Package 'lambdaTS'

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Type Package

Title Variational Seq2Seq Model with Lambda Transformer for Time Series Analysis

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Author Giancarlo Vercellino

Maintainer Giancarlo Vercellino <giancarlo.vercellino@gmail.com>

Description
Time series analysis based on lambda transformer and variational seq2seq, built on 'Torch'.

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.1.1

Depends R (>= 3.6)

Imports purrr, abind, ggplot2, readr, stringr, lubridate, narray, bestNormalize, fANCOVA, imputeTS, modeest, scales, tictoc, bizdays, torch

NeedsCompilation no

Repository CRAN

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R topics documented:

bitcoin_gold_oil *bitcoin_gold_oil data set*

Description

A data frame with different time series (prices and volumes) for bitcoin, gold and oil.

Usage

```
bitcoin_gold_oil
```

Format

A data frame with 18 columns and 1827 rows.

Source

Yahoo Finance

lambdaTS *lambdaTS: Variational Seq2Seq Lambda Transformer Model for Time Series Analysis*

Description

Time series analysis based on Lambda Transformer and Variational Seq2Seq, built on 'Torch'.

Usage

```
lambdaTS(
  data,
  target,
  future,
  past = future,
  ci = 0.8,
  deriv = 1,
  yjt = TRUE,
  shift = 0,
  smoother = FALSE,
  k_embed = 30,
  r_proj = ceiling(k_embed/3) + 1,
  n_heads = 1,
  n_bases = 1,
  activ = "linear",
  loss_metric = "elbo",
  optim = "adam",
```

```
  epochs = 30,
  lr = 0.01,
  patience = epochs,
  verbose = TRUE,
  sample_n = 100,
  seed = 42,
  dev = "cpu",
  starting_date = NULL,
  dbreak = NULL,
  days_off = NULL,
  min_set = future,
  holdout = 0.5,
  batch_size = 30
)
```

Arguments

data	A data frame with ts on columns and possibly a date column (not mandatory)
target	String. Time series names to be jointly analyzed within the seq2seq model
future	Positive integer. The future dimension with number of time-steps to be predicted
past	Positive integer. The past dimension with number of time-steps in the past used for the prediction. Default: future
ci	Confidence interval. Default: 0.8
deriv	Positive integer. Number of differentiation operations to perform on the original series. 0 = no change; 1: one diff; 2: two diff, and so on.
yjt	Logical. Performing Yeo-Johnson Transformation on data is always advisable, especially when dealing with different ts at different scales. Default: TRUE
shift	Vector of positive integers. Allow for target variables to shift ahead of time. Zero means no shift. Length must be equal to the number of targets.
smoother	Logical. Perform optimal smooting using standard loess. Default: FALSE
k_embed	Positive integer. Number of Time2Vec embedding dimensions. Minimum value is 2. Default: 30
r_proj	Positive integer. Number of dimensions for the reduction space (to reduce quadratic complexity). Must be largely less than k_embed size. Default: ceiling(k_embed/3) + 1
n_heads	Positive integer. Number of heads for the attention mechanism. Computationally expensive, use with care. Default: 1
n_bases	Positive integer. Number of normal curves to build on each parameter. WIth more than one base you can model be Default: 1
activ	String. The activation function for the linear transformation of the attention matrix into the future sequence. Implemented options are: "linear", "leaky_relu", "celu", "elu", "gelu", "selu", "softplus", "bent", "snake", "softmax", "softmin", "softsign", "sigmoid", "tanh", "tanhshrink", "swish", "hardtanh", "mish". Default: "linear".

loss_metric	String. Loss function for the variational model. Two options: "elbo" or "crps". Default: "crps".
optim	String. Optimization methods available are: "adadelta", "adagrad", "rmsprop", "rprop", "sgd", "asgd", "adam". Default: "adam".
epochs	Positive integer. Default: 30.
lr	Positive numeric. Learning rate. Default: 0.01.
patience	Positive integer. Waiting time (in epochs) before evaluating the overfit performance.
verbose	Logical. Default: TRUE
sample_n	Positive integer. Number of samples from the variational model to evalute the mean forecast values. Computationally expensive, use with care. Default: 100.
seed	Random seed. Default: 42.
dev	String. Torch implementation of computational platform: "cpu" or "cuda" (gpu). Default: "cpu".
starting_date	Date. Initial date to assign temporal values to the series. Default: NULL (progressive numbers).
dbreak	String. Minimum time marker for x-axis, in liberal form: i.e., "3 months", "1 week", "20 days". Default: NULL.
days_off	String. Weekdays to exclude (i.e., c("saturday", "sunday")). Default: NULL.
min_set	Positive integer. Minimun number for validation set in case of automatic resize of past dimension. Default: future.
holdout	Positive numeric. Percentage of time series for holdout validation. Default: 0.5.
batch_size	Positive integer. Default: 30.

Value

This function returns a list including:

- prediction: a table with quantile predictions, mean and std for each ts
- history: plot of loss during the training process for the joint-transformed ts
- plot: graph with history and prediction for each ts
- learning_error: errors for the joint-transformed ts (rmse, mae, mdae, mpe, mape, smape, rrse, rae)
- feature_errors: errors for each ts (rmse, mae, mdae, mpe, mape, smape, rrse, rae)
- pred_stats: some stats on predicted ts (average iqr, iqr ratio t/1, approx upside probability)
- time_log

Author(s)

Giancarlo Vercellino <giancarlo.vercellino@gmail.com>

Examples

```
## Not run:
lambdaTS(bitcoin_gold_oil, c("bitcoin_Close", "gold_close", "oil_Close"), 30, 30, deriv = 2)

## End(Not run)
```

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