

What Is the Potential of Integrating Phase Space Reconstruction with SVM-FFA Data-Intelligence Model? Application of Rainfall Forecasting over Regional Scale

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Abstract

Rainfall modeling is one of the major component process in the meteorological engineering. Hence, exploring an advance and reliable intelligent model for its forecasting is essential for water resources engineering. In this current research, novel integrative intelligence model coupled with phase space reconstruction is proposed to forecast monthly rainfall in Chhattisgarh State, India. The proposed model is a hybridization of support vector machine (SVM) model with firefly optimization algorithm (FFA). The modeling is undertaken based on three stages starting with configuring the delay time and embedding dimension using mutual information and false nearest neighbors to determine the input matrix of the forecasting model. In the second stage, the firefly optimizer is employed to tune the SVM model. Finally, the hybrid model is conducted to forecast the monthly time scale rainfall time series. Monthly time scale rainfall data for sixteen rain gauge stations over a century (1901–2002) are utilized and tested. A validation of the capacity of the suggested model is carried out by comparing the accuracy results with classical SVM and hybrid SVM-FFA Bwithout mutual information analysis[^] models. The three predictive models are trained using 75% of available data set and tested the remaining 25% dataset. The model's results were statistically verified using mean absolute error and best-good-fitness measurements in addition to Taylor diagram visualization. In conclusion, the proposed model was significantly improved the forecasting accuracy of the modeling. Also, it was exhibited a very robust intelligent model that can be applied for the Indian regional zone for monthly rainfall forecasting