

A hybrid method and its analysis based on Co-evolution for Classification

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Abstract

A new method of fuzzy classification method based on hybrid Co-evolution model is presented. A key feature of the method is that it integrates Michigan-style and Pittsburgh-style genetic algorithm to construct a single hybrid Co-evolution algorithm. The hybrid Co-evolution algorithm owns three species including the number of fuzzy rules species, the premise structure species and the parameters species. Considering both precision and interpretability, the fitness function is calculated on cooperation of individuals from the three species. The simulation results for the Iris, Wine and Ionosphere classification problem to show its validity.

Keyword: *Fuzzy classification; Co-evolution model; fuzzy rules; Imprecise Probability;*

References

- [1] Ishibuchi H, Nakashima T, Murata T. Three-objective genetics-based machine learning for linguistic rule extraction [J]. *Information Science*, 2001, 136(1-4): 109-133.
- [2] M.Setnes and H.Roubos. GA-Fuzzy modeling and classification: complexity and performance[J]. *IEEE Trans. Fuzzy Systems*, 2000, 8: 509-522.
- [3] J. Abonyi, H. Roubos, F. Szeifert. Data-Driven Generation of Compact, Accurate, and Linguistically Sound Fuzzy Classifiers Based on a Decision Tree Initialization. *International Journal of Approximate Reasoning*. 2003, 32: 1-21.
- [4] Guillaume S. Designing fuzzy inference systems from data: an interpretability-oriented review[J]. *IEEE Trans on Fuzzy Systems*, 2001, 9 (3): 426-443
- [5] Y. Jin,W. von Seelen, B. Sendhoff. On generating FC3 fuzzy rule systems from data using evolution strategies[J]. *IEEE Trans. Systems Man Cybernet*. 1999, 29(6): 829–845.
- [6] S.F. Smith. *A learning system based on genetic adaptive algorithms*[D]. Ph.D. University of Pittsburgh, 1980.
- [7] L.B.Booker, D.E.Goldberg and J.H.Holland. Classifier systems and genetic algorithms[J]. *Artificial Intelligence*, 1989, 40: 235-282.
- [8] Setnes M, Babuska R, Kaymak U, Lemke H R N. Similarity Measures in Fuzzy Rule Base Simplification [J]. *IEEE Trans on Systems Man and Cybernetics*, 1998, 28(3): 376-386.
- [9] H. Ishibuchi, T. Nakashima, and T. Murata. Performance evaluation of fuzzy classifier systems for multidimensional pattern classification problems[J]. *IEEE Trans on Systems Man and Cybernetics, Part B*, 1999, 29: 601-618.