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Prediction of hourly solar radiation using a novel hybrid model of ARMA and TDNN

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Abstract

In this work, a new approach that contains two phases is used to predict the hourly solar radiation series. In the detrending phase, several models are applied to remove the non-stationary trend lying in the solar radiation series. To judge the goodness of different detrending models, the Augmented Dickey–Fuller method is applied to test the stationarity of the residual. The optimal model is used to detrend the solar radiation series. In the prediction phase, the Autoregressive and Moving Average (ARMA) model is used to predict the stationary residual series. Furthermore, the controversial Time Delay Neural Network (TDNN) is applied to do the prediction. Because ARMA and TDNN have their own strength respectively, a novel hybrid model that combines both the ARMA and TDNN, is applied to produce better prediction. The simulation result shows that this hybrid model can take the advantages of both ARMA and TDNN and give excellent result.

Research highlights

â–° We explored the stationarity of solar time series with several detrending models. â–° We tested the performance of prediction of different models with detrended series. â–° The simulation result shows that this hybrid model can give excellent result.



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Keywords

Solar radiation prediction; ARMA; TDNN; Hybrid model

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