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Advanced time series prediction methods

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As a data mining field, analysis of time series has been one of the main research subjects for decades. In the literature, many models have been put forward for the prediction problems. Traditional prediction models, for modelling the time series, may fail to solve the prediction problems including complex real-world time series because of the several assumptions which need to be taken account of. These methods can be grouped as probabilistic methods. An effective way to predict time series has been to utilize advanced time series prediction models that can be grouped as non-probabilistic including fuzzy inference systems based on fuzzy sets and fuzzy arithmetic, and computational inference system based on artificial neural networks. Not requiring any assumption in prediction, therefore, makes advanced time series prediction models applicable for many fields. Multilayer perceptron (MLP) proposed by McCuloch and Pitts (1943) has been commonly used as a computational method. Single multiplicative neuron model (S-MNM) that does not contain this type of problem is introduced by Yadav *et al.* (2007). S-MNM uses a multiplicative function in its neuron as an aggregation function on the contrary to MLP that uses additive function. An ANN structure named linear and non-linear artificial neural network incorporating the properties of these two neural networks has been suggested by Yolcu *et al.* (2013). Fuzzy time series (FTS) approaches, introduced by Song and Chissom (1993), are another prediction tools that have been used efficiently in recent years. To improve prediction performance, Cagcag Yolcu (2013), and Cagcag Yolcu *et al.* (2016) put forward hybrid FTS models in which combined artificial neural networks and fuzzy clustering. In this talk, the reason of researchers need to use non-probabilistic prediction methods will be emphasized and some models in fuzzy inference systems and computational inference systems will be talked with their some applications.

Recent Publications

1. Cagcag Yolcu O, Yolcu U, Egrioglu E and Aladag C H (2016) A high order fuzzy time series forecasting method based on operation of intersection. Applied Mathematical Modelling 40(19-20):8750-8765.
2. Cagcag Yolcu O (2013) A hybrid fuzzy time series approach based on fuzzy clustering and artificial neural network with single multiplicative neuron model. Mathematical Problems in Engineering 560472:9.
3. Yadav R N, Kalra P K and John J (2007) Time series prediction with single multiplicative neuron model. Applied Soft Computing 7(4):1157-1163.
4. McCulloch W S and Pitts W (1943) A logical calculus of the ideas immanent in nervous activity. Bulletin of Mathematical Biophysics 5(4):115-133.
5. Yolcu U, Egrioglu E and Aladag C H (2013) A new linear & nonlinear artificial neural network model for time series forecasting. Decision Support Systems 54(3):1340-1347.

Biography

Ozge Cagcag Yolcu is a Professor at Department of Industrial Engineering of Giresun University, Turkey. She received the MSc (Thesis title: Optimization of patient waiting time in the department of brain surgery of Ondokuz Mayis University by simulation) and the PhD (Thesis title: A new hybrid fuzzy time series approach) degrees in statistics at the Faculty of Science and Arts of the University of Ondokuz Mayis, Turkey, in 2010 and 2013, respectively. She was situated in the Robotics Research Group, Department of Informatics at King's College London for a year in 2015 for Postdoctoral research. She has her expertise in time series analysis, fuzzy inference systems, artificial neural networks, artificial intelligence optimization algorithms and robust statistics. She has various studies on time series prediction models including fuzzy inference systems and computational systems.

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