

Review of Literature

REVIEW OF LITERATURE

Soft Set Theory is one of the recent topics gaining significance in finding rational and logical solutions to various real life problems which involve uncertainty, impreciseness and vagueness.

Uncertainty is present in almost every sphere of our daily life. Traditional mathematical tools are not sufficient to handle all the practical problems in fields such as Medical Science, Social Science, Engineering, Economics etc. which involve various types of uncertainty. Zadeh [39], in 1965 was the first to come up with his remarkable theory of Fuzzy Set for dealing these types of uncertainties where conventional tools fail. His theory brought a grand paradigmatic change in mathematics.

Later, there are theories namely the Intuitionistic Fuzzy Sets, Vague Sets, Rough Sets, Interval Mathematics etc. for handling uncertainty. All these theories are successful to some extent in dealing with the problems arising due to the vagueness present in the real world. But there are also cases where these theories failed to give satisfactory results, possibly due to the inadequacy of the parameterization tool in them.

In 1999, Molodtsov [23] initiated the theory of Soft Sets as a new mathematical tool for dealing uncertainty. Possible applications of Soft Sets in various problems such as Smoothness of Functions, Game Theory, Operations Research, Riemann Integration, Perron Integration, Theory of Probability, Theory of Measurement, Economics, Social Sciences, Medical Sciences etc. are shown by Molodtsov [23] and others. H.Aktas and N.Cagman has shown that every Fuzzy Set and every Rough Set can be considered as a Soft Set. In that sense one can say that this theory is much more general than its predecessors.

In 2003, Maji et al [20] studied the theory of Soft Sets initiated by Molodtsov [23] and developed several basic notions of Soft Set Theory. At present, researchers are contributing a lot on the extension of Soft Set Theory.

In recent years the researchers have contributed a lot towards fuzzification of Soft Set Theory, Maji et al [17] initiated the concept of Fuzzy Soft Sets with some properties regarding union, intersection and complement of a Fuzzy Soft Set, De Morgan's Law etc. These results were further revised and improved by Ahmad and Kharal [2]. They defined arbitrary fuzzy soft union and intersection and proved De Morgan's Inclusions and De Morgan's Laws in Fuzzy Soft Set Theory. Neog and Sut [34] studied basic properties of Fuzzy Soft Sets and put a forward a new notion of complement of a Fuzzy Soft Set.

Cagman, Citak and Eugi Noglu [24] defined the concept of Fuzzy Parameterized Fuzzy Soft Sets and illustrated their applications. In 2009, by combining the Interval-Valued Fuzzy Sets and Soft Sets Yang et al. [38] introduced the concept of Interval-Valued Fuzzy Soft Sets.

In 2011, Alkhazaled et al [29] introduced the concept of Fuzzy Parameterized Interval-Valued Fuzzy Soft Sets. In 2010, Pinaki Majumdar and S.K.Samanta [26] generalised the concept of Fuzzy Soft Sets and introduced Generalised Fuzzy Soft Sets.

In 2011, Shawkat Alkhazaleh and Abdul Razak Salleh [31] obtained a new Soft Set model named as Generalised Interval-Valued Fuzzy Soft Sets by combining the Generalised Fuzzy Soft Sets and Interval-Valued Fuzzy Sets.

Applications of Fuzzy Soft Sets in real life problems facilitate deriving scientific and logical solutions.

The following are some of the articles published on applications of Fuzzy Soft Sets in real life problems:

- 1) "A Fuzzy Soft Set Theoretic Approach to Decision Making Problems", Roy, A.R. and Maji, P.K., 2007 [28].
- 2) "An Application of Fuzzy Soft Set in Medical Diagnosis using Fuzzy Arithmetic Operations on Fuzzy Number", Das, P.K. and Borgohain, R., 2010 [12].
- 3) "An Application of Fuzzy Soft Sets in Medical Diagnosis using Fuzzy Soft Complement", Tridiv Jyoti Neog and Dusmanta Kumar Sut, 2011 [32].
- 4) "An Application of Interval-Valued Fuzzy Soft Sets in Medical Diagnosis", Chetia, B. and Das, P.K., 2010 [10].
- 5) "Fuzzy Parameterized Fuzzy Soft Set Theory and its Applications", Naim Cagman, Filiz Citak and Serdar Enginoglu, 2010 [24].
- 6) "Solutions of the Decision Making Problems using Fuzzy Soft Relations", Arindam Chaudhuri, Dr.Kajal De and Dr.Dipak Chatterjee, 2009 [3].
- 7) "Generalised Intuitionistic Fuzzy Soft Sets and its Application in Decision Making", Bivas Dinda, Tuhin Bera and Samanta, T.K., 2010 [7].
- 8) "Generalised Intuitionistic Fuzzy Soft Set and its Application in Practical Medical Diagnosis Problem", Agarwal, M., Hanmandhu, M., and Biswas, K.K., 2011 [1].
- 9) "Predicting Suicide Attacks: A Fuzzy Soft Set Approach", Athar Kharal, 2010 [5].

In this review of literature a brief survey of some of the articles published on Soft Sets, Fuzzy Soft Sets and some of their applications are given.

1) Soft Set Theory – First Results

Molodtsov, D. (1999) [23]

The soft set theory offers a general mathematical tool for dealing objects. The basic notions of the theory of soft sets are introduced, the first results of the theory are presented and some problems of the future are discussed.

2) From Soft Sets to Information Systems

Daowu Pei and Duoqian Miao (2005) [11]

This paper discusses 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.

3) Distance and Similarity Measures for Soft Sets

Athar Kharal (2010) [4]

In this paper, new similarity measures for soft sets using set theoretic operations are proposed. An application of the proposed measures of similarity in the area of automated financial analysis is also presented.

4) An Application of Soft Sets in a Decision Making Problem

Maji, P.K. and Roy, A.R. (2002) [19]

In this paper, the theory of soft sets one applied to solve a decision making problem using rough mathematics.

5) On Similarity Measures of Fuzzy Soft Sets

Pinaki Majumdar and Sumanta, S.K. (2011) [27]

In this paper several similarity measures of fuzzy soft sets are introduced. The measures are examined based on the geometric model, the set theoretic approach and the matching function. A comparative study of these measures is done.

6) An Application of Fuzzy Soft Set in Medical Diagnosis using Fuzzy Arithmetic Operations on Fuzzy Number

Das, P.K. and Borgohain, R. (2010) [12]

In this paper, the authors applied fuzzy soft set technology through the well known Sanchez's approach for medical diagnosis using arithmetic operations on fuzzy numbers and exhibit the technique with a hypothetical case study.

7) A Fuzzy Soft Set Theoretic Approach to Decision Making Problems

Roy, A.R. and Maji, P.K. (2007) [28]

The problem of decision making in an imprecise environment has found paramount importance in recent years. A novel method of object recognition from an imprecise multi observer data has been presented here. The method involves construction of a comparison table from a fuzzy soft set in a parametric sense for decision making.

8) Intuitionistic Fuzzy Soft Sets

Maji, P.K., Roy, A.R., and Biswas, R. (2001) [18]

The concept of intuitionistic fuzzy soft set (IFSS) which combines the advantage of soft set and intuitionistic fuzzy set (IFS) is proposed. Then some

basic notions of IFSS are also presented in this paper. Based on the "Complement", "intersection", "union" operations on IFS theory, the "Complement", "intersection", "union", "AND" and "OR" operations of IFSS are defined. Some properties of the above operations are also discussed.

9) Possibility Intuitionistic Fuzzy Soft Set

Maruah Bashir, Abdul Razak Salleh and Shawkat Alkhazaleh (2011) [22]

Possibility intuitionistic fuzzy soft set and its operations are introduced and a few of their properties are studied. An application of possibility intuitionistic fuzzy soft sets in decision making is investigated. A similarity measure of two possibility intuitionistic fuzzy soft sets has been discussed. An application of this similarity measure in medical diagnosis has been shown.

10) Relations on Intuitionistic Fuzzy Soft Sets

Bivas Dinda and Samanta, T.K. (2010) [6]

In this paper, the concept of relations in intuitionistic fuzzy soft set is presented and some of their properties are studied. Also symmetric, transitive and reflexive intuitionistic fuzzy soft relations are discussed.

11) Generalised Intuitionistic Fuzzy Soft Sets and its Application in Decision Making

Bivas Dinda, Tuhin Bera and Samanta, T.K. (2010) [7]

In this paper, generalised intuitionistic fuzzy soft sets and relations on generalised intuitionistic fuzzy soft sets are defined and a few of their properties are studied. An application of generalised intuitionistic fuzzy soft sets in decision making with respect to degree of preference is investigated.

12) Generalised Intuitionistic Fuzzy Soft Sets and an Adjustable Approach to Decision Making

Bivas Dinda, Tuhin Bera and Samanta, T.K. (2011) [8]

In this paper, the concept of intuitionistic fuzzy soft set is generalised. Relations on generalised intuitionistic fuzzy soft sets and a few of their algebraic properties are studied. Finally, an adjustable approach to generalised intuitionistic fuzzy soft sets based decision making is presented.

13) An Adjustable Approach to Interval-Valued Intuitionistic Fuzzy Soft Sets based Decision Making

Hongwn Qin, Xiuqin Ma, Tutut Herawan and Jasni Mohamad Zain (2011) [13]

In this paper the notion of reduct intuitionistic fuzzy soft sets are defined and an adjustable approach to interval-valued intuitionistic fuzzy soft set based decision making by using reduct intuitionistic fuzzy soft sets and level soft sets of intuitionistic fuzzy soft sets is presented.