Package ‘LocKer’

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Title Locally Sparse Estimator of Generalized Varying Coefficient Model for Asynchronous Longitudinal Data

Version 1.1

Description Locally sparse estimator of generalized varying coefficient model for asynchronous longitudinal data by kernel-weighted estimating equation.

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Description

Locally sparse estimator of generalized varying coefficient model for asynchronous longitudinal data by kernel-weighted estimating equation. The function is suitable for generalized varying coefficient model with one covariate.
Usage

\texttt{LocKer(}
\begin{verbatim}
    X, Y, family, X_obser_num, Y_obser_num, X_obser, Y_obser, timeint, L_list, roupen_para_list, lambda_list, absTol_list, nfold = 5, d = 3
\end{verbatim}
\texttt{)}

Arguments

\texttt{X} \quad A list of \( n \) vectors, where \( n \) is the sample size. Each entry contains the measurements of the covariate for each subject at the observation time correspond to \( X_{\text{obser}} \).

\texttt{Y} \quad A list of \( n \) vectors, where \( n \) is the sample size. Each entry contains the measurements of the response for each subject at the observation time correspond to \( Y_{\text{obser}} \).

\texttt{family} \quad A character string representing the distribution family of the response. The value can be "Gaussian", "binomial", "poisson".

\texttt{X_obser_num} \quad A vector denoting the observation size of the covariate for each subject.

\texttt{Y_obser_num} \quad A vector denoting the observation size of the response for each subject.

\texttt{X_obser} \quad A list of \( n \) vectors, where \( n \) is the sample size. Each entry contains the observation times of the covariate for each subject.

\texttt{Y_obser} \quad A list of \( n \) vectors, where \( n \) is the sample size. Each entry contains the observation times of the response for each subject.

\texttt{timeint} \quad A vector of length two denoting the supporting interval.

\texttt{L_list} \quad A vector denoting the candidates for the number of B-spline basis functions. The best \( L \) is chosen by cross-validation.

\texttt{roupen_para_list} \quad A vector denoting the candidates for the roughness parameters. The best roughness parameter is chosen by EBIC together with sparseness parameter.

\texttt{lambda_list} \quad A vector denoting the candidates for the sparseness parameter. The best sparseness parameter is chosen by EBIC together with roughness parameter.

\texttt{absTol_list} \quad A vector denoting the threshold of the norm for coefficient function on each sub-interval. The vector is related to \( L_{\text{list}} \), with the same length as \( L_{\text{list}} \).
nfold An integer denoting the number of fold for the selection of L by cross-validation. (default: 5)
d An integer denoting the degree of B-spline basis functions. (default: 3)

Value

A list containing the following components:

- beta0fd_est A functional data object denoting the estimated intercept function.
- betafd_est A functional data object denoting the estimated coefficient function.
- time A scalar denoting the computation time.
- L An integer denoting the selected number of B-spline basis function.
- roupen_select A scalar denoting the selected roughness parameter.
- lambda_select A scalar denoting the selected sparseness parameter.
- EBIC A matrix denoting the EBIC scores for various roughness parameters and sparseness parameters belongs to the candidates when using the selected L.

Examples

```r
### Generate data
n <- 200
beta0 <- function(x)(cos(2 * pi * x))
beta <- function(x)(sin(2 * pi * x))
Y_rate <- 15
X_rate <- 15
Y_obser_num <- NULL
X_obser_num <- NULL
Y_obser <- list()
X_obser <- list()
for(i in 1:n){
  Y_obser_num[i] <- stats::rpois(1, Y_rate) + 1
  Y_obser[i] <- stats::runif(Y_obser_num[i], 0, 1)
  X_obser_num[i] <- stats::rpois(1, X_rate) + 1
  X_obser[i] <- stats::runif(X_obser_num[i], 0, 1)
}
## The covariate functions X_i(t)
X_basis <- fda::create.bspline.basis(c(0, 1), nbasis = 74, norder = 5, breaks = seq(0, 1, length.out = 71))
a <- matrix(0, nrow = n, ncol = 74)
X <- list()
XY <- list() # X at the observation time of Y
muY <- list()
for(i in 1:n){
  a[i,] <- stats::rnorm(74)
  Xi_B <- splines::bs(X_obser[i], knots = seq(0, 1, length.out = 71)[-c(1, 71)], degree = 4, intercept = TRUE)
  X[i] <- Xi_B %*% a[i,]
  Yi_B <- splines::bs(Y_obser[i], knots = seq(0, 1, length.out = 71)[-c(1, 71)], degree = 4, intercept = TRUE)
  XY[i] <- Yi_B %*% a[i,]
}
muY[i] <- beta0(Y_obser[i]) + XY[i] * beta(Y_obser[i])
}

Y <- list()
errY <- list()
for(i in 1:n){
  errY[i] <- stats::rnorm(Y_obser_num[i], mean = 0, sd = 1)
  Y[i] <- muY[i] + errY[i]
}

L_list <- 20
absTol_list <- 10^(-3)
roupen_para_list <- 1.5 * 10^(-3)
lambda_list <- c(0, 0.001, 0.002)
LocKer_list <- LocKer(X, Y, family = "Gaussian", X_obser_num, Y_obser_num, X_obser,
                      Y_obser, timeint = c(0, 1), L_list, roupen_para_list, lambda_list, absTol_list)
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