

Package ‘WaveletRF’

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Type Package
Title Wavelet-RF Hybrid Model for Time Series Forecasting
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Description
The Wavelet Decomposition followed by Random Forest Regression (RF) models have been applied for time series forecasting. The maximum overlap discrete wavelet transform (MODWT) algorithm was chosen as it works for any length of the series. The series is first divided into training and testing sets. In each of the wavelet decomposed series, the supervised machine learning approach namely random forest was employed to train the model. This package also provides accuracy metrics in the form of Root Mean Square Error (RMSE) and Mean Absolute Prediction Error (MAPE). This package is based on the algorithm of Ding et al. (2021) <[DOI:10.1007/s11356-020-12298-3](https://doi.org/10.1007/s11356-020-12298-3)>.

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WaveletFitting	<i>Wavelet Transform Using Maximal Overlap Discrete Wavelet Transform (MODWT) Algorithm</i>
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Description

Transforms the time series data by using hybrid MODWT algorithm.

Usage

```
WaveletFitting(
  ts,
  Wvlevels,
  WFilter = "haar",
  bndry = "periodic",
  FFlag = TRUE
)
```

Arguments

ts	Univariate time series
Wvlevels	The level of wavelet decomposition
WFilter	Wavelet filter use in the decomposition
bndry	The boundary condition of wavelet decomposition: 'periodic' or 'reflection'
FFlag	The FastFlag condition of wavelet decomposition: True or False

Value

- WaveletSeries - The wavelet transform of the series

References

- Aminghafari, M. and Poggi, J.M. 2007. Forecasting time series using wavelets. International Journal of Wavelets, Multiresolution and Information Processing, 5, 709 to 724
- Percival D. B. and Walden A. T. 2000. Wavelet Methods for Time-Series Analysis. Cambridge Univ. Press, U.K.
- Paul R. K., Prajneshu and Ghosh H. 2013. Wavelet Frequency Domain Approach for Modelling and Forecasting of Indian Monsoon Rainfall Time-Series Data. Journal of the Indian society of agricultural statistics, 67, 319 to 327.

Examples

```
data<-rnorm(200,mean=20,sd=3)
Wavelet<-WaveletFitting(ts=data,Wvlevels=3,WFilter='haar',bndry='periodic',FFlag=TRUE)
```

Description

The Wavelet Decomposition followed by Random Forest Regression (RF) models have been applied for time series forecasting. The maximum overlap discrete wavelet transform (MODWT) algorithm was chosen as it works for any length of the series. The series is first divided into training and testing sets. In each of the wavelet decomposed series, the supervised machine learning approach namely random forest was employed to train the model. This package also provides accuracy metrics in the form of Root Mean Square Error (RMSE) and Mean Absolute Prediction Error (MAPE).

Usage

```
WaveletFittingRF(
  ts,
  tlag = ACF,
  Waveletlevels,
  WaveletFilter = "haar",
  boundary = "periodic",
  FastFlag = TRUE,
  SplitRatio = 0.8
)
```

Arguments

ts	Univariate time series
tlag	Number of lags
Waveletlevels	The level of wavelet decomposition
WaveletFilter	Wavelet filter use in the decomposition
boundary	The boundary condition of wavelet decomposition
FastFlag	The FastFlag condition of wavelet decomposition: True or False
SplitRatio	Training and testing data split

Value

- TrainFittedValue - Fitted value of train data
- TestPredictedValue - Predicted value of test data
- AccuracyTable - RMSE and MAPE of train and test data

References

- Ding, Y., Zhang, W., Zhao, X., Zhang, L. and Yan, F., 2020. A hybrid random forest method fusing wavelet transform and variable importance for the quantitative analysis of K in potassic salt ore using laser-induced breakdown spectroscopy. *Journal of Analytical Atomic Spectrometry*, 35(6), 1131-1138.
- Rezaali, M., Fouladi-Fard, R., Mojarad, H., Sorooshian, A., Mahdinia, M. and Mirzaei, N., 2021. A wavelet-based random forest approach for indoor BTEX spatiotemporal modeling and health risk assessment. *Environmental Science and Pollution Research*, 28(18), 22522-22535.
- Paul, R. K., Prajneshu and Ghosh H. 2013. Wavelet Frequency Domain Approach for Modelling and Forecasting of Indian Monsoon Rainfall Time-Series Data. *Journal of the Indian society of agricultural statistics*, 67, 319-327.
- Paul, R. K. and Birthal, P.S. 2015. Investigating rainfall trend over India using wavelet technique. *Journal of Water and Climate Change*, 7, 365 to 378.
- Paul, R. K. 2015. ARIMAX-GARCH-WAVELET Model for forecasting volatile data. *Model Assisted Statistics and Application*, 10, 243 to 252.

Examples

```
data<-rnorm(200,mean=20,sd=3)
WRF<-WaveletFittingRF(ts=data,tlag=2,Waveletlevels=3)
```

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