iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** III **Month of publication:** March 2024

DOI: https://doi.org/10.22214/ijraset.2024.58868

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue III Mar 2024- Available at www.ijraset.com

Some Structures of Neutrosophic Fuzzy Relations over Neutrosophic Fuzzy Sets

P. Geethanjali[1], V. Shalini[2]
[1]*Assistant Professor,* [2]*PG Scholar, PG and Research Department of Mathematics, Cauvery College for Women(Autonomous), Trichy-18*

Abstract: ***Neutrosophic fuzzy relations are crucial in real-world situations when uncertainties exist regarding the truth, indeterminacy, and falsity membership degrees of an element. The topic is attracting a lot of attention from academics these days since it makes use of neutrosophic fuzzy relations, which facilitate and expedite decision-making. For instance, neutrosophic fuzzy relations over neutrosophic fuzzy sets are defined in this paper. The neutrosophic fuzzy relations over neutrosophic fuzzy sets are characterized in terms of several features. Finally, a few properties of the fuzzy relations over a neutrosophic fuzzy set are investigated.***

Keywords: ***Neutrosophic Fuzzy Sets, Neutrosophic Fuzzy Relations, Neutrosophic Fuzzy Inverse Relations.***

I. INTRODUCTION

L.A. Zadeh [25] invented fuzzy set theory, and Atanassov [1] developed the intuitionistic fuzzy set and fuzzy set extension. An element can include membership degrees of truth, indeterminacy, and falsity, since it is an extension of an intuitionistic fuzzy set. Nevertheless, neutrosophic fuzzy sets have been the subject of current attention for a number of educators. Since the neutrosophic fuzzy set was developed, it has been recognized as a powerful mathematical method that functions well in situations where there are more yeses, absence, no, and rejection replies in human perspectives. Kaufmann[18] and Zadeh[26] were the next to construct fuzzy relations. Kalaiarasi and Geethanjali [14][15] have also expressed fuzzy graphs concept.

Several authors have also looked into it, such as Zimmerman [27] and Klir and Yaun [19]. Many academics have now used it extensively in other fields, such as fuzzy reasoning, fuzzy control, fuzzy comprehensive evaluation[21][11][9], medical diagnostics, clustering analysis, and decision-making [2] [5] [24] [22]. Bruillo and Bustince gave the definition of intuitionistic fuzzy relations[4][3] and discussed some of its features. More study on intuitionistic fuzzy relations and their composition operation was done in 2005 by Lei et al[20]. In 2005, it was also shown that there are fourteen intuitionistic fuzzy relations and how they are composed. Yang developed the idea of intuitionistic fuzzy relation[23] kernels and closures in addition to demonstrating fourteen intuitionistic fuzzy relation theorems. Kalaiarasi and Mahalakshmi [16][17] gave the definition of strong fuzzy graph and discussed some of its features. Kalaiarasi and Divya[12][13] have also expressed fuzzy graph concept.

B.C. Cuong established the idea of neutrosophic fuzzy relations and looked into some of its related properties[6][7]. In this paper, we define the neutrosophic fuzzy relation over the neutrosophic fuzzy set. Examples of various processes utilizing this neutrosophic fuzzy relation are given.

This article is organized as follows: Section 2 presents some preliminary findings that are necessary to comprehend the remainder of the article. In section 3, some structural features of neutrosophic fuzzy relations over neutrosophic fuzzy sets are illustrated. Section 4 describes some properties of neutrosophic fuzzy relations in neutrosophic fuzzy sets. Lastly, a few characteristics of the neutrosophic fuzzy relations over a neutrosophic fuzzy set are explored.

II. PRELIMINARIES

A. *Definition 2.1[25]*

Let X be non-empty set. A set A in X is given by

$$A = \{ (x, \mu_A(x)) : x \in X \},$$

Where $\mu_A : X \to [0,1]$.

B. Definition 2.2[1]

An intuitionistic fuzzy set A in X is given by

$$A=\{(x,\mu_A(x),\nu_A(x)):x\in X\},$$

Where $\mu_A:X\to[0,1]$ and $\nu_A:X\to[0,1]$, with the condition

$$0\le\mu_A(x)+\nu_A(x)\le 1;\forall x\in X$$

The values $\mu_A(x)$ and $\nu_A(x)$ represent the membership degree and non-membership degree respectively of the elements X to the set A.

For any intuitionistic fuzzy set A on the universal set X, for $x\in X$

$$\pi_A(x)=1-(\mu_A(x)+\nu_A(x))$$

is called the hesitancy degree (or intuitionistic fuzzy index) of an element X in A .It is the degree of indeterminacy membership of the element X whether belonging to A or not.

Obviously, $0\le\pi_A(x)\le 1$ for any $x\in X$.

Particularly, $\pi_A(x)=1-\mu_A(x)-\nu_A(x)$ is always valid for any fuzzy set A on the universal set X.

The set of all intuitionistic fuzzy sets in X will be denoted by $IFS(X)$.

C. Definition 2.3

A neutrosophic fuzzy set A_{NS} on a universe of discourse X is of the form

$$A_{NS}=\{(x,T_{A_{NS}}(x),I_{A_{NS}}(x),F_{A_{NS}}(x)):x\in X\},$$

Where $T_{A_{NS}}(x)\in[0,1]$ is called the degree of truth-membership of X in A_{NS}

$I_{A_{NS}}(x)\in[0,1]$ is called the degree of indeterminacy-membership of X in A_{NS}

$F_{A_{NS}}(x)\in[0,1]$ is called the degree of falsity-membership of X in A_{NS}, and where

$T_{A_{NS}}(x)$, $I_{A_{NS}}(x)$ and $F_{A_{NS}}(x)$ satisfy the following condition :

$$0\le T_{A_{NS}}(x)+I_{A_{NS}}(x)+F_{A_{NS}}(x)\le 3;\forall x\in X$$

Here $3-(T_{A_{NS}}(x)+I_{A_{NS}}(x)+F_{A_{NS}}(x));\forall x\in X$ is called the degree of refusal membership of X in A_{NS}.

The set of all neutrosophic fuzzy sets in X will be denoted by $NFS(X)$.

D. Definition 2.4

Let $P,Q\in NFS(X)$, then the subset, equality, the union, intersection and complement are defined as follows:

1) $P\subseteq Q$ iff $\forall x\in X, T_P(x)\le T_Q(x), I_P(x)\le I_Q(x)$ and $F_P(x)\ge F_Q(x)$

2) $P=Q$ iff $\forall x\in X, T_P(x)=T_Q(x), I_P(x)=I_Q(x)$ and $F_P(x)=F_Q(x)$

3) $P\cup Q=\{(x,\max(T_P(x),T_Q(x)),\min(I_P(x),I_Q(x)),\min(F_P(x),F_Q(x))):x\in X\}$

4) $P\cap Q=\{(x,\min(T_P(x),T_Q(x)),\min(I_P(x),I_Q(x)),\max(F_P(x),F_Q(x))):x\in X\}$

5) $P^c=\{(x,T_P(x),I_P(x),F_P(x)):x\in X\}$.

E. Definition 2.5

Let A, B and C be ordinary non-empty sets. A neutrosophic fuzzy relation R is a neutrosophic fuzzy subset of $A\times B$ i.e. R given by

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue III Mar 2024- Available at www.ijraset.com

$$R=\{((a,b),T_R(a,b),I_R(a,b),F_R(a,b)):a\in A,b\in B\}$$

Where $T_R: A\times B\to[0,1], I_R: A\times B\to[0,1], F_R: A\times B\to[0,1]$ satisfying the condition $0\le T_R(a,b)+I_R(a,b)+F_R(a,b)\le 3$ for every $(a,b)\in(A\times B)$.

The set of all neutrosophic fuzzy relations in $A\times B$ will be denoted by $NFR(A\times B)$.

F. Definition 2.6

Let R and P be two neutrosophic fuzzy relations between A and B ,for every $(a,b)\in A\times B$ we define

1) $R\le P \Leftrightarrow (T_R(a,b)\le T_P(a,b))$ and $(I_R(a,b)\le I_P(a,b))$ and $(F_R(a,b)\ge F_P(a,b))$
2) $R\vee P=\{(a,b),T_R(a,b)\vee T_P(a,b),I_R(a,b)\wedge I_P(a,b),F_R(a,b)\wedge F_P(a,b):a\in A,b\in B\}$
3) $R\wedge P=\{(a,b),T_R(a,b)\wedge T_P(a,b),I_R(a,b)\wedge I_P(a,b),F_R(a,b)\vee F_P(a,b):a\in A,b\in B\}$
4) $R^c=\{((a,b),T_R(a,b),I_R(a,b),F_R(a,b)):a\in A,b\in B\}$

Here, $\vee$ and $\wedge$ denote the maximum and minimum operators respectively.

G. Definition 2.7

Let $R\in NFR(A\times B)$ and $S\in NFR(B\times C)$. Then the composition of R and S is the NFR from A to C defined as

$$R\circ S=\{((a,c),T_{R\circ S}(a,c),I_{R\circ S}(a,c),F_{R\circ S}(a,c)):a\in A,c\in C\}$$

where $T_{R\circ S}(a,c)=\vee_{b\in B}\{T_S(a,b)\wedge T_R(b,c)\}$,

$I_{R\circ S}(a,c)=\wedge_{b\in B}\{I_S(a,b)\wedge I_R(b,c)\}$ and

$F_{R\circ S}(a,c)=\wedge_{b\in B}\{F_S(a,b)\vee F_R(b,c)\}$.

III. SOME STRUCTURES OF NEUTROSOPHIC FUZZY RELATIONS

A. Definition 3.1

Let $R\in NFR(A\times B)$.We define the inverse relation R^{-1} between B and A :

$T_{R^{-1}}(b,a)=T_R(a,b), I_{R^{-1}}(b,a)=I_R(a,b), F_{R^{-1}}(b,a)=F_R(a,b), \forall(a,b)\in A\times B$.

B. Theorem 3.1

Let $R\in NFR(P\times Q)$ be a neutrosophic fuzzy relation. Then $(R^{-1})^{-1}=R$.

Proof:

By the definition of inverse relation, we have

$$T_{R^{-1}}(b,a)=T_R(a,b),\ I_{R^{-1}}(b,a)=I_R(a,b),\ F_{R^{-1}}(b,a)=F_R(a,b).$$

Now, $T_{(R^{-1})^{-1}}(b,a)=T_{R^{-1}}(a,b)=T_R(b,a)$

$I_{(R^{-1})^{-1}}(b,a)=I_{R^{-1}}(a,b)=I_R(b,a)$ and

$F_{(R^{-1})^{-1}}(b,a)=F_{R^{-1}}(a,b)=F_R(b,a)$.

Hence $(R^{-1})^{-1}=R$.

©IJRASET: All Rights are Reserved

C. Theorem 3.2

Let $R_1, R_2 \in NFR(P \times Q)$ be two neutrosophic fuzzy relations. Then

1) $(R_1 \cup R_2)^{-1} = R_1^{-1} \cup R_2^{-1}$.

2) $(R_1 \cap R_2)^{-1} = R_1^{-1} \cap R_2^{-1}$.

Proof:

1) By the definition of inverse relation, we have

$T_{R_1^{-1}}(b,a) = T_{R_1}(a,b), I_{R_1^{-1}}(b,a) = I_{R_1}(a,b)$, $F_{R_1^{-1}}(b,a) = F_{R_1}(a,b)$ and $T_{R_2^{-1}}(b,a) = T_{R_2}(a,b)$,

$I_{R_2^{-1}}(b,a) = I_{R_2}(a,b)$, $F_{R_2^{-1}}(b,a) = F_{R_2}(a,b)$.

Therefore,

$$\begin{aligned} T_{(R_1 \cup R_2)^{-1}}(b,a) &= T_{R_1 \cup R_2}(a,b) \\ &= \max\{T_{R_1}(a,b), T_{R_2}(a,b)\} \\ &= \max\{T_{R_1^{-1}}(b,a), T_{R_2^{-1}}(b,a)\} \\ &= T_{R_1^{-1} \cup R_2^{-1}}(b,a) \end{aligned}$$

$$\begin{aligned} I_{(R_1 \cup R_2)^{-1}}(b,a) &= I_{R_1 \cup R_2}(a,b) \\ &= \min\{I_{R_1}(a,b), I_{R_2}(a,b)\} \\ &= \min\{I_{R_1^{-1}}(b,a), I_{R_2^{-1}}(b,a)\} \\ &= I_{R_1^{-1} \cup R_2^{-1}}(b,a) \end{aligned}$$

And

$$\begin{aligned} F_{(R_1 \cup R_2)^{-1}}(b,a) &= F_{R_1 \cup R_2}(a,b) \\ &= \min\{F_{R_1}(a,b), F_{R_2}(a,b)\} \\ &= \min\{F_{R_1^{-1}}(b,a), F_{R_2^{-1}}(b,a)\} \\ &= F_{R_1^{-1} \cup R_2^{-1}}(b,a) \end{aligned}$$

Hence $(R_1 \cup R_2)^{-1} = R_1^{-1} \cup R_2^{-1}$.

Similarly 2),

Hence $(R_1 \cap R_2)^{-1} = R_1^{-1} \cap R_2^{-1}$.

IV. NEUTROSOPHIC FUZZY RELATION IN A NEUTROSOPHIC FUZZY SET

A. Definition 4.1

The relation $R \in NFR(A \times A)$ is called:

1) Reflexive if $T_R(a,a) = 1, I_R(a,a) = 0$ and $F_R(a,a) = 0; \forall a \in A$.

2) Anti-reflexive if $T_R(a,a) = 0, I_R(a,a) = 0$ and $F_R(a,a) = 1; \forall a \in A$.

B. Definition 4.2

A NFR, $R(A \times A)$ is reflexive of order (α, γ, β) if $T_R(a,a) = \alpha$, $I_R(a,a) = \gamma$ and $F_R(a,a) = \beta; \forall a \in A$ and $\alpha + \gamma + \beta \leq 1$.

C. Theorem 4.1

Let $R \in NFR(X \times X)$, then R is reflexive iff R^c is anti-reflexive.

Proof:

Let R is reflexive. Then we have,

$T_R(a,a)=1$, $I_R(a,a)=0$ and $F_R(a,a)=0$

From the definition of complement relation, we have

$T_{R^c}(a,a)=T_R(a,a)$, $I_{R^c}(a,a)=I_R(a,a)$ and $F_{R^c}(a,a)=F_R(a,a)$

Which implies ,

$T_{R^c}(a,a)=0$, $I_{R^c}(a,a)=0$ and $F_{R^c}(a,a)=1$.

Thus, R^c is anti-reflexive.

Conversely, let R^c is anti-reflexive. Then

$T_{R^c}(a,a)=0$, $I_{R^c}(a,a)=0$ and $F_{R^c}(a,a)=1$.

From the definition of complement relation, we have

$T_{R^c}(a,a)=T_R(a,a)$, $I_{R^c}(a,a)=I_R(a,a)$ and $F_{R^c}(a,a)=F_R(a,a)$

Which implies,

$T_R(a,a)=1$, $I_R(a,a)=0$ and $F_R(a,a)=0$.

Hence proved

D. Definition 4.3

A neutrosophic fuzzy relation $R(A\times A)$ is symmetric if

$T_R(a,b)=T_R(b,a)$, $I_R(a,b)=I_R(b,a)$ and $F_R(a,b)=F_R(b,a)$; $\forall a,b \in A$.

E. Theorem 4.2

If R is symmetric, then so is R^{-1}.

Proof:

We know,

$$\begin{aligned} T_{R^{-1}}(a,b) &= T_R(b,a) \\ &= T_R(a,b) \text{ since } R \text{ is symmetric} \\ &= T_{R^{-1}}(b,a) \text{ by definition of } R^{-1} \end{aligned}$$

$$\begin{aligned} I_{R^{-1}}(a,b) &= I_R(b,a) \\ &= I_R(a,b) \text{ since } R \text{ is symmetric} \\ &= I_{R^{-1}}(b,a) \text{ by definition of } R^{-1} \end{aligned}$$

$$\begin{aligned} F_{R^{-1}}(a,b) &= F_R(b,a) \\ &= F_R(a,b) \text{ since } R \text{ is symmetric} \\ &= F_{R^{-1}}(b,a) \text{ by definition of } R^{-1} \end{aligned}$$

F. Definition 4.4

Let $R(A\times A)$ be a neutrosophic fuzzy relation. Then R is transitive $R\circ R\subseteq R$.

G. Theorem 4.3

If R is transitive ,then so is R^{-1}.

Proof:

We know,

$$\begin{aligned}
T_{R^{-1}}(a,b) &= T_R(b,a)\\
&\geq T_{R\circ R}(b,a)\\
&= \vee_{c\in A}\{T_R(b,c)\wedge T_R(c,a)\}\\
&= \vee_{c\in A}\{T_{R^{-1}}(a,c)\wedge T_{R^{-1}}(c,b)\}\\
&= T_{R^{-1}\circ R^{-1}}(a,b)\\
I_{R^{-1}}(a,b) &= I_R(b,a)\\
&\geq I_{R\circ R}(b,a)\\
&= \wedge_{c\in A}\{I_R(b,c)\wedge I_R(c,a)\}\\
&= \wedge_{c\in A}\{I_{R^{-1}}(a,c)\wedge I_{R^{-1}}(c,b)\}\\
&= I_{R^{-1}\circ R^{-1}}(a,b)\\
F_{R^{-1}}(a,b) &= F_R(b,a)\\
&\leq F_{R\circ R}(b,a)\\
&= \wedge_{c\in A}\{F_R(b,c)\vee F_R(c,a)\}\\
&= \wedge_{c\in A}\{F_{R^{-1}}(a,c)\vee F_{R^{-1}}(c,b)\}\\
&= F_{R^{-1}\circ R^{-1}}(a,b)
\end{aligned}$$

So, $R^{-1}\circ R^{-1}\subseteq R^{-1}$.

Hence the thoerem is proved.

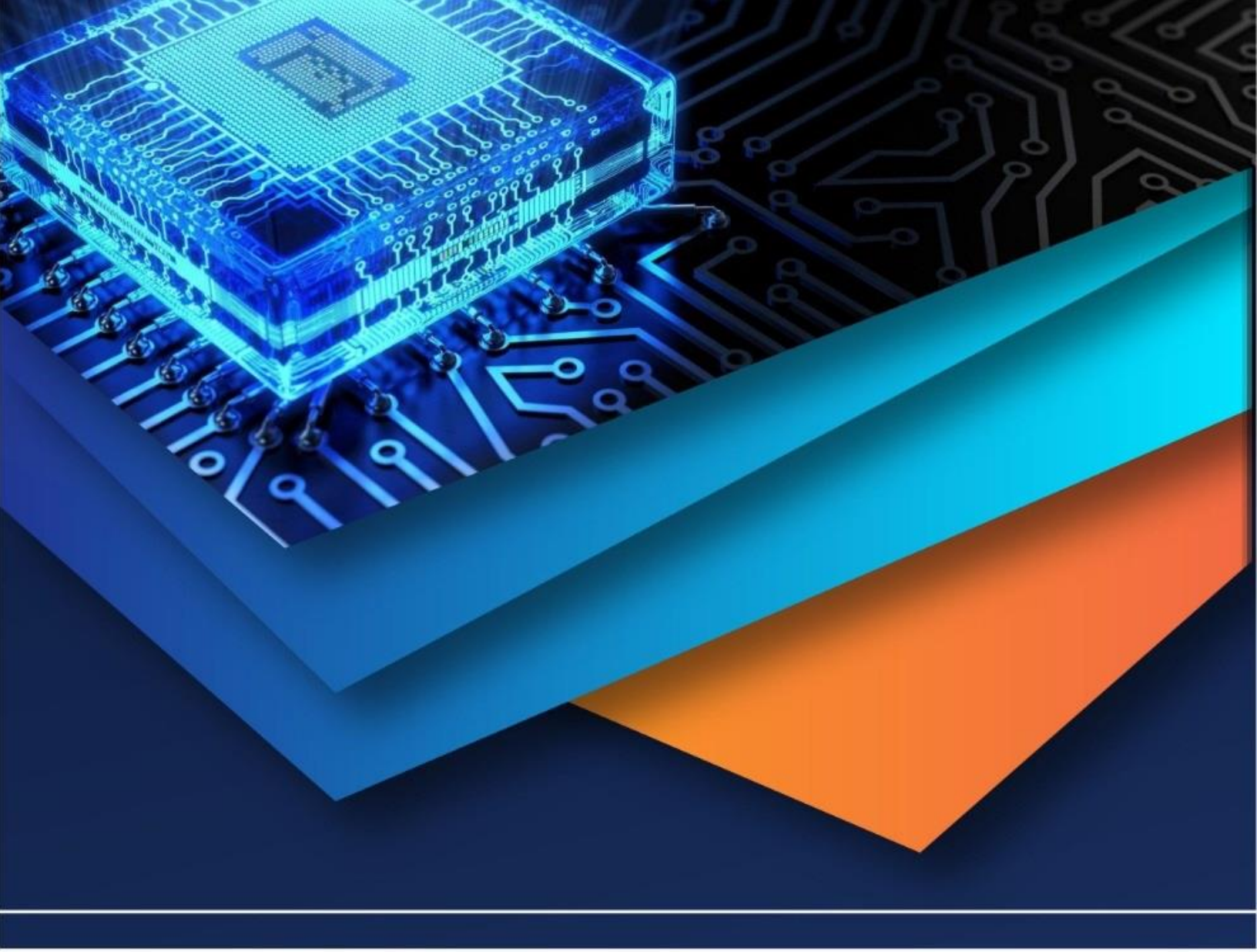
V. CONCLUSION

The analysis of mathematics with uncertainty has expanded recently in the area of neutrosophic fuzzy set theory, which considers an object's degrees of truth, falsity, and indeterminacy. In this paper we study different concepts like reflexivity, symmetry, and transitivity of a neutrosophic fuzzy relation are specified over a neutrosophic fuzzy set. Finally, a few properties of the fuzzy relations over a neutrosophic fuzzy set are explored.

REFERENCES

[1] Atanassov.K.T. (1986) Intuitionistic Fuzzy Sets. Fuzzy Sets and Systems, 20, 87-96. https://doi.org/10.1016/S0165-0114(86)80034-3
[2] Blin.J.M. (1974) Fuzzy Relations in Group Decision Theory. Journal of Cybernetics, 4, 17-22. https://doi.org/10.1080/01969727408546063
[3] Burillo.P. and Bustince.H. (1995) Intuitionistic Fuzzy Relations (Part I). Mathware and Soft Computing, 2, 5-38.
[4] Bustince.H. (2000) Construction of Intuitionistic Fuzzy Relations with Predetermined Properties. Fuzzy Sets and Systems, 109, 379-403. https://doi.org/10.1016/S0165-0114(97)00381-3]
[5] Cock.M.D. and Kerre.E.E. (2003) On (Un)Suitable Fuzzy Relations to Model Approximate Equality. Fuzzy Sets and Systems, 133, 137-153. https://doi.org/10.1016/S0165-0114(02)00239-7
[6] Cuong.B.C. and Kreinovich.V. (2013) Picture Fuzzy Sets-A New Concept for Computational Intelligence Problems. Proceedings of 2013 Third World Congress on Information and Communication Technologies (WIICT 2013), Hanoi, 15-18 December 2013, 1-6. https://doi.org/10.1109/WICT.2013.7113099
[7] Cuong..B.C. (2014) Picture Fuzzy Sets. Journal of Computer Science and Cybernetics, 30, 409-420.

[8] Cuong.B.C, and Van Hai Pham. Some fuzzy logic operators for picture fuzzy sets. In:2015 Seventh International Conference on Knowledge and Systems Engineering (KSE), (pp.132{137). IEEE 2015
[9] Dai.W.Y., Zhou.C.M. and Lei.Y.J. (2009) Information Security Evaluation Based on Multilevel Intuitionistic Fuzzy Comprehensive Method. Microelectron Computer, 26, 75-179.
[10] Dutta.P. and Saikia.K. (2018) Some Aspects of Equivalence Picture Fuzzy Relation. Amse Journals-Amse Iieta Publication-2017-Series: Advances A, 54, 424-434.
[11] Jin. J.L., Wei.Y.M. and Ding, J. (2004) Fuzzy Comprehensive Evaluation Model Based on Improved Analytic Hierarchy Process. Journal of Hydraulic Engineering, 3, 65-70.
[12] Kalaiarasi.K, Divya.R, Strong Interval-valued Neutrosophic Intuitionistic Fuzzy Graph", International journal of pure and Applied Mathematics, Volume 120, Issue : Special Issue, Sep 2018, Pg.no1251-1272, Impact Factor : 7.19, ISSN 1314-3395.
[13] K.Kalaiarasi, Divya.R, Minimal Spanning Tree Under Single Valued Neutrosophic Fuzzy Graphs, The international journal of analytical and experimental modal analysis, Volume XII, Issue 1, January 2020, Pg.no: 395-401, Impact Factor : 6.3, ISSN 0886-9367.
[14] Kalaiarasi.K and Geethanjali.P, The join product and dual strong domination in mixed split intuitionistic fuzzy graph, Parishodh Journal, Vol IX, Issue III, March 2020, Pg no: 779-791, ISSN NO: 2347-6648.
[15] Kalaiarasi.K and Geethanjali.P, A Study on Domination in Product Picture Fuzzy Graph and its Application", Advances and Applications in Mathematical Sciences, Vol 21, Issue 5, March 2022, Pg no: 2911-2934, ISSN NO: 0974-6803
[16] Kalaiarasi.K and Mahalakshmi.L Published an article titled Regular and Irregular m-polar Fuzzy Graphs, Global Journal of Mathematical Sciences:Theory and Practical. Volume 9, Number 2 (2017),pp.139-152, ISSN 0974-3200.
[17] Kalaiarasi.K and Mahalakshmi.L Published an article titled Coloring of Regular and Strong Arcs Fuzzy Graphs,International journal of Fuzzy Mathematical Archive. Volume 14, Number 1 (2017), pp. 59-69, Impact factor -1.37,ISSN:2320-3242(P),2320-3250(online).
[18] Kaufman, A. (1975) Introduction to the Theory of Fuzzy Subsets: Fundamental Theoretical Elements. Academic Press, New York.
[19] Klir, G. and Yaun, B. (1995) Fuzzy Set and Fuzzy Logic: Theory and Application. Prentice Hall, Upper Saddle River.
[20] Lei, Y.J., Wang, B.S. and Miao, Q.G. (2005) On the Intuitionistic Fuzzy Relations with Compositional Operations. Systems Engineering-Theory & Practice, 25, 30-34.
[21] Qi, F., Yang, S.W., Feng, X. and Jiang, X.L. (2013) Research on the Comprehensive Evaluation of Sports Management System with Interval-Valued Intuitionistic FuzzyInformation. Bulletin of Science and Technology, 29, 85-87.
[22] Tamura, S., Higuchi, S. and Tanaka, K. (1971) Pattern Classification Based on Fuzzy Relations. IEEE Transactions on Systems, Man, and Cybernetics, SMC-1, 61-66. https://doi.org/10.1109/TSMC.1971.5408605
[23] Yang, H.-L. and Li, S.-G. (2009) Restudy of Intuitionistic Fuzzy Relations. Systems Engineering-Theory & Practice, 29, 114-120. https://doi.org/10.1016/S1874-8651(10)60041-5
[24] Yang, M.S. and Shih, H.-M. (2001) Cluster Analysis Based on Fuzzy Relations. Fuzzy Sets and Systems, 120, 197-212. https://doi.org/10.1016/S0165-0114(99)00146-3
[25] Zadeh, L.A. (1965) Fuzzy Sets. Information and Control, 8, 338-353. https://doi.org/10.1016/S0019-9958(65)90241-X
[26] Zadeh, L.A. (1971) Similarity Relations and Fuzzy Orderings. Information Sciences, 3, 177-200. https://doi.org/10.1016/S0020-0255(71)80005-1
[27] Zimmerman, H.J. (1996) Fuzzy Set Theory and Its Application. Kluwer Academic Publishers, Netherlands.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)