

Abstract of the doctoral thesis "Application of Fuzzy Set Theory in Classifying Author's Dominant Scientific Disciplines in Scientometrics"

One of the main issues in Scientometrics is the classification of authors' scientific disciplines, which has a significant impact on the evaluation of their scientific output. Traditional methods, based on simple algorithms and limited interpretation of data, often lead to ambiguities in classification. This thesis proposes the use of fuzzy set theory, developed by Lotfi Zadeh, as a solution to this problem. This theory allows to model the imprecision of information and offers new perspectives for achieving unambiguous classification of disciplines on a large scale.

The main purpose of the work is to explore the possibility of using fuzzy set theory to improve the classification algorithm of the authors' dominant scientific discipline using modal value. The study I conducted aimed not only to theoretically understand the impact of application of this theory on classification, but also to practically test the effectiveness of the proposed modifications on the basis of the full bibliometric database Scopus provided in the platform ICSR Lab, Elsevier. The research hypotheses focused both on the possibility of increasing the unambiguity of the classification by identifying key concepts from the field of Scientometrics, and on determining the similarity of the classification obtained by the proposed modifications with the commonly used approach that does not take into account imprecision of information.

The study used the most popular methods from fuzzy set theory to improve classification process of the authors' scientific disciplines. The first proposed solution involved the use of linguistic variables represented by three levels of intensity: low, medium and high. Another effective solution was the construction of fuzzy controllers to create more flexible classification rules. The last approach involved aggregating fuzzy values with OWA operators. With these three proposals, a more unambiguous classification of authors in Scientometrics has been achieved. The use of this method improved the unambiguous classification from about 69% to over 95%. Thus, with the modifications used, the unambiguous classification of authors increased by more than 37% compared to an approach that does not take into consideration the imprecision of information. The results of my research indicate a significant role for the application of fuzzy set theory in Scientometrics, which opens the possibilities for further research in both fields.

