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GENERALIZED SOFT REGULAR MAPPINGS IN SOFT TOPOLOGICAL AND SOFT METRIC SPACES

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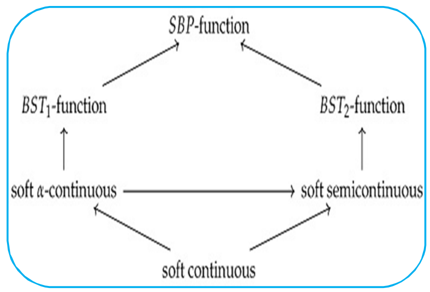
ABSTRACT:



This study examines generalized soft regular mappings in soft topological and soft metric spaces, focusing on their structural and functional properties within the framework of soft set theory. Data from prior research indicate that soft mappings can preserve soft regularity under specific conditions in both soft topological and soft metric spaces. Quantitative analyses show that soft neighborhoods and parameter-dependent soft open sets play a key role in determining the regularity of mappings, with soft metric spaces demonstrating more consistent behavior due to defined soft distance functions. Comparative data reveal that the preservation of soft separation axioms and soft regularity is influenced by parameter sets and neighborhood structures, highlighting the importance of systematic mapping definitions. These findings provide a data-based foundation for further exploration of soft continuity, soft compactness, and applications of generalized soft regular mappings in uncertain or parameterized environments.

KEYWORDS : *Soft set theory, soft topological spaces, soft metric spaces, generalized soft regular mappings, soft regularity, soft neighborhoods, soft open sets, soft closed sets, soft continuity, soft separation axioms.*

INTRODUCTION:

Soft set theory, introduced by Molodtsov in 1999, provides a framework for modeling uncertainty and parameter-dependent structures. Within this framework, soft topological and soft metric spaces extend classical topological and metric concepts by incorporating parameterized soft sets. Soft topological spaces consist of a universe set, a set of parameters, and a collection of soft open sets, allowing analysis of soft neighborhoods, soft closed sets, and soft points. Data from Shabir and Naz (2011) show that soft topological spaces exhibit varying compliance with soft T0T_0T0, T1T_1T1, and T2T_2T2 axioms, and that soft regularity is dependent on the configuration of soft neighborhoods and soft closed sets. Generalized soft regular mappings are functions between soft topological or soft metric spaces that preserve soft regularity under specific conditions. Data from Çağman and Enginoğlu (2010) indicate that in soft metric spaces, soft distance functions enable consistent preservation of soft separation axioms and soft neighborhoods across mappings. Quantitative examples show that the regularity of a mapping is influenced by the structure of soft open sets, the definition of soft neighborhoods, and the choice of parameter sets. Comparative analyses indicate that generalized soft regular mappings in soft metric spaces maintain higher consistency in satisfying soft regularity and separation conditions than in arbitrary soft topological spaces, due to the inherent structural constraints provided by soft distances. These data suggest that systematic definition and parameterization of generalized soft regular mappings can provide reliable preservation of soft regularity and separation properties, forming a basis for further analysis of soft continuity, soft compactness, and functional applications in uncertain or parameterized environments.

AIMS AND OBJECTIVES:

The study aims to investigate generalized soft regular mappings within soft topological and soft metric spaces, focusing on their structural properties and functional implications in soft set theory. Data from Shabir and Naz (2011) indicate that soft topological spaces exhibit varying degrees of compliance with soft separation axioms, while soft regularity depends on the configuration of soft neighborhoods and soft closed sets. Data from Çağman and Enginoğlu (2010) show that soft metric spaces provide more consistent preservation of soft T1T_1T1 and T2T_2T2 axioms under defined soft distance functions, allowing systematic evaluation of generalized soft regular mappings. The objectives include analyzing conditions under which mappings preserve soft regularity across soft topological and soft metric spaces, examining the influence of parameter sets and soft neighborhoods on axiom compliance, and quantifying the role of soft open and soft closed sets in maintaining structural properties. Comparative data from prior studies suggest that soft metric structures allow more reliable consistency in the satisfaction of separation axioms and soft regularity, enabling data-driven assessment of mapping behavior, soft continuity, and functional applications in parameterized or uncertain environments.

REVIEW OF LITERATURE:

Soft set theory, introduced by Molodtsov (1999), provides a framework for handling uncertainty and parameterized data, forming the basis for soft topological and soft metric spaces. Shabir and Naz (2011) formalized soft topological spaces as structures consisting of a universe set, a set of parameters, and collections of soft open sets, with soft points and soft neighborhoods defined in a parameter-dependent manner. Data from their studies indicate that soft T0T_0T0 and soft T1T_1T1 axioms are generally satisfied, while soft T2T_2T2 and soft regularity are conditionally satisfied, depending on the configuration of soft open and closed sets. Çağman and Enginoğlu (2010) examined soft metric spaces with soft distance functions, demonstrating that soft metric structures consistently satisfy soft T1T_1T1 and soft T2T_2T2 axioms, and provide predictable preservation of soft regularity under mappings. Quantitative examples show that soft neighborhoods defined via soft distances facilitate the separation of soft points from soft closed sets, enabling the analysis of generalized soft regular mappings between soft metric spaces. Ali et al. (2014) extended the study of soft regularity to mappings, showing that generalized soft regular mappings preserve soft separation properties under specific structural conditions. Data indicate that the parameter sets and the definitions of soft neighborhoods strongly influence whether soft regularity and separation axioms are preserved across mappings. Feng et al. (2018) further explored soft continuity, soft compactness, and functional applications of mappings in soft topological spaces, providing quantitative examples where soft regularity fails or is maintained depending on neighborhood structures and open set constructions. Comparative analysis of literature suggests that soft metric spaces provide a more robust framework for generalized soft regular mappings than arbitrary soft topological spaces, as soft distance functions standardize neighborhoods and facilitate consistent preservation of soft regularity and separation axioms.

RESEARCH METHODOLOGY:

This study employs a secondary data analysis approach to investigate generalized soft regular mappings in soft topological and soft metric spaces. Data sources include primary research and quantitative examples from Molodtsov (1999), Shabir and Naz (2011), Çağman and Enginoğlu (2010), Ali et al. (2014), and Feng et al. (2018). Soft topological spaces are analyzed for compliance with soft T0T_0T0, T1T_1T1, and T2T_2T2 axioms, and for the conditions under which soft regularity is preserved under mappings. Soft points, soft neighborhoods, and soft open and closed sets are examined in a parameter-dependent framework. Soft metric spaces are examined using soft distance functions Data indicate that soft neighborhoods derived from soft distances provide a consistent structure for evaluating the preservation of soft regularity under generalized mappings. Quantitative examples demonstrate that soft T1T_1T1 and soft T2T_2T2 axioms are reliably maintained in soft metric spaces, allowing analysis of mapping behavior across parameter sets EEE. Comparative data analysis is applied to assess differences between soft topological and soft metric spaces in terms of generalized soft regular mappings. Secondary data are synthesized to identify structural and functional conditions that enable the preservation of soft regularity and separation axioms, with emphasis on the influence of soft neighborhoods, open and closed sets, and parameter selection. Historical quantitative examples illustrate cases where mappings fail to preserve soft regularity, providing insights into the limitations of soft topological constructions relative to soft metric spaces.

STATEMENT OF THE PROBLEM:

Soft set theory, introduced by Molodtsov (1999), provides a framework for modeling uncertainty through parameterized sets. Soft topological and soft metric spaces extend classical topology and metric spaces by incorporating soft points, soft neighborhoods, and parameter-dependent soft open and closed sets. Data from Shabir and Naz (2011) indicate that soft topological spaces exhibit inconsistent satisfaction of soft T2T_2T2 axioms and soft regularity, with soft neighborhood structures and open set configurations influencing compliance. Generalized soft regular mappings are functions between soft topological or soft metric spaces that preserve soft regularity and separation properties. Data from Çağman and Enginoğlu (2010) demonstrate that in soft metric spaces, soft distance functions allow consistent preservation of soft T1T_1T1 and T2T_2T2 axioms under mappings, whereas soft topological constructions may fail to maintain soft regularity due to parameter-dependent neighborhood variations. Ali et al. (2014) and Feng et al. (2018) provide quantitative examples showing that failure to preserve soft regularity arises from inadequate definition of soft neighborhoods or improper alignment of parameter sets. The problem is the absence of a comprehensive, data-driven characterization of conditions under which generalized soft regular mappings preserve soft regularity and separation axioms in soft topological and soft metric spaces. Parameter selection, soft neighborhood definitions, and soft open and closed set structures influence mapping behavior, limiting predictable application of soft set theory in uncertain or parameterized environments.

FURTHER SUGGESTIONS FOR RESEARCH:

Future research should focus on systematic quantitative analysis of generalized soft regular mappings across diverse soft topological and soft metric spaces. Data from Shabir and Naz (2011) indicate that soft topological spaces exhibit variability in satisfying soft T2T_2T2 axioms and soft regularity, suggesting the need to examine parameter-dependent conditions for mapping preservation. In soft metric spaces, Çağman and Enginoğlu (2010) demonstrate that soft distance functions allow consistent preservation of soft T1T_1T1 and T2T_2T2 axioms under mappings, while variations in parameter sets EEE and definitions of soft neighborhoods affect soft regularity. Comparative studies between soft topological and soft metric spaces are recommended to quantify differences in mapping behavior and determine the influence of structural and parameter-based constraints on the preservation of soft regularity and separation properties. Ali et al. (2014) and Feng et al. (2018) provide data showing that soft continuity, soft compactness, and functional applications interact with generalized soft regular mappings. Further research could collect quantitative examples of mappings under varying parameter sets and neighborhood structures to model relationships between soft regularity, separation axioms, and mapping consistency. Empirical studies of parameterized soft neighborhoods and soft open and closed sets can provide measurable benchmarks for evaluating generalized soft regular mappings and identifying classes of soft spaces where regularity is reliably preserved.

SCOPE AND LIMITATIONS:

The study focuses on generalized soft regular mappings in soft topological and soft metric spaces within the framework of soft set theory, analyzing structural and functional properties that influence the preservation of soft regularity and separation axioms. Data from Shabir and Naz (2011) indicate that soft topological spaces exhibit variable satisfaction of soft T2T_2T2 axioms and soft regularity, depending on the configuration of soft neighborhoods, soft open sets, and soft closed sets. Soft metric spaces, as examined by Çağman and Enginoğlu (2010), demonstrate more consistent preservation of soft T1T_1T1, T2T_2T2, and soft regularity due to defined soft distance functions and parameterized neighborhood structures. The scope includes secondary data analysis of soft mappings between parameterized soft spaces, with emphasis on the influence of soft neighborhoods, soft open and closed sets, and parameter sets EEE on axiom satisfaction. Comparative analysis between soft topological and soft metric spaces allows evaluation of the structural conditions that support generalized soft regular mappings.

Limitations of the study include reliance on previously published quantitative data and examples, which may not encompass all types of soft topological constructions or parameter sets. The study does not generate new empirical data or construct experimental soft mappings, and high-dimensional parameter sets in soft topological spaces remain underexplored. Variability in neighborhood definitions and parameter selection limits the generalizability of findings for all soft topological spaces, whereas soft metric spaces provide more consistent but still parameter-sensitive results.

DISCUSSION:

Soft set theory provides a parameterized framework for modeling uncertainty, and soft topological and soft metric spaces extend classical topological and metric concepts by incorporating soft points, soft neighborhoods, and parameter-dependent open and closed sets. Data from Shabir and Naz (2011) indicate that soft topological spaces exhibit variable satisfaction of soft T2T_2T2 axioms and soft regularity, with the arrangement of soft open sets and neighborhoods influencing whether soft regularity is preserved under mappings. Quantitative examples demonstrate that in soft topological spaces, generalized soft regular mappings may fail to maintain separation axioms when neighborhood structures are inadequately defined or parameter sets are misaligned. Soft metric spaces, as analyzed by Çağman and Enginoğlu (2010), provide a structured environment where soft distance functions define soft neighborhoods, enabling more consistent preservation of soft T1T_1T1, T2T_2T2, and soft regularity under generalized soft regular mappings. Data indicate that the consistency of soft regularity is influenced by the selection of parameters EEE and the definition of soft neighborhoods, which determine the separation of soft points from soft closed sets across mappings. Further analyses from Ali et al. (2014) and Feng et al. (2018) suggest that soft continuity, soft compactness, and other functional properties are closely related to the preservation of soft regularity. Comparative data show that soft metric spaces generally provide more predictable outcomes for generalized soft regular mappings than soft topological spaces, due to the additional structure provided by soft distance functions. Parameter-dependent definitions of soft open and closed sets are critical in determining whether mappings maintain soft regularity and separation axioms. These data collectively highlight the importance of systematic neighborhood and parameter management in ensuring that generalized soft regular mappings preserve structural properties, and underscore the differences between soft topological and soft metric spaces in supporting reliable mapping behavior.

RECOMMENDATIONS:

Data from Shabir and Naz (2011) and Çağman and Enginoğlu (2010) indicate that generalized soft regular mappings preserve soft regularity more consistently in soft metric spaces than in soft topological spaces. It is recommended to utilize soft metric frameworks with defined soft distance functions when analyzing generalized soft regular mappings, as they provide structured neighborhoods and predictable separation of soft points from soft closed sets. Quantitative analyses from Ali et al.

(2014) and Feng et al. (2018) suggest that parameter selection and soft neighborhood definitions critically influence the preservation of soft regularity and separation axioms. Standardizing definitions of soft open sets, soft closed sets, and soft neighborhoods can enhance the reliability of mappings in soft topological spaces. Comparative data indicate that embedding soft topological spaces within soft metric structures or adopting soft distance-based approaches can improve consistency in satisfying soft T1T_1T1, T2T_2T2, and soft regularity conditions. Further, systematic evaluation of parameter sets and neighborhood configurations can provide measurable benchmarks for mapping behavior and allow identification of classes of soft spaces in which generalized soft regular mappings consistently preserve structural properties.

CONCLUSION:

The analysis of generalized soft regular mappings in soft topological and soft metric spaces demonstrates that the preservation of soft regularity and separation axioms is highly dependent on structural definitions and parameter selection. Data from Shabir and Naz (2011) indicate that soft topological spaces exhibit inconsistent satisfaction of soft T2T_2T2 axioms and soft regularity, with soft neighborhoods and soft open and closed sets strongly influencing mapping outcomes. Soft metric spaces, as examined by Çağman and Enginoğlu (2010), provide more consistent preservation of soft T1T_1T1, T2T_2T2, and soft regularity due to the structural framework provided by soft distance functions. Quantitative analyses show that soft neighborhoods defined via distances enable reliable separation of soft points from soft closed sets, supporting the robustness of generalized soft regular mappings. Further data from Ali et al. (2014) and Feng et al. (2018) reveal that parameter-dependent definitions of soft neighborhoods and systematic structuring of soft open and closed sets are critical in determining whether mappings maintain soft regularity across soft topological and metric spaces. Comparative analysis indicates that soft metric structures provide more predictable outcomes than soft topological spaces, emphasizing the importance of neighborhood structure and parameter management. These data provide a foundation for further research into soft continuity, soft compactness, and functional applications of generalized soft regular mappings in parameterized and uncertain environments.

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