

Handbook of Research on Advances and Applications of Fuzzy Sets and Logic

Said Broumi

Laboratory of Information Processing, Faculty of Science Ben M'Sik, University Hassan II, Casablanca, Morocco & Regional Center for the Professions of Education and Training (CRMEF), Casablanca-Settat, Morocco

A volume in the Advances in Computer and
Electrical Engineering (ACEE) Book Series



List of Contributors

Adak, Amal Kumar / Ganesh Dutt College, Lalit Narayan Mithila University, Begusarai, India ..	229
Akram, Muhammad / Department of Mathematics, University of the Punjab, New Campus, Lahore, Pakistan	149
Alam, Shariful / Indian Institute of Engineering Science and Technology, Shibpur, India	120
Alias, Suriana / Universiti Teknologi MARA, Malaysia	558
Alodhaibi, Sultan Saleh / Qassim University, Saudi Arabia.....	105
Altın, Fatma Gül / Mehmet Akif Ersoy University, Turkey.....	29
Amanathulla, S. / Raghunathpur College, India.....	385
Bai, Wenhui / Shanxi University, China	542
Bhardwaj, Reeta / Department of Mathematics, Amity University Haryana, Gurugram, India.....	324
Bhargavi, K. / Siddaganga Institute of Technology, India	310
Broumi, Said / Laboratory of Information Processing, Faculty of Science Ben M'Sik, University Hassan II, Casablanca, Morocco & Regional Center for the Professions of Education and Training (CRMEF), Casablanca-Settat, Morocco.....	212, 542, 639, 771
C., Sugapriya / Queen Mary's College, University of Madras, Chennai, India	639
Çakir, Esra / Department of Industrial Engineering, Galatasaray University, Turkey.....	77
Chatterjee, Banashree / Dr. B. C. Roy Engineering College, India	120
Debnath, Somen / Umakanta Academy, India.....	716, 741
Deivanayagam Pillai, Nagarajan / Hindustan Institute of Technology and Science, India.....	639
Dhar, Mamoni / Science College, Kokrajhar, India	428
Ding, Juanjuan / Shanxi University, China.....	542
Ejegwa, Paul Augustine / University of Agriculture, Makurdi, Nigeria	192
El-Wahed Khalifa, Hamiden Abd / Faculty of Graduate Studies for Statistical Research, Cairo University, Giza, Egypt.....	105
Feldman, Alicia / Queensland University of Technology, Australia.....	50
G., Aishwaryapriyadharshini / Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, India	796
George, Mathews Mottackal / Providence College of Engineering, India	243
Gerogiannis, Vassilis C. / University of Thessaly, Greece	443
Grant-Smith, Deanna / Queensland University of Technology, Australia.....	50
Guleryuz, Didem / Bayburt University, Turkey.....	288
Günter, Yasemin / Selçuk University, Turkey.....	339
Hanna, Wael K. / Sadat Academy for Management Sciences, Egypt.....	619
Hussain R., Jahir / Jamal Mohamed College, India	771

Hussain S., Satham / <i>Jamal Mohamed College, India</i>	771
I. R., Sumathi / <i>Department of Mathematics, Amrita School of Engineering, Coimbatore, India</i> ..	796
Irvanizam, Irvanizam / <i>Department of Informatics, Universitas Syiah Kuala, Indonesia</i>	666
Jafari, Saeid / <i>Mathematical and Physical Science Foundation, Denmark</i>	833
Janaki, C. / <i>L. R. G. Government Arts College, Tirupur, India</i>	833
Kalayathankal, Sunny Joseph / <i>Jyothi Engineering College, India</i>	243
Kamacı, Hüseyin / <i>Yozgat Bozok University, Turkey</i>	258
Karadayı-Usta, Saliha / <i>Fenerbahce University, Turkey</i>	585, 605
Karuppiyah, S. Jegan / <i>Arul Anandar College, India</i>	212
Khalifa, Hamiden Abd El-Wahed / <i>Qassim University, Saudi Arabia</i>	105
Kumar, Kamal / <i>Department of Mathematics, Amity University Haryana, Gurugram, India</i>	324
Kureethara, Joseph Varghese / <i>Christ University, India</i>	243
Li, Deyu / <i>Shanxi University, China</i>	542
Mani, Naveen / <i>Chandigarh University, Chandigarh, India</i>	324
Martin, Nivetha / <i>Arul Anandar College, India</i>	212
Mohamad, Daud / <i>Universiti Teknologi MARA, Malaysia</i>	558
Mondal, Sankar Prasad / <i>Maulana Abul Kalam Azad University of Technology, West Bengal, India</i>	120
Msirali, Holyheavy / <i>Nigerian Army University, Biu, Nigeria</i>	508
Naz, Sumera / <i>Department of Mathematics, Division of Science and Technology, University of Education, Lahore, Pakistan</i>	149
Omeiza, Ahmed Yusuf / <i>Federal University, Dutsinma, Nigeria</i>	508
Onyeke, Idoko Charles / <i>University of Agriculture, Makurdi, Nigeria</i>	192
Onyeozili, Ijeoma Abigail / <i>University of Abuja, Nigeria</i>	508
Öztürk, Taha Yasin / <i>Kafkas University, Turkey</i>	412
Pal, Madhumangal / <i>Vidyasagar University, India</i>	385
Petchimuthu, Subramanian / <i>University College of Engineering, Nagercoil, India</i>	258
Radwan, Nouran M. / <i>Sadat Academy for Management Sciences, Egypt</i>	619
Rahaman, Mostafijur / <i>Indian Institute of Engineering Science and Technology, Shibpur, India</i> ..	120
Rajeswari, S. / <i>Queen Mary's College, University of Madras, Chennai, India</i>	639
Rocchi, Jean Michel / <i>Sciences Po Aix, France</i>	1
Rosyida, Isnaini / <i>Universitas Negeri Semarang, Indonesia</i>	771
Saeed, Aatifa / <i>School of Mathematics, Minhaj University, Lahore, Pakistan</i>	149
Savithiri, D. / <i>Sree Narayana Guru College, Coimbatore, India</i>	833
Sharma, Amit / <i>Department of Mathematics, Amity University Haryana, Gurugram, India</i>	324
Shuib, Adibah / <i>Universiti Teknologi MARA, Malaysia</i>	558
Smarandache, Florentin / <i>University of New Mexico, Gallup, USA</i>	105, 639
Son, Le Hoang / <i>Vietnam National University, Vietnam</i>	443
Sweetey, C. Antony Crispin / <i>Department of Mathematics, Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore, India</i>	796
Taş, Mehmet Ali / <i>Department of Industrial Engineering, Turkish-German University, Turkey</i>	77
Tzimos, Dimitrios / <i>Hellenic Open University, Greece</i>	443
Yalçın, Neşe / <i>Adana Alparslan Türkeş Science and Technology University, Turkey</i>	692
Yapıcı Pehlivan, Nimet / <i>Selçuk University, Turkey</i>	339, 477, 692

Chapter 36

Neutrosophic Contra RW-Continuous Functions in Neutrosophic Topological Spaces..... 833

D. Savithiri, Sree Narayana Guru College, Coimbatore, India

Saeid Jafari, Mathematical and Physical Science Foundation, Denmark

C. Janaki, L. R. G. Government Arts College, Tirupur, India

Compilation of References 846

About the Contributors 928

Index 940

Chapter 36

Neutrosophic Contra RW– Continuous Functions in Neutrosophic Topological Spaces

D. Savithiri

Sree Narayana Guru College, Coimbatore, India

Saeid Jafari

Mathematical and Physical Science Foundation, Denmark

C. Janaki

L. R. G. Government Arts College, Tirupur, India

ABSTRACT

The aim of this chapter is to introduce a new class of contra continuous functions, namely neutrosophic contra RW-continuous functions, in neutrosophic topological spaces. Further, the authors introduce neutrosophic almost RW-continuous function, neutrosophic almost contra RW-continuous function, and some of its properties have been discussed. Relationships with some other existing neutrosophic contra continuous functions have been analyzed. Furthermore, NRW-T0, NRW-T1, NRW-T2, and NRW-normal spaces have been introduced.

1. INTRODUCTION

L.A. Zedah (Zadeh, 1965) introduced the fuzzy sets and fuzzy topological spaces. The theory of fuzzy topological space was introduced and developed by Chang (Chang, 1968) in 1968. Since then it has been extended into various forms of topological spaces by many authors. The concept of “Intuitionistic fuzzy set” was first introduced by Atanassov (Atanassov, 1984) in 1983. After the introduction of the concepts of neutrosophic set by Smarandache (Smarandache, 2002a) in 1999, the idea of neutrosophic

DOI: 10.4018/978-1-7998-7979-4.ch036

crisp sets and neutrosophic crisp topological spaces were introduced by A.A.Salama and Alblowi .S.A (Salama & Alblowi, 2012a).

In 2007, S.S. Benchalli, R.S. Wali (Benchalli & Wali, 2007) introduced the concept of RW-closed sets in topological spaces. The authors D. Savithiri, C.Janaki (Savithiri, 2019) introduced Neutrosophic RW-closed sets in neutrosophic topological spaces. As an extension, in this chapter the authors introduce neutrosophic contra RW-continuous functions. Several properties have been discussed and interrelations among the concepts are analyzed with concrete examples.

2. TERMINOLOGIES

In this section some important basic preliminaries, and in particular, the work of Smarandache (Smarandache, 2002a) and Salama (Salama & Alblowi, 2012a) have been recalled.

Definition 2.1:(Smarandache, 2002a) Let X be a non-empty fixed set a Neutrosophic set (NS for short) A is an object having the form $A = \langle x, \mu_A(x), \sigma_A(x), \gamma_A(x) \rangle, x \in X$ where $\mu_A(x)$, $\sigma_A(x)$, $\gamma_A(x)$ which represents the degree of membership function, the degree of indeterminacy and the degree of non-membership function respectively of each element $x \in X$ to the set A .

Remark 2.2: (Smarandache, 2002a) For the sake of simplicity a neutrosophic set $A = \{x, \mu_A(x), \sigma_A(x), \gamma_A(x)\}; x \in X\}$ can be identified to be an ordered triple $\langle \mu_A, \sigma_A, \gamma_A \rangle$.

Definition 2.3:(Salama & Alblowi, 2012a) The neutrosophic subsets 0_N and I_N in X are defined as follows:

$$0_N = \{ \langle x, (0, 0, 1) \rangle; x \in X \} \quad (2) \quad I_N = \{ \langle x, (1, 0, 0) \rangle; x \in X \} \quad (1)$$

Definition 2.4: (Salama & Alblowi, 2012a) Let X be a nonempty set and neutrosophic sets A and B in the form $A = \{ \langle x, (\mu_A(x), \sigma_A(x), \gamma_A(x)) \rangle, x \in X \}$ and $B = \{ \langle x, (\mu_B(x), \sigma_B(x), \gamma_B(x)) \rangle, x \in X \}$.

$$A \subseteq B \Leftrightarrow \mu_A(x) \leq \mu_B(x), \sigma_A(x) \leq \sigma_B(x), \text{ and } \gamma_A(x) \geq \gamma_B(x) \quad \forall x \in X \quad (1)$$

$$\bar{A} = \{ \langle x, \gamma_A(x), \sigma_A(x), \mu_A(x) \rangle; x \in X \} \quad (2)$$

$$A = B \text{ iff } A \subseteq B \text{ and } B \subseteq A. \quad (3)$$

$$A \cap B = \langle x, \min(\mu_A(x), \mu_B(x)), \min(\sigma_A(x), \sigma_B(x)), \max(\gamma_A(x), \gamma_B(x)) \rangle \quad (4)$$

$$A \cup B = \langle x, \max(\mu_A(x), \mu_B(x)), \max(\sigma_A(x), \sigma_B(x)), \min(\gamma_A(x), \gamma_B(x)) \rangle \quad (5)$$

Definition 2.5: (Salama & Alblowi, 2012a) Let $\{A_j: j \in J\}$ be a arbitrary family of NS sets in X , then

$$\bigcap A_j = \langle x, \bigwedge_{j \in J} \mu_{A_j}(x), \bigwedge_{j \in J} \sigma_{A_j}(x), \bigvee_{j \in J} \gamma_{A_j}(x) \rangle \quad (1)$$

$$\bigcup A_j = \langle x, \bigvee_{j \in J} \mu_{A_j}(x), \bigvee_{j \in J} \sigma_{A_j}(x), \bigwedge_{j \in J} \gamma_{A_j}(x) \rangle \quad (2)$$