

A Literature Survey: Classification Of Soft Sets & Fuzzy Sets

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Abstract: Mathematical development has highly developed in computer science to a very high standard and is still approaching today. In this evaluation, the basic mathematical framework of fuzzy set theory will be described, as well as the most important applications of this theory to other theory and technique. Fuzzy set theory, the theory of neural nets and the area of evolutionary programming have become known under the name of 'computational intelligence or 'soft computing'. The relationship between these areas has naturally become particularly close. In this evaluation, however, we will center of attention primarily on fuzzy set theory.

Keywords: Classification of soft sets, Sets theory, Fuzzy sets.

I. INTRODUCTIONS

Discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous. In the objects studied in discrete mathematics – such as integers, graphs, and statements in logic [1] – do not vary smoothly in this way, but have distinct, separated values[2]. Discrete mathematics therefore excludes topics in “continuous mathematics” such as calculus and analysis. Discrete objects can often be enumerated by integers. More formally, discrete mathematics has been characterized as the branch of mathematics dealing with countable sets [3]. Research in discrete mathematics increased in the latter half of the twentieth century partly due to the development of digital computers which operate in discrete steps and store data in discrete bits. Concepts and notations from discrete mathematics are useful in studying and describing objects and problems in branches of computer science, such as computer algorithms, programming, cryptography, automated theorem proving, and software development. In mathematics, fuzzy sets whose elements have degrees of membership. Fuzzy mathematics is the study of fuzzy structures, such mathematical structures that at some points replace the two classical truth values 0 and 1 with a larger structure of degrees. Most of our traditional tools for formal modelling, reasoning, and computing are crisp, deterministic, and precise in character. Crisp means dichotomous, that is, yes-or-no type

rather than more-or-less type [4]. In traditional dual logic, for instance, a statement can be true or false—and nothing in between. In set theory, an element can either belong to a set or not; in optimization a solution can be feasible or not. Precision assumes that the parameters of a model represent exactly the real system that has been modelled. This, generally, also implies that the model is unequivocal, that is, that it contains no ambiguities. Certainty eventually indicates that we assume the structures and parameters of the model to be definitely known and that there are no doubts about their values or their occurrence. Unluckily these assumptions and beliefs are not justified if it is important, that the model describes well reality. The development up to the recent state of the art is surveyed. However, all the systems proved to be algebraic in the technical, which means that they also have algebraic semantics, provided by a class and usually a variety of algebraic structures and which sometimes are denied immediately via an algebraic semantics. It is an old approach, dating back to the early days of fuzzy set theory, to identify the membership degrees of fuzzy sets with truth degrees of a suitable many-valued logic. In different forms, this idea has been ordered and explained [5]. This point of view toward fuzzy set theory has been one of the motivations behind the development of mathematical fuzzy logics. Therefore one may expect that the recent results in this field of mathematical fuzzy logics give rise to a return to this starting point to use the new insights e.g. for a coherent development of a fuzzy set

theory [6]. But more is of interest here because, in classical logic, there is a reach field of extensions of classical first order logic which all lead to systems in between first order and second order logic. Such systems are e.g. determined by generalized quantifiers, particularly by cardinality quantifiers. Fuzzy sets generalize classical sets, since the indicator functions of classical sets are special cases of the membership functions of fuzzy sets, if the latter only take values 0 or 1. Theoretical computer science includes areas of discrete mathematics relevant to computing. It draws heavily on graph theory and mathematical logic.

Set theory is a branch of mathematical logic that studies sets, which informally are collections of objects. Although any type of object can be collected into a set, set theory is applied most often to objects that are relevant to mathematics. The language of set theory can be used in the definitions of nearly all mathematical objects. Set theory as a foundation for mathematicians accepts that theorems in these areas can be derived from the relevant definitions and the axioms of set theory [7].

II. CLASSIFICATION OF SOFT SETS

Let \mathfrak{F} be a collection of fuzzy sets on U . Each fuzzy set is defined by a neighborhood (may be a singleton) in the membership function space; let $\mathcal{C}\mathcal{O}\mathcal{L}$ be a neighborhood system [12]. Let $MF(U)$ be the total space of membership functions under consideration, i.e. $MF(U)$ is the total union of all membership functions representing \mathfrak{F} , namely the union of members in $\mathcal{C}\mathcal{O}\mathcal{L}$: $MF(U) = \cup \mathcal{C}\mathcal{O}\mathcal{L}$. $\mathcal{C}\mathcal{O}\mathcal{L}$ is a neighborhood system on $MF(U)$. Depending on the nature of $\mathcal{C}\mathcal{O}\mathcal{L}$, we have various types of fuzzy sets. To avoid confusing, here will call the fuzzy sets defined by $\mathcal{C}\mathcal{O}\mathcal{L}$ soft sets (or sofset). Here is a list of soft sets.

A. W-SOFSET

Weighted Soft Set (Mathematical Soft Set or Quantitative Soft Set), if $\mathcal{C}\mathcal{O}\mathcal{L}$ consists of singletons. Every membership function is treated as a characteristic function of a soft set. Many classical fuzzy theorists have implicitly taken this view. For clarity, when refer their works, will use, instead of fuzzy set, weighted soft set, also we will say each element in a soft set has a weight (instead of grade). soft set theory is essentially a “new” mathematical analysis of real variables where one studies functions from the point of view of weighted memberships.

B. F-SOFSET

Finite-multi Soft Set, if $\mathcal{C}\mathcal{O}\mathcal{L}$ consists of finite sets.

C. P-SOFSET

Partitioned Soft Set, if $\mathcal{C}\mathcal{O}\mathcal{L}$ forms a crispy partition. Mathematically this is a most beautiful theory, realizing that a fuzzy set (that tolerates perturbation) has to be represented by a set of membership functions. Each set represents one and only one fuzzy set. Then the space of membership functions is

partitioned into equivalence classes. So P-sofset theory is very elegant and beautiful. However, one may wonder how could there be a natural partition in a “continuous” membership function space.

D. B-SOFSET

Basic Neighborhood Soft Set, if $\mathcal{C}\mathcal{O}\mathcal{L}$ forms a basic neighborhood system (i.e., the neighborhood system is defined by a binary relation). Basic neighborhoods are geometric view of binary relation. Intuitively, related membership functions are “geometrically” near to each other. A basic neighborhood system is an abstract binary relation, so it may include some “unexpected” cases [8].

E. C-SOFSET

Covering Soft Set, if $\mathcal{C}\mathcal{O}\mathcal{L}$ forms a covering. 3.6. N-Sofset Neighborhood Soft Set (Real World Soft Set or Qualitative Soft Set), if $\mathcal{C}\mathcal{O}\mathcal{L}$ forms a neighborhood system.

F. FP-SOFSET

Fuzzy-Partitioned Soft Sets, if $\mathcal{C}\mathcal{O}\mathcal{L}$ forms a fuzzy (weighted) partition.

G. FF-SOFTSET

Double Fuzzy Soft Sets, if $\mathcal{C}\mathcal{O}\mathcal{L}$ forms a fuzzy (weighted) covering.

III. RELATED WORK

Fuzzy set theory, which was firstly proposed by researcher Zadeh in [9], has become a very important tool to solve problems and provides an appropriate framework for representing vague concepts by allowing partial membership. Fuzzy set theory has been studied by both mathematicians and computer scientists and many applications of fuzzy set theory have arisen over the years, such as fuzzy control systems, fuzzy automata, fuzzy logic, fuzzy topology etc. Beside this theory, there are also theories of probability, rough set theory which deal with to solve these problems. Each of these theories has its inherent difficulties as pointed out in [10] by Molodtsov who introduced the concept of soft set theory which is a completely new approach for modeling uncertainty. The origin of soft set theory could be traced to the work of Pawlak [11] in 1993 titled hard sets and soft sets. His notion of soft sets is a unified view of classical, rough and fuzzy sets. This motivated by Molodtsov in 1999[10] titled soft set theory: first result, there in, the basic notions of the theory of soft sets and some of its possible applications were presented. In [12] 1996 Lin have present a set theory for soft computing and presenting unified view of fuzzy sets via neighborhoods. This paper proposed fuzzy sets should be abstractly defined by such structures and are termed soft sets (sofsets). Based on such structures, W-sofset, F-sofset, P-sofset, B-sofset, C-sofset, N-sofset, FP-sofset, and FF-sofsets have been identified. Maji et al., [13] presented a combination of fuzzy

and soft set theories, fuzzy soft set theory is a more general soft set model which makes descriptions of the objective world more general, realistic, practical and accurate in some cases of decision making. In [14] again presented soft set theory with some implementation in their work. Roy & Maji [15] presented a novel method of object recognition from an imprecise multi observer data in decision making problem. Pei & Miao [16] have discussed the relationship between soft sets and information systems. It is showed that soft sets are a class of special information systems. After soft sets are extended to several classes of general cases, the more general results also show that partition-type soft sets and information systems have the same formal structures, and that fuzzy soft sets and fuzzy information systems are equivalent. Xiao et al., [17] in his paper, an appropriate definition and method is designed for recognizing soft information patterns by establishing the information table based on soft sets theory and at the same time the solutions are proposed corresponding to the different recognition vectors. In Mushrif et al., [18] studied the texture classification via Soft Set Theory based in a Classification Algorithm. In Aktas & Cagman [19] have introduces the basic properties of soft sets and compare soft sets to the related concepts of fuzzy sets and rough sets. In the same year, Kovkov et al., have presented the stability of sets given by constraints is considered within the context of the theory of soft sets. Feng et al., [20] extended the study of soft set to soft semirings. The notions of soft semirings, soft subsemirings, soft ideals, idealistic soft semirings and soft semi ring homomorphism were introduced, and several related properties were investigated. Jun [21] have presented a new algebra method is Soft BCK/BCI-algebras and in Jun et al., [22] apply the notion of soft sets by Molodtsov to commutative ideals of BCK-algebras, commutative soft ideals and commutative idealistic soft BCK-algebras are introduced, and their basic properties are investigated. Kong et al., [23] presented a heuristic algorithm of normal parameter reduction. Furthermore, the normal parameter reduction is also investigated in fuzzy soft sets. Sun et al., [24] presented the definition of soft modules and construct some basic properties using modules. Yao et al., [25] presented the concept of soft fuzzy set and its properties. Xiao et al., [26] in these paper data analysis approaches of soft sets under incomplete information is calculated by weighted-average of all possible choice values of the object, and the weight of each possible choice value is decided by the distribution of other objects. In Ali et al., [27] gives some new notions such as the restricted intersection, the restricted union, the restricted difference and the extended intersection of two soft sets. Herawan et al., [28] proposed an approach for visualizing soft maximal association rules which contains four main steps, including discovering, visualizing maximal supported sets, capturing and finally visualizing the maximal rules under soft set theory. Jun et al., [29] applied the notion of soft sets to the theory of BCK/BCI-algebras and introduced soft sub algebras and then derived their basic properties with some illustrative examples. Jun & Park [30] introduced the concept of soft Hilbert algebra, soft Hilbert abysmal algebra and soft Hilbert deductive algebra and investigated their properties. Yang et al., [31] introduced the combination of interval-valued fuzzy set and soft set models. The complement, AND, OR operations, DeMorgan's,

associative and distribution laws of the interval-valued fuzzy soft sets are then proved. In Acar et al., [32] introduce the basic notions of soft rings, which are actually a parameterized family of subrings of a ring, over a ring Babitha & Sunil [33], presented the concept of soft set relations are introduced as a sub soft set of the Cartesian product of the soft sets and many related concepts such equivalent soft set relation, partition, composition, function etc. Cagman & Enginoglu [34] define soft matrices and their operations which are more functional to make theoretical studies in the soft set theory and finally construct a soft max-min decision making method which can be successfully applied to the problems that contain uncertainties and also improving several new results, products of soft sets and uni-int decision function Cagman & Enginoglu, 2010A. Feng et al., [35] aim of this paper is providing a framework to combine fuzzy sets, rough sets, and soft sets all together, which gives rise to several interesting new concepts such as rough soft sets and soft rough sets. Soft-rough fuzzy sets. Feng et al., [36] aim of this paper to give deeper insights into decision making involving interval valued fuzzy soft sets, a hybrid model combining soft with interval valued fuzzy sets. Many authors works in different areas like Soft lattices [37], bijective soft set [38], on soft mappings [39]. Majumdar & Samanta [40] have further generalised the concept of fuzzy soft sets as introduced by Qin & Hong [41], paper deals with the algebraic structure of soft sets and constructed lattice structures. It is proved that soft equality is a congruence relation with respect to some operations and the soft quotient algebra is established. Xiao et al., [42], in his paper proposes the notion of exclusive disjunctive soft sets and studies some of its operations, such as, restricted/relaxed AND operations, dependency between exclusive disjunctive soft sets and bijective soft sets etc. Xu et al., [43] introduce the notion of vague soft set which is an extension to the soft set and discuss basic properties of vague soft sets. In Ali et al., [44] studied some important properties associated with these new operations. A collection of all soft sets with respect to new operations give rise to four idempotent monoids. Alkhazaleh et al., [45], in his paper, as a generalization of Molodtsov's soft set introduce the definitions of a soft multiset, its basic operations such as complement, union and intersection. Atagun & Sezgin [46] introduces soft subfields of a field and soft sub module of a left R-module their related properties about soft substructures of rings, fields and modules are investigated. In this paper Babitha & Sunil [47], Antisymmetric relation and transitive closure of a soft set relation are introduced and proposed Warshall's algorithm. Celik et al., [48] have introduced the notion of soft ring and soft ideal over a ring and some examples are given. Also obtain some new properties of soft rings and soft ideals. Feng et al., [49], presented to establish an interesting connection between two mathematical approaches to vagueness: rough sets and soft sets. Also define new types of soft sets such as full soft sets, intersection complete soft sets and partition soft sets. FuLi [50] paper based on some results of soft operations, using the DeMolan's laws and gives the distributive laws of the restricted union and the restricted intersection and the distributive laws of the union and the extended intersection. Ge & Yang [51] paper investigated operational rules and obtains some sufficient necessary conditions such that

corresponding operational rules hold and give correct forms for some operational rules. Ghosh et al., [52] defined fuzzy soft ring and study some of its algebraic properties. Herawan & Deris [53], a soft set approach for association rule mining have define the notion of regular and maximal association rules between two sets of parameters Jiang et al., [54] extended fuzzy soft sets with fuzzy DLs, i.e., present an extended fuzzy soft set theory by using the concepts of fuzzy DLs to act as the parameters of fuzzy soft sets and define some operations for the extended fuzzy soft sets. Jun et al., [55] present the notions of positive implicative soft ideals and positive implicative idealistic soft BCK-algebras are introduced, and their basic properties are derived. Kharal & Ahmad [56] define the notion of a mapping on soft classes and study several properties of images and inverse images of soft sets supported by examples. Lee et al., [57] introduced implicative soft ideals in BCK-algebras and implicative idealistic soft BCK-algebras and related properties are investigated. Ozturk & Inna [58] presented soft-rings and idealistic soft rings. Pal & Mondal [59] defined soft matrices based on soft set and operations of kernel, symmetric kernel, reflexive closure, and symmetric closure of a soft set relation are first introduced, respectively. Finally, soft set relation mappings and inverse soft set relation mappings are proposed. Zhou et al., [62] applied the concept of intuitionist fuzzy soft sets to semi group theory. In Karaaslan et al., [63] defined concept of a soft lattice, soft sub lattice, complete soft lattice, modular soft lattice, distributive soft lattice, and soft chain and study their related properties. Min [64] has studied the concept of similarity between soft sets, which is an extension of the equality for soft set theory. Singh & Onyeozili [65] presented the main objective and clarify some conceptual misunderstandings of the fundamentals soft matrices are defined like AND, OR, union, intersection etc. for soft matrices are investigated. Sezgin & Atagun [60] discussed basic properties of operations on soft sets such as intersection, extended intersection, restricted union and restricted difference and illustrated their interconnections between each other. Yang & Guo [61] in this paper, the notions of anti-reflexive of soft set theory and investigate some distributive and absorption properties of operations on soft sets [66]. Xiao et al., [67], this paper aims to extend classical soft sets to trapezoidal fuzzy soft sets based on trapezoidal fuzzy numbers. Xiao et al., [68], an integrated FCM and fuzzy soft set for supplier selection problem based on risk evaluation. This study first integrates the Fuzzy Cognitive Map (FCM) and fuzzy soft set model for solving the supplier selection problem. Alhazaymeh et al., [69], presented the innovative definition like the operations of union, intersection, OR and AND operators of soft intuitionist fuzzy sets along with illustrative examples. Ali [70], to discuss the idea of reduction of parameters in case of soft sets and studied approximation space of Pawlak associated with a soft set.

IV. CONCLUSION

Applications of fuzzy set theory to real problems are abound. Some references will be given. Classification with Fuzzy Logic is generated more number of rules. The

performance analysis is based on Sensitivity, Specificity and Accuracy with different cluster numbers. To explain even a part of them would certainly exceed the scope of this review. A moment ago, various researches had been done on this theory both in theory and in practice. In this paper, a reviews literature of soft set theory and review of its existing literature is accepted out. Our future work to broaden this work, one could generalize it to fuzzy soft set theory, multi set theory and soft multi set theory.

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