

## AN IMPROVED FORECASTING MODEL BASED ON THE WEIGHTED FUZZY RELATIONSHIP MATRIX COMBINED WITH A PSO ADAPTATION FOR ENROLLMENTS

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**ABSTRACT.** *Most fuzzy forecasting approaches are based on modeling fuzzy relations according to the past data. In this paper, an improved forecasting model which combines weighted fuzzy relationship matrices and particle swarm optimization is presented for enrollments. First, the weighted fuzzy relationship matrices are more effective to capture fuzzy relations on time series data than fuzzy logical relationship rules. Second, the particle swarm optimization for the optimized lengths of intervals is developed to adjust interval lengths by searching the space of the universe of discourse. To verify the effectiveness of the proposed model, the empirical data for the enrollments of the University of Alabama are illustrated, and the experimental results show that the proposed model outperforms those of previous forecasting models for both the training and testing phases with various orders and different interval lengths. These results are very encouraging for future work on the development of fuzzy time series and particle swarm optimization in forecasting real-world applications.*

**Keywords:** Fuzzy time series, Particle swarm optimization, Fuzzy logical relationship, Fuzzy relationship matrix

1. **Introduction.** In order to advance the decision-making process concerning future requirements, many researchers have focused on real-world problems to deal with various time series data, such as weather news [1,2], crop productions [3,4], stock markets [2,5-7] and academic enrollments [8-14]. However, conventional forecasting methods only