# Interval forecasting model for time series based on the fuzzy clustering technique

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**Abstract.** This paper proposes the forecasting model for the fuzzy time series based on the improvement of the background data and fuzzy relationship (IFTC). This algorithm is built based on the fuzzy cluster analysis which the suitable number of clusters for series is considered. The problem of interpolating data according to fuzzy relationships of time series in the trapezoidal fuzzy number is also established. The proposed model is illustrated step by step by a numerical example and effectively implemented by the Matlab procedure. The IFCT has advantages in comparing to other models via the several indexes such as the MAE, MAPE and MSE with the Enrollment dataset.

## 1. Introduction

Forecasting is the process of making predictions based on historical data, knowledge and experience of the related problems. Because of its important role in many fields, forecasting has been paying much attention by scientists. It is an important science basis for projects, policies and appropriate development strategy. Thus, forecasting is always interested in managers and scientists. Regarding data, time series is popular and has great demand on forecasting in reality. For this data, the two main models used for forecasting are regression and time series. The regression model has conditional constraints on data that are difficult to satisfy in reality, so it has the disadvantage in many cases [5,8]. The time series model (TS) is considered to have many more advantages, so it is used very popularly today, Many scientists utilized the TS models as Auto regression (AR), Autoregressive Intergrated Moving Average (ARIMA) to apply in Economy, environment and hydrology [7,13,17].

For the mechanical and manufacturing engineering field, there are some outstanding studies as Fang-mei tseng et al. [21] proposed a procedure of fuzzy seasonal time series and apply this method to forecasting the production value of the mechanical industry in Taiwan. This method includes interval models with interval parameters and provides the possibility distribution of future value. From the results of practical application to the mechanical industry, it can be shown that this method makes good forecasts. Further, this method makes it possible for decision makers to forecast the possible  situations