

## A NEW SEASONAL FUZZY TIME SERIES METHOD BASED ON THE MULTIPLICATIVE NEURON MODEL AND SARIMA

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### Abstract

When fuzzy time series include a seasonal component, conventional fuzzy time series models are not sufficient. For such fuzzy time series, lagged variables which are around the period of the time series should also be included in the model. Determining the lagged variables which will be in the forecasting model is a vital issue. Also, defining fuzzy relations is another important issue in the fuzzy time series approach. When the number of fuzzy lagged variables is large, using artificial neural networks to define fuzzy relations makes the operations easier and increases the forecasting accuracy. In this study, in order to deal with the problem of determining the lagged variables, and defining the fuzzy relations, a novel seasonal fuzzy time series approach based on SARIMA and the multiplicative neuron model is proposed. In the proposed method, the SARIMA method is exploited to choose the fuzzy lagged variables and multiplicative neuron model is employed to establish the fuzzy relations. To show the applicability of the proposed method, it is applied to the invoice sum accrued to health service providers. For comparison, the data is also analyzed with other fuzzy time series approaches in the literature. It is observed that the proposed method has the best forecasting accuracy with respect to other methods.

**Keywords:** Fuzzy time series, SARIMA, Multiplicative neuron model, Forecasting.

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