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Human Development Index using Membership Functions of Fuzzy Sets

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Abstract

Fuzzy set theory has been successfully applied to many fields of knowledge domains, especially in computer science and engineering. Although in smaller scale, there have been several attempts made to apply the theory to social measurement including human development. However, most of the social measurements used fuzzy proportion and fuzzy rules as a basis in computation. This would deprive the definition of membership function in fuzzy set theory. This paper aims to propose fuzzy human development index (fuzzy HDI) using various shapes of membership functions of fuzzy sets. Five membership functions, namely triangular, trapezoidal, bell-shaped, sigmoid and Gaussian membership functions are considered as the basis for proposing the fuzzy HDI. Three typical dimensions of HDI and aggregation methods are retained in these computations. Secondary data of Malaysia are employed to illustrate the computation. This computational approach combines the advantages of various membership functions and retain the aggregation operations of the three dimensions, which eventually obtained the new HDI. A comparison between fuzzy HDI and HDI is also made. The results indicate that fuzzy HDI provide flexible indices depending on the shape of the functions used. It suggests the importance of employing a robust and reliable method in proposing HDI.

Keywords

Fuzzy sets, Human Development, Index, Membership Function

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