Fuzzy Min-Max Classifier Based on New Membership Function for Pattern Classification: A Conceptual Solution

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ABSTRACT

The fuzzy min-max (FMM) neural network is one of the most powerful neural networks that combines neural network and fuzzy set theory into a common framework for tackling pattern classification problems. FMM neural network carries out learning processes that consist of hyperbox expansion, hyperbox overlap test and hyperbox contraction to execute pattern classification. Although these processes provide FMM with several outstanding features and make it a unique pattern classifier, the contraction process is considered a major limitation that affects the FMM learning process and hinders it from handling hyperbox overlapped boundaries appropriately. This drawback could affect membership decision making and cause the classifier to provide random decisions when test samples have the same fitness values with different hyperboxes from different classes (ambiguity issue). The performance of the classifier consequently declines. Thus, this study aims to provide a conceptual solution called `fuzzy min-max classifier based on new membership function' through a new method, `Euclidean distance', in the test phase to handle the hyperbox overlapping boundaries of different classes. The conceptual solution has not been implemented and tested in a real scenario. Hence, the application of the conceptual solution to real scenarios is recommended in future studies to assess its performance.

KEYWORDS: Pattern classification; Hyperbox contraction; Membership function

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