

# **Weighted Fuzzy Rule Interpolation Based on GA-Based Weight-Learning Techniques**

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## **Abstract**

Fuzzy interpolative reasoning is an inference technique to solve a problem of sparse fuzzy rule bases. Sparse fuzzy rule bases contain blank areas that are not covered by fuzzy rules in the universe of discourse with respect to the input variables. When the observation occurs in these blank areas, traditional fuzzy rule-based systems may get improper fuzzy reasoning results. Because fuzzy interpolation techniques can make inferences with sparse fuzzy rule bases effectively, fuzzy interpolation is an essential solution for inference in sparse fuzzy rule-based systems. In order to overcome the problem of empty areas in sparse fuzzy rule bases, some fuzzy interpolative reasoning methods have been presented for sparse fuzzy rule-based systems.

In this talk, we propose a weighted fuzzy interpolative reasoning method for sparse fuzzy rule-based systems based on a genetic algorithm (GA)-based weight-learning technique. The proposed method can deal with fuzzy rule interpolation with weighted antecedent variables. It also can deal with fuzzy rule interpolation with polygonal membership functions and bell-shaped membership functions. We also propose a GA-based weight-learning algorithm to automatically learn the optimal weights of the antecedent variables of the fuzzy rules. Furthermore, we apply the proposed weighted fuzzy interpolative reasoning method and the proposed GA-based weight-learning algorithm to deal with the truck backer-upper control problem, the computer activity prediction problem, and the multivariate regression problems. Finally, we offer some research directions, which are worth pursuing for future research.