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Age Group of Children Affects the Obesity Problem using Intuitionistic Fuzzy Soft Matrix

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Abstract: ***The Paper Comprises of a case study which is done on children in the age group of 6 to 16 years. Childhood Obesity is a condition where excess body fat negatively affects a child health (or) well being, due to the rising prevalence of Obesity in Children and its many adverse health effects it is being recognized as a serious public health concern. Childhood Obesity however can also lead to life-threatening condition including diabetes, high blood pressure, heart diseases, sleeping problems, Cancer and other disorders. Obesity also affects the Children is Physical, Mental, Behavioural, Social, Academic. The concept of Intuitionistic fuzzy soft Matrix is applied to identify the group of children (based on age) worst affected.***

Keywords: Soft Set, Fuzzy soft set, Intuitionistic Fuzzy soft set, Intuitionistic fuzzy soft Matrix

1. Introduction

In the Previous notes, Studied about the Obesity of the children have been on data collected from schools [1] for various health problems such as Cholesterol, heart problem, blood pressure, diabetes and other disorder. It has been established that how on the basis of over weight and Obesity [2] these disease appear in the children. These Children consumes more of Junk food, which affect their Obesity. Obesity [1] has been a major health issue. In the Present Study we have taken into account a sample of school children in Nagapattinam.

2. Need for Study

The study of obesity is children has been gaining atmost important because of the disease such as diabetes, blood pressure, Cholestrol etc., which are of highprevalence in children at a very young age. Due to these disease; it has become very important for the parents to become aware of their child's health before they are affected by Serious health issue. I has been seen that since both the parents are working they are not have able to provide sufficient time to monitor their child food habits, physical activity etc., Due to all there reasons it is very important to analyze what percentage of total activities contribution comes from physical activities and how increasing and decreasing of these activities would lead them to a normal, overweight or obesity condition.

3. Basic Definitions

Definition 1 [4] : Let U be a non-empty finite set of Objects called Universe and let E be a non-empty set of parameters. An ordered pair (F,E) is said to be a soft set over U, if F is a mapping from E to the set of all subsets of U.

Definition 2 [6] : Let U be a Universe. A fuzzy set X over U is a set defined by a function μ, representing a mapping $\mu_x: U \to [0,1]$. Here μ_1 called Membership function of X_1 and the value $\mu_X(u)$ is called the grade of membership of $u \in U$. The Value represents the degree of u belonging to the fuzzy set X. Thus a fuzzy set X over U can be represented as follows,

$$X = \{(u/\mu_x(u): u \in U, \mu_X(u) \in [0,1])\}.$$

Definition 3 [3]: Let U be a Universe set E, a set of parameters and $A \subset E$. Then a pair (F,A) is called fuzzy soft set over U, where F is a mapping from A to the set of all fuzzy subsets of U.

Definition 4 [5]: An Intuitionistic fuzzy set A is a non-empty set U (a universe of discourse) is an object having the form $A = \{x, \mu_A(x), v_A(x): U \to [0,1]\}$, where the function $\mu_A(x): U \to [0,1]$, $v_A(x): U \to [0,1]$, denotes the degree of membership and degree of non-membership of each element $X \in U$ to the set A, respectively and $0 \leq \mu_A(x) + v_A(x) \leq 1$ for all $x \in U$. Given an universal set U and a set of parameters E, for $A \subseteq E$, the pair (F,A) is called an Intuitionistic fuzzy soft set over U if F is a mapping from A to the set of all Intuitionistic fuzzy subsets of U.

Definition 5 [7]: Let $U = \{c_1, c_2, c_3, \dots, c_m\}$ be the Universal set and $E = \{e_1, e_2, e_3, \dots, e_n\}$ be the set of parameters. Let $A \subseteq E$ and (F, A) be a intuitionistic fuzzy soft set in the fuzzy soft class (U,E). Then intuitionistic fuzzy soft set (F,A) can be represented in matrix form as $S_{m\ n} = [a_{ij}]_{m\ n}$ (or)

$$S = [a_{ij}], i = 1,2,..,m, j = 1,2,..,n \text{ where}$$

$$a_{ij} = \begin{cases} \mu_j(c_i), V_j(c_i), if\ e_j \in A \\ (0,1), \qquad if\ e_j \notin A \end{cases}$$

Here $\mu_j(c_i)$ represents the membership of c_i in the intuitionistic fuzzy set $F(e_j)$ and $V_j(c_i)$ represents the non membership of c_i in the intuitionistic fuzzy set $F(e_j)$. The matrix $S_{m\ n}$ is called intuitionistic fuzzy soft matrix. This matrix S can also be written as $S = (\mu_A, \gamma_A)$ or $S = (\mu_{ij}, \gamma_{ij})$.

Definition 6 [7]: Let $A = [a_{ij}]_{m\ n}$ be an intutitionistic fuzzy soft matrix, where $a_{ij} = (\mu_j(c_i), \gamma_j(c_i))$. Then we

define the value matrix of intuitionistic fuzzy soft matrix A is $V(A) = [a_{ij}] = (\mu_{ij} - \gamma_{ij}), i = 1,2,..,m, j = 1,2,..,n.$

Definition 7 [7]: If $A = [a_{ij}]_{m\ n}$, $B = [b_{ij}]_{m\ n}$ be two intuitionistic fuzzy soft matrices then we define Score matrix of A and B as $S_{(A,B)} = [d_{ij}]_{m\ n}$ where $[d_{ij}] = V(A) - V(B)$.

Definition 8 [7]: Let $A = [a_{ij}]_{m\ n}$, $B = [b_{ij}]_{m\ n}$ be two Intuitionistic fuzzy soft matrices. Let the corresponding value matrix be V(A), V(B) and their Score matix is then we define Score matrix of A and B as $S_{(A,B)} = [d_{ij}]_{m\ n}$, then we define total score for each c_i in U is $s_i = \sum_{j=1}^{n} d_{ij}$.

4. Methodology

Algorithm for decision making method by using Intuitionistic fuzzy soft matrices.

Step 1 : Input the Intuitionistic fuzzy soft set (F,c) and Obtain the Intuitionistic fuzzy soft Matrix A corresponding to (F, c) respectively.

Step 2 : Write the Intuitionistic fuzzy soft complement Matrix A^c.

Step 3 : Compute $V(A), V(A^c)$ and $S((A)(A^c))$.

Step 4: Compute the total score S_i for each u_i in U.

Step 5: Find u_i for which $max(S_i)$. Incase $Max\ S_i$ occur for more than one value, then repeat the process by reassessing the parameters. Incase max S_i occurs for more than one value, then repeat the process by reassessing the parameters.

Application of Intuitionistic fuzzy soft matrices

To ascertain the ill-effects of Obesity of the Children, an interview Schedule was administered to the children and Parents in Nagapattinam. Based on the pilot study we grouped the problems into 5 Categories as follows:

1) Physical
2) Mental
3) Behavioural
4) Social
5) Academic

The respondents were grouped into 5 categories based on the age of their children which forms the alternative set (or) Universal set $U = \{u_1, u_2, u_3, u_4, u_5\}$ and the categories of problem were used to form the criteria set $C = \{c_1, c_2, c_3, c_4, c_5\}$.

Group of Respondents (Universal set U) (Based on age of children)

u_1 - 6 to 8 years
u_2 - 9 to 10 years
u_3 - 11 to 12 years
u_4 - 13 to 14 years
u_5 - 14 to 15 years

Criteria Set C

c_1 – Physical
c_2 – Mental
c_3 – Behavioural
c_4 – Social
c_5 – Academic

In order to collect data an interview schedule was developed, pre tested and administered to the respondents. A sample of 200 respondents (40 in each group) was selected adopting convenient sampling technique.

The Corresponding intuitionistic fuzzy soft set is

$$(F,c) = F(c_1) = \begin{Bmatrix}(u_1, 0.4,0.3)(u_2, 0.7,0.3)(u_3, 0.8,0.1)\\ (u_4, 0.7,0.3)\ (u_5, 0.6,0.3)\end{Bmatrix}$$

$$F(c_1) = \begin{Bmatrix}(u_1, 0.4,0.3)(u_2, 0.6,0.4)(u_3, 0.9,0.1)\\ (u_4, 0.8,0.2)\ (u_5, 0.7,0.3)\end{Bmatrix}$$

$$F(c_3) = \begin{Bmatrix}(u_1, 0.6,0.4)(u_2, 0.7,0.3)(u_3, 0.9,0.1)\\ (u_4, 0.8,0.2)\ (u_5, 0.8,0.2)\end{Bmatrix}$$

$$F(c_4) = \begin{Bmatrix}(u_1, 0.7,0.3)(u_2, 0.8,0.2)(u_3, 0.7,0.5)\\ (u_4, 0.6,0.5)\ (u_5, 0.7,0.5)\end{Bmatrix}$$

$$F(c_5) = \begin{Bmatrix}(u_1, 0.8,0.2)(u_2, 0.9,0.1)(u_3, 0.7,0.3)\\ (u_4, 0.7,0.5)\ (u_5, 0.7,0.4)\end{Bmatrix}$$

The Intuitionistic fuzzy soft matrix

$$A = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \end{array} \begin{array}{c} c_1 \quad\quad c_2 \quad\quad c_3 \quad\quad c_4 \quad\quad c_5 \\ \begin{pmatrix} (0.4,0.3) & (0.4,0.3) & (0.6,0.4) & (0.7,0.3) & (0.8,0.2) \\ (0.7,0.2) & (0.6,0.4) & (0.7,0.3) & (0.8,0.2) & (0.9,0.1) \\ (0.8,0.1) & (0.9,0.1) & (0.9,0.1) & (0.7,0.5) & (0.7,0.3) \\ (0.7,0.3) & (0.8,0.2) & (0.8,0.2) & (0.6,0.5) & (0.7,0.5) \\ (0.6,0.3) & (0.7,0.3) & (0.8,0.2) & (0.7,0.5) & (0.7,0.4) \end{pmatrix} \end{array}$$

The Intuitionistic fuzzy soft matrix

$$A^c = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \end{array} \begin{array}{c} c_1 \quad\quad c_2 \quad\quad c_3 \quad\quad c_4 \quad\quad c_5 \\ \begin{pmatrix} (0.3,0.4) & (0.4,0.3) & (0.4,0.6) & (0.3,0.7) & (0.2,0.5) \\ (0.2,0.7) & (0.4,0.6) & (0.3,0.7) & (0.2,0.8) & (0.1,0.9) \\ (0.1,0.8) & (0.1,0.9) & (0.1,0.9) & (0.5,0.7) & (0.3,0.7) \\ (0.3,0.7) & (0.2,0.8) & (0.2,0.8) & (0.5,0.6) & (0.5,0.7) \\ (0.3,0.6) & (0.3,0.7) & (0.2,0.8) & (0.5,0.7) & (0.4,0.7) \end{pmatrix} \end{array}$$

$$S_{(A,A^c)} = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \end{array} \begin{array}{c} c_1 \quad c_2 \quad c_3 \quad c_4 \quad c_5 \\ \begin{pmatrix} 0.2 & 0.2 & 0.4 & 0.8 & 1.2 \\ 1.0 & 0.4 & 0.8 & 1.2 & 1.6 \\ 1.4 & 1.6 & 1.6 & 0.4 & 0.8 \\ 0.8 & 1.2 & 1.2 & 0.2 & 0.4 \\ 0.6 & 0.8 & 1.2 & 0.4 & 0.6 \end{pmatrix} \end{array}$$

$$Total\ Score = \begin{array}{c} \\ u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \end{array} \begin{array}{c} \\ \begin{pmatrix} 2.8 \\ 5 \\ 5.8 \\ 3.8 \\ 3.6 \end{pmatrix} \end{array}$$

It is seen that the group u_3 has the maximum score and it is calculated that the children in the age group of children in the age of 11 to 12 years are worst affected.

5. Conclusion

Conclusion drawn were on the basis of inference derived in consultation with a dietician. The Conclusions drawn can be used for advice to the Parents for their children. The Study is useful for children.

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