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ON FIXED POINT RESULTS FOR HYBRID-INTERPOLATIVE REICH-ISTRĂŢESCU-TYPE CONTRACTIONS WITHIN THE FRAMEWORK OF SOFT METRIC SPACES

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ABSTRACT

In recent decades, the study of uncertainty has garnered substantial attention across various disciplines, leading to the development of several mathematical tools. Among these, soft set theory, introduced by Molodtsov in 1999 [1], has emerged as a significant framework for addressing problems characterized by imprecise, ambiguous, or incomplete information. Its flexible and comprehensive structure has led to a growing body of literature exploring its theoretical and applied dimensions. Concurrently, the generalization of classical metric space theory has been a focal point of research. Scholars have proposed numerous generalized metric structures by either modifying the axioms of metric spaces or extending the nature of the set over which the metric is defined. One such innovative structure is the soft metric space, which integrates the principles of soft set theory into the framework of metric spaces, offering a novel and effective approach for analyzing problems involving uncertainty.

A particularly vibrant area within the theory of metric and generalized metric spaces is fixed point theory, which investigates the conditions under which mappings admit fixed points. The existence and uniqueness of such points have profound implications in mathematics and related fields. In this context, various contractive conditions have been formulated to generalize the classical Banach contraction principle. Among recent advancements, Karapınar et al. (2022) [2] introduced a new class of contractive mappings known as hybrid-interpolative Reich-Istrăţescu-type contractions. These mappings are characterized by their dependence on multiple parameters, allowing for a more flexible and encompassing framework. Their formulation provides a unifying structure that generalizes several well-known contractive mappings, and hence, has potential applications in diverse generalized metric settings, including soft metric spaces.

This paper aims to extend the applicability of hybrid-interpolative Reich-Istrăţescu-type contractions by formulating and analyzing them within the framework of soft metric spaces. To this end, we first provide a rigorous definition of this class of contractions in the context of soft metric spaces, incorporating the notion of soft points and soft mappings. Subsequently, we establish a series of fixed point theorems under these generalized contractive conditions. The existence and uniqueness results are derived using novel analytical techniques tailored to the soft metric framework. Furthermore, illustrative examples are presented to demonstrate the applicability and effectiveness of the theoretical results obtained. These examples validate the assumptions and highlight the practical relevance of the proposed theorems.

The findings of this study contribute significantly to the growing literature on fixed point theory in generalized metric spaces. By extending the concept of hybrid-interpolative contractions to soft

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metric spaces, we not only enrich the theoretical foundation of soft analysis but also open new avenues for future research in the area of non-classical metric structures. The results presented herein are expected to have implications in fields where uncertainty modeling and decision-making under vagueness are essential, including optimization, control theory, and computational mathematics.

***K*eywords** Hybrid-interpolative Reich-Istra¸tescu-type contractions, soft metric spaces, soft points, soft mappings

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