all the values in D have been checked

STEP 13: Stop

Here 'bv' denotes the beginning value and 'ev' denotes the ending the value. [5,6,10]

Table 2: Degree of Membership of the attributes – Single parents

Attributes	Mean	Low	Moderate	High
1	8.7	0	0	1
2	7.4	0	0.1	0.9
3	7.1	0	0.4	0.6
4	6.2	0	1	0
5	5.3	0	1	0
6	8.1	0	0	1
7	9.5	0	0	1
8	5.3	0.1	0.9	0
9	4.9	0.3	0.7	0
10	7.0	0	0.5	0.5
11	3.2	1	0	0
12	3.1	1	0	0
13	4.3	0.4	0.6	0

5. CONCLUSION

Taking the opinions of the problems faced by single parents in Chennai, degree of membership value is calculated using the above algorithm is shown in Table: 2.

Attributes 11 and 12 with a mean rating 3.2 and 3.1 is entirely (100%) with a membership value of 1in cluster 1. (i.e.) LOW.

Attributes 4 and 5 with a mean rating 6.2 and 5.3 is entirely (100 %) with a membership value of 1in cluster 2. (i.e.) MODERATE.

Attributes 1, 6 and 7 with a mean rating 8.7, 8.1 and 9.5 is entirely (100 %) with a membership value of 1in cluster 3. (i.e.) HIGH.

Attributes 8, 9 and 13 with a mean ratings 5.3, 4.9 and 4.3 belongs to 10 % in cluster 1 and 90 % in cluster 2, 30 % in cluster 1 and 70% in cluster 2 and 40 % in cluster 1 and 60 % in cluster 2 (i.e.) between LOW and MODERATE.

Attributes 2, 3, 10 with a mean ratings 7.4, 7.1 and 7.0 belongs to 10 % in cluster 2 and 90 % in cluster 3, 40 % in cluster 2 and 60 % in cluster 3 and 50 % in cluster 2 and 50 % in cluster 3. (i.e.) between MODERATE and HIGH.

On analysis the major problems faced by the single parents in Chennai are found to lie in the high range of clusters with the range value from 6.5 to 10. The dominant issues pertaining to the single parents has the membership value one in the high range of classification of clusters. [8,10,6]

C1 - Lack of sufficient income.

C6 - Health problem due to over work & stress.

C7 - Children suffer emotional behavior problems.

Are the attributes contributing to the dominant problems experienced by the single parents in Chennai.

6. REFERENCES

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