Chapter 11
Word Prediction Using Fuzzy Sets and Computational Intelligence

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ABSTRACT

Fuzzy soft sets find an extensive assortment of applications in many decision-making problems. Fuzzy sets are applied to overcome uncertainty, and soft sets came into existence as an extension. It is called soft because the boundary depends on the parameters. Soft sets are the generalization of fuzzy sets. Parameter reduction in soft sets shows an energetic role in reducing the complexity of any decision-making problems. Fuzzy soft sets are applied to identify a word. The set of alphabets is taken as the universal set, and the words formed using these alphabets give the parameter

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set. The length of the word is first calculated. The first three letters of the word to be identified are given as the input. The parameter set consists of words of the same length, and the first three letters are generated using NLG. The word is identified using machine learning of word classification and prediction. The results are compared, and the final accuracy is calculated.

INTRODUCTION

Fuzzy soft sets have various applications in decision-making scenarios. They address uncertainty and were developed as an extension of the Fuzzy Set (FS). The term "soft" is used because parameters determine the boundaries. Soft sets are a broader version of FS. Simplifying parameters in soft sets is crucial for easing the intricacy of decision-making problems (Wang et al., 2023).

In this study, we utilize fuzzy soft sets to determine a word. The universal set is demarcated as the collection of alphabets, and words created from these alphabets make up the parameter set. Initially, the length of the word is determined, followed by inputting the first three letters of the word to be identified. Through Natural Language Generation (NLG), a parameter set consisting of words of equal length and beginning with the specified three letters is generated. The word is then identified using similarity and matching algorithms (Al-Shami, 2023). A comparison of the outcomes from both algorithms allows for the successful detection of the word.

FUZZY INTRODUCTION

FS theory helps decision-making by providing a structure for effectively handling imprecise and subjective information (Zadeh et al., 1996). It is credited with creating FSs that have been instrumental in finding solutions for unclear situations. Conventional decision-making models often face confrontations with ambiguity and uncertainty in practical situations. FSs offer a solution for managing uncertain data.

When faced with uncertainty and rough data, FS theory provides a way for decision-makers to describe the situation accurately. By utilizing graded membership FSs, uncertainty can be visually represented more intuitively (Garg et al., 2018). FSs introduce the idea of partial membership, where objects can fit into a set to varying degrees between 0 and 1 (Ejegwa, 2022). This membership level is determined by a membership function that assigns a value based on how well the element fits within the set. Incorporating Fuzzy Logic (FL) allows decision-makers to navigate situations where category distinctions are not clear-cut and objects cannot easily be quantified or categorized as binary entities (Zhou et al., 2023).