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On Soft Expert Metric Spaces

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ABSTRACT

In this paper, we first introduce soft expert real number and soft expert point. Following this, the notion of soft expert metric over soft expert real sets has been defined and then soft expert metric spaces are investigated. Later, soft expert open ball, soft expert closed ball, soft expert neighborhood, soft expert open set and soft expert closed set are defined and studied some properties of these concepts.

Keywords: Soft expert set, soft expert point, soft expert open set, soft expert closed set, soft expert metric spaces

1. Introduction

Many of the real life problems in environment, social sciences, medical science and engineering etc. include varying uncertainties. In the related literature before theory of soft set fuzzy real numbers and it was studied the basic properties of it (1). In (2) Gerla studied necessary and sufficient conditions for the existence of a good definition of fuzzy point. Gottwald and Siegfried (3) show that three theorems of Wong on local properties of fuzzy topology are wrong. In (4) Murali show the equivalence to the set of fuzzy points and study its effect on the relationship between fuzzy points and fuzzy subsets. Neog, Jyoti, Sut and Hazarika in (5) studied some properties related to fuzzy soft topological spaces. Ming and Ming (6) investigated structure of a fuzzy point. Fuzzy open set and fuzzy closed set are explored in (7, 8), soft open set and soft closed set are investigated in(9–12), fuzzy soft open set, fuzzy soft closed set in (13, 14) and fuzzy metric space were studied by many researchers such as (15–22). For these subject uncertainties principle firstly studied by Molodtsov (23). In his study Molodtsov initiated the theory of soft sets as a new mathematical tool for dealing with uncertainties. Studies related to the soft theory and applications in soft sets were done by Chen et al. (24) and Maji et al.(25, 26). Following this, soft metric spaces (27–30), neighborhood properties of soft topological spaces were studied in (31). However, there are many points to study related to the soft set idea, see (33–35). Further the subject of soft expert metric spaces has also not been studied yet. For this reason, using the definition of soft expert set given by (32), we introduce a notion of soft expert metric and soft expert metric space based on soft expert point of soft expert sets. In this way we obtain soft expert metric which is more generalized set definition than soft metric. In Section 1 many studies from fuzzy sets to soft expert sets are mention. In section 2 well-known results of some preliminaries are given. In section 3 notions of soft expert real number and soft expert point are explored. In section 4the definition of soft expert metric and some properties of soft expert metric spaces with theorems and examples are given. In Section 5 give conclusions.

2. Preliminaries

In this section we recall some basic notions in soft experts set theory (32). Let U be universe,E a set of parameters and X a set of experts. Let O be a set opinions, $Z = E \times O \times X$ and $A \subseteq Z$.

Definition 2.1. *(32) A pair (F, A) is called a soft expert set over U, where F is mapping given by $F : A \to P(U)$ where $P(U)$ denotes the power set of U.*

We assume in this paper, two-valued opinions only in set O that is

$$O = \{0 = disagree,\ 1 = agree\}$$

but multi-valued opinions may be assumed as well.

Definition 2.2. *(32) For two soft expert sets (F, A) and (G, B) over U, (F, A) is called a soft expert subset of (G, B) if*

1. $A \subseteq B$
2. $\forall \ \ \varepsilon \in B, G(\varepsilon) \subseteq F(\varepsilon)$.

This relationship is denoted by $(F, A) \subseteq (G, B)$. In this case (G, B) is called a soft expert superset of (F, A).

Definition 2.3. *(32) Two soft expert sets (F, A) and (G, B) over a common universe U, are said to be equal if (F, A) is a soft expert subsets of (G, B) and (G, B) is a soft expert subset of (F, A).*

Definition 2.4. *(32) Let E be a set of parameters and$X$ a set of experts. The NOT set of $Z = E \times O \times X$ denoted by IZ is defined by*

$$IZ = \{(I_{e_i, x_j, o_k}), \forall i, j, k\}$$

where, I_{e_i} is not e_i.

Theorem 2.1. *(32) The complement of a soft expert set (F, A) is denoted by $(F, A)^c$ and is defined by $(F, A)^c = (F^c, IA)$, where $F^c : IA \to P(U)$ is mapping given by*

$$F(\alpha)^c = U - F(I\alpha) \quad \forall \alpha \in IA.$$

Definition 2.5. *(32) An agree soft expert set $(F, A)_1$ over U is a soft expert subset of (F, A) defined as follow:*

$$(F, A)_1 = \{F_1(\alpha) : \alpha \in E \times X \times \{1\}\}.$$

Definition 2.6. *(32) An disagree soft expert set $(F, A)_0$ over U is a soft expert subset of (F, A) defined as follow:*

$$(F, A)_0 = \{F_0(\alpha) : \alpha \in E \times X \times \{0\}\}.$$

Definition 2.7. *(32) The union of two soft expert sets (F, A) and (G, B) over U denoted by "$(F, A)\tilde{\cup}(G, B)$" is the soft expert set (H, C), where $C = A \cup B$ and $\forall e \in C$,*

$$H(e) = \begin{cases} F(e), & if e \in A - B \\ G(e), & if e \in B - A \\ F(e) \cup G(e), & if e \in A \cap B \end{cases}$$

we express it as $(F, A)\tilde{\cup}(G, B) = (H, C)$.

The following definition of intersection of two soft expert sets is given as that of the bi intersection in.

Definition 2.8. *(32) The intersection of two soft expert sets* (F, A) *and* (G, B) *over* U *denoted by "*$(F, A)\tilde{\cap}(G, B)$*" is the soft expert set* (H, C)*, where* $C = A \cap B$ *and* $\forall e \in C$*,*

$$H(e) = \begin{cases} F(e), & if e \in A - B \\ G(e), & if e \in B - A \\ F(e) \cap G(e), & if e \in A \cap B \end{cases}$$

we express it as $(F, A)\tilde{\cap}(G, B) = (H, C)$.

Definition 2.9. *(32) If* (F, A) *and* (G, B) *are two soft expert sets over* U *then* (F, A) *AND* (G, B) *denoted by* $(F, A) \wedge (G, B)$ *is defined by*

$$(F, A) \wedge (G, B) = (H, A \times B)$$

where $H(\alpha) = F(\alpha)\tilde{\cap}G(\alpha) \quad \forall(\alpha, \beta) \in A \times B$.

Definition 2.10. *(32) If* (F, A) *and* (G, B) *are two soft expert sets over* U *then* (F, A) *OR* (G, B) *denoted by* $(F, A) \vee (G, B)$ *is defined by*

$$(F, A) \vee (G, B) = (O, A \times B)$$

where $O(\alpha) = F(\alpha)\tilde{\cup}G(\alpha) \quad \forall(\alpha, \beta) \in A \times B$.

3. Soft Expert Real Number and Soft Expert Point

Definition 3.1. *Let* R *be the set of real numbers and* $B(R)$ *be collection of all non-empties bounded subsets of* R *and* E *a set parameters and* X *a set of expert. Let* O *be a set opinions,* $Z = E \times O \times X$ *and* $A \subseteq Z$*. Then a mapping* $F : A \to B(R)$ *is called a soft expert real set. It is denoted by* (F, A)*. If specifically* (F, A) *is a singleton soft expert set, then identifying* (F, A) *with the corresponding soft expert element, it will be called a soft expert real number and denoted* $\tilde{k}, \tilde{m}, \tilde{n}$ *such that* $\tilde{k}(e) = e$*,* $\forall e \in A$ *etc. For example* $\bar{1}$ *soft expert real number* $\bar{1}(e) = 1$ $\forall e \in A$.

Definition 3.2. *For two soft expert real numbers;*

1. $\tilde{k}\tilde{\leq}\tilde{m}$ *if* $\tilde{k}(a)\tilde{\leq}\tilde{m}(a)\forall\ a \in A$;
2. $\tilde{k}\tilde{\geq}\tilde{m}$ *if* $\tilde{k}(a)\tilde{\geq}\tilde{m}(a)\forall\ a \in A$;

3. $\tilde{k}\tilde{<}\tilde{m}$ *if* $\tilde{k}(a)\tilde{<}\tilde{m}(a)\forall\ a \in A$;

4. $\tilde{k}\tilde{>}\tilde{m}$ *if* $\tilde{k}(a)\tilde{>}\tilde{m}(a)\forall\ a \in A$.

Definition 3.3. *A soft expert set (P, A) over U is said to be soft expert point if there is exactly one $e \in A$, such that $P(a) = \{\tilde{x}\}$for some $\tilde{x} \in U$ and $P(a') = \emptyset\ \ \forall a' \in A\ \{a\}$. It will be denoted by $\tilde{x}_a$.*

Definition 3.4. *Two soft expert points $\tilde{x}_a, \tilde{y}_a$ are said to be equal if $a' = a$ and $P(a) = P(a')$ i.e. $\tilde{x} = \tilde{y}$. Thus $\tilde{x}_a = \tilde{y}_a \Leftrightarrow \tilde{x} \neq \tilde{y}$, or $a' \neq a$.*

Theorem 3.1. *The union of any collection of soft expert points can be considered as soft expert set and every soft expert set can express as union of all soft expert points belonging to it:*

$$(F, A) = \bigcup_{\tilde{x}_a \in (F,A)} \tilde{x}_a$$

Let$\tilde{U}$ be absolute soft expert set i.e. $F(a) = U, a \in A$, where, $(F, A) = \tilde{U}$ and SEP$\tilde{U}$ be collection of all soft expert point $\tilde{U}$ and $R(A)^*$ denoted the set of all non-negative soft expert real numbers.

4. Soft Expert Metric and Soft Expert Metric Spaces

Definition 4.1. *A mapping $\tilde{d} : SEP(\tilde{U}) \times SEP(\tilde{U}) \to R(A)^*$ is said to be a soft expert metric on the soft expert set $\tilde{U}$ if $\tilde{d}$ satisfies the following conditions:*

$$\begin{array}{ll} SEM1 & \tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2})\tilde{\geq}\bar{0} \quad \forall \tilde{x}_{a_1}, \tilde{y}_{a_2} \in \tilde{U}, \\ SEM2 & \tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2}) = \bar{0} \Leftrightarrow \tilde{x}_{a_1} = \tilde{y}_{a_2}, \\ SEM3 & \tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2}) = \tilde{d}(\tilde{y}_{a_2}, \tilde{x}_{a_1}) \quad \forall \tilde{x}_{a_1}, \tilde{y}_{a_2} \in \tilde{U}, \\ SEM4 & \forall \tilde{x}_{a_1}, \tilde{y}_{a_2}, \tilde{z}_{a_3} \in \tilde{U}, \tilde{d}(\tilde{x}_{a_1}, \tilde{z}_{a_3})\tilde{\leq}\tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2}) + \tilde{d}(\tilde{y}_{a_2}, \tilde{z}_{a_3}). \end{array}$$

The soft expert set $\tilde{U}$ with soft expert metric $\tilde{d}$ on $\tilde{U}$ is called a soft expert metric space and denoted by $(\tilde{U}, \tilde{d}, A)$.

Definition 4.2. *Let$(F, A)(\neq) \in s(\tilde{U})$, then the collection of all soft expert elements of (F, A) will be denoted by SEE(F, A). For a collection B of soft expert elements of $\tilde{U}$, the soft expert set generated by B is denoted by SES(B).*

Example 4.1. *Let $\tilde{U}$ is being a non- empty set and E a set of parameters and X a set of experts. Let O be a set opinions, $Z = E \times O \times X$ and $A \subseteq Z$. Let*

$\tilde{U}$ be the absolute soft expert set i.e. $F(r) = \tilde{U}, \forall r \in A$, where $(F, A) = \tilde{U}$. We define $\forall \;\; \tilde{x}_{a_1}, \tilde{y}_{a_2} \in \tilde{U}, \tilde{d} : SEP(\tilde{U}) \times SEP(\tilde{U}) \to R(A)^*$ by

$$\tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2}) = \begin{cases} \bar{0}, & \tilde{x}_{a_1} = \tilde{y}_{a_2} \\ \bar{1}, & \tilde{x}_{a_1} \neq \tilde{y}_{a_2} \end{cases}$$

Normally $\tilde{d}$ satisfies all the soft expert metric axioms. So,$\tilde{d}$ is soft expert metric on the soft expert set $\tilde{U}$ and $(\tilde{U}, \tilde{d}, A)$. $\tilde{d}$ is called the discrete soft expert metric on the soft expert set $\tilde{U}$ and $(\tilde{U}, \tilde{d}, A)$ is said to be the discrete soft expert metric space.

Example 4.2. *Let $\tilde{U} \subseteq R$ be a non-empty set and $E \subseteq R$ be the non- empty set of parameters and X a set of experts. Let O be a set opinion, $Z = E \times O \times X$ and $A \subseteq Z$. Let $\tilde{U}$ be the absolute soft expert set i.e. $F(r) = \tilde{U}, \forall r \in A$ where $(F, A) = \tilde{U}$. Let $\tilde{a}$ denote the soft expert real number such that $\tilde{a}(r) = r$, $\forall r \in A$. We define $\tilde{d} : SEP(\tilde{U}) \times SEP(\tilde{U}) \to R(A)^*$ by*

$$\tilde{d}(\tilde{x}_{a_1}(\gamma), \tilde{y}_{a_2}(\mu)) = |\tilde{x}_{a_1} - \tilde{y}_{a_2}| - |\bar{\gamma} - \bar{\mu}|,$$

for $\forall \tilde{x}_{a_1}, \tilde{y}_{a_2} \in \tilde{U}$; where $|.|$ denotes the modules of soft expert real numbers. Then $\tilde{d}$ is a soft expert metric on $\tilde{U}$. Let us satisfies (SEM1), (SEM2), (SEM3) and (SEM4) for soft expert metric.

SEM1) It is obvious from the above definition that;

$$\tilde{d}(\tilde{x}_{a_1}(\gamma), \tilde{y}_{a_2}(\mu)) \tilde{\geq} \bar{0}, \quad \forall \tilde{x}_{a_1}(\gamma), \tilde{y}_{a_2}(\mu) \in \tilde{U}.$$

SEM2) we have

$$\begin{aligned} \tilde{d}(\tilde{x}_{a_1}(\gamma), \tilde{y}_{a_2}(\mu)) = 0 &\Leftrightarrow \quad |\tilde{x}_{a_1} - \tilde{y}_{a_2}| - |\bar{\gamma} - \bar{\mu}| = 0 \\ &\Leftrightarrow \quad |\tilde{x}_{a_1} - \tilde{y}_{a_2}| = 0 \text{ and } |\bar{\gamma} - \bar{\mu}| = 0 \\ &\Leftrightarrow \quad x = y \text{ and } \gamma = \mu \\ &\Leftrightarrow \quad \tilde{x}_{a_1}(\gamma) = \tilde{y}_{a_2}(\mu) \end{aligned}$$

SEM3) we have

$$\begin{aligned} \tilde{d}(\tilde{x}_{a_1}(\gamma), \tilde{y}_{a_2}(\mu)) &= \quad |\tilde{x}_{a_1} - \tilde{y}_{a_2}| - |\bar{\gamma} - \bar{\mu}| \\ &= \quad |\tilde{y}_{a_2} - \tilde{x}_{a_1}| - |\bar{\mu} - \bar{\gamma}| \\ &= \quad \tilde{d}(\tilde{y}_{a_2}(\mu), \tilde{x}_{a_1}(\gamma)), \quad \forall \tilde{x}_{a_1}(\gamma), \tilde{y}_{a_2}(\mu) \in \tilde{U}, \end{aligned}$$

SEM4) we have $\forall \tilde{x}_{a_1}(\gamma), \tilde{y}_{a_2}(\mu), \tilde{z}_{a_3}(\delta) \in \tilde{U}$;

$$\begin{aligned} \tilde{d}(\tilde{x}_{a_1}(\gamma), \tilde{z}_{a_3}(\delta)) &= \quad |\tilde{x}_{a_1} - \tilde{z}_{a_3}| - |\bar{\gamma} - \bar{\delta}| \\ &= \quad |\tilde{x}_{a_1} - \tilde{y}_{a_2} + \tilde{y}_{a_2} - \tilde{z}_{a_3}| - |\bar{\gamma} - \bar{\mu} + \bar{\mu} - \bar{\delta}| \\ &\tilde{\leq} \quad |\tilde{x}_{a_1} - \tilde{y}_{a_2}| + |\tilde{y}_{a_2} - \tilde{z}_{a_3}| - |\bar{\gamma} - \bar{\mu}| + |\bar{\mu} - \bar{\delta}| \\ &\tilde{\leq} \quad \tilde{d}(\tilde{x}_{a_1}(\gamma), \tilde{y}_{a_2}(\mu)) + \tilde{d}(\tilde{y}_{a_2}(\mu), \tilde{z}_{a_3}(\delta)) \end{aligned}$$

Thus $\tilde{d}$ is soft expert metric on $\tilde{U}$.

Definition 4.3. *Let $(\tilde{U}, \tilde{d}, A)$ be a soft expert metric space and $\tilde{\varepsilon}$ be a non-negative soft expert real number*

$$D(\tilde{x}_{a_1}, \tilde{\varepsilon}) = \{\tilde{y}_{a_2} \in \tilde{U} : \tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2}) \tilde{<} \tilde{\varepsilon}\} \tilde{\subset} SEP(\tilde{U})$$

is called the soft expert open ball with center $\tilde{x}_{a_1}$ an radius $\tilde{\varepsilon}$ and

$$D[\tilde{x}_{a_1}, \tilde{\varepsilon}] = \{\tilde{y}_{a_2} \in \tilde{U} : \tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2}) \tilde{\leq} \tilde{\varepsilon}\} \tilde{\subset} SEP(\tilde{U})$$

is called the soft expert closed ball with center $\tilde{x}_{a_1}$ an radius $\tilde{\varepsilon}$.

Example 4.3. *Consider the discrete soft expert metric space $(\tilde{U}, \tilde{d}, A)$ as in Example 4.2. Then for any $\tilde{x}_{a_1} \in \tilde{U}$, $D(\tilde{x}_{a_1}, \tilde{\varepsilon}) = SEP(\tilde{U}), \bar{1} \tilde{<} \tilde{\varepsilon}$ and $D(\tilde{x}_{a_1}, \tilde{\varepsilon}) = \{\tilde{x}_{a_1}\}$ if $\tilde{\varepsilon} \tilde{<} \bar{1}$ also $D[\tilde{x}_{a_1}, \tilde{\varepsilon}] = SEP(\tilde{U}), \bar{1} \tilde{\leq} \tilde{\varepsilon}$ and $D[\tilde{x}_{a_1}, \tilde{\varepsilon}] = \{\tilde{x}_{a_1}\}$.*

Definition 4.4. *Let $(\tilde{U}, \tilde{d}, A)$ be a soft expert metric space $\tilde{x}_a \in \tilde{U}$. A collection $N(\tilde{x}_a)$ of soft expert points containing the soft expert point $\tilde{x}_a$ is said to be neighbourhood of the soft expert point $\tilde{x}_a$, if there exists a non-negative soft expert real number $\tilde{\varepsilon}$ such that $\tilde{x}_a \in D(\tilde{x}_a, \tilde{\varepsilon}) \tilde{\subset} N(\tilde{x}_a)$. $SES(N(\tilde{x}_a))$ will be called a soft expert neighbourhood of the soft expert point $\tilde{x}_a$.*

Theorem 4.1. *Every soft expert open ball is a soft expert neighborhood of each of its soft experts points.*

Proof. Let $(\tilde{U}, \tilde{d}, A)$ be a soft expert metric space. Let us consider any soft expert open ball $SES(D(\tilde{x}_a, \tilde{\varepsilon}))$ with centre $\tilde{x}_a$ and radius $\tilde{\varepsilon}$. From the definition of soft expert neighbourhood it follows that $SES(D(\tilde{x}_a, \tilde{\varepsilon}))$ is a soft expert neighbourhood of $\tilde{x}_a$ in $(\tilde{U}, \tilde{d}, A)$. Let us consider any soft expert points $\tilde{y}_{a_2} \in SES(D(\tilde{x}_{a_1}, \tilde{\varepsilon})) \tilde{<} \tilde{\varepsilon}$ other than $\tilde{x}_{a_1}$ then we have must $\bar{0} \neq \tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2}) \tilde{<} \tilde{\varepsilon}$. Choose $\tilde{\varepsilon_1}$ with $\bar{0} \tilde{<} \tilde{\varepsilon_1} \tilde{<} \tilde{\varepsilon} - \tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2})$. Then $\tilde{\varepsilon_1}$ is a non-negative soft expert real number. Now each$\tilde{z}_{a_3} \in SES(D(\tilde{y}_{a_2}, \tilde{\varepsilon}))$, we have $\tilde{d}(\tilde{y}_{a_2}, \tilde{z}_{a_3})$. Now by SEM4), we get,

$$\begin{aligned} \tilde{d}(\tilde{x}_{a_1}, \tilde{z}_{a_3}) &\tilde{\leq} \tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2}) + \tilde{d}(\tilde{y}_{a_2}, \tilde{z}_{a_3}) \\ &\tilde{\leq} \tilde{d}(\tilde{x}_{a_1}, \tilde{y}_{a_2}) + \tilde{\varepsilon_1} \\ &\tilde{\leq} \tilde{\varepsilon}. \end{aligned}$$

$SES(D(\tilde{x}_{a_1}, \tilde{\varepsilon}))$ is a soft expert neighbourhood of each of its soft expert points. □

Definition 4.5. *Let (F, B) be a soft expert subset in a soft expert metric space $(\tilde{U}, \tilde{d}, A)$. Then a soft expert point $\tilde{x}_a$ is said to be interior point of the soft expert set (F, B). If $\exists$ a non-negative soft expert real number $\tilde{\varepsilon}$ such that $\tilde{x}_a \in D(\tilde{x}_a, \tilde{\varepsilon}) \tilde{\subset} SEP(F, B)$.*

Definition 4.6. *Let (F, B) be a soft expert subset in a soft expert metric space $(\tilde{U}, \tilde{d}, A)$. Then the interior of the soft expert set (F, B) is defined to be the set consisting of all interior points (F, B). The interior of the soft expert set (F, B) is denoted by $(F, B)^{\circ}$.*

Definition 4.7. *Let $(\tilde{U}, \tilde{d}, A)$ be a soft expert metric space and (F, B) be a soft expert subset of $\tilde{U}.(F, B)$ is called a soft expert open subset of $\tilde{U}$ and $\tilde{\varepsilon}$ non-negative soft expert real number if; $D(\tilde{x}_a, \tilde{\varepsilon}) \tilde{\subset} (F, B) \ \ \forall \tilde{x}_a \in (F, B)$.*

Definition 4.8. *Let $(\tilde{U}, \tilde{d}, A)$ be a soft expert metric space. A soft expert set $(G, R) \tilde{\subset} \tilde{U}$, is said to be "soft expert closed in $\tilde{U}$ with respect to $\tilde{d}$ " if its complement $(G, R)^c$ is soft expert open set in $(\tilde{U}, \tilde{d}, A)$.*

Theorem 4.2. *In a soft expert metric space every soft expert open ball is a soft expert open set.*

Proof. Let $D(\tilde{x}_a, \tilde{\varepsilon})$ be soft expert open ball with center $\tilde{x}_a$ and radius $\tilde{\varepsilon}$ in a soft expert metric space $(\tilde{U}, \tilde{d}, A)$. We are proving that $D(\tilde{x}_a, \tilde{\varepsilon})$ is a soft expert open set. Clearly $SES(D(\tilde{x}_a, \tilde{\varepsilon}))$ is generated by the set of all soft expert point of $D(\tilde{x}_a, \tilde{\varepsilon})$ and all of them are interior points of $SES(D(\tilde{x}_a, \tilde{\varepsilon}))$. Thus $SES(D(\tilde{x}_a, \tilde{\varepsilon}))$ is a soft expert open set in the soft expert metric space $(\tilde{U}, \tilde{d}, A)$.

□

5. Conclusion

In this study firstly, we have introduced the definition of soft expert point in soft expert sets and using this we have given the definition of soft expert metric. Following this soft expert open ball, soft expert closed ball, soft expert neighborhood, theorem of soft expert open sets and soft expert closed sets are studied.This may lead to an ample scope on soft expert metric spaces in soft expert set setting.

References

[1] Gahler, Siegfried, Werner Gähler, Fuzzy real numbers. Fuzzy Sets and Systems 66(2)(1994): 137–158.

[2] Gerla, G. On the concept of fuzzy point. Fuzzy Sets and Systems 18(2) (1986): 159–172.

[3] Gottwald, Siegfried. Fuzzy points and local properties of fuzzy topological spaces. Fuzzy Sets and Systems 5(2) (1981): 199–201.

[4] Murali, Venkat. Fuzzy points of equivalent fuzzy subsets. Information Sciences 158 (2004): 277–288.

[5] Neog, Tridiv Jyoti, Dusmanta Kumar Sut, and Gopal Chandra Hazarika. Fuzzy Soft Topological Spaces. International Journal of Latest Trends in Mathematics 2(1) (2012).

[6] P. P Ming, L.Y Ming. Fuzzy topology. I. Neighborhood structure of a fuzzy point and Moore Smith convergence, J. Math. Anal. Appl., 76(1980): 571–599.

[7] YANG, Ping, Huai-xin CAO, and Hai-yan SI. Fuzzy closed and fuzzy open sets in a generalized fuzzy normed space. Journal of Shandong University (Natural Science) 4(2011): 026.

[8] Yalvac, Tuna Hatice. Fuzzy sets and functions on fuzzy spaces. Journal of mathematical Analysis and Applications 126(2) (1987): 409–423.

[9] Ahmad, B., and Sabir H. On some structures of soft topology. Mathematical Sciences 6(1)(2012): 1–7.

[10] Cagman, N., S. Karatas, and S. Enginoglu. Soft topology. Computers Mathematics with Applications 62(1) (2011): 351–358.

[11] Chen, Bin. Soft semi-open sets and related properties in soft topological spaces. Appl. Math 7(1) (2013): 287–294.

[12] Kannan, K. Soft Generalized closed sets in soft Topological Spaces. Journal of Theoretical and Applied Information Technology 37(1) (2012): 17–21.

[13] Roy, Sanjay, and T. K. Samanta. A note on fuzzy soft topological spaces. Annals of Fuzzy Mathematics and Informatics 3(2) (2011): 305–311.

[14] Simsekler, T. H., and Saziye Yuksel. Fuzzy soft topological spaces. Ann. Fuzzy Math. Inf 5(1)(2012): 87–96.

[15] Grabiec, Mariusz. Fixed points in fuzzy metric spaces. Fuzzy Sets and Systems 27(3) (1988): 385–389.

[16] George, A., and P. Veeramani. On some results in fuzzy metric spaces. Fuzzy Sets and Systems 64(3) (1994): 395–399.

[17] George, A., and P. Veeramani. On some results of analysis for fuzzy metric spaces. Fuzzy Sets and Systems 90(3) (1997): 365–368.

[18] Gregori, V., and Salvador R. Some properties of fuzzy metric spaces. Fuzzy Sets and Systems 115(3) (2000): 485–489.

[19] Kaleva, O., and Seppo S. On fuzzy metric spaces. Fuzzy Sets and Systems 12(3) (1984): 215–229.

[20] Kramosil, I., and Jirí Michálek. Fuzzy metrics and statistical metric spaces. Kybernetika 11(5) (1975): 336–344.

[21] Mashhour, Ali S., and Nehad N. Morsi. Fuzzy metric neighbourhood spaces. Fuzzy Sets and Systems 45(3) (1992): 367–388.

[22] Sharma, Sushil. On fuzzy metric space. Southeast Asian Bulletin of Mathematics 26(1) (2003): 133–145.

[23] D. Molodtsov, Soft set theory-first results, Computers Mathematics with Applications, 37(4-5)(1999): 19–31.

[24] D. Chen, E. C. C. Tsang, D. S. Yeung, and X.Wang, The parameterization reduction of soft sets and its applications, Computers Mathematics with Applications, 49(5-6)(2005): 757–763.

[25] P. K. Maji, R. Biswas, and A. R. Roy, Soft set theory, Computers Mathematics with Applications, 45(4-5)(2003): 555–562.

[26] P. K. Maji, A. R. Roy, and R. Biswas, An application of soft sets in a decision making problem, Computers Mathematics with Applications, 44(8-9)(2002): 1077–1083.

[27] S. Bayramov, C. Gunduz(Aras), Soft locally compact and soft paracompact spaces, Journal of Mathematics and System Science, in press.

[28] Sujoy Das and S. K. Samanta, Soft real sets, soft real numbers and their properties, J. Fuzzy Math. 20(3) (2012): 551–576.

[29] Sujoy Das and S. K. Samanta, Soft metric, Annals of Fuzzy Mathematics and Informatics, 6(1)(2013): 77–94.

[30] Sujoy Das and S. K. Samanta, On soft metric spaces, J. Fuzzy Math, in press.

[31] Nazmul, Sk, and S. K. Samanta. Neighbourhood properties of soft topological spaces. Ann. Fuzzy Math. Inform 6 (2013): 1–15.

[32] S. Alkhazaleh and A. R. Salleh, Soft expert sets, Advances in Decision Sciences, vol. 2011, Article ID 757868, (2011): 12 pages.

[33] A. Zahedi Khameneh, A. Kılıçman and A. R. Salleh, Fuzzy soft product topology, Annals of Fuzzy Mathematics and Information, 7(6) (2014), 935–947.

[34] A. Zahedi Khameneh, A. Kılıçman and A. R. Salleh, Fuzzy soft boundary, Annals of Fuzzy Mathematics and Information, 8(5) (2014), 687–703.

[35] A. Zahedi Khameneh, A. Kılıçman and A. R. Salleh, An Adjustable Method for Data Ranking based on Fuzzy Soft Sets, Indian Journal of Science and Technology, DOI: 10.17485/ijst/2015/v8i21/72587.