Metric Spaces Of Fuzzy Sets Theory And Applications

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This paper introduces the novel concept of KM-single valued neutrosophic metric spaces as an especial generalization of KM-fuzzy metric spaces, investigates several topological and structural properties and presents some of its applications. This study also considers the metric spaces and constructs KM-single valued neutrosophic spaces with respect to any given triangular norms and triangular conorms.

This distinctly nonclassical treatment focuses on developing aspects that differ from the theory of ordinary metric spaces, working directly with probability distribution functions rather than random variables. The two-part treatment begins with an overview that discusses the theory's historical evolution, followed by a development of related mathematical machinery. The presentation defines all needed concepts, states all necessary results, and provides relevant proofs. The second part opens with definitions of probabilistic metric spaces and proceeds to examinations of special classes of probabilistic metric spaces, topologies, and several related structures, such as probabilistic normed and inner-product spaces. Throughout, the authors focus on developing aspects that differ from the theory of ordinary metric spaces, rather than simply transferring known metric space results to a more general setting.

Fuzzy Logic: State of the Art covers a wide range of both theory and applications of fuzzy sets, ranging from mathematical basics, through artificial intelligence, computer management and systems science to engineering applications. Fuzzy Logic will be of interest to researchers working in fuzzy set theory and its applications.

In this paper, we introduce the neutrosophic cantractive and neutrosophic mapping. We establish some results on fixed points of a neutrosophic mapping.

The various uncertainties arise in complicated problems in Economics, Engineering, Environmental Science, Medical Science and Social Science. The methods of classical Mathematics may not be successfully used to solve them. Mathematical theories such as probability theory, fuzzy set theory and rough set theory were established by researchers to model uncertainties appearing in the above fields. But all these theories have their own difficulties. To overcome these difficulties, In 1999 Molodstov[7] introduced the concept of soft set as a new mathematical tool for dealing with uncertainties. As the problem of setting the membership function does not arise in soft set theory, it can be easily applied to many different fields. In 2003, Maji.et.al.[5] studied some operations on the soft set theory. In 2009, M.I.Ali et.al.[1] studied some new operations on soft sets and its applications. In 2013, Sujoy Das et.al.[11] proposed soft metric space. In 2015, Thangaraj Beaula et.al.,[12] established the fuzzy soft metric spaces. In chapter 1, the basic definitions, examples, properties and theorems are given which are used for throughout the dissertation. In chapter 2, we defined Fuzzy soft metric space with suitable illustrations. We proved arbitrary union of fuzzy soft open set is fuzzy soft open set and the intersection of finite number of fuzzy soft open set is fuzzy soft open set. In chapter 3, Cauchy sequence are defined. First category, second category, dense, nowhere dense are all defined with suitable illustrations. We established Cantor intersection theorem on complete fuzzy soft metric space and also we proved Baires category theorem on fuzzy soft metric space. In chapter 4, fuzzy soft open cover, fuzzy soft compact set and fuzzy soft totally bounded set are defined. We proved some important theorems. Also we defined Bolzano Weirstress property and based on this we proved theorem namely fuzzy soft metric space becomes fuzzy soft sequentially compact if and only if fuzzy soft metric space has the property Bolzano Weirstrass. In chapter 5, we defined convex fuzzy soft metric space. Also we defined self mapping, fixed point and convergence of convex fuzzy soft metric space. Using these all we proved fixed point theorem on convex fuzzy soft metric space.

In present paper, the definition of new metric space with neutrosophic numbers is given. Several topological and structural properties have been investigated. The analogues of Baire Category Theorem and Uniform Convergence Theorem are given for Neutrosophic metric spaces.

The 7th International Workshop on Fuzzy Logic and Applications, held in Camogli, Italy in July 2007, presented the latest findings in the field. This volume features the refereed proceedings from that meeting. It includes 84 full papers as well as three keynote speeches. The papers are organized into topical sections covering fuzzy set theory, fuzzy

information access and retrieval, fuzzy machine learning, and fuzzy architectures and systems.

The concept of fuzzy sets and fuzzy logic was introduced by Professor Lofti A Zadeh in 1965. The success of research in fuzzy sets and fuzzy logic has been demonstrated in a variety of fields, such as artificial intelligence, computer science, control engineering, computer applications, robotics and many moreIn the book we adopt the notion of fuzzy metric space due to George and Veeramani [14] which is a modification of the notion of fuzzy metric space as studied by Kramosil and Michalek [29]. The notion of fuzzy metric space by George and Veeramani has many advantages in analysis as many notions and results from classical metric spaces can be extended and generalized to the setting of fuzzy metric spaces, for instance: the notion of completeness, completion of spaces as well as extension of maps

The primary aim of the book is to provide a systematic development of the theory of metric spaces of normal, upper semicontinuous fuzzy convex fuzzy sets with compact support sets, mainly on the base space ?n. An additional aim is to sketch selected applications in which these metric space results and methods are essential for a thorough mathematical analysis.This book is distinctly mathematical in its orientation and style, in contrast with many of the other books now available on fuzzy sets, which, although all making use of mathematical formalism to some extent, are essentially motivated by and oriented towards more immediate applications and related practical issues. The reader is assumed to have some previous undergraduate level acquaintance with metric spaces and elementary functional analysis.

This book provides a clear exposition of the flourishing field of fixed point theory. Starting from the basics of Banach's contraction theorem, most of the main results and techniques are developed: fixed point results are established for several classes of maps and the three main approaches to establishing continuation principles are presented. The theory is applied to many areas of interest in analysis. Topological considerations play a crucial role, including a final chapter on the relationship with degree theory. Researchers and graduate students in applicable analysis will find this to be a useful survey of the fundamental principles of the subject. The very extensive bibliography and close to 100 exercises mean that it can be used both as a text and as a comprehensive reference work, currently the only one of its type.

Fixed point theory in probabilistic metric spaces can be considered as a part of Probabilistic Analysis, which is a very dynamic area of mathematical research. A primary aim of this monograph is to stimulate interest among scientists and students in this fascinating field. The text is self-contained for a reader with a modest knowledge of the metric fixed point theory. Several themes run through this book. The first is the theory of triangular norms (t-norms), which is closely related to fixed point theory in probabilistic metric spaces. Its recent development has had a strong influence upon the fixed point theory in probabilistic metric spaces. In Chapter 1 some basic properties of t-norms are presented and several special classes of t-norms are investigated. Chapter 2 is an overview of some basic definitions and examples from the theory of probabilistic metric spaces. Chapters 3, 4, and 5 deal with some single-valued and multi-valued probabilistic versions of the Banach contraction principle. In Chapter 6, some basic results in locally convex topological vector spaces are used and applied to fixed point theory in vector spaces. Audience: The book will be of value to graduate students, researchers, and applied mathematicians working in nonlinear analysis and probabilistic metric spaces.

This book provides a timely and comprehensive overview of current theories and methods in fuzzy logic, as well as relevant applications in a variety of fields of science and technology. Dedicated to Lotfi A. Zadeh on his one year death anniversary, the book goes beyond a pure commemorative text. Yet, it offers a fresh perspective on a number of relevant topics, such as computing with words, theory of perceptions, possibility theory, and decision-making in a fuzzy environment. Written by Zadeh’s closest colleagues and friends, the different chapters are intended both as a timely reference guide and a source of inspiration for scientists, developers and researchers who have been dealing with fuzzy sets or would like to learn more about their potential for their future research.

Papers on Smarandache adjacent number sequences and its asymptotic property, counterexamples to a theorem concerning solution of certain quadratic Diophantine equation, short interval result for the e-squarefree e-divisor function, log convexity and concavity of some double sequences, intuitionistic fuzzy resolvable and intuitionistic fuzzy irresolvable spaces, super Weyl transform and some of its properties, and similar topics. Contributors: S. Panayappan, J. Wei, S. Chauhan, S. Kumar, S. Keawrahun, U. Leerawat, S. Balasubramanian, P. A. S. Vyjayanthi, S. Balasubramanian, and others.

This book collects papers on major topics in fixed point theory and its applications. Each chapter is accompanied by basic notions, mathematical preliminaries and proofs of the main results. The book discusses common fixed point theory, convergence theorems, split variational inclusion problems and fixed point problems for asymptotically nonexpansive semigroups; fixed point property and almost fixed point property in digital spaces, nonexpansive semigroups over CAT(?) spaces, measures of noncompactness, integral equations, the study of fixed points that are zeros of a given function, best proximity point theory, monotone mappings in modular function spaces, fuzzy contractive mappings, ordered hyperbolic metric spaces, generalized contractions in b-metric spaces, multi-tupled fixed points, functional equations in dynamic programming and Picard operators. This book addresses the mathematical community working with methods and tools of nonlinear analysis. It also serves as a reference, source for examples and new approaches associated with fixed point theory and its applications for a wide audience including graduate students and researchers.

Neutrosophic Sets and Systems (NSS) is an academic journal, published quarterly online and on paper, that has been created for publications of advanced studies in neutrosophy, neutrosophic set, neutrosophic logic, neutrosophic probability, neutrosophic statistics etc. and their applications in any field.

Metric fixed point theory encompasses the branch of fixed point theory which metric conditions on the underlying space and/or on the mappings play a fundamental role. In some sense the theory is a far-reaching outgrowth of Banach's contraction mapping principle. A natural extension of the study of contractions is the limiting case when the Lipschitz constant is allowed to equal one. Such mappings are called nonexpansive. Nonexpansive mappings arise in a variety of natural ways, for example in the study of holomorphic mappings and hyperconvex metric spaces. Because most of the spaces studied in analysis share many algebraic and topological properties as well as metric properties, there is no clear line separating metric fixed point theory from the topological or set-theoretic branch of the theory. Also, because of its metric underpinnings, metric fixed point theory has provided the motivation for the study of many geometric properties of Banach spaces. The contents of this Handbook reflect all of these facts. The purpose of the Handbook is to provide a primary resource for anyone interested in fixed point theory with a metric flavor. The goal is to provide information for those wishing to find results that might apply to their own work and for those wishing to obtain a deeper understanding of the theory. The book should be of interest to a wide range of researchers in mathematical analysis as well as to those whose primary interest is the study of fixed point theory and the underlying spaces. The level of exposition is directed to a wide audience, including students and established researchers.

The intention of this paper is to give the general de nition of cone metric space in the context of the neutrosophic theory. In this relation, we obtain some fundamental results concerting xed points for weakly compatible mapping.

This book aims at providing an overview of state-of-the-art in both the theory and methods of intuitionistic fuzzy logic, partial differential equations and numerical methods in informatics. It covers topics such as fuzzy intuitionistic Hilbert spaces, intuitionistic fuzzy differential equations, fuzzy intuitionistic metric spaces, and numerical methods for differential equations. It reports on applications such as fuzzy real time scheduling, intelligent control, diagnostics and time series prediction. Chapters were carefully selected among contributions presented at the second edition of the International Conference on Intuitionistic Fuzzy Sets and Mathematical Science, ICIFSMAS, held on April 11-13, 2018, at Al Akhawayn University of Ifrane, in Morocco.

Metric Spaces of Fuzzy SetsTheory and ApplicationsWorld Scientific
Mathematics of Fuzzy Sets: Logic, Topology and Measure Theory is a major attempt to provide much-needed coherence for the mathematics of fuzzy sets. Much of this book is new material required to standardize this mathematics, making this volume a reference tool with broad appeal as well as a platform for future research. Fourteen chapters are organized into three parts: mathematical logic and foundations (Chapters 1-2), general topology (Chapters 3-10), and measure and probability theory (Chapters 11-14). Chapter 1 deals with non-classical logics and their syntactic and semantic foundations. Chapter 2 details the lattice-theoretic foundations of image and preimage powerset operators. Chapters 3 and 4 lay down the axiomatic and categorical foundations of general topology using lattice-valued mappings as a fundamental tool. Chapter 3 focuses on the fixed-basis case, including a convergence theory demonstrating the utility of the underlying axioms. Chapter 4 focuses on the more general variable-basis case, providing a categorical unification of locales, fixed-basis topological spaces, and variable-basis compactifications. Chapter 5 relates lattice-valued topologies to probabilistic topological spaces and fuzzy neighborhood spaces. Chapter 6 investigates the important role of separation axioms in lattice-valued topology from the perspective of space embedding and mapping extension problems, while Chapter 7 examines separation axioms from the perspective of Stone-Cech-compactification and Stone-representation theorems. Chapters 8 and 9 introduce the most important concepts and properties of uniformities, including the covering and entourage approaches and the basic theory of precompact or complete [0,1]-valued uniform spaces. Chapter 10 sets out the algebraic, topological, and uniform structures of the fundamentally important fuzzy real line and fuzzy unit interval. Chapter 11 lays the foundations of generalized measure theory and representation by Markov kernels. Chapter 12 develops the important theory of conditioning operators with applications to measure-free conditioning. Chapter 13 presents elements of pseudo-analysis with applications to the Hamilton–Jacobi equation and optimization problems. Chapter 14 surveys briefly the fundamentals of fuzzy random variables which are [0,1]-valued interpretations of random sets.
Since its inception by Professor Lotfi Zadeh about 18 years ago, the theory of fuzzy sets has evolved in many directions, and is finding applications in a wide variety of fields in which the phenomena under study are too complex or too ill-defined to be analyzed by conventional techniques. Thus, by providing a basis for a systematic approach to approximate reasoning and inexact inference, the theory of fuzzy sets may well have a substantial impact on scientific methodology in the years ahead, particularly in the realms of psychology, economics, engineering, law, medicine, decision-analysis, information retrieval, and artificial intelli gence. This volume consists of 24 selected papers invited by the editor, Professor Paul P. Wang. These papers cover the theory and applications of fuzzy sets, almost equal in number. We are very fortunate to have Professor A. Kaufmann to contribute an overview paper of the advances in fuzzy sets. One special feature of this volume is the strong participation of Chinese researchers in this area. The fact is that Chinese mathematicians, scientists and engineers have made important contributions to the theory and applications of fuzzy sets through the past decade. However, not until the visit of Professor A. Kaufmann to China in 1974 and again in 1980, did the Western World become fully aware of the important work of Chinese researchers. Now, Professor Paul Wang has initiated the effort to document these important contributions in this volume to expose them to the western researchers.
En las últimas décadas, la Topología se ha revelado como una poderosa herramienta para acometer diferentes problemas relacionados con un amplio espectro de ciencias aplicadas más allá de las matemáticas, como Economía, Inteligencia Artificial, Ciencias de la Computación o Sistemas Dinámicos. El presente volumen recoge las ponencias del Workshop in Applied Topology WiAT¿12, celebrado en junio de 2012 en la Universitat Jaume I, en el que participaron diferentes grupos de investigación del área de la Topología General y sus Aplicaciones.
In this paper, the notion of compact neutrosophic soft metric space is introduced. The concept of neutrosophic soft function and the composition of functions in a neutrosophic soft metric space along with suitable examples also have been brought. The continuity and uniform continuity of a neutrosophic soft function in this space have been defined and verified by proper examples. Several related properties, theorems and structural characteristics of these have been investigated here.
This book is a printed edition of the Special Issue "New Trends in Fuzzy Set Theory and Related Items" that was published in Axioms
Fundamentals of Fuzzy Sets covers the basic elements of fuzzy set theory. Its four-part organization provides easy referencing of recent as well as older results in the field. The first part discusses the historical emergence of fuzzy sets, and delves into fuzzy set connectives, and the representation and measurement of membership functions. The second part covers fuzzy relations, including orderings, similarity, and relational equations. The third part, devoted to uncertainty modelling, introduces possibility theory, contrasting and relating it with probabilities, and reviews information measures of specificity and fuzziness. The last part concerns fuzzy sets on the real line - computation with fuzzy intervals, metric topology of fuzzy numbers, and the calculus of fuzzy-valued functions. Each chapter is written by one or more recognized specialists and offers a tutorial introduction to the topics, together with an extensive bibliography.
Type-2 fuzzy sets extend both ordinary and interval-valued fuzzy sets to allow distributions, rather than single values, as degrees of membership. Computations with these truth values are governed by the truth value algebra of type-2 fuzzy sets. The Truth Value Algebra of Type-2 Fuzzy Sets: Order Convolutions of Functions on the Unit Interval explores the fundamental properties of this algebra and the role of these properties in applications. Accessible to anyone with a standard undergraduate mathematics background, this self-contained book offers several options for a one- or two-semester course. It covers topics increasingly used in fuzzy set theory, such as lattice theory, analysis, category theory, and universal algebra. The book discusses the basics of the type-2 truth value algebra, its subalgebra of convex normal functions, and their applications. It also examines the truth value algebra from a more algebraic and axiomatic view.
This self-contained monograph presents an overview of fuzzy operator theory in mathematical analysis. Concepts, principles, methods, techniques, and applications of fuzzy operator theory are unified in this book to provide an introduction to graduate students and researchers in mathematics, applied sciences, physics, engineering, optimization, and operations research. New approaches to fuzzy operator theory and fixed point theory with applications to fuzzy metric spaces, fuzzy normed spaces, partially ordered fuzzy metric spaces, fuzzy normed algebras, and non-Archimedean fuzzy metric spaces are presented. Surveys are provided on: Basic theory of fuzzy metric and normed spaces and its topology, fuzzy normed and Banach spaces, linear operators, fundamental theorems (open mapping and closed graph), applications of contractions and fixed point theory, approximation theory and best proximity theory, fuzzy metric type space, topology and applications.
This book serves as a textbook for an introductory course in metric spaces for undergraduate or graduate students. The goal is to present the basics of metric spaces in a natural and intuitive way and encourage students to think geometrically while actively participating in the learning of this subject. In this book, the authors illustrated the strategy of the proofs of various theorems that motivate readers to complete them on their own. Bits of pertinent history are infused in the text, including brief biographies of some of the central players in the development of metric

spaces. The textbook is divided into seven chapters that contain the main materials on metric spaces; namely, introductory concepts, completeness, compactness, connectedness, continuous functions and metric fixed point theorems with applications. Some of the noteworthy features of this book include · Diagrammatic illustrations that encourage readers to think geometrically · Focus on systematic strategy to generate ideas for the proofs of theorems · A wealth of remarks, observations along with a variety of exercises · Historical notes and brief biographies appearing throughout the text

“Neutrosophic Sets and Systems” has been created for publications on advanced studies in neutrosophy, neutrosophic set, neutrosophic logic, neutrosophic probability, neutrosophic statistics that started in 1995 and their applications in any field, such as the neutrosophic structures developed in algebra, geometry, topology, etc. Some articles in this issue: n-Refined Neutrosophic Modules, A Neutrosophic Approach to Digital Images, A Novel Method for Neutrosophic Assignment Problem by using Interval-Valued Trapezoidal Neutrosophic Number.

It is an indisputable argument that the formulation of metrics (by Fréchet in the early 1900s) opened a new subject in mathematics called non-linear analysis after the appearance of Banach’s fixed point theorem. Because the underlying space of this theorem is a metric space, the theory that developed following its publication is known as metric fixed point theory. It is well known that metric fixed point theory provides essential tools for solving problems arising in various branches of mathematics and other sciences such as split feasibility problems, variational inequality problems, non-linear optimization problems, equilibrium problems, selection and matching problems, and problems of proving the existence of solutions of integral and differential equations are closely related to fixed point theory. For this reason, many people over the past seventy years have tried to generalize the definition of metric space and corresponding fixed point theory. This trend still continues. A few questions lying at the heart of the theory remain open and there are many unanswered questions regarding the limits to which the theory may be extended. Metric Structures and Fixed Point Theory provides an extensive understanding and the latest updates on the subject. The book not only shows diversified aspects of popular generalizations of metric spaces such as symmetric, b-metric, w-distance, G-metric, modular metric, probabilistic metric, fuzzy metric, graphical metric and corresponding fixed point theory but also motivates work on existing open problems on the subject. Each of the nine chapters—contributed by various authors—contains an Introduction section which summarizes the material needed to read the chapter independently of the others and contains the necessary background, several examples, and comprehensive literature to comprehend the concepts presented therein. This is helpful for those who want to pursue their research career in metric fixed point theory and its related areas. Features Explores the latest research and developments in fixed point theory on the most popular generalizations of metric spaces Description of various generalizations of metric spaces Very new topics on fixed point theory in graphical and modular metric spaces Enriched with examples and open problems This book serves as a reference for scientific investigators who need to analyze a simple and direct presentation of the fundamentals of the theory of metric fixed points. It may also be used as a text book for postgraduate and research students who are trying to derive future research scope in this area.

This book focusing on Metric fixed point theory is designed to provide an extensive understanding of the topic with the latest updates. It provides a good source of references, open questions and new approaches. While the book is principally addressed to graduate students, it is also intended to be useful to mathematicians, both pure and applied.

This book is the result of a meeting on Topology and Functional Analysis, and is dedicated to Professor Manuel López-Pellicer's mathematical research. Covering topics in descriptive topology and functional analysis, including topological groups and Banach space theory, fuzzy topology, differentiability and renorming, tensor products of Banach spaces and aspects of Cp-theory, this volume is particularly useful to young researchers wanting to learn about the latest developments in these areas.

This book is a printed edition of the Special Issue "Fuzzy Mathematics" that was published in Mathematics

"This book provides original research on the theoretical and applied aspects of artificial life, as well as addresses scientific, psychological, and social issues of synthetic life-like behavior and abilities"--Provided by publisher.

The Second International Conference on Fuzzy Information and Engineering (ICFIE2007) is a major symposium for scientists, engineers and practitioners in China as well as the world to present their latest results, ideas, developments and applications in all areas of fuzzy information and knowledge engineering. It aims to strengthen relations between industry research laboratories and universities, and to create a primary symposium for world scientists.

In this paper, the notion of neutrosophic soft metric space(NSMS) is introduced interms of neutrosophic soft points and several related properties, structural characteristics have been investigated. Then the convergence of sequence in neutrosophic soft metric space is de?ned and illustrated by examples.

Featuring the clearly presented and expertly-refereed contributions of leading researchers in the field of approximation theory, this volume is a collection of the best contributions at the Third International Conference on Applied Mathematics and Approximation Theory, an international conference held at TOBB University of Economics and Technology in Ankara, Turkey, on May 28-31, 2015. The goal of the conference, and this volume, is to bring together key work from researchers in all areas of approximation theory, covering topics such as ODEs, PDEs, difference equations, applied analysis, computational analysis, signal theory, positive operators, statistical approximation, fuzzy approximation, fractional analysis, semigroups, inequalities, special functions and summability. These topics are presented both within their traditional context of approximation theory, while also focusing on their connections to applied mathematics. As a result, this collection will be an invaluable resource for researchers in applied mathematics, engineering and statistics.??