Package ‘MRwarping’

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Title Multiresolution time warping for functional data.
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Description The Bayesian procedure starts with one warplet in the model and uses the posterior distributions as priors for a more extended model with one more warplet. The model is built with adding one warplet at a time and allows for amplitude variations.
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MRwarping-package

This package performs Bayesian multiresolution time warping for functional data.

Description

Time warping is performed via a composition of warplets. The Bayesian model starts with one warplet and adds warplets one at a time until the warping action becomes negligible in the sense of having almost zero intensity or too narrow domains. The posterior distributions are used as prior distributions for the extended model in the next step. Warplets have an immediate interpretation as warping functions and the inverse warplet is trivial to obtain.

Details

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Type: Package
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License: What license is it under?
LazyLoad: yes

Author(s)

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References

URL http://www.jstatsoft.org/v55/i03/.


comp

Constructs and evaluates a single warplet.

description

A quartic warplet kernel is used to construct a warplet with parameters \(a, \lambda, r_1, r_2, x\). This function is used within MRwarp.
Usage

\texttt{comp(a, lambda, r1, r2, x)}

Arguments

\begin{itemize}
\item \texttt{a} Center of the warplet kernel.
\item \texttt{lambda} Intensity of the warp, should be between (-1,1).
\item \texttt{r1} Radius on the left-hand side of the center \texttt{a}, such that \texttt{a-r1} is the lower bound of the warping domain.
\item \texttt{r2} Radius on the right-hand side of the center \texttt{a}, such that \texttt{a+r2} is the upper bound of the warping domain.
\item \texttt{x} Time point where to evaluate the warplet.
\end{itemize}

Value

The vector of warped time points.

Author(s)

L. Slaets, G. Claeskens, B.W. Silverman.

References


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\texttt{MRwarp} \hspace{1cm} \textit{Main function to perform multiresolution warping for functional data in a Bayesian way.}

Description

The Bayesian procedure starts with one warplet in the model and uses the posterior distributions as priors for a more extended model with one more warplet. The model is built with adding one warplet at a time and allows for amplitude variations.

Usage

\texttt{MRwarp(Xdata, Ydata, chain = 400, thin = 10, burnin = 200, kernel.s, components = 1, selection = "FIXED", shr = 0.3, outputfit = 1, alpha = 0.1)}
Arguments

xdata  N by T matrix containing the T x-coordinates or time points of the N curve observations. Each row corresponds to a particular subject. No default.

ydata  N by T matrix containing the T y-coordinates or response values of the N curve observations. Each row corresponds to a particular subject. No default.

chain  The total number of MCMC iterations (default=400).

thin  The thinning factor of the MCMC algorithm (default=10).

burnin  The number of MCMC iterations that are discarded (default=200).

kernel.s  Vector containing the starting values for the kernel parameters. No default.

components  The number of warping components in the final model (default=1). The value is ignored when selection="STEP".

selection  Whether we want to estimate a fixed number of warplets ("FIXED"), or evaluate the warping procedure after each component ("STEP") (default= "FIXED").

shr  Determines the variance of the prior on the warplet intensities and shifts (default = 0.3).

outputfit  1 if the warped curves should be plotted after each estimated model, 0 otherwise (default=1).

alpha  The significance level to be used in the model selection procedure (default=0.1).

Value

last  List of output values for the last fitted model.

previous  List of output values for the one but last fitted model.

shift  Component of the output list. A MCMC chain of the estimated horizontal shift for curves 1 to N.

warping  Component of the output list that is itself a list containing four quantities: lower, A, upper and Intensities.

lower  Component of warping. Adaptive MCMC chains of the estimated warping lower bounds \((w_{l,1}, \ldots, w_{l,Q-1})\).

A  Component of warping. Adaptive MCMC chains of the estimated warping centers \((a_1, \ldots, a_{Q-1})\).

upper  Component of warping. AMCMC chains of the estimated warping upper bounds \((w_{u,1}, \ldots, w_{u,Q-1})\).

Intensities  Component of warping. Adaptive MCMC chains of the estimated warping intensities, first all \(N\) values for warplet 1,..., all \(N\) values for warplet \(Q\).

kernels  Component of the output list. Adaptive MCMC chains of the estimated kernel lower bounds, centers and upper bounds.

error.variance  Component of the output list. The estimated value of the error variance.

max.post.dens  Component of the output list. The row in the parameter chain vectors/matrices corresponding to the highest posterior pseudo-log-likelihood.
TICdata

Author(s)
L. Slaets, G. Claeskens, B.W. Silverman.

References


Examples

```R
data(TICdata)
TIC = as.matrix(TICdata)

index = 1:200*2-1
TICY = t(matrix(index,200,11))
x = 1:400
for (i in 1:11)
{
   TIC.sm = spm(TIC[i,]-f(x))
   TICY[i,] = TIC.sm$fit$fitted[index]
}
TICx = t(matrix(index,200,11))
kernel.s = c(70,100,130,270,285,300)

# Not run:
output = MRwarp(Xdata=TICx,Ydata=TICY,chain=100,thin=5,burnin=50,kernel.s,
components=1,selection="FIXED",shr=0.3,outputfit=1,alpha=0.1)

# End(Not run)
```

TICdata  
*TIC data.*

Description

Usage

data(TICdata)
Format

A data frame with 400 observations for each of 11 curves. The different rows correspond to the different curves.

Source


Examples

data(TICdata)
TIC=as.matrix(TICdata)
n# Preparing the TIC data for use in warping.

# for smoothing the LC-MS data TIC
library("SemiPar")

index = 1:200x2-1
TICy = t(matrix(index,200,11))
TIC = as.matrix(TICdata)
for (i in 1:11)
{
 TIC.sm = spm(TIC[i,]-f(x))
 TICy[i,] = TIC.sm$fit$fitted[index]
}
TICx = t(matrix(index,200,11))

---

warp

Evaluates a composition of warplets.

Description

The function warp evaluates a composition of warplets that are constructed by the function comp.

Usage

warp(A, Lambda, R1, R2, x)

Arguments

A Vector of centers of the warplets.
Lambda Vector of intensities.
R1 Vector of radii on the left-hand side of the centers.
R2 Vector of radii on the right-hand side of the centers.
x Vector of time points at which to evaluate the warping function.
Value

warp contains the warping function evaluated at x, see also comp.

Author(s)

L. Slaets, G. Claeskens, B.W. Silverman.

References


Examples

t = seq(0,10,length.out=1000)
tau.t = warp(c(5,2),c(0.6,0.4),c(2,1.5),c(3,2),t)

## The function is currently defined as
warp =
function(A,Lambda,R1,R2,x)
{
  Wx = x
  for (i in 1:length(A))
    {  
      warp = comp(A[i],Lambda[i],R1[i],R2[i],Wx)
      Wx = warp
    }
  return(Wx)
}
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