

## Guest Editorial Preface

# Special Issue on “Theory and Applications of Soft Sets in Fuzzy and Related Contexts” (Part 2)

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### INTRODUCTION

One major issue associated with the notion of a set is the concept of vagueness. Vagueness or the representation of imperfect knowledge has been a problem for a long time for philosophers, logicians and mathematicians. One of the solutions to overcome this, proposed by Russian Mathematician Moldostov (1999), using a certain parameterization of a given set, is the concept of a soft structure over the given set. As usual, this new perspective idea has drawn attention of both pure mathematicians as well as researchers in the area of applied mathematics. Specifically, the specialists found the concept of a soft set well coordinated with modern mathematical concepts such as fuzzy sets, multisets, rough sets etc. The aim of this notion was to make a certain discretization of such fundamental mathematical concepts with effectively continuous nature and to provide a new tool for the mathematical analysis in real life problems. This idea has resulted in a series of works where soft versions of fuzzy mathematical concepts were realized. Various hybridizations of soft sets with other structures is possible and are quite useful in applications where handling imperfect knowledge is required. This special issue is devoted to the advancement of the theory and application of soft sets especially in the fuzzy environment.

### INSIDE THIS ISSUE

Focusing on these, the first article strengthens the theoretical side of soft sets by introducing the Dual Hesitant Fuzzy Soft Rings. Based on level soft sets of the dual hesitant fuzzy soft set, a characterization theorem for the dual hesitant fuzzy soft ring is established. Further, the homomorphic and bi-soft homomorphic properties of a dual hesitant fuzzy soft ring are also discussed.

Second article explores the theoretical aspects of union-soft sets by extending the notions of equivalence relations, partition, composition of relations, and functions to the framework of union-soft sets. Further the Cartesian product, the relation between union-soft sets, induced relations from the universal set and the attribute set with examples are discussed. Moreover, the composition of union-soft set relationships with examples and some related theorems are also demonstrated.

An application of Bipolar intuitionistic fuzzy soft sets in decision making problem is discussed in the third article. After presenting the basic operations on bipolar intuitionistic fuzzy soft sets like extended union, intersection etc., a general algorithm to solve decision making problems is developed.

Information technology and internet together infused organizations with huge amount of data. Consequently, accumulating, storing, understanding and analyzing data at a large scale is equally important and complex. Out of this data not all is information data, in order to extract information, one need to discard redundant, irrelevant and unnecessary data. Fourth article aims to introduce a

data reduction technique which will be useful to discard irrelevant data. Fuzzy-soft set technique namely fuzzy-soft information matrix is used for this purpose.

Some new basic operations and results of Ordered Intuitionistic Fuzzy Soft (OIFS) sets, such as equality, complement, subset, union, intersection, OR, and AND operators along with several examples are investigated in the fifth article. Further, based on the analysis of several operations on OIFS sets, numerous algebraic properties and famous De Morgans inclusions and De Morgans laws are established. Using the notions of OIFS sets, an algorithm is developed and implemented in a numerical example.

Hybridization of individual models leads to models which are more efficient than their individual components. One such model is the interval valued intuitionistic fuzzy soft sets (IVIFSS). Sixth article proposes a group decision making algorithm using IVIFSS, which generalizes many of earlier existing algorithms. Complexity of this algorithm is determined and computation is established experimentally with graphical illustrations.

## CONCLUSION

Many of the already existing techniques of modeling and decision-making lack in parameterization of the tools and hence they could not be applied successfully in tackling real life problems. In this context, soft set theory is standing in a unique way in the sense that it is relatively free from such difficulties and offers a wider scope for many applications in a multidimensional way. It is earnestly hoped that this special issue is beneficial to the international advancement of the theory and application of soft sets and applications.

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