Package ‘flowfield’

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ffplot

Flow field forecast plot

Description

Plots the original data, the penalized spline regression, the forecast values and error bands.

Usage

ffplot(t, y, skeleton, fcast, std.error)

Arguments

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Value

Returns no values. This function returns a plot of the time series, the penalized spline regression, the forecast values and prediction bands.

Author(s)

Kyle A. Caudle

References


Flow Field Forecasting

Forecast of a univariate time series Flow Field Forecasting

Description

Flow field forecasting draws information from an interpolated flow field of the observed time series to incrementally build a forecast. The time series need not have uniformly spaced observations. Flow field forecasting works best on relatively long time series (i.e. > 1000 observations) where forecasts must be made autonomously.

Details
Time series response values should be loaded into a numeric vector. Since flow field forecasting accepts unequally spaced observations, a second vector of observation times is also required. Flow field forecasting uses penalized spline regression to make a historical data skeleton in order to summarize the data prior to building the forecast. Forecasts are made at time steps equivalent to the knot spacing in the data skeleton. For forecasts at times between knots we recommend doing a linear interpolation.

Author(s)

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References


Examples

library(SemiPar)
data(lidar)

\[ t <- \text{lidar$range} \]
\[ y <- \text{lidar$logratio} \]

\[ \text{steps <- 10 # number of forecast steps (steps must be 10 or less)} \]
\[ \text{flowfield(t,y,steps,TRUE)} \]
Usage

flowfield(t,y,steps,plot)

Arguments

t  A vector of time series observation times.

y  A vector of time series response values

steps  Number of steps to forecast. Forecasts > 10 steps are not allowed, a warning will occur. Forecasts occur in knot intervals of the penalized spline regression. Knots are evenly spaced within the range of data approximately one knot for every 10 data points.

plot  If a plot is required, set plot = TRUE otherwise set plot = FALSE

Value

This function returns the flow field forecasts and the associated prediction errors. A plot of the original data, the penalized spline regression, the forecast values and the prediction bands is also provided upon request.

Note

If data is too sparse, a WARNING will be given to the issue to indicate that forecasts may be inaccurate.

Author(s)

Kyle A. Caudle

References


Examples

library(SemiPar)
data(lidar)

t <- lidar$range
y <- lidar$logratio

steps <- 10 # number of forecast steps (steps must be 10 or less)
flowfield(t,y,steps,TRUE)
Description

Performs the flow field forecast given a historical data skeleton from the penalized spline regression.

Usage

forecast(skeleton, steps)

Arguments

skeleton data skeleton from penalized spline regression
steps Number of steps to forecast. Forecasts occur in knot intervals of the penalized spline regression. Knots are evenly spaced within the range of data approximately one knot for every 10 data points.

Value

Returns the forecast values.

Note

If data is too sparse, a WARNING will be given to the issue to indicate that forecasts may be inaccurate.

Author(s)

Kyle A. Caudle

References

**GCV**

### Description
Evaluates the generalized cross generalization criterion for a specific value of lambda.

### Usage
```
GCV(lambda, y, x, d)
```

### Arguments
- `lambda`: lambda value to evaluate the GCV criterion at
- `y`: Time series response values.
- `x`: Design matrix from the penalized spline regression.
- `d`: Diagonal matrix used to constrain the linear model. This is a type of Ridge regression.

### Value
Returns the GCV value for a specific value of lambda and an input into the optimize function in order to minimize this function.

### Author(s)
Kyle A. Caudle

### References

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**gpr**

### Description
Interpolates the penalized regression skeleton using Gaussian process regression.

### Usage
```
gpr(h, rec3.sd, rec3.delta, ssd, sdelta, responses)
```
Arguments

h  History space. Current version uses the current and last 2 levels of the systematically determined component (SDC) and the previous 3 forward response derivatives.
rec3.sd  Most recent SDC values in the history space.
rec3.delta  Most recent forward response derivatives in the history space.
ssd  Standard deviation of the SDCs.
sdelta  Standard deviation of the forward response derivatives.
responses  All values of the forward response derivatives in the history space.

Value

Returns the GPR interpolated value by comparing the current history to the entire history space.

Author(s)

Kyle A. Caudle

References


Description

Constructs a penalized spline regression of the historical time series data to be used in flow field forecasting.

Usage

psr(t, y)

Arguments

  t  Time series observation times.
  y  Time series response values.

Value

Returns the penalized spline regression data skeleton.
Author(s)
Kyle A. Caudle

References

Description
Determines the smoothing parameter in the penalized spline regression.

Usage
smoothp(t, y, x, d)

Arguments
- t: Time series observation times.
- y: Time series response values.
- x: Design matrix from the penalized spline regression.
- d: Diagonal matrix used to constrain the linear model. This is a type of Ridge regression.

Value
Returns the smoothing parameter lambda for the penalized spline regression.

Author(s)
Kyle A. Caudle

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