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Weighted Fuzzy c-means Time Series Forecasting

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Abstract

Fuzzy time series relies heavily on the length of intervals and the formulation of fuzzy relationships. This study proposes a combination of fuzzy c-means (FCM) and frequency-weighted fuzzy logical relationship groups (FLRG) to overcome these problems. It is noted that FCM simplifies the process of fuzzification as it avoids the subjective measures to determine the interval length. However, the results of FCM is sensitive to initial values and it is easily trapped in the local minima. To overcome this, we propose a method to identify the initial centers. The frequency-weighted FLRG is deemed reasonable as the frequency indicates the likelihood of the occurrence of the fuzzy logical relationships (FLR) in the future. To examine the effect of these two factors on the modeling accuracy, the performance of the proposed model is compared to the existing models of equal interval length with no weights, frequency-and-recentness-weights, and a modified model that takes equal interval length with frequency-weights. The results are verified by performing the procedures with various number of groups on the enrollment data as well as some stock indexes. The results show that the proposed method outperforms the other models on these data.

Keywords: Fuzzy time series, Fuzzy c-means, Fuzzy logical relationships.