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# Neutrosophic $\alpha$ gs Continuity And Neutrosophic $\alpha$ gs Irresolute Maps

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**Abstract.** Neutrosophic Continuity functions very first introduced by A.A.Salama et.al.Aim of this present paper is, we introduce and investigate new kind of Neutrosophic continuity is called Neutrosophic  $\alpha$ gs Continuity maps in Neutrosophic topological spaces and also discussed about some properties and characterization of Neutrosophic  $\alpha$ gs Irresolute Maps.

**Keywords:** Neutrosophic  $\alpha$ -closed sets, Neutrosophic semi-closed sets, Neutrosophic  $\alpha$ gs-closed sets Neutrosophic  $\alpha$ gs Continuity maps, Neutrosophic  $\alpha$ gs irresolute maps

## 1. Introduction

Neutrosophic set theory concepts first initiated by F.Smarandache[11] which is Based on K. Atanassov's intuitionistic[6]fuzzy sets & L.A.Zadeh's [20]fuzzy sets. Also it defined by three parameters truth(T), indeterminacy (I),and falsity(F)-membership function. Smarandache's neutrosophic concept have wide range of real time applications for the fields of [1,2,3,4&5] Information Systems, Computer Science, Artificial Intelligence, Applied Mathematics, decision making. Mechanics, Electrical & Electronic, Medicine and Management Science etc.,

A.A.Salama[16] introduced Neutrosophic topological spaces by using Smarandache's Neutrosophic sets. I.Arokiaarani.[7] et.al., introduced Neutrosophic  $\alpha$ -closed sets.P. Ishwarya, [13]et.al., introduced and studied Neutrosophic semi-open sets in Neutrosophic topological spaces. Neutrosophic continuity functions introduced by A.A.Salama[15]. Neutrosophic  $\alpha$ gs-closed set[8] introduced by V.Banu priya&S.Chandrasekar. Aim of this present paper is, we introduce and investigate new kind of Neutrosophic continuity is called Neutrosophic  $\alpha$ gs Continuity maps in Neutrosophic topological spaces and also we discussed about properties and characterization Neutrosophic  $\alpha$ gs Irresolute Maps

## 2. PRELIMINARIES

In this section, we introduce the basic definition for Neutrosophic sets and its operations.

**Definition 2.1** [11]

Let E be a non-empty fixed set. A Neutrosophic set  $\lambda$  writing the format is

$$\lambda = \{ \langle e, \eta_\lambda(e), \sigma_\lambda(e), \gamma_\lambda(e) \rangle : e \in E \}$$

Where  $\eta_\lambda(e)$ ,  $\sigma_\lambda(e)$  and  $\gamma_\lambda(e)$  which represents Neutrosophic topological spaces the degree of membership function, indeterminacy and non-membership function respectively of each element  $e \in E$  to the set  $\lambda$ .

**Remark 2.2** [11]

A Neutrosophic set  $\lambda = \{ \langle e, \eta_\lambda(e), \sigma_\lambda(e), \gamma_\lambda(e) \rangle : e \in E \}$  can be identified to an ordered triple  $\langle \eta_\lambda, \sigma_\lambda, \gamma_\lambda \rangle$  in  $]-0,1+[$  on E.

**Remark 2.3**[11]

Neutrosophic set  $\lambda = \{ \langle e, \eta_\lambda(e), \sigma_\lambda(e), \gamma_\lambda(e) \rangle : e \in E \}$  our convenient we can write  $\lambda = \langle \eta_\lambda, \sigma_\lambda, \gamma_\lambda \rangle$ .

**Example 2.4** [11]

we must introduce the Neutrosophic set  $0_N$  and  $1_N$  in E as follows:

$0_N$  may be defined as:

$$(0_1) 0_N = \{ \langle e, 0, 0, 1 \rangle : e \in E \}$$

$$(0_2) 0_N = \{ \langle e, 0, 1, 1 \rangle : e \in E \}$$

$$(0_3) 0_N = \{ \langle e, 0, 1, 0 \rangle : e \in E \}$$

$$(0_4) 0_N = \{ \langle e, 0, 0, 0 \rangle : e \in E \}$$

$1_N$  may be defined as:

$$(1_1) 1_N = \{ \langle e, 1, 0, 0 \rangle : e \in E \}$$

$$(1_2) 1_N = \{ \langle e, 1, 0, 1 \rangle : e \in E \}$$

$$(1_3) 1_N = \{ \langle e, 1, 1, 0 \rangle : e \in E \}$$

$$(1_4) 1_N = \{ \langle e, 1, 1, 1 \rangle : e \in E \}$$

**Definition 2.5** [11]

Let  $\lambda = \langle \eta_\lambda, \sigma_\lambda, \gamma_\lambda \rangle$  be a Neutrosophic set on E, then  $\lambda^C$  defined as  $\lambda^C = \{ \langle e, \gamma_\lambda(e), 1 - \sigma_\lambda(e), \eta_\lambda(e) \rangle : e \in E \}$

**Definition 2.6** [11]

Let E be a non-empty set, and Neutrosophic sets  $\lambda$  and  $\mu$  in the form

$$\lambda = \{ \langle e, \eta_\lambda(e), \sigma_\lambda(e), \gamma_\lambda(e) \rangle : e \in E \} \text{ and}$$

$$\mu = \{ \langle e, \eta_\mu(e), \sigma_\mu(e), \gamma_\mu(e) \rangle : e \in E \}.$$

Then we consider definition for subsets ( $\lambda \subseteq \mu$ ).

$\lambda \subseteq \mu$  defined as:  $\lambda \subseteq \mu \Leftrightarrow \eta_\lambda(e) \leq \eta_\mu(e), \sigma_\lambda(e) \leq \sigma_\mu(e)$  and  $\gamma_\lambda(e) \geq \gamma_\mu(e)$  for all  $e \in E$

**Proposition 2.7** [11]

For any Neutrosophic set  $\lambda$ , then the following condition are holds:

$$(i) 0_N \subseteq \lambda, 0_N \subseteq 0_N$$

$$(ii) \lambda \subseteq 1_N, 1_N \subseteq 1_N$$

**Definition 2.8** [11]

Let E be a non-empty set, and  $\lambda = \langle e, \eta_\lambda(e), \sigma_\lambda(e), \gamma_\lambda(e) \rangle, \mu = \langle e, \eta_\mu(e), \sigma_\mu(e), \gamma_\mu(e) \rangle$  be two Neutrosophic sets. Then

$$(i) \lambda \cap \mu \text{ defined as } : \lambda \cap \mu = \langle e, \eta_\lambda(e) \wedge \eta_\mu(e), \sigma_\lambda(e) \wedge \sigma_\mu(e), \gamma_\lambda(e) \vee \gamma_\mu(e) \rangle$$

$$(ii) \lambda \cup \mu \text{ defined as } : \lambda \cup \mu = \langle e, \eta_\lambda(e) \vee \eta_\mu(e), \sigma_\lambda(e) \vee \sigma_\mu(e), \gamma_\lambda(e) \wedge \gamma_\mu(e) \rangle$$

**Proposition 2.9** [11]

For all  $\lambda$  and  $\mu$  are two Neutrosophic sets then the following condition are true:

$$(i) (\lambda \cap \mu)^C = \lambda^C \cup \mu^C$$

$$(ii) (\lambda \cup \mu)^C = \lambda^C \cap \mu^C.$$

**Definition 2.10** [16]

A Neutrosophic topology is a non-empty set E is a family  $\tau_N$  of Neutrosophic subsets in E satisfying the following axioms:

$$(i) 0_N, 1_N \in \tau_N,$$

$$(ii) G_1 \cap G_2 \in \tau_N \text{ for any } G_1, G_2 \in \tau_N,$$

$$(iii) \cup G_i \in \tau_N \text{ for any family } \{G_i \mid i \in J\} \subseteq \tau_N.$$

the pair  $(E, \tau_N)$  is called a Neutrosophic topological space.

The element Neutrosophic topological spaces of  $\tau_N$  are called Neutrosophic open sets.

A Neutrosophic set  $\lambda$  is closed if and only if  $\lambda^C$  is Neutrosophic open.

**Example 2.11** [16]

Let  $E = \{e\}$  and

$$A_1 = \{ \langle e, .6, .6, .5 \rangle : e \in E \}$$

$$A_2 = \{ \langle e, .5, .7, .9 \rangle : e \in E \}$$

$$A_3 = \{ \langle e, .6, .7, .5 \rangle : e \in E \}$$

$$A_4 = \{ \langle e, .5, .6, .9 \rangle : e \in E \}$$

Then the family  $\tau_N = \{0_N, 1_N, A_1, A_2, A_3, A_4\}$  is called a Neutrosophic topological space on E.

**Definition 2.12** [16]

Let  $(E, \tau_N)$  be Neutrosophic topological spaces and  $\lambda = \{ \langle e, \eta_\lambda(e), \sigma_\lambda(e), \gamma_\lambda(e) \rangle : e \in E \}$  be a Neutrosophic set in E.

Then the Neutrosophic closure and Neutrosophic interior of  $\lambda$  are defined by

$$\text{Neu-cl}(\lambda) = \cap \{D : D \text{ is a Neutrosophic closed set in } E \text{ and } \lambda \subseteq D\}$$

$$\text{Neu-int}(\lambda) = \cup \{C : C \text{ is a Neutrosophic open set in } E \text{ and } C \subseteq \lambda\}.$$

**Definition 2.13**

Let  $(E, \tau_N)$  be a Neutrosophic topological space. Then  $\lambda$  is called

$$(i) \text{ Neutrosophic regular Closed set [7] (Neu-RCS in short) if } \lambda = \text{Neu-Cl}(\text{Neu-Int}(\lambda)),$$

$$(ii) \text{ Neutrosophic } \alpha\text{-Closed set [7] (Neu-}\alpha\text{CS in short) if } \text{Neu-Cl}(\text{Neu-Int}(\text{Neu-Cl}(\lambda))) \subseteq \lambda,$$

$$(iii) \text{ Neutrosophic semi Closed set [13] (Neu-SCS in short) if } \text{Neu-Int}(\text{Neu-Cl}(\lambda)) \subseteq \lambda,$$

$$(iv) \text{ Neutrosophic pre Closed set [18] (Neu-PCS in short) if } \text{Neu-Cl}(\text{Neu-Int}(\lambda)) \subseteq \lambda,$$

**Definition 2.14**

Let  $(E, \tau_N)$  be a Neutrosophic topological space. Then  $\lambda$  is called

$$(i). \text{ Neutrosophic regular open set [7] (Neu-ROS in short) if } \lambda = \text{Neu-Int}(\text{Neu-Cl}(\lambda)),$$

$$(ii). \text{ Neutrosophic } \alpha\text{-open set [7] (Neu-}\alpha\text{OS in short) if } \lambda \subseteq \text{Neu-Int}(\text{Neu-Cl}(\text{Neu-Int}(\lambda))),$$

$$(iii). \text{ Neutrosophic semi open set [13] (Neu-SOS in short) if } \lambda \subseteq \text{Neu-Cl}(\text{Neu-Int}(\lambda)),$$

$$(iv). \text{ Neutrosophic pre open set [18] (Neu-POS in short) if } \lambda \subseteq \text{Neu-Int}(\text{Neu-Cl}(\lambda)),$$

**Definition 2.15**

Let  $(E, \tau_N)$  be a Neutrosophic topological space. Then  $\lambda$  is called

$$(i). \text{ Neutrosophic generalized closed set [9] (Neu-GCS in short) if } \text{Neu-cl}(\lambda) \subseteq U \text{ whenever } \lambda \subseteq U \text{ and } U \text{ is a Neu-}$$

- OS in  $E$ ,
- (ii).Neutrosophic generalized semi closed set[17] (Neu-GSCS in short) if  $\text{Neu-scl}(\lambda) \subseteq U$  Whenever  $\lambda \subseteq U$  and  $U$  is a Neu-OS in  $E$ ,
- (iii).Neutrosophic  $\alpha$  generalized closed set [14](Neu- $\alpha$ GCS in short) if  $\text{Neu-}\alpha\text{cl}(\lambda) \subseteq U$  whenever  $\lambda \subseteq U$  and  $U$  is a Neu-OS in  $E$ ,
- (iv).Neutrosophic generalized alpha closed set [10] (Neu-G $\alpha$ CS in short) if  $\text{Neu-}\alpha\text{cl}(\lambda) \subseteq U$  whenever  $\lambda \subseteq U$  and  $U$  is a Neu- $\alpha$ OS in  $E$ .

The complements of the above mentioned Neutrosophic closed sets are called their respective Neutrosophic open sets.

**Definition 2.16 [8]**

Let  $(E, \tau_N)$  be a Neutrosophic topological space. Then  $\lambda$  is called Neutrosophic  $\alpha$  generalized Semi closed set (Neu- $\alpha$ GSCS in short) if  $\text{Neu-}\alpha\text{cl}(\lambda) \subseteq U$  whenever  $\lambda \subseteq U$  and  $U$  is a Neu-SOS in  $E$

The complements of Neutrosophic  $\alpha$ GS closed sets is called Neutrosophic  $\alpha$ GS open sets.

**3. Neutrosophic ags-Continuity maps**

In this section we Introduce Neutrosophic  $\alpha$ -generalized semi continuity maps and study some of its properties.

**Definition 3.1.**

A maps  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  is called a Neutrosophic  $\alpha$ -generalized semi continuity(Neu- $\alpha$ GS continuity in short)  $f^{-1}(\mu)$  is a Neu- $\alpha$ GSCS in  $(E_1, \tau_N)$  for every Neu-CS  $\mu$  of  $(E_2, \sigma_N)$

**Example 3.2.**

Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.7, .5, .8), (.5, .5, .4) \rangle$  and  $V = \langle e_2, (1, .5, .9), (.2, .5, .3) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively.

Define a maps  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Then  $f$  is a Neu- $\alpha$ GS continuity maps.

**Theorem 3.3.**

Every Neu-continuity maps is a Neu- $\alpha$ GS continuity maps.

**Proof.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu-continuity maps. Let  $\lambda$  be a Neu-CS in  $E_2$ . Since  $f$  is a Neu-continuity maps,  $f^{-1}(\lambda)$  is a Neu-CS in  $E_1$ . Since every Neu-CS is a Neu- $\alpha$ GSCS,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ . Hence  $f$  is a Neu- $\alpha$ GS continuity maps.

**Example 3.4.**

Neu- $\alpha$ GS continuity maps is not Neu-continuity maps

Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.5, .5, .3), (.7, .5, .8) \rangle$  and  $V = \langle e_2, (.4, .5, .3), (.8, .5, .9) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic sets on  $E_1$  and  $E_2$  respectively. Define a maps  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Since the Neutrosophic set  $\lambda = \langle y, (.3, .5, .4), (.9, .5, .8) \rangle$  is Neu-CS in  $E_2$ ,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS but not Neu-CS in  $E_1$ . Therefore  $f$  is a Neu- $\alpha$ GS continuity maps but not a Neu-continuity maps.

**Theorem 3.5.**

Every Neu- $\alpha$  continuity maps is a Neu- $\alpha$ GS continuity maps.

**Proof.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$  continuity maps. Let  $\lambda$  be a Neu-CS in  $E_2$ . Then by hypothesis  $f^{-1}(\lambda)$  is a Neu- $\alpha$ CS in  $E_1$ . Since every Neu- $\alpha$ CS is a Neu- $\alpha$ GSCS,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ . Hence  $f$  is a Neu- $\alpha$ GS continuity maps.

**Example 3.6.**

Neu- $\alpha$ GS continuity maps is not Neu- $\alpha$  continuity maps

Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.5, .5, .6), (.7, .5, .6) \rangle$  and  $V = \langle e_2, (.3, .5, .9), (.5, .5, .7) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively. Define a maps  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Since the Neutrosophic set  $\lambda = \langle e_2, (.9, .5, .3), (.7, .5, .5) \rangle$  is Neu-CS in  $E_2$ ,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS continuity maps.

**Remark 3.7.**

Neu-G continuity maps and Neu- $\alpha$ GS continuity maps are independent of each other.

**Example 3.8.**

Neu- $\alpha$ GS continuity maps is not Neu-G continuity maps.

Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.5, .5, .6), (.8, .5, .4) \rangle$  and  $V = \langle e_2, (.7, .5, .4), (.9, .5, .3) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively. Define a maps  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Then  $f$  is Neu- $\alpha$ GS continuity maps but not Neu-G continuity maps.

Since  $\lambda = \langle e_1, (.4, .5, .7), (.3, .5, .9) \rangle$  is Neu-CS in  $E_2$ ,  $f^{-1}(\lambda) = \langle e_2, (.4, .5, .7), (.7, .5, .3) \rangle$  is not Neu-GCS in  $E_1$ .

**Example 3.9.**

Neu-G continuity maps is not Neu- $\alpha$ GS continuity maps.

Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.6, .5, .4), (.8, .5, .2) \rangle$  and  $V = \langle e_2, (.3, .5, .7), (.1, .5, .9) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively. Define a maps  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Then  $f$  is Neu-G continuity maps but not a Neu- $\alpha$ GS continuity maps.

Since  $\lambda = \langle e_2, (.7, .5, .3), (.9, .5, .1) \rangle$  is Neu-CS in  $E_2$ ,  $f^{-1}(\lambda) = \langle e_1, (.7, .5, .3), (.9, .5, .1) \rangle$  is not Neu- $\alpha$ GSCS in  $E_1$ .

**Theorem 3.10.**

Every Neu- $\alpha$ GS continuity maps is a Neu-GS continuity maps.

**Proof.**

Let  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$ GS continuity maps. Let  $\lambda$  be a Neu-CS in  $E_2$ . Then by hypothesis  $f^{-1}(\lambda)$  Neu- $\alpha$ GSCS in  $E_1$ . Since every Neu- $\alpha$ GSCS is a Neu-GSCS,  $f^{-1}(\lambda)$  is a Neu-GSCS in  $E_1$ . Hence  $f$  is a Neu-GS continuity maps.

**Example 3.11.**

Neu-GS continuity maps is not Neu- $\alpha$ GS continuity maps.

Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.8, .5, .4), (.9, .5, .2) \rangle$  and  $V = \langle e_2, (.3, .5, .9), (0.1, .5, .9) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively. Define a maps  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Since the Neutrosophic set  $\lambda = \langle e_2, (.9, .5, .3), (.9, .5, .1) \rangle$  is Neu-CS in  $E_2$ ,  $f^{-1}(\lambda)$  is Neu-GSCS in  $E_1$  but not Neu- $\alpha$ GSCS in  $E_1$ . Therefore  $f$  is a Neu-GS continuity maps but not a Neu- $\alpha$ GS continuity maps.

**Remark 3.12.**

Neu-P continuity maps and Neu- $\alpha$ GS continuity maps are independent of each other.

**Example 3.13.**

Neu-P continuity maps is not Neu- $\alpha$ GS continuity maps Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.3, .5, .7), (.4, .5, .6) \rangle$  and  $V = \langle e_2, (.8, .5, .3), (.9, .5, .2) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively. Define a maps  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Since the Neutrosophic set  $\lambda = \langle e_2, (.3, .5, .8), (.2, .5, .9) \rangle$  is Neu-CS in  $E_2$ ,  $f^{-1}(\lambda)$  is Neu-PCS in  $E_1$  but not Neu- $\alpha$ GSCS in  $E_1$ . Therefore  $f$  is a Neu-P continuity maps but not Neu- $\alpha$ GS continuity maps.

**Example 3.14.**

Neu- $\alpha$ GS continuity maps is not Neu-P continuity maps

Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.4, .5, .8), (.5, .5, .7) \rangle$  and  $V = \langle e_1, (.5, .5, .7), (.6, .5, .6) \rangle$  and  $W = \langle e_2, (.8, .5, .4), (.5, .5, .7) \rangle$ . Then  $\tau_N = \{0_N, U, V, 1_N\}$  and  $\sigma_N = \{0_N, W, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively. Define a maps  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Since the Neutrosophic set  $\lambda = \langle y, (.4, .5, .8), (.7, .5, .5) \rangle$  is Neu- $\alpha$ GSCS but not Neu-PCS in  $E_2$ ,  $f^{-1}(\lambda)$  is Neu- $\alpha$ GSCS in  $E_1$  but not Neu-PCS in  $E_1$ . Therefore  $f$  is a Neu- $\alpha$ GS continuity maps but not Neu-P continuity maps.

**Theorem 3.15.**

Every Neu- $\alpha$ GS continuity maps is a Neu- $\alpha$ G continuity maps.

**Proof.**

Let  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$ GS continuity maps. Let  $\lambda$  be a Neu-CS in  $E_2$ . Since  $f$  is Neu- $\alpha$ GS continuity maps,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ . Since every Neu- $\alpha$ GSCS is a Neu- $\alpha$ GCS,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GCS in  $E_1$ . Hence  $f$  is a Neu- $\alpha$ G continuity maps.

**Example 3.16.**

Neu- $\alpha$ G continuity maps is not Neu- $\alpha$ GS continuity maps

Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.1, .5, .7), (.3, .5, .6) \rangle$  and  $V = \langle e_2, (.7, .5, .4), (.6, .5, .5) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively. Define a maps  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Since the Neutrosophic set  $\lambda = \langle e_2, (.4, .5, .7), (.5, .5, .6) \rangle$  is Neu-CS in  $E_2$ ,  $f^{-1}(\lambda)$  is Neu- $\alpha$ GCS in  $E_1$  but not Neu- $\alpha$ GSCS in  $E_1$ . Therefore  $f$  is a Neu- $\alpha$ G continuity maps but not a Neu- $\alpha$ GS continuity maps.

**Theorem 3.17.**

Every Neu- $\alpha$ GS continuity maps is a Neu-G $\alpha$  continuity maps.

**Proof.**

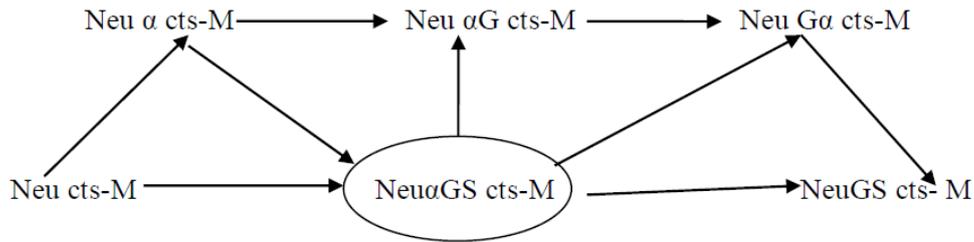
Let  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$ GS continuity maps. Let  $\lambda$  be a Neu-CS in  $E_2$ . Since  $f$  is Neu- $\alpha$ GS continuity maps,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ . Since every Neu- $\alpha$ GSCS is a Neu-G $\alpha$ CS,  $f^{-1}(\lambda)$  is a Neu-G $\alpha$ CS in  $E_1$ . Hence  $f$  is a Neu-G $\alpha$  continuity maps.

**Example 3.18.**

Neu-G $\alpha$  continuity maps is not Neu- $\alpha$ GS continuity maps Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.5, .5, .7), (.3, .5, .9) \rangle$  and  $V = \langle e_2, (.6, .5, .6), (.5, .5, .7) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively. Define a maps  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Since the Neutrosophic set  $\lambda = \langle y, (.6, .5, .6), (.7, .5, .5) \rangle$  is Neu-CS in  $E_2$ ,  $f^{-1}(\lambda)$  is Neu-G $\alpha$ CS in  $E_1$  but not Neu- $\alpha$ GSCS in  $E_1$ . Therefore  $f$  is a Neu-G $\alpha$  continuity maps but not a Neu- $\alpha$ GS continuity maps.

**Remark 3.19.**

We obtain the following diagram from the results we discussed above.



**Theorem 3.20.**

A maps  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  is Neu- $\alpha$ GS continuity if and only if the inverse image of each Neutrosophic set in  $E_2$  is a Neu- $\alpha$ GSOS in  $E_1$ .

**Proof.**

first part Let  $\lambda$  be a Neutrosophic set in  $E_2$ . This implies  $\lambda^c$  is Neu-CS in  $E_2$ . Since  $f$  is Neu- $\alpha$ GS continuity,  $f^{-1}(\lambda^c)$  is Neu- $\alpha$ GSCS in  $E_1$ . Since  $f^{-1}(\lambda^c) = (f^{-1}(\lambda))^c$ ,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSOS in  $E_1$ .

Converse part Let  $\lambda$  be a Neu-CS in  $E_2$ . Then  $\lambda^c$  is a Neutrosophic set in  $E_2$ . By hypothesis  $f^{-1}(\lambda^c)$  is Neu- $\alpha$ GSOS in  $E_1$ . Since  $f^{-1}(\lambda^c) = (f^{-1}(\lambda))^c$ ,  $(f^{-1}(\lambda))^c$  is a Neu- $\alpha$ GSOS in  $E_1$ . Therefore  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ . Hence  $f$  is Neu- $\alpha$ GS continuity.

**Theorem 3.21.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a maps and  $f^{-1}(\lambda)$  be a Neu-RCS in  $E_1$  for every Neu-CS  $\lambda$  in  $E_2$ . Then  $f$  is a Neu- $\alpha$ GS continuity maps.

**Proof.**

Let  $\lambda$  be a Neu-CS in  $E_2$  and  $f^{-1}(\lambda)$  be a Neu-RCS in  $E_1$ . Since every Neu-RCS is a Neu- $\alpha$ GSCS,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ . Hence  $f$  is a Neu- $\alpha$ GS continuity maps.

**Definition 3.22.**

A Neutrosophic Topology  $(E, \tau_N)$  is said to be an

- (i) Neu- $\alpha_{ga}U_{1/2}$  (in short Neu- $\alpha_{ga}U_{1/2}$ ) space, if every Neu- $\alpha$ GSCS in  $E$  is a Neu-CS in  $E$ ,
- (ii) Neu- $\alpha_{gb}U_{1/2}$  (in short Neu- $\alpha_{gb}U_{1/2}$ ) space, if every Neu- $\alpha$ GSCS in  $E$  is a Neu-GCS in  $E$ ,
- (iii) Neu- $\alpha_{gc}U_{1/2}$  (in short Neu- $\alpha_{gc}U_{1/2}$ ) space, if every Neu- $\alpha$ GSCS in  $E$  is a Neu-GSCS in  $E$ .

**Theorem 3.23.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$ GS continuity maps, then  $f$  is a Neu-continuity maps if  $E_1$  is a Neu- $\alpha_{ga}U_{1/2}$  space.

**Proof.**

Let  $\lambda$  be a Neu-CS in  $E_2$ . Then  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ , by hypothesis. Since  $E_1$  is a Neu- $\alpha_{ga}U_{1/2}$ ,  $f^{-1}(\lambda)$  is a Neu-CS in  $E_1$ . Hence  $f$  is a Neu-continuity maps.

**Theorem 3.24.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$ GS continuity maps, then  $f$  is a Neu-G continuity maps if  $E_1$  is a Neu- $\alpha_{gb}U_{1/2}$  space.

**Proof.**

Let  $\lambda$  be a Neu-CS in  $E_2$ . Then  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ , by hypothesis. Since  $E_1$  is a Neu- $\alpha_{gb}U_{1/2}$ ,  $f^{-1}(\lambda)$  is a Neu-GCS in  $E_1$ . Hence  $f$  is a Neu-G continuity maps.

**Theorem 3.25.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$ GS continuity maps, then  $f$  is a Neu-GS continuity maps if  $E_1$  is a Neu- $\alpha_{gc}U_{1/2}$  space.

**Proof.**

Let  $\lambda$  be a Neu-CS in  $E_2$ . Then  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ , by hypothesis. Since  $E_1$  is a Neu- $\alpha_{gc}U_{1/2}$ ,  $f^{-1}(\lambda)$  is a Neu-GSCS in  $E_1$ . Hence  $f$  is a Neu-GS continuity maps.

**Theorem 3.26.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$ GS continuity maps and  $g:(E_2, \sigma_N) \rightarrow (E_3, \rho_N)$  be an Neutrosophic continuity, then  $g \circ f:(E_1, \tau_N) \rightarrow (E_3, \rho_N)$  is a Neu- $\alpha$ GS continuity.

**Proof.**

Let  $\lambda$  be a Neu-CS in  $E_3$ . Then  $g^{-1}(\lambda)$  is a Neu-CS in  $E_2$ , by hypothesis. Since  $f$  is a Neu- $\alpha$ GS continuity maps,  $f^{-1}(g^{-1}(\lambda))$  is a Neu- $\alpha$ GSCS in  $E_1$ . Hence  $g \circ f$  is a Neu- $\alpha$ GS continuity maps.

**Theorem 3.27.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a maps from Neutrosophic Topology in  $E_1$  into a Neutrosophic Topology  $E_2$ . Then the following conditions set are equivalent if  $E_1$  is a Neu- $\alpha_{ga}U_{1/2}$  space.

- (i)  $f$  is a Neu- $\alpha$ GS continuity maps.
- (ii) if  $\mu$  is a Neutrosophic set in  $E_2$  then  $f^{-1}(\mu)$  is a Neu- $\alpha$ GSOS in  $E_1$ .
- (iii)  $f^{-1}(\text{Neu-int}(\mu)) \subseteq \text{Neu-int}(\text{Neu-Cl}(\text{Neu-int}(f^{-1}(\mu))))$  for every Neutrosophic set  $\mu$  in  $E_2$ .

**Proof.**

(i)  $\rightarrow$  (ii): is obviously true.

(ii)  $\rightarrow$  (iii): Let  $\mu$  be any Neutrosophic set in  $E_2$ . Then  $\text{Neu-int}(\mu)$  is a Neutrosophic set in  $E_2$ . Then  $f^{-1}(\text{Neu-int}(\mu))$  is a  $\text{Neu-}\alpha\text{GSOS}$  in  $E_1$ . Since  $E_1$  is a  $\text{Neu-}\alpha\text{U}_{1/2}$  space,  $f^{-1}(\text{Neu-int}(\mu))$  is a Neutrosophic set in  $E_1$ . Therefore  $f^{-1}(\text{Neu-int}(\mu)) = \text{Neu-int}(f^{-1}(\text{Neu-int}(\mu))) \subseteq \text{Neu-int}(\text{Neu-Cl}(\text{Neu-int}(f^{-1}(\mu))))$ .

(iii)  $\rightarrow$  (i) Let  $\mu$  be a  $\text{Neu-CS}$  in  $E_2$ . Then its complement  $\mu^c$  is a Neutrosophic set in  $E_2$ . By Hypothesis  $f^{-1}(\text{Neu-int}(\mu^c)) \subseteq \text{Neu-int}(\text{Neu-Cl}(\text{Neu-int}(f^{-1}(\text{Neu-int}(\mu^c)))))$ . This implies that  $f^{-1}(\mu^c) \subseteq \text{Neu-int}(\text{Neu-Cl}(\text{Neu-int}(f^{-1}(\text{Neu-int}(\mu^c)))))$ . Hence  $f^{-1}(\mu^c)$  is a  $\text{Neu-}\alpha\text{OS}$  in  $E_1$ . Since every  $\text{Neu-}\alpha\text{OS}$  is a  $\text{Neu-}\alpha\text{GSOS}$ ,  $f^{-1}(\mu^c)$  is a  $\text{Neu-}\alpha\text{GSOS}$  in  $E_1$ . Therefore  $f^{-1}(\mu)$  is a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_1$ . Hence  $f$  is a  $\text{Neu-}\alpha\text{GS}$  continuity maps.

**Theorem 3.28.**

Let  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a maps. Then the following conditions set are equivalent if  $E_1$  is a  $\text{Neu-}\alpha\text{U}_{1/2}$  space.

(i)  $f$  is a  $\text{Neu-}\alpha\text{GS}$  continuity maps.

(ii)  $f^{-1}(\lambda)$  is a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_1$  for every  $\text{Neu-CS}$   $\lambda$  in  $E_2$ .

(iii)  $\text{Neu-Cl}(\text{Neu-int}(\text{Neu-Cl}(f^{-1}(\lambda)))) \subseteq f^{-1}(\text{Neu-Cl}(\lambda))$  for every Neutrosophic set  $\lambda$  in  $E_2$ .

**Proof.**

(i)  $\rightarrow$  (ii): is obviously true.

(ii)  $\rightarrow$  (iii): Let  $\lambda$  be a Neutrosophic set in  $E_2$ . Then  $\text{Neu-Cl}(\lambda)$  is a  $\text{Neu-CS}$  in  $E_2$ . By hypothesis,  $f^{-1}(\text{Neu-Cl}(\lambda))$  is a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_1$ . Since  $E_1$  is a  $\text{Neu-}\alpha\text{U}_{1/2}$  space,  $f^{-1}(\text{Neu-Cl}(\lambda))$  is a  $\text{Neu-CS}$  in  $E_1$ . Therefore  $\text{Neu-Cl}(f^{-1}(\text{Neu-Cl}(\lambda))) = f^{-1}(\text{Neu-Cl}(\lambda))$ . Now  $\text{Neu-Cl}(\text{Neu-int}(\text{Neu-Cl}(f^{-1}(\lambda)))) \subseteq \text{Neu-Cl}(\text{Neu-int}(\text{Neu-Cl}(f^{-1}(\text{Neu-Cl}(\lambda)))) \subseteq f^{-1}(\text{Neu-Cl}(\lambda))$ .

(iii)  $\rightarrow$  (i): Let  $\lambda$  be a  $\text{Neu-CS}$  in  $E_2$ . By hypothesis  $\text{Neu-Cl}(\text{Neu-int}(\text{Neu-Cl}(f^{-1}(\lambda)))) \subseteq f^{-1}(\text{Neu-Cl}(\lambda)) = f^{-1}(\lambda)$ . This implies  $f^{-1}(\lambda)$  is a  $\text{Neu-}\alpha\text{CS}$  in  $E_1$  and hence it is a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_1$ . Therefore  $f$  is a  $\text{Neu-}\alpha\text{GS}$  continuity maps.

**Definition 3.29.**

Let  $(E, \tau_N)$  be a Neutrosophic topology. The Neutrosophic alpha generalized semi closure ( $\text{Neu-}\alpha\text{GSCl}(\lambda)$  in short) for any Neutrosophic set  $\lambda$  is Defined as follows.  $\text{Neu-}\alpha\text{GSCl}(\lambda) = \bigcap \{ K \mid K \text{ is a } \text{Neu-}\alpha\text{GSCS} \text{ in } E_1 \text{ and } \lambda \subseteq K \}$ . If  $\lambda$  is  $\text{Neu-}\alpha\text{GSCS}$ , then  $\text{Neu-}\alpha\text{GSCl}(\lambda) = \lambda$ .

**Theorem 3.30.**

Let  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a  $\text{Neu-}\alpha\text{GS}$  continuity maps. Then the following conditions set are hold.

(i)  $f(\text{Neu-}\alpha\text{GSCl}(\lambda)) \subseteq \text{Neu-Cl}(f(\lambda))$ , for every Neutrosophic set  $\lambda$  in  $E_1$ .

(ii)  $\text{Neu-}\alpha\text{GSCl}(f^{-1}(\mu)) \subseteq f^{-1}(\text{Neu-Cl}(\mu))$ , for every Neutrosophic set  $\mu$  in  $E_2$ .

**Proof.**

(i) Since  $\text{Neu-Cl}(f(\lambda))$  is a  $\text{Neu-CS}$  in  $E_2$  and  $f$  is a  $\text{Neu-}\alpha\text{GS}$  continuity maps,  $f^{-1}(\text{Neu-Cl}(f(\lambda)))$  is  $\text{Neu-}\alpha\text{GSCS}$  in  $E_1$ . That is  $\text{Neu-}\alpha\text{GSCl}(\lambda) \subseteq f^{-1}(\text{Neu-Cl}(f(\lambda)))$ . Therefore  $f(\text{Neu-}\alpha\text{GSCl}(\lambda)) \subseteq \text{Neu-Cl}(f(\lambda))$ , for every Neutrosophic set  $\lambda$  in  $E_1$ .

(ii) Replacing  $\lambda$  by  $f^{-1}(\mu)$  in (i) we get  $f(\text{Neu-}\alpha\text{GSCl}(f^{-1}(\mu))) \subseteq \text{Neu-Cl}(f(f^{-1}(\mu))) \subseteq \text{Neu-Cl}(\mu)$ . Hence  $\text{Neu-}\alpha\text{GSCl}(f^{-1}(\mu)) \subseteq f^{-1}(\text{Neu-Cl}(\mu))$ , for every Neutrosophic set  $\mu$  in  $E_2$ .

**4. Neutrosophic  $\alpha$ -Generalized Semi Irresolute Maps**

In this section we Introduce Neutrosophic  $\alpha$ -generalized semi irresolute maps and study some of its characterizations.

**Definition 4.1.**

A maps  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  is called a Neutrosophic alpha-generalized semi irresolute ( $\text{Neu-}\alpha\text{GS}$  irresolute) maps if  $f^{-1}(\lambda)$  is a  $\text{Neu-}\alpha\text{GSCS}$  in  $(E_1, \tau_N)$  for every  $\text{Neu-}\alpha\text{GSCS}$   $\lambda$  of  $(E_2, \sigma_N)$

**Theorem 4.2.**

Let  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a  $\text{Neu-}\alpha\text{GS}$  irresolute, then  $f$  is a  $\text{Neu-}\alpha\text{GS}$  continuity maps.

**Proof.**

Let  $f$  be a  $\text{Neu-}\alpha\text{GS}$  irresolute maps. Let  $\lambda$  be any  $\text{Neu-CS}$  in  $E_2$ . Since every  $\text{Neu-CS}$  is a  $\text{Neu-}\alpha\text{GSCS}$ ,  $\lambda$  is a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_2$ . By hypothesis  $f^{-1}(\lambda)$  is a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_2$ . Hence  $f$  is a  $\text{Neu-}\alpha\text{GS}$  continuity maps.

**Example 4.3.**

$\text{Neu-}\alpha\text{GS}$  continuity maps is not  $\text{Neu-}\alpha\text{GS}$  irresolute maps.

Let  $E_1 = \{a_1, a_2\}$ ,  $E_2 = \{b_1, b_2\}$ ,  $U = \langle e_1, (.4, .5, .7), (.5, .5, .6) \rangle$  and  $V = \langle e_2, (.8, .5, .3), (.4, .6, .7) \rangle$ . Then  $\tau_N = \{0_N, U, 1_N\}$  and  $\sigma_N = \{0_N, V, 1_N\}$  are Neutrosophic Topologies on  $E_1$  and  $E_2$  respectively. Define a maps  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  by  $f(a_1) = b_1$  and  $f(a_2) = b_2$ . Then  $f$  is a  $\text{Neu-}\alpha\text{GS}$  continuity. We have  $\mu = \langle e_2, (.2, .5, .9), (.6, .5, .5) \rangle$  is a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_2$  but  $f^{-1}(\mu)$  is not a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_1$ . Therefore  $f$  is not a  $\text{Neu-}\alpha\text{GS}$  irresolute maps.

**Theorem 4.4.**

Let  $f: (E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a  $\text{Neu-}\alpha\text{GS}$  irresolute, then  $f$  is a Neutrosophic irresolute maps if  $E_1$  is a  $\text{Neu-}\alpha\text{U}_{1/2}$  space.

**Proof.**

Let  $\lambda$  be a  $\text{Neu-CS}$  in  $E_2$ . Then  $\lambda$  is a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_2$ . Therefore  $f^{-1}(\lambda)$  is a  $\text{Neu-}\alpha\text{GSCS}$  in  $E_1$ , by hypothesis. Since  $E_1$  is a  $\text{Neu-}\alpha\text{U}_{1/2}$  space,  $f^{-1}(\lambda)$  is a  $\text{Neu-CS}$  in  $E_1$ . Hence  $f$  is a Neutrosophic irresolute maps.

**Theorem 4.5.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  and  $g:(E_2, \sigma_N) \rightarrow (E_3, \rho_N)$  be Neu- $\alpha$ GS irresolute maps, then  $g \circ f:(E_1, \tau_N) \rightarrow (E_3, \rho_N)$  is a Neu- $\alpha$ GS irresolute maps.

**Proof.**

Let  $\lambda$  be a Neu- $\alpha$ GSCS in  $E_3$ . Then  $g^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_2$ . Since  $f$  is a Neu- $\alpha$ GS irresolute maps.  $f^{-1}((g^{-1}(\lambda)))$  is a Neu- $\alpha$ GSCS in  $E_1$ . Hence  $g \circ f$  is a Neu- $\alpha$ GS irresolute maps.

**Theorem 4.6.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$ GS irresolute and  $g:(E_2, \sigma_N) \rightarrow (E_3, \rho_N)$  be Neu- $\alpha$ GS continuity maps, then  $g \circ f:(E_1, \tau_N) \rightarrow (E_3, \rho_N)$  is a Neu- $\alpha$ GS continuity maps.

**Proof.**

Let  $\lambda$  be a Neu-CS in  $E_3$ . Then  $g^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_2$ . Since  $f$  is a Neu- $\alpha$ GS irresolute,  $f^{-1}((g^{-1}(\lambda)))$  is a Neu- $\alpha$ GSCS in  $E_1$ . Hence  $g \circ f$  is a Neu- $\alpha$ GS continuity maps.

**Theorem 4.7.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a Neu- $\alpha$ GS irresolute, then  $f$  is a Neu-G irresolute maps if  $E_1$  is a Neu- $\alpha_{gb}U_{1/2}$  space.

**Proof.**

Let  $\lambda$  be a Neu- $\alpha$ GSCS in  $E_2$ . By hypothesis,  $f^{-1}(\lambda)$  is a Neu- $\alpha$ GSCS in  $E_1$ . Since  $E_1$  is a Neu- $\alpha_{gb}U_{1/2}$  space,  $f^{-1}(\lambda)$  is a Neu-GCS in  $E_1$ . Hence  $f$  is a Neu-G irresolute maps.

**Theorem 4.8.**

Let  $f:(E_1, \tau_N) \rightarrow (E_2, \sigma_N)$  be a maps from a Neutrosophic Topology  $E_1$  Into a Neutrosophic Topology  $E_2$ . Then the following conditions set are equivalent if  $E_1$  and  $E_2$  are Neu- $\alpha_{ga}U_{1/2}$  spaces.

(i)  $f$  is a Neu- $\alpha$ GS irresolute maps.

(ii)  $f^{-1}(\mu)$  is a Neu- $\alpha$ GSOS in  $E_1$  for each Neu- $\alpha$ GSOS  $\mu$  in  $E_2$ .

(iii)  $\text{Neu-Cl}(f^{-1}(\mu)) \subseteq f^{-1}(\text{Neu-Cl}(\mu))$  for each Neutrosophic set  $\mu$  of  $E_2$ .

**Proof.**

(i)  $\rightarrow$  (ii) : Let  $\mu$  be any Neu- $\alpha$ GSOS in  $E_2$ . Then  $\mu^c$  is a Neu- $\alpha$ GSCS in  $E_2$ . Since  $f$  is Neu- $\alpha$ GS irresolute,  $f^{-1}(\mu^c)$  is a Neu- $\alpha$ GSCS in  $E_1$ . But  $f^{-1}(\mu^c) = (f^{-1}(\mu))^c$ . Therefore  $f^{-1}(\mu)$  is a Neu- $\alpha$ GSOS in  $E_1$ .

(ii)  $\rightarrow$  (iii) : Let  $\mu$  be any Neutrosophic set in  $E_2$  and  $\mu \subseteq \text{Neu-Cl}(\mu)$ . Then  $f^{-1}(\mu) \subseteq f^{-1}(\text{Neu-Cl}(\mu))$ . Since  $\text{Neu-Cl}(\mu)$  is a Neu-CS in  $E_2$ ,  $\text{Neu-Cl}(\mu)$  is a Neu- $\alpha$ GSCS in  $E_2$ . Therefore  $(\text{Neu-Cl}(\mu))^c$  is a Neu- $\alpha$ GSOS in  $E_2$ . By hypothesis,  $f^{-1}((\text{Neu-Cl}(\mu))^c)$  is a Neu- $\alpha$ GSOS in  $E_1$ . Since  $f^{-1}((\text{Neu-Cl}(\mu))^c) = (f^{-1}(\text{Neu-Cl}(\mu)))^c$ ,  $f^{-1}(\text{Neu-Cl}(\mu))$  is a Neu- $\alpha$ GSCS in  $E_1$ . Since  $E_1$  is Neu- $\alpha_{ga}U_{1/2}$  space,  $f^{-1}(\text{Neu-Cl}(\mu))$  is a Neu-CS in  $E_1$ . Hence  $\text{Neu-Cl}(f^{-1}(\mu)) \subseteq \text{Neu-Cl}(f^{-1}(\text{Neu-Cl}(\mu))) = f^{-1}(\text{Neu-Cl}(\mu))$ . That is  $\text{Neu-Cl}(f^{-1}(\mu)) \subseteq f^{-1}(\text{Neu-Cl}(\mu))$ .

(iii)  $\rightarrow$  (i) : Let  $\mu$  be any Neu- $\alpha$ GSCS in  $E_2$ . Since  $E_2$  is Neu- $\alpha_{ga}U_{1/2}$  space,  $\mu$  is a Neu-CS in  $E_2$  and  $\text{Neu-Cl}(\mu) = \mu$ . Hence  $f^{-1}(\mu) = f^{-1}(\text{Neu-Cl}(\mu)) \supseteq \text{Neu-Cl}(f^{-1}(\mu))$ . But clearly  $f^{-1}(\mu) \subseteq \text{Neu-Cl}(f^{-1}(\mu))$ . Therefore  $\text{Neu-Cl}(f^{-1}(\mu)) = f^{-1}(\mu)$ . This implies  $f^{-1}(\mu)$  is a Neu-CS and hence it is a Neu- $\alpha$ GSCS in  $E_1$ . Thus  $f$  is a Neu- $\alpha$ GS irresolute maps.

**Conclusion**

In this research paper using Neu- $\alpha$ GSCS (Neutrosophic  $\alpha$ gs-closed sets) we are defined Neu- $\alpha$ GS continuity maps and analyzed its properties. After that we were compared already existing Neutrosophic continuity maps to Neu- $\alpha$ GSCS continuity maps. Furthermore we were extended to this maps to Neu- $\alpha$ GS irresolute maps, Finally This concepts can be extended to future Research for some mathematical applications.

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