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Almost Contra Continuous Mappings In Interval Valued Intuitionistic Multi Fuzzy Topological Structures

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ABSTRACT

In this paper, we study some of the properties of interval valued intuitionistic fuzzy almost contra generalized semiprecontinuous mappings and studied some of its properties. Also we have provided the relation between various types of interval valued intuitionistic multi fuzzy contra continuous mappings.

KEYWORDS: Fuzzy subset, multi fuzzy subset, interval valued multi fuzzy subset, interval valued intuitionistic fuzzy subset,interval valued intuitionistic multi fuzzy subset, interval valued intuitionistic multi fuzzy topological space, interval valued intuitionistic multi fuzzy interior, interval valued intuitionistic multi fuzzy closure.

INTRODUCTION

In 1965, Zadeh [16] introduced the notion of a fuzzy subset of a set, fuzzy sets are a kind of useful mathematical structure to represent a collection of objects whose boundary is vague. Since then it has become a vigorous area of research in different domains, there have been a number of generalizations of this fundamental concept such as intuitionistic fuzzy sets, interval valued fuzzy sets, vague sets, soft sets etc. The intuitionistic fuzzy set was introduced by Atanassov.K.T[1, 2]. The following papers have motivated us to work on this paper C.L.Chang [4] introduced and studied fuzzy topological spaces in 1968 as a generalization of topological spaces many researchers like, and many others have contributed to the development of fuzzy topological spaces. Dontchev [5] has introduced generalized semipreclosed sets in general topology. After that the set was generalized to fuzzy topological spaces by saraf and khanna [13]. Tapas kumar mondal and S.K.Samantha [10] have introduced the topology of interval valued fuzzy sets. Now we have generalized the set to interval valued intuitionistic fuzzy topological spaces. V.Murugan et.al[11, 12] have introduced the multi fuzzy rw-closed and multi fuzzy rw-open sets in multi fuzzy topological spaces. Jeyabalan.R and K. Arjunan[8] defined and introduced the interval valued fuzzy generalized semipreclosed sets after that the concept was extended into interval valued intuitionistic fuzzy generalized semipreclosed sets by Vinoth.S & K.Arjunan[114, 15].

Some interesting theorems and results on interval valued intuitionistic fuzzy almost contra generalized semiprecontinuous mappings are provided in this paper.

1.PRELIMINARIES:

Definition[105]: Let X be a nonempty set. A fuzzy set A in X can be described in the form A = { < x, $\mu_A(x)$>: x ∈ X } where the function μ_A: X → [0, 1] is called the membership function and $\mu_A(x)$ denotes the degree to which x∈A and $0 \le \mu_A(x) \le 1$ for each x ∈ X.

1.1.2 Example: Let X = { a, b, c } be a set. Then A = { ⟨ a, 0.4 ⟩, ⟨ b, 0.5 ⟩, ⟨ c, 0.3 ⟩ } is a fuzzy subset of X.

1.2 Definition[16]: A **multi fuzzy subset** A of a set X is defined as an object of the form A = { ⟨ x, $A_1(x)$, $A_2(x)$, $A_3(x)$, …, $A_n(x)$ ⟩ / x∈X}, where A_i : X→[0, 1] for all i. It is denoted as A = ⟨ $A_1, A_2, A_3, …, A_n$⟩.

1.3 Definition[16]: Let X be a non-empty set. A **interval valued fuzzy subset A** of X is a function A: X →D[0, 1], where $D[0,1]$ denotes the family of all closed subintervals of [0, 1].

1.4 Definition[16]: A **interval valued multi fuzzy subset** A of a set X is defined as an object of the form A = { ⟨ x, $A_1(x)$, $A_2(x)$, $A_3(x)$, …, $A_n(x)$ ⟩ / x∈X}, where A_i : X→D[0, 1] for all i, where $D[0,1]$ denotes the family of all closed subintervals of [0, 1]. It is denoted as A = ⟨ $A_1, A_2, A_3, …, A_n$⟩.

1.5 Definition[1]: An **intuitionistic fuzzy subset(IFS)** A of a set X is defined as an object of the form A = { ⟨ x, $\mu_A(x)$, $\nu_A(x)$ ⟩ / x∈X }, where μ_A : X → [0, 1] and ν_A : X → [0, 1] define the degree of membership and the degree of non-membership of the element x in X respectively and for every x in X satisfying $0 \le \mu_A(x) + \nu_A(x) \le 1$.

1.6 Example: Let X = { a, b, c } be a set. Then A = { ⟨ a, 0.52, 0.34 ⟩, ⟨ b, 0.14, 0.71 ⟩, ⟨ c, 0.25, 0.34 ⟩ } is an intuitionistic fuzzy subset of X.

1.7 Definition[1]: A **intuitionistic multi fuzzy subset (IMFS)** A of a set X is defined as an object of the form A = { ⟨ x, $\mu_A(x)$, $\nu_A(x)$ ⟩ / x∈X }, where $\mu_A(x)$ = ($\mu_{A1}(x)$, $\mu_{A2}(x)$, … $\mu_{An}(x)$), μ_{Ai} : X →[0, 1] for all i and $\nu_A(x)$ = ($\nu_{A1}(x)$, $\nu_{A2}(x)$, …, $\nu_{An}(x)$), ν_{Ai} : X →[0, 1] for all i, define the degree of membership and the degree of non-membership of the element x in X respectively and for every x in X satisfying $0 \le \mu_{Ai}(x) + \nu_{Ai}(x) \le 1$ for all i.

1.8 Definition: A **interval valued intuitionistic multi fuzzy subset (IVIMFS)** A of a set X is defined as an object of the form A = { ⟨ x, $\mu_A(x)$, $\nu_A(x)$ ⟩ / x∈X }, where $\mu_A(x)$ = ($\mu_{A1}(x)$, $\mu_{A2}(x)$, … $\mu_{An}(x)$), μ_{Ai} : X →D[0, 1] for all i and $\nu_A(x)$ = ($\nu_{A1}(x)$, $\nu_{A2}(x)$, …, $\nu_{An}(x)$), ν_{Ai} : X →D[0, 1] for all i, define the degree of membership and the degree of non-membership of the element x in X respectively and for every x in X satisfying $0 \le \sup \mu_{Ai}(x) + \sup \nu_{Ai}(x) \le 1$ for all i, where $D[0,1]$ denotes the family of all closed subintervals of [0, 1].

1.9 Definition: Let A and B be any two interval valued intuitionistic multi fuzzy subsets of a set X. We define the following relations and operations:

(i) A ⊆ B if and only if $\mu_A(x) \le \mu_B(x)$ and $\nu_A(x) \ge \nu_B(x)$, for all x in X.

(ii) A = B if and only if $\mu_A(x) = \mu_B(x)$ and $\nu_A(x) = \nu_B(x)$, for all x in X.

(iii) A^c = { ⟨ x, $\nu_A(x)$, $\mu_A(x)$ ⟩ / x∈X }.

(iv) A∩B = { ⟨ x, min{ $\mu_A(x)$, $\mu_B(x)$ }, max{ $\nu_A(x)$, $\nu_B(x)$ } ⟩ / x∈X }.

(v) A∪B = { ⟨ x, max { $\mu_A(x)$, $\mu_B(x)$ }, min{ $\nu_A(x)$, $\nu_B(x)$ } ⟩ / x∈X }.

1.10 Definition: Let X be a set and ℑ be a family of interval valued intuitionistic multi fuzzy subsets of X. The family ℑ is called an interval valued intuitionistic multi fuzzy topology(IVIMFT) on X if and only if ℑ satisfies the following axioms (i) $0_X, 1_X \in ℑ$, (ii) If { A_i ; i∈I } ⊆ℑ, then $\bigcup_{i\in I} A_i \in ℑ$, (iii) If $A_1, A_2, A_3, …… A_n \in ℑ$, then $\bigcap_{i=1}^{i=n} A_i \in ℑ$. The pair (X, ℑ) is called an interval valued intuitionistic multi fuzzy topological space (IVIMFTS). The members of ℑ are called interval valued intuitionistic multi fuzzy open sets(IVIMFOSs) in X. An interval valued intuitionistic multi fuzzy set A in X is said to be interval valued intuitionistic multi fuzzy closed set(IVIMFCS) in X if and only if A^c is an interval valued intuitionistic multi fuzzy open set in X.

1.11 Definition: Let (X, ℑ) be an IVIMFTS and A be an IVIMFS in X. Then the interval valued intuitionistic multi fuzzy interior and interval valued intuitionistic multi fuzzy closure are defined by $ivimfint(A)$ = ∪ {G : $G$is an IVIMFOS in X and G ⊆ A}, $ivimfcl(A)$ = ∩ {K: $K$is an IVIMFCS in X and A⊆ K}. For any IVIMFS A in (X, ℑ), we have $ivimfcl(A^C) = (ivimfint(A))^c$ and $ivimfint(A^C) = (ivimfcl(A))^c$.

1.12 Definition: An IVIMFS A of an IVIMFTS (X, $\Im$) is said to be an

(i) interval valued intuitionistic multi fuzzy regular closed set (IVIMFRCS for short)

if A = $ivimfcl(ivimfint(A))$

(ii) interval valued intuitionistic multi fuzzy semiclosed set (IVIMFSCS for short) if $ivimfint(ivimfcl(A)) \subseteq A$

(iii) interval valued intuitionistic multi fuzzy preclosed set (IVIMFPCS for short) if

$$ivimfcl(ivimfint(A)) \subseteq A$$

(iv) interval valued intuitionistic multi fuzzy α closed set (IVIMFαCS for short) if $ivimfcl\left(ivimfint(ivimfcl(A))\right) \subseteq A$

(v) interval valued intuitionistic multi fuzzy β closed set (IVIMFβCS for short) if $ivimfint\left(ivimfcl(ivimfint(A))\right) \subseteq A.$

1.13 Definition: An IVIMFS A of an IVIMFTS (X, $\Im$) is said to be an

(i) interval valued intuitionistic multi fuzzy generalized closed set (IVIMFGCS for short) if $ivimfcl(A)$ = U, whenever A⊆ U and U is an IVIMFOS

(ii) interval valued intuitionistic multi fuzzy regular generalized closed set (IVIMFRGCS for short) if $ivimfcl(A) \subseteq U$, whenever A⊆ U and U is an IVIMFROS.

1.14 Definition: An IVIMFS A of an IVIMFTS (X, $\Im$) is said to be an

(i) interval valued intuitionistic multi fuzzy semipreclosed set (IVIMFSPCS for short) if there exists an IVIMFPCS B such that $ivimfint(B) \subseteq A \subseteq B$

(ii) interval valued intuitionistic multi fuzzy semipreopen set (IVIMFSPOS for short) if there exists an IVIMFPOS B such that B ⊆ $A \subseteq ivimfcl(B)$.

1.15 Definition: Let A be an IVIMFS in an IVIMFTS (X, $\Im$). Then the interval valued intuitionistic multi fuzzy semipre interior of A ($ivimfspint$(A) for short) and the interval valued intuitionistic multi fuzzy semipre closure of A ($ivimfspcl(A)$ for short) are defined by $ivimfspint(A)$= ∪ {G: G is an IVIMFSPOS in X and G $\subseteq A\}$, $ivimfspcl(A)$ =∩ {K: K is an IVIMFSPCS in X and A $\subseteq K\}$. For any IVIMFS A in ($X,\Im$), we have $ivimfspcl(A^c) = (ivimfspint(A))^c$ and $ivimfspint(A^c) = (ivimfspcl(A))^c$.

1.16 Definition: An IVIMFS A in IVIMFTS (X, $\Im$) is said to be an interval valued intuitionistic multi fuzzy generalized semipreclosed set (IVIMFGSPCS for short) if $ivimfspcl(A) \subseteq U$ whenever A ⊆ U and U is an IVIMFOS in (X,$\Im$).

1.17 Example: Let $X = \{a, b\}$ and G = { ⟨ a, [0.5, 0.5], [0.55, 0.55], [0.6, 0.6], [0.5, 0.5], [0.45, 0.45], [0.4, 0.4] ⟩, ⟨ b, [0.4, 0.4], [0.45, 0.45], [0.5, 0.5], [0.6, 0.6], [0.55, 0.55], [0.5, 0.5] ⟩ }. Then τ = {0_X, G, 1_X} is an IVIMFTS on X. Let A = { ⟨ a, [0.4, 0.4], [0.45, 0.45], [0.5, 0.5], [0.6, 0.6], [0.55, 0.55], [0.5, 0.5] ⟩, ⟨ b, [0.2, 0.2], [0.25, 0.25], [0.3, 0.3], [0.7, 0.7], [0.65, 0.65], [0.6, 0.6] ⟩ } is an IVIMFGSPCS in (X,$\Im$).

2.PROPERTIES

2.1 Definition: A mapping f: X→ Y is said to be an interval valued intuitionistic multi fuzzy almost contra generalized semiprecontinuous mapping (IVIFACGSP continuous mapping for short) if $f^{-1}(A)$ is an IVIMFGSPCS in X for every IVIMFROS A in Y.

2.2 Example: Let X = { a, b }, Y = { u, v } and G_1 = { ⟨ a, [0.45, 0.45],[0.55, 0.55],[0.55, 0.55],[0.45, 0.45]⟩, ⟨ b, [0.4, 0.4], [0.6, 0.6],[0.6, 0.6],[0.4, 0.4]⟩ }, G_2 = { ⟨ u, [0.4, 0.4], [0.6, 0.6],[0.6, 0.6],0.4, 0.4]⟩, ⟨ v, [0.2, 0.2],[0.6, 0.6] [0.8, 0.8],[0.4, 0.4] ⟩ }. Then τ = {0_X, G_1, 1_X} and σ = { 0_Y, G_2, 1_Y} are IVIMFT on X and Y respectively. Define a mapping f : (X, τ)→ (Y, σ) by f(a) = u and f(b) = v. Then f is an IVIMFACGSP continuous mapping.

2.3 Theorem: Every IVIMFC continuous mapping is an IVIMFACGSP continuous mapping but not conversely.

Proof: Let A ⊆ Y be an IVIMFROS. Since every IVIMFROS is an IVIMFOS, A is an IVIMFOS in Y. Then $f^{-1}(A)$ is an IVIMFCS in X, by hypothesis. Hence $f^{-1}(A)$ is an IVIMFGSPCS in X. Therefore f is an IVIMFACGSP continuous mapping.

2.4 Example: Let X = { a, b }, Y = { u, v } and G_1 = { ⟨ a, [0.5, 0.5], [0.45, 0.45], [0.5, 0.5] ,[0.55, 0.55]⟩, ⟨ b, [0.4, 0.4], [0.6, 0.6],[0.6, 0.6],0.4, 0.4]⟩ }, G_2 = { ⟨ u, [0.4, 0.4], [0.6, 0.6],[0.6, 0.6],0.4, 0.4]⟩, ⟨ v, [0.2, 0.2],[0.6, 0.6] [0.8, 0.8],[0.4, 0.4] ⟩ }. Then τ = { 0_X, G_1, 1_X } and σ = { 0_Y, G_2, 1_Y } are IVIMFT on X and Y respectively. Define a mapping f : (X, τ)→ (Y, σ) by f(a) = u and f(b) = v. Then f is an IVIMFACGSP continuous mapping but not an IVIMFC continuous mapping, since G_2 is an IVIMFOS in Y but $f^{-1}(G_2)$ = { ⟨ a, [0.4, 0.4], [0.6, 0.6],[0.6, 0.6],0.4, 0.4]⟩, ⟨ b, [0.2, 0.2],[0.6, 0.6] [0.8, 0.8],[0.4, 0.4] ⟩ }in X is not an IVIMFCS, because IVIMFcl($f^{-1}(G_2)$) = $G_1^c \neq f^{-1}(G_2)$.

2.5 Theorem: Every IVIMFCα continuous mapping is an IVIMFACGSP continuous mapping but not conversely.

Proof: Let A ⊆ Y be an IVIMFROS. Since every IVIMFROS is an IVIMFOS, A is an IVIMFOS in Y. Then $f^{-1}(A)$ is an IVIMFαCS in X, by hypothesis. Hence $f^{-1}(A)$ is an IVIMFGSPCS in X. Therefore f is an IVIMFACGSP continuous mapping.

2.6 Example: Let X = { a, b }, Y = { u, v} and G_1 = { ⟨ a, [0.45, 0.45],[0.55, 0.55], [0.55, 0.55],[0.45, 0.45]⟩, ⟨ b, [0.4, 0.4], [0.6, 0.6],[0.6, 0.6],0.4, 0.4]⟩ }, G_2 = { ⟨ u, [0.4, 0.4], [0.6, 0.6],[0.6, 0.6],0.4, 0.4]⟩, ⟨ v, [0.2, 0.2],[0.6, 0.6] [0.8, 0.8],[0.4, 0.4] ⟩ }. Then τ = { 0_X, G_1, 1_X } and σ = { 0_Y, G_2, 1_Y } are IVIMFT on X and Y respectively. Define a mapping f : (X, τ)→ (Y, σ) by f(a) = u and f(b) = v. Then f is an IVIMFACGSP continuous mapping but not an IVIMFCα continuous mapping, since G_2 is an IVIMFOS in Y, but $f^{-1}(G_2)$ = {⟨ a, [0.4, 0.4], [0.6, 0.6],[0.6, 0.6],0.4, 0.4]⟩, ⟨ b, [0.2, 0.2],[0.6, 0.6] [0.8, 0.8],[0.4, 0.4] ⟩ } in X is not an IVIMFαCS, because IVIMFcl (IVIMFint (IVIMFcl ($f^{-1}(G_2)$))) = IVIMFcl (IVIMFint(G_1^c)) = IVIMFcl(G_1) = $G_1^c \not\subseteq f^{-1}(G_2)$.

2.7 Theorem: Every IVIMFCP continuous mapping is an IVIMFACGSP continuous mapping but not conversely.

Proof: Let A ⊆ Y be an IVIMFROS. Since every IVIMFROS is an IVIMFOS, A is an IVIMFOS in Y. Then $f^{-1}(A)$ is an IVIMFPCS in X, by hypothesis. Hence $f^{-1}(A)$ is an IVIMFGSPCS in X. Therefore f is an IVIMFACGSP continuous mapping.

2.8 Example: Let X = { a, b }, Y = { u, v } and G_1 = { ⟨ a, [0.45, 0.45],[0.55, 0.55], [0.45, 0.45],[0.55, 0.55]⟩, ⟨ b, [0.6, 0.6], [0.5, 0.5], [0.4, 0.4] ,[0.5, 05] ⟩ }, G_2 = { ⟨ u, [0.45, 0.45],[0.55, 0.55], [0.45, 0.45],[0.55, 0.55]⟩, ⟨ v, [0.7, 0.7], [0.8, 0.8], [0.3, 0.3] ,[0.2, 0.2] ⟩ } and G_3 = { ⟨ u, [0.4, 0.4], [0.45, 0.45],[0.55, 0.55]⟩, ⟨ v, [0.2, 0.2],[0.6, 0.6] [0.8, 0.8],[0.4, 0.4] ⟩ }. Then τ = { 0_X, G_1, 1_X } and σ = { 0_Y, G_2, G_3, 1_Y } are IVIMFT on X and Y respectively. Define a mapping f : (X, τ)→ (Y, σ) by f(a) = u and f(b) = v. Then f is an IVIMFACGSP continuous mapping but not an IVIMFCP continuous mapping, since G_2 is an IVIMFOS in Y but $f^{-1}(G_2)$ is not an IVIMFPCS in X, becauseIVIMFcl (IVIMFint ($f^{-1}(G_2)$)) = IVIMFcl(G_1) = $1_X \not\subseteq f^{-1}(G_2^C)$.

2.9 Theorem: Every IVIMFCoGSP continuous mapping is an IVIMFACGSP continuous mapping but not conversely.

Proof: Let f : X→ Y be an IVIMFCoGSP continuous mapping. Let A ⊆ Y be an IVIMFROS. Then A is an IVIMFOS in Y. By hypothesis, $f^{-1}(A)$ is an IVIMFGSPCS in X. Hence f is an IVIMFACGSP continuous mapping.

2.10 Example: Let X = { a, b }, Y = {u, v} and G_1 = { ⟨ a, [0.45, 0.45],[0.55, 0.55], [0.45, 0.45],[0.55, 0.55]⟩, ⟨ b, [0.6, 0.6], [0.5, 0.5], [0.4, 0.4] ,[0.5, 05] ⟩ }, G_2 = { ⟨ u, [0.45, 0.45],[0.55, 0.55], [0.45, 0.45],[0.55, 0.55]⟩, ⟨ v, [0.7, 0.7], [0.8, 0.8], [0.3, 0.3] ,[0.2, 0.2] ⟩ }, G_3 = { ⟨ u, [0.4, 0.4], [0.45, 0.45],[0.55, 0.55]⟩, ⟨ v, [0.2, 0.2],[0.6, 0.6] [0.8, 0.8],[0.4, 0.4] ⟩ } and G_4 = {⟨ u, [0.45, 0.45],[0.55, 0.55], [0.45, 0.45],[0.55, 0.55]⟩, ⟨ v, [0.6, 0.6], [0.5, 0.5], [0.4, 0.4] ,[0.5, 05] ⟩ }. Then τ = {0_X, G_1, 1_X} and σ = { 0_Y, G_2, G_3, G_4, 1_Y } are IVIMFT on X and Y respectively. Define a mapping f : (X, τ)→ (Y, σ) by f(a) = u and f(b) = v. Then f is an IVIMFACGSP continuous mapping but not an IVIMFCoGSP continuous mapping, since G_4 is an IVIMFOS in Y but $f^{-1}(G_4)$ = { ⟨ a, [0.45, 0.45],[0.55, 0.55], [0.45, 0.45],[0.55, 0.55]⟩, ⟨ b, [0.6, 0.6], [0.5, 0.5], [0.4, 0.4] ,[0.5, 05] ⟩ } is not an IVIMFGSPCS in X, because $f^{-1}(G_4) \subseteq G_1$, but IVIMFspcl($f^{-1}(G_4)$) = $1_X \not\subseteq G_1$.

2.11 Theorem: Let f : X→ Y be a mapping. Then the following are equivalent:

(i) f is an IVIMFACGSP continuous mapping,

(ii) $f^{-1}(A)$ ∈IVIMFGSPO(X) for every A∈IVIMFRC(Y).

Proof: (i) ⇒ (ii) Let A be an IVIMFRCS in Y. Then A^c is an IVIMFROS in Y. By hypothesis, $f^{-1}(A^c)$ is an IVIMFGSPCS in X.

Therefore $f^{-1}(A)$ is an IVIMFGSPOS in X.

(ii) ⇒(i) Let A be an IVIMFROS in Y. Then A^c is an IVIMFRCS in Y. By hypothesis, $f^{-1}(A^c)$ is an IVIMFGSPOS in X. Therefore $f^{-1}(A)$ is an IVIMFGSPCS in X.

Hence f is an IVIMFACGSP continuous mapping.

The relation between various types of interval valued intuitionistic multi fuzzy contra continuity is given in the following diagram.

IVIMFCαCM

↗ ↓ ↘

IVIMFCCM →IVIMFACGSPCM ←IVIMFCGSPCM

↘↑↗

IVIMFCoGSPCM

The reverse implications are not true in general in the above diagram.

2.12 Theorem: If f : X →Y is a mapping, where X is an IVIMFSPT$_{1/2}$ space, then the following are equivalent:

(i) f is an IVIMFACGSP continuous mapping,
(ii) f^{-1}(A)∈IVIMFGSPO(X) for every A∈IVIMFRC(Y),
(iii) f^{-1}(IVIMFint (IVIMFcl(G))) ∈IVIMFGSPC(X) for every IVIMFOS G ⊆ Y,
(iv) f^{-1}(IVIMFcl (IVIMFint(H))) ∈IVIMFGSPO(X) for every IVIMFCS H ⊆ Y.

Proof: (i) ⇔ (ii) is obvious from the Theorem 3.7.11.
(i)⇒(iii) Let G be any IVIMFOS in Y. Then IVIMFint (IVIMFcl(G)) is an IVIMFROS in Y. By hypothesis, f^{-1}(IVIMFint (IVIMFcl(G))) is an IVIMFGSPCS in X.
Hence f^{-1}(IVIMFint (IVIMFcl(G))) ∈IVIMFGSPC(X).
(iii)⇒(i) Let A be any IVIMFROS in Y. Then A is an IVIMFOS in Y. By hypothesis, we have f^{-1}(IVIMFint (IVIMFcl(A))) ∈IVIMFGSPC(X). That is f^{-1}(A)∈IVIMFGSPC(X), since IVIMFint (IVIMFcl(A)) = A. Hence fis an IVIMFACGSP continuous mapping.
(ii) ⇔ (iv) is similar to (i)⇔ (iii).

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

References

[1] Atanassov.K.T., Intuitionistic fuzzy sets, Fuzzy sets and systems, 20(1) (1986), 87-96.
[2] Atanassov.K.T., Intuitionistic fuzzy sets theory and applications, Physica-Verlag, A Spsemigrouper-Verlag company, April 1999, Bulgaria.
[3] Bhattacarya.B., and Lahiri.B.K., Semi-generalized Closed Set in Topology, Indian Jour.Math.,29 (1987), 375-382.
[4] Chang.C.L., FTSs. JI. Math. Anal. Appl., 24(1968), 182-190.
[5] Dontchev.J., On Generalizing Semipreopen sets, Mem. Fac. sci. Kochi. Univ. Ser. A, Math.,16, (1995), 35-48.
[6] Ganguly.S and Saha.S, A Note on fuzzy Semipreopen Sets in Fuzzy Topological Spaces, Fuzzy Sets and System, 18, (1986), 83-96.
[7] Indira.R, Arjunan.K and Palaniappan.N, Notes on interval valued fuzzy rw-Closed, interval valued fuzzy rw-Open sets in interval valued fuzzy topological space, International Journal of Computational and Applied Mathematics.,Vol .3,No.1(2013), 23-38.
[8] Jeyabalan.R and K. Arjunan, "Notes on interval valued fuzzy generalized semipreclosed sets", International Journal of Fuzzy Mathematics and Systems, Volume 3, Number 3 (2013), 215 –224.
[9] Levine.N, Generalized Closed Sets in Topology, Rend. Circ. Math. Palermo,19,(1970),89-96.
[10] Mondal.T.K., Topology of Interval Valued Fuzzy Sets, Indian J. Pure Appl.Math.30(1999), No.1, 23-38.
[11] Murugan.V, U.Karuppiah & M.Marudai, Notes on multi fuzzy rw-closed, multi fuzzy rw-open sets in multi fuzzy topological spaces, Bulletin of Mathematics and Statistics Research, Vo.4, Issu. 1, 2016, 174-179.
[12] Murugan.V, U.Karuppiah & M.Marudai, Some Theorems in multi intuitionistic fuzzy rw-closed and multi intuitionistic fuzzy rw-open sets in multi intuitionistic fuzzy topological spaces, International Journal of Scientific Research, Vol.5, Iss.11, 2016, 642-646.
[13] Saraf.R.K and Khanna.K., Fuzzy Generalized semipreclosed sets, Jour.Tripura. Math.Soc.,3, (2001), 59-68.
[14] Vinoth.S & K.Arjunan, "A study on interval valued intuitionistic fuzzy generalized semipreclosed sets", International Journal of Fuzzy Mathematics and Systems, Vol. 5, No. 1 (2015), 47 – 55.
[15] Vinoth.S& K.Arjunan, "Interval valued intuitionistic fuzzy generalized semipreclosed mappings",International Journal of Mathematical Archive, 6(8) (2015), 129 –135.
[16] Zadeh.L.A., Fuzzy sets, Information and control, Vol.8 (1965), 338-353.
[17] Vinoth.S , Uma Maheswari.P &Arjunan.K "Detection of interval valued intuitionistic multi fuzzy generalized semipreclosed mappings",International Journal of Engineering and Advanced Technology , Is5,Volume 9, 2019, 274 –278.