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Application of Sanchez's Approach to Disease Identification Using Trapezoidal Fuzzy Numbers

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Abstract: This article presents an integrated approach of mathematical techniques and various aspects of the medical diagnosis, which aims to provide an effective tool in the field of therapeutics. Sanchez technique based on fuzzy soft set theory has been developed and employed to simplify the disease diagnosis procedure. In the end, to get more insight of the developed approach, an elaborative example assuming hypothetical data has also been presented.
Keywords:FSS, SS; Trapezoidal fuzzy number (TpFN); Disease identification; approach of Sanchez; Fuzzy number (FN)

I. INTRODUCTION

Numerous complexities in engineering, financial, societal disciplines, therapeutic fields and numerous different arenas include provisional information. All such issues, a person comes to confront within life, cannot be illuminated utilizing traditional mathematical techniques. In traditional arithmetic, a numerical model of an entity is created and concept of particular elucidation of this classical paradigm is resolved. Therefore, the numerical model is excessively mind boggling, the particular result can't be found.

There are numerous renowned speculations to depict uncertainty. Case in point, FS theory (FSST) [1], rough set theory (RSST) and additional arithmetic apparatuses, smoothness of functions, game theory, operations research, Riemann-integration, Perron-integration, probability, theory of measurement, etc [2]. However, in the respect of application in decision-making problem, most of the previous researches (some other). Be that as it may, these speculations have certain acquired difficulties as indicated by an investigator. To defeat these dilemmas, a researcher presented conception of a soft set (SS) like another arithmetical mechanism for management of ambiguities which exempted all the challenges influencing the currently using strategies. This theory of SS has strong capability regarding appropriate usages in numerous arenas, few of them were revealed by various researchers in their endeavor [3]. Presently, efforts on SS theory are gaining ground quickly.

An investigator [4] started the notion of FSS with a few characteristics concerning fuzzy soft union, crossing point, counterpart of a fuzzy soft set (FSS), law of De Morgan and so forth. Alternatively an author have reintroduced and reclassified, respectively the idea of FS sets and the match of a FSS as a consequence [5]. They have demonstrated that the reformed description of the complemente of a FSS adjust every one of the constraints that the complement of a set truly executes in the traditional sciences. FSST complement Utilizations in numerous controls as well as genuine circumstances have been concentrated by numerous analysts. Another analyst [6] have contemplated method of Sanchez [7,8]. Strategy for disease identification utilizing an intuitionistic FSS. A Strategy in [6] utilizing intuitionistic FSS theory have also protracted by a researcher [9].

The trapezoidal fuzzy number, as a vigorousidea of fuzzy set, is gradually applied in Refs. [15,16]. The membership function of a TFN is piecewise linear and trapezoidal, which can express ambiguous information caused by linguistic evaluations through converting them into numerical variables objectively. Trapezoidal fuzzy soft sets can identify linguistic variables to deal with vague or imprecise information efficiently. It can be useful into many real selection and decision problems as supplier selection, place selection, and stock selection,

II. PRELIMINARIES

Definition 2.1([3, 13]).

Suppose V be a ground set and X subsists as a set of parameters. The power set of V is designated as $P(V)$ and B is a subsection of X.A pair (X, B) subsists as SS over V, where X is a function presented by means of $G : B \to P(V)$

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Definition 2.2([1]).

A fuzzy subsection$k$ of V is demarcated as a function from V to [0,1]. The classof all fuzzy subsections of V is represented by$G(V)$. Assume $k, l \in G(V)$ and$n \in V$. So the union and intersection of k and l are expressed in the subsequent manner:

$$(k \vee l)(n) = k\,(n) \vee l(n)$$
$$(k \wedge\, l)(n) = k\,(n) \wedge l(n)$$

$k \leq l$if and only if $k(n) \leq l(n)$ for all $n \in V$.

Definition 2.3([4]).

Let V be a mutualuniversal set, Xsubsist as a set of $parameters$ and $B \subseteq E$. Then a pair (G, A) is entitled asFSS over V, where G is a mapping provided by $G : B \rightarrow G(V)$.

Definition 2.4 [4]

For two FSS(E, B) and (H, C) on a common universal set$V$, then(E, B) is a FS subset of (H, C) if

a) $B \subseteq C$

b) $E(c) \leq H(c)$ for every$c \in B$

Herein, we $write\ out(E, B) \,\tilde{\subseteq}\, (H, B)$

Definition2.5 ([14]).

The comparative counterpart of a FSS $(E, B)$is meant by $(E, B)^c$ and is characterized by$(E, B)^c = (E^c, B)$, where $E^c\colon B \rightarrow E(V)$ is a function given by $E^c(c) = 1 - E(c)$ for all $c \in E$.

It ought to be noticed that $1 - E(c)$represents the fuzzy complement of $E(c)$.

Definition2.6 [4]

(i) AnyFSS (G, B) is said to be the absolute FSSover V, symbolized by Ω. If $G(c) = 1_V$for all $c \in B$.

(ii) AnyFSS(G, B) is said to be the null FSS over V, represented by ϕ, if $G(c) = 0_V$ for all $c \in B$.

Definition2.7 ([4, 14]).

Let (E, M) and (W, N) be two FSS over a mutualuniversal set$V$then

(i) The union of FSS(E, M) and (W, N) is characterizedas the FSS$(K, C) = (E, M) \,\tilde{\cup}\, (W, N)$ over V, where $C = M \cup N$ and

$$K(e) = \begin{cases} E(e) & if\ e \in M \backslash N \\ W(e) & if\ e \in N \backslash M \\ E(e) \vee W(e) & if\ e \in M \cap N \end{cases}$$

For all $e \in C$.

(ii) The restricted intersection of FSS (E, M) and (W, N) is regarded as the FSS$(K, C) = (E, M) \,\tilde{\sqcap}\, (W, N)$over V, where $C = M \cap N \neq \emptyset$ and $K(e) = E(e) \wedge W(e)$ for all $e \in C$.

(iii) The restricted union of FSS (E, M) and (W, N) is characterized as the FSS$(K, C) = (E, M) \,\tilde{\sqcup}\, (W, N)$over V, where $C = M \cap N \neq \emptyset$ and $K(e) = E(e) \wedge W(e)$ for all $e \in C$.

(iv) The extended intersection of FSS (E, M) and (W, N) is described as the FSS$(K, C) = (E, M) \,\tilde{\cap}\, (W, N)$ over V, where $C = M \cup N$ and

$$K(e) = \begin{cases} E(e) & if\ e \in M \backslash N \\ W(e) & if\ e \in N \backslash M \\ E(e) \wedge W(e) & if\ e \in M \cap N \end{cases}$$

For all $e \in C$.

(v) The ∧- intersection of FSS (E, M) and (W, N)emergesas the FSS$(K, C) = (E, M) \,\tilde{\wedge}\, (W, N)$over V, where $C = M \times N$ and $K(s, t) = E(s) \wedge W(t)$ for all $(s, t) \in M \times N$.

(vi) The $\vee -$unionof FSS$(E, M)$and (W, N) is termed as the FSS$(K, C) = (E, M) \,\tilde{\vee}\, (W, N)$over V, where $C = M \times N$ and $K(s, t) = E(s) \vee W(t)$ for all $(s, t) \in M \times N$.

Example2.8.

Presume $K = \{k_1, k_2, k_3\}$subsistsas set of three $houses$in considerationand

$X = \{x_1(\text{expensive}), x_2(\text{wonderful }), x_3(\text{grassy green backgrounds})\}$exist as set of $parameters$.

Let two FSS (G, B) and (H, C) where $B = \{x_1, x_2\}$ and $C = \{x_1, x_2, x_3\}$given by $(G, B) = \{G(x_1) = \{(k, .7), (k_2, .5), (k_3, .3)\}, G(x_2) = \{(k_1, .7), (k_2, .6), (k_3, .5)\}\}$and $(H, C) = \{H(x_1) = \{(k_1, .7), (k_2, .5), (k_3, .3)\}, H(x_2) = \{(k_1, .7), (k_2, .6), (k_3, .5)\}, H(x_3) =$ *{k1,.2,k2,.4,(k3,.5)}*. Then

(i) $(G, B)^c = G^c(x_1) = \{(k_1, .3), (k_2, .5), (k_3, .7)\}, G^c(x_2) = \{(k_1, .3), (k_2, .4), (k_3, .5)\}$,

(ii) $(G, B) \tilde{\subseteq} (H, C)$

Proposition 2.9([4, 14]).

Presume (E, M) and (W, N) be two FSS over a mutual universal set V. Therefore

a) $(E, M) \tilde{\cup} (E, M) = (E, M)$,
b) $(E, M) \tilde{\cap} (E, M) = (E, M)$,
c) $\left((E, M) \tilde{\cup} (W, N)\right)^c = (E, M)^c \tilde{\cap} (W, N)^c$,
d) $\left((E, M) \tilde{\cap} (W, N)\right)^c = (E, M)^c \tilde{\cup} (W, N)^c$,
e) $\left((E, M) \tilde{\vee} (W, N)\right)^c = (E, M)^c \tilde{\wedge} (W, N)^c$,
f) $\left((E, M) \tilde{\wedge} (W, N)\right)^c = (E, M)^c \tilde{\vee} (W, N)^c$.

Definition2.10 ([12]).

1) A fuzzy subsection is convex, on the universalset$\mathbb{R}$ iff for $c, d \in U, \mu(\alpha c + \beta d) \geq \mu(c) \wedge \mu(d)$, where $\alpha + \beta = 1$.
2) On the universal set V, a fuzzy subsection μ is entitled as a normal $fuzzy\ subset$ if here $subsist\ c_i \in V$ such that $\mu(c_i) = 1$.
3) Stated upon the universal set S, a $fuzzy$ numeral is a fuzzy subset thatexists as together convex and normal.

A $FN\mu$ upon the $universe$ of discourse S might be described by a three-sided distribution function $parameterized$ by a triplet (f, g, h). The FN's membership functionis described as

$$\mu(v) = \begin{cases} 0 & if\ v < f \\ \dfrac{a - f}{g - f} & if\ f \leq v \leq g, \\ \dfrac{g - a}{h - d} & if\ g \leq v \leq h, \\ 0 & if\ v > h \end{cases}$$

The μ isregarded as a TFN, if the membership function $\mu(v)$ is piecewise linear.

Let two triangular fuzzy numbers μ and β be parameterized by the triplet $d_1 = (c, d_1, e_1)$ and $d_2 = (c_2, d_2, e_2)$correspondingly. Thenceforth multiplication as well as addition of μ and β as presented

$$\mu \oplus \beta = \tilde{c_2} \oplus \widetilde{d_2} = (c_1, c_2, c_3) \oplus (d_1, d_2 d_3)$$
$$= (c_1 + d_1, c_2 + d_2, c_3 + d_3)$$

And

$$\mu \otimes \beta = \tilde{c_2} \otimes \widetilde{d_2} = (c_1, c_2, c_3) \otimes (d_1, d_2 d_3)$$
$$= (c_1 \times d_1, c_2 \times d_2, c_3 \times d_3).$$

Subsequently we provide the defuzzificationtechnique of a TFN . Choose a quadrupletly(j, k, l, m)parameterized trapezoidal fuzzy number.

At that point the defuzzificationvalue n of the FN is computed like so:

$$(n - k)(1) + \frac{1}{2}(k - j)(1) + \frac{1}{2}(m - l)(1)$$
$$\Rightarrow (n - k) + \frac{1}{2}(k - j) = (l - n) + \frac{1}{2}(m - l)$$
$$\Rightarrow 2n = \frac{m - l - k - j}{2} + k + l$$
$$\Rightarrow 2n = \frac{j + k + l + m}{2}$$
$$\Rightarrow n = \frac{j + k + l + m}{4}$$

Likewise, the defuzzification value e of a triangular FN(a, b, c) is equal to

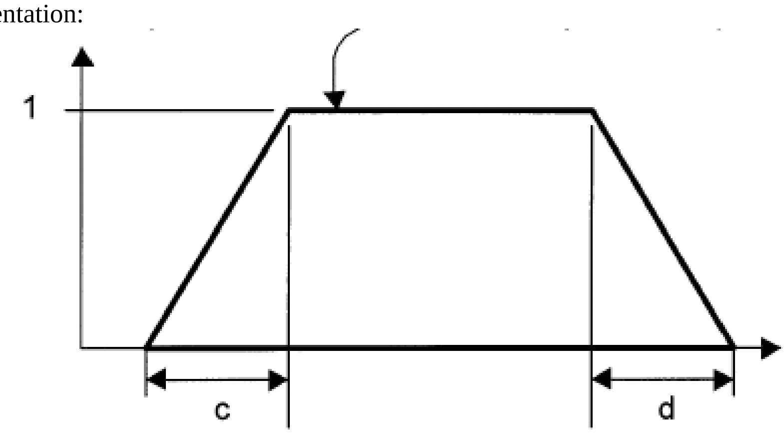
$$e = \frac{c + d + d + e}{4}$$

Definition2.11 ([1]).

The membership function of generalized TpFN$(c, d, e, f;\ z)$, where $c \leq d \leq e \leq f$, $0 < z \leq 1$ is termed as

$$\mu_A(y) = \begin{cases} 0 & y < c \\ z\left(\frac{y-c}{d-c}\right) & c \leq y \leq d \\ w & d \leq y \leq e \\ z\left(\frac{y-e}{f-e}\right) & e \leq y \leq f \\ 0 & y > f \end{cases}$$

Graphical Representation:



1. If $z = 1$ then $GTFN\tilde{A}$ is a typicalTFN$B = (c, d, e, f)$.
2. If $c = d\ and\ e = f$ then $\tilde{A}$ is a crisp interval ,
3. If $d = e$ then $\tilde{A}$ is a generalizedtriangular FN.
4. If $c = d = e = f$ and $z = 1$ then $\tilde{A}$ is a real number.

III. METHODOLOGY AND ALGORITHM

A calculation for therapeutic diagnostics by utilizing fuzzy arithmetic operations are exhibited in this segment. Suppose that there is m patients set, $P = \{p_1, p, p_3, \ldots, p_m\}$ with a the set of n manifestations $M = \{m_1, m_2, m_3, \ldots, m_n\}$ associated with a set of k ailments $D = \{d_1, d_2, d_3, \ldots, d_k\}$.

We employ FSnotion to build up a strategy through technique of Sanchez to analyze which patient is experiencing what sickness. For this, build a FSS (G, P) over P where G is a function $G: P \longrightarrow \mathcal{F}(m)$. This FSS offersthe patient- disease signmatrix which is a ground that delineate relation between patient and symptom and is symbolized as T, where the entry items are FNs $\tilde{s}$constrict restrained by a quadruplet $(s-2, s-1,, s+1, s+2)$.

At that point develop alternative FSS (H, M) upon A, where H is a mapping $H: M \longrightarrow \mathcal{F}(D)$. This FSSprovide a relation matrix (weightedmatrix, every component indicates the significance of the symptoms for a particular sickness. Thesecomponents are considered identical to Trapezoidal FNs.

Hence the conventional form of T is

$$T = \begin{matrix} \\ p_1 \\ p_2 \\ p_3 \\ \vdots \\ p_m \end{matrix} \begin{matrix} m_1 & m_2 & m_3 & \cdot & \cdot & \cdot & m_n \\ \end{matrix}$$

$$T = \begin{array}{c} p_1 \\ p_2 \\ p_3 \\ \vdots \\ p_m \end{array} \overset{\begin{array}{ccccccc} m_1 & m_2 & m_3 & \cdot & \cdot & \cdot & m_n \end{array}}{\begin{bmatrix} \widetilde{a_{11}} & \widetilde{a_{12}} & \widetilde{a_{13}} & \cdot & \cdot & \cdot & \widetilde{a_{1n}} \\ \widetilde{a_{21}} & \widetilde{a_{22}} & \widetilde{a_{23}} & \cdot & \cdot & \cdot & \widetilde{a_{2n}} \\ \widetilde{a_{31}} & \widetilde{a_{32}} & \widetilde{a_{33}} & \cdot & \cdot & \cdot & \widetilde{a_{3n}} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \widetilde{a_{m1}} & \widetilde{a_{m2}} & \widetilde{a_{m3}} & \cdot & \cdot & \cdot & \widetilde{a_{mn}} \end{bmatrix}}$$

As well as the conventional form of U is

$$U = \begin{array}{c} \\ m_1 \\ m_2 \\ m_3 \\ \vdots \\ m_m \end{array} \overset{\begin{array}{cccccc} d_1 & d_2 & d_3 & . & . & . & d_n \end{array}}{\begin{bmatrix} \widetilde{b_{11}} & \widetilde{b_{12}} & \widetilde{b_{13}} & \cdots & \widetilde{b_{1k}} \\ \widetilde{b_{21}} & \widetilde{b_{22}} & \widetilde{b_{23}} & \cdots & \widetilde{b_{2k}} \\ \widetilde{b_{31}} & \widetilde{b_{32}} & \widetilde{b_{33}} & \cdots & \widetilde{b_{3k}} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \widetilde{b_{m1}} & \widetilde{b_{m2}} & \widetilde{b_{m3}} & \cdots & \widetilde{b_{nk}} \end{bmatrix}}$$

Presently executing the transformation operation $T \otimes U$, we procure the disease identification matrix of patient D^* like so:

$$D^* = \begin{array}{c} \\ p_1 \\ p_2 \\ p_3 \\ \vdots \\ p_m \end{array} \overset{\begin{array}{cccccc} d_1 & d_2 & d_3 & . & . & . & d_n \end{array}}{\begin{bmatrix} \widetilde{c_{11}} & \widetilde{c_{12}} & \widetilde{c_{13}} & \cdots & \widetilde{c_{1k}} \\ \widetilde{c_{21}} & \widetilde{c_{22}} & \widetilde{c_{23}} & \cdots & \widetilde{c_{2k}} \\ \widetilde{c_{31}} & \widetilde{c_{32}} & \widetilde{c_{33}} & \cdots & \widetilde{c_{3k}} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \widetilde{c_{m1}} & \widetilde{c_{m2}} & \widetilde{c_{m3}} & \cdots & \widetilde{c_{mk}} \end{bmatrix}}$$

where

$$C_{il} = \left(\sum_{j=1}^{4} (a_{ij} - 2)(b_{ij} - 2)\ , \sum_{j=1}^{4} (a_{ij} - 1)(b_{ij} - 1)\ , \sum_{j=1}^{4} (a_{ij} + 1)(b_{ij} + 1)\ , \sum_{j=1}^{4} (a_{ij} + 2)(b_{ij} + 2) \right)$$

At that point, defuzzifying every component of the exceeding framework by (1), we acquire the brief disease identification matrix like

$$D^{\cdot\cdot} = \begin{array}{c} \\ p_1 \\ p_2 \\ p_3 \\ \vdots \\ p_m \end{array} \overset{\begin{array}{cccccc} d_1 & d_2 & d_3 & . & . & . & d_n \end{array}}{\begin{bmatrix} \widetilde{v_{11}} & \widetilde{v_{12}} & \widetilde{v_{13}} & \cdots & \widetilde{v_{1k}} \\ \widetilde{v_{21}} & \widetilde{v_{22}} & \widetilde{v_{23}} & \cdots & \widetilde{v_{2k}} \\ \widetilde{v_{31}} & \widetilde{v_{32}} & \widetilde{v_{33}} & \cdots & \widetilde{v_{3k}} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \widetilde{v_{m1}} & \widetilde{v_{m2}} & \widetilde{v_{m3}} & \cdots & \widetilde{v_{mk}} \end{bmatrix}}$$

Presently if $\max\ v_{il} = v_{is}$ for $1 < l < k$, then we infer that the disease suffering person s_i is experiencing ailmentd_s. On the off chance that $\max\ v_{il}$come aboutexceeding than 1 value of l, $1 \leq l \leq m$, thenceforth we can reexamine the manifestationsfor coming towards an end.

IV. CASE STUDY

Assumehere are 3 patients Amna, Zoya and Ammara in a hospital havingdisease signs of fever, cerebral problem, cough and abdominal disorder. Let the probable illnessesin association withexceeding symptoms be pyrexia, liver inflammation and pleurisy. Then consider$P = \{p_1, p_2, p_3\}$asthe ground set at which $d_1, d_2$and$d_3$symbolize patients Amna, Zoya and Ammara, correspondingly. Thentake into consideration the set $M = \{m_1, m_2, m_3, m_4\}$as a universal set where m_1, m_2, m_3, m_4denotesymptoms fever, cerebral problem, cough and abdominal ailment, in that order and the set $D = \{d_1, d_2, d_3\}$where d_1, d_2, d_3characterize the disorders pyrexia, liver inflammation and pleurisy, individually.
Suppose

$$G(p_1) = \{m_1/\widetilde{7}, m_2/\widetilde{3}, m_3/\widetilde{5}, m/\widetilde{2}\}$$
$$G(p_2) = \{m_1/\widetilde{6}, m_2/\widetilde{2}, m_3/\widetilde{3}, m_4/\widetilde{5}\}$$
$$G(p_3) = \{m_1/\widetilde{3}, m_2/\widetilde{5}, m_3/\widetilde{3}, m_4/\widetilde{6}\}$$

At that point the FSS(G, P) is a parameterized group of all fuzzy sets over$M$ and offersaassemblage of a rough depiction of the patient-disease indications in the hospital. This FSS(G, P) describe the patient-disease sign matrix$T$ (relation matrix) and is given by

$$T = \begin{array}{c} \\ p_1 \\ p_2 \\ p_3 \end{array} \overset{\begin{array}{cccc} m_1 & m_2 & m_3 & m_4 \end{array}}{\begin{bmatrix} \tilde{7} & \tilde{3} & \tilde{5} & \tilde{2} \\ \tilde{6} & \tilde{2} & \tilde{3} & \tilde{5} \\ \tilde{3} & \tilde{5} & \tilde{3} & \tilde{6} \end{bmatrix}}$$

Subsequently assume

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$$H(m_1) = \{d_1\widetilde{/9}, d_2\widetilde{/5}, d_3\widetilde{/1}\}$$
$$H(m_2) = \{d_1\widetilde{/3}, d_2\widetilde{/5}, d_3\widetilde{/5}\}$$
$$H(m_3) = \{d_1\widetilde{/5}, d_2\widetilde{/2}, d_3\widetilde{/5}\}$$
$$H(m_4) = \{d_1\widetilde{/2}, d_2\widetilde{/8}, d_3\widetilde{/8}\}$$

At that point the FSS (H, M) is a parameterized group $\{H(m_1), H(m_2), H(m_3), H(m_4)\}$ of all FSuponthe set M where $H : M \to G(D)$ and is established after special health credentials. Hence the FSS(H, M)offers an estimated delineation of the 3 ailments and their manifestations. This SS is denoted by a relative matrix (symptom-disease matrix) T and is presentedvia

$$U = \begin{matrix} & d_1 & d_2 & d_3 \\ m_1 & \tilde{9} & \tilde{5} & \tilde{1} \\ m_2 & \tilde{3} & \tilde{5} & \tilde{5} \\ m_3 & \tilde{5} & \tilde{2} & \tilde{5} \\ m_4 & \tilde{2} & \tilde{8} & \tilde{8} \end{matrix}$$

Presently executing the transformation operation $T \otimes U$, we acquire the disease identification matrix of patient D^* like so

$$D^* = T \otimes U = \begin{matrix} & d_1 & d_2 & d_3 \\ p_1 & \widetilde{141} & \widetilde{117} & \widetilde{103} \\ p_2 & \widetilde{124} & \widetilde{126} & \widetilde{110} \\ p_3 & 109 & 135 & 131 \end{matrix}$$

whereC_{ij} can be calculated as follow

$$C_{il} = \left(\sum_{j=1}^{4} (a_{ij} - 2)(b_{ij} - 2), \sum_{j=1}^{4} (a_{ij} - 1)(b_{ij} - 1), \sum_{j=1}^{4} (a_{ij} + 1)(b_{ij} + 1), \sum_{j=1}^{4} (a_{ij} + 2)(b_{ij} + 2) \right)$$

For i=1, j=1
$\boldsymbol{C_{11} = (a_{11}-2)(b_{11}-2) + (a_{12}-2)(b_{21}-2) + (a_{13}-2)(b_{31}-2) + (a_{14}-2)(b_{41}-2)}$ $\boldsymbol{, (a_{11}-1)(b_{11}-1) + (a_{12}-1)(b_{21}-1) + (a_{13}-1)(b_{31}-1) + (a_{14}-1)(b_{41}-1)}$ $\boldsymbol{, (a_{11}+1)(b_{11}+1) + (a_{12}+1)(b_{21}+1) + (a_{13}+1)(b_{31}+1) + (a_{14}+1)(b_{41}+1)}$ $\boldsymbol{, (a_{11}+2)(b_{11}+2) + (a_{12}+2)(b_{21}+2) + (a_{13}+2)(b_{31}+2) + (a_{14}+2)(b_{41}+2)}$ $\boldsymbol{C_{11} = (7-2)(9-2) + (3-2)(3-2) + (5-2)(5-2) + (2-2)(2-2)}$ $\boldsymbol{, (7-1)(9-1) + (3-1)(3-1) + (5-1)(5-1) + (2-1)(2-1)}$ $\boldsymbol{, (7+1)(9+1) + (3+1)(3+1) + (5+1)(5+1) + (2+1)(2+1)}$ $\boldsymbol{, (7+2)(9+2) + (3+2)(3+2) + (5+2)(5+2) + (2+2)(2+2)}$ $\boldsymbol{C_{11} = ((5)(7) + (1)(1) + (3)(3) + (0)(0)), ((6)(8) + (2)(2) + (4)(4) + (1)(1))}$ $\boldsymbol{((8)(10) + (4)(4) + (6)(6) + (3)(3)), ((9)(11) + ((5)(5) + (7)(7) + (4)(4))}$ $\boldsymbol{C_{11} = ((35+1+9+0), (48+4+16+1), (80+16+36+9), (99+25+49+16))}$ $\boldsymbol{C_{11} = (45, 69, 141, 179)}$

Here we are presenting the all values obtained by above method

$\boldsymbol{C_{ij}}$	$\boldsymbol{j = 1}$	$\boldsymbol{j = 2}$	$\boldsymbol{j = 3}$
$\boldsymbol{i = 1}$	$(45, 69, 141, 179) = \widetilde{141}$	$(18, 43, 117, 166) = \widetilde{117}$	$(7, 31, 103, 151) = \widetilde{103}$
$\boldsymbol{i = 2}$	$(31, 54, 124, 171) = \widetilde{124}$	$(30, 54, 126, 174) = \widetilde{126}$	$(17, 40, 110, 157) = \widetilde{110}$
$\boldsymbol{i = 3}$	$(13, 37, 109, 157) = \widetilde{109}$	$(36, 61, 135, 184) = \widetilde{135}$	$(35, 59, 131, 179) = \widetilde{131}$

Now de fuzzyfying the above process, we get

C_{ij}	$j = 1$	$j = 2$	$j = 3$
$i = 1$	$\frac{45 + 69 + 141 + 179}{4} = \frac{434}{4}$ =108.5	$\frac{18 + 43 + 117 + 166}{4} = \frac{344}{4}$ = 86	$\frac{7 + 31 + 103 + 151}{4} = \frac{292}{4}$ = 73
$i = 2$	$\frac{31 + 54 + 124 + 171}{4} = \frac{380}{4}$ = 95	$\frac{30 + 54 + 126 + 174}{4} = \frac{384}{4}$ = 96	$\frac{17 + 40 + 110 + 157}{4} = \frac{324}{4}$ = 81
$i = 3$	$\frac{13 + 37 + 109 + 157}{4} = \frac{316}{4}$ = 79	$\frac{36 + 61 + 135 + 184}{4} = \frac{416}{4}$ = 104	$\frac{35 + 59 + 131 + 179}{4} = \frac{404}{4}$ = 101

Hence, defuzzifying theexceeding matrix is

$$D^{**} = \begin{matrix} & d_1 & d_2 & d_3 \\ p_1 & & & \\ p_2 & 108.5 & 86 & 73 \\ & 95 & 96 & 81 \\ p_3 & 79 & 104 & 101 \end{matrix}$$

From the exceeding matrix it is evident that patient p_1(Amna)experiencing disease d_1(pyrexia) and patients p_2(Zoya) and p_3(Ammara)together are be ill with disease d_2(liver inflammation)

V. CONCLUSION

To expedite various aspects of the medical diagnosis, a diagnosis problem is discussed with the help of TFN (trapezoidal fuzzy numbers) by operating sanchez's method in this paper. For the application of the said approach's simplicity and effectiveness, a case study has been conducted.In this Respect prospectivestudiesare required to investigate either the concepts set forth in this paper produce aworthy outcome or not.

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