Chapter 1
Enhancing Decision-Making for Parents: A Neutrosophic Pythagorean Plithogenic Hypersoft Set Approach to School Selection With TOPSIS Method

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ABSTRACT

TOPSIS (technique for order preference by similarity to ideal solution) is a mathematical approach employed in the context of multi-criteria decision-making. Its primary purpose is to establish a ranking among various alternatives by taking into consideration multiple attributes or criteria. This method utilizes distance metrics to gauge the nearness of each alternative to both the ideal and anti-ideal solutions. Ultimately, its goal is to facilitate the identification of the most optimal alternative. In this era of uncertainty, many parents grapple with myriad uncertainties when it comes to selecting the right educational institution for their children. This chapter provides an initial glimpse into the neutrosophic pythagorean plithogenic hypersoft set (N_pphs) along with its fundamental definition. Additionally, an algorithm has

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been devised for the TOPSIS methodology, accompanied by a practical numerical illustration. This is intended to assist parents in making an informed decision when choosing the most suitable school for their children with their set of criteria.

1. INTRODUCTION

In today's dynamic world, parents are confronted with the daunting task of selecting the most suitable educational institution for their children. This decision, laden with uncertainties and complexities, is often fraught with anxiety and indecision. The multitude of factors to consider, ranging from academic reputation and teaching methodologies to extracurricular offerings and location, only serve to exacerbate the challenge. It is within this context of uncertainty that our study seeks to provide a solution.

Existing approaches to decision-making, while valuable, often struggle to adequately address the multifaceted nature of the decision-making process involved in selecting educational institutions. Traditional methods may overlook crucial factors or fail to account for the inherent uncertainties and ambiguities in the decision-making environment. This gap in the literature underscores the need for a more comprehensive and nuanced approach.

The methodologies of fuzzy sets, neutrosophic sets, and soft sets offer a promising avenue for addressing the complexities of decision-making under uncertainty. By allowing for the representation of vague, imprecise, or conflicting information, these methodologies provide a more nuanced understanding of the decision space. Moreover, their flexibility and adaptability make them well-suited for integrating multiple criteria and preferences, essential in the context of educational decision-making.

Prior studies have addressed the challenges inherent in decision-making under uncertainty, particularly in the context of selecting educational institutions for children. These studies have underscored the multifaceted nature of the decision-making process and the need for comprehensive frameworks to guide parents in their choices (Zadeh, 1965; Zadeh, 1978; Atanassov, 2012).

Zadeh's seminal work on fuzzy sets laid the groundwork for handling imprecise and uncertain information in decision-making (Zadeh, 1965). Subsequent research by Atanassov (2012) extended this framework to intuitionistic fuzzy sets, which incorporate degrees of hesitation or non-membership. These methodologies have been applied in various domains to address decision-making challenges influenced by fuzziness and ambiguity (Bellman & Zadeh, 1970).

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