

ABSTRACT

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The aim of this work is to introduce a system to synthesize the interpretable classifiers based on fuzzy modeling. The structure fuzzy used is named Fuzzy Pattern Trees (FPT), which does not use rules and comes up as an option to the Rule-Based Fuzzy Systems. Some alternatives are proposed to methods already known of synthesis for these structures, they are using Participatory Learning on the search process of better trees to the classification task in a supervised process of training. In the tree structure, the inner nodes are generalized logic operators already in use on Fuzzy Systems and the leaf nodes are fuzzy terms associated to an input attribute. The method generates a tree structure for each class, allowing a hierarchical evaluation of the influence for each attribute in the classification task. From this structure, it is possible to obtain an expression that allows a good interpretability linked to the values of accuracy that are at the state-of-the-art level. The methods of tree synthesis here proposed are based on participatory search, it is grounded on a population that seeks its evolution through generations, it is guided by a method of evaluation for each individual who belongs to this population. In the participatory method, the search continues guided by the compatibility between individuals, always keeping the best individual from the populations back and randomly introducing individuals at each step of the algorithm. The proposed methods of synthesis have the purpose of exploring the best space of search based on the good performance that the participatory search presents in relation to the state-of-the-art. The methods were compared with the algorithms: Support Vector Machine, k-nearest neighbors, Random Forest and the learning method originally proposed by the FPT, in several UCI Machine Learning databases. It was observed that the models are compatible with the state-of-the-art and smaller trees, generating competitive results, that improve the levels of interpretability.

Keywords: Machine Learning, Fuzzy Systems, Fuzzy Pattern Trees, Hierarchical Model, Participatory Search, Participatory Learning, Classification, Interpretability.