

A survey of fuzzy min max neural networks for pattern classification: variants and applications

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ABSTRACT

Over the last few decades, pattern classification has become one of the most important fields of artificial intelligence because it constitutes an essential component in many real-world applications. Artificial neural networks and fuzzy logic are the two most widely used models in pattern classification. To build an efficient and powerful model, researchers have introduced hybrid models that combine both fuzzy logic and artificial neural networks. Among the existing hybrid models, the family of Fuzzy Min-Max (FMM) neural networks offers a premier model for undertaking pattern classification problems. While the original FMM model is useful in terms of its capability of online learning, it suffers from several limitations in its learning procedure. Therefore, researchers have proposed numerous improvements to overcome the limitations over the years. In this paper, we conduct a comprehensive survey on the developments of FMM-based models for pattern classification. To allow researchers in selecting the most suitable FMM variants and to provide a proper guideline for future developments, this study divides the FMM variants into two main categories, namely FMM variants with and without contraction. This division facilitates understanding of the improvements on the original FMM model, as well as enables identification of the limitations that still exist in various FMM-based models. We also summarize the use of FMM and its variants in solving different benchmark and real-world pattern classification problems. In addition, future trends and research directions of FMM-based models are highlighted.

KEYWORDS:

Fuzzy min–max model, Pattern classification, Hyperbox structure, and Neural network learning