Package 'tramvs'

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Type Package

Title Optimal Subset Selection for Transformation Models

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`abess_mmlt` *Optimal subset selection for multivariate transformation models*

Description

Optimal subset selection for multivariate transformation models

Usage

```
abess_mmlt(
  mltargs,
  supp,
  k_max = supp,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  m0 = NULL,
  ...
)
```

Arguments

mltargs	Arguments passed to mmlt
supp	support size of the coefficient vector
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
m0	Transformation model for initialization
...	Currently ignored

Value

List containing the fitted model via mmlt, active set A and inactive set I.

---

abess_tram *Optimal subset selection for transformation models*

Description

Optimal subset selection for transformation models

Usage

```
abess_tram(
  formula,
  data,
  modFUN,
  supp,
```

```
  mandatory = NULL,
  k_max = supp,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  m0 = NULL,
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
modFUN	function for fitting a transformation model, e.g., BoxCox().
supp	support size of the coefficient vector
mandatory	formula of mandatory covariates, which will always be included and estimated in the model. Note that this also changes the intialization of the active set. The active set is then computed with regards to the model residuals of modFUN(mandatory, ...) instead of the unconditional model.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
m0	Transformation model for initialization
...	additional arguments supplied to modFUN.

Value

List containing the fitted model via modFUN, active set A and inactive set I.

References

Siegfried, S., Kook, L., & Hothorn, T. (2023). Distribution-free location-scale regression. The American Statistician, 77(4), 345-356. doi:10.1080/00031305.2023.2203177

Examples

```
set.seed(24101968)
library(tramvs)

N <- 1e2
P <- 5
nz <- 3
```

```
beta <- rep(c(1, 0), c(nz, P - nz))
X <- matrix(rnorm(N * P), nrow = N, ncol = P)
Y <- 1 + X %*% beta + rnorm(N)

dat <- data.frame(y = Y, x = X)

abess_tram(y ~ ., dat, modFUN = Lm, supp = 3)
```

`AIC.tramvs` *AIC "tramvs"*

Description

AIC "tramvs"

Usage

```
## S3 method for class 'tramvs'
AIC(object, ...)
```

Arguments

`object`	object of class `"tramvs"`
`...`	additional arguments to `AIC()`

Value

Numeric vector containing AIC of best model

`BoxCoxVS` *Optimal subset selection in a BoxCox-type transformation model*

Description

Optimal subset selection in a BoxCox-type transformation model

Usage

```
BoxCoxVS(
  formula,
  data,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
```

```
  parallel = FALSE,
  future_args = list(strategy = "multisession", workers = supp_max),
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
parallel	toggle for parallel computing via future_lapply
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
...	Additional arguments supplied to BoxCox

Value

See tramvs

---

coef.abess_tram *Coef "abess_tram"*

Description

Coef "abess_tram"

Usage

```
## S3 method for class 'abess_tram'
coef(object, ...)
```

Arguments

object	object of class "tramvs"
...	additional arguments to coef()

Value

Named numeric vector containing coefficient estimates see coef.tram

coef.mmltvs *Coef "mmltvs"*

Description

Coef "mmltvs"

Usage

```
## S3 method for class 'mmltvs'
coef(object, best_only = FALSE, ...)
```

Arguments

object	Object of class "tramvs"
best_only	Wether to return the coefficients of the best model only (default: FALSE)
...	additional arguments to coef()

Value

Vector (best_only = TRUE) or matrix (best_only = FALSE) of coefficients

coef.tramvs *Coef "tramvs"*

Description

Coef "tramvs"

Usage

```
## S3 method for class 'tramvs'
coef(object, best_only = FALSE, ...)
```

Arguments

object	Object of class "tramvs"
best_only	Wether to return the coefficients of the best model only (default: FALSE)
...	additional arguments to coef()

Value

Vector (best_only = TRUE) or matrix (best_only = FALSE) of coefficients

ColrVS *Optimal subset selection in a Colr-type transformation model*

Description

Optimal subset selection in a Colr-type transformation model

Usage

```
ColrVS(
  formula,
  data,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  parallel = FALSE,
  future_args = list(strategy = "multisession", workers = supp_max),
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
parallel	toggle for parallel computing via future_lapply
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
...	Additional arguments supplied to Colr

Value

See tramvs

cor_init *Compute correlation for initializing the active set*

Description

Compute correlation for initializing the active set

Usage

```
cor_init(m0, mb)
```

Arguments

m0	modFUN(formula, data)
mb	modFUN(mandatory, data)

Value

Vector of correlations for initializing the active set, depends on type of model (see e.g. cor_init.default)

cor_init.default *Default method for computing correlation*

Description

Default method for computing correlation

Usage

```
## Default S3 method:
cor_init(m0, mb)
```

Arguments

m0	modFUN(formula, data)
mb	modFUN(mandatory, data)

Value

Vector of correlation for initializing the active set

cor_init.mmlt *Method for computing correlations in mmlts*

Description

Method for computing correlations in mmlts

Usage

```
## S3 method for class 'mmlt'
cor_init(m0, mb)
```

Arguments

m0	modFUN(formula, data)
mb	modFUN(mandatory, data)

Value

Vector of correlation for initializing the active set

cor_init.stram *Shift-scale tram method for computing correlation*

Description

Shift-scale tram method for computing correlation

Usage

```
## S3 method for class 'stram'
cor_init(m0, mb)
```

Arguments

m0	modFUN(formula, data)
mb	modFUN(mandatory, data)

Value

Vector of correlations for initializing the active set, includes both shift and scale residuals

cotramVS *Optimal subset selection in a cotram model*

Description

Optimal subset selection in a cotram model

Usage

```
cotramVS(
  formula,
  data,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  parallel = FALSE,
  future_args = list(strategy = "multisession", workers = supp_max),
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
parallel	toggle for parallel computing via future_lapply
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
...	Additional arguments supplied to cotram

Value

See tramvs

CoxphVS *Optimal subset selection in a Coxph-type transformation model*

Description

Optimal subset selection in a Coxph-type transformation model

Usage

```
CoxphVS(
  formula,
  data,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  parallel = FALSE,
  future_args = list(strategy = "multisession", workers = supp_max),
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
parallel	toggle for parallel computing via future_lapply
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
...	Additional arguments supplied to Coxph

Value

See tramvs

LehmannVS *Optimal subset selection in a Lehmann-type transformation model*

Description

Optimal subset selection in a Lehmann-type transformation model

Usage

```
LehmannVS(
  formula,
  data,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  parallel = FALSE,
  future_args = list(strategy = "multisession", workers = supp_max),
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
parallel	toggle for parallel computing via future_lapply
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
...	Additional arguments supplied to Lehmann

Value

See tramvs

LmVS *Optimal subset selection in an Lm-type transformation model*

Description

Optimal subset selection in an Lm-type transformation model

Usage

```
LmVS(
  formula,
  data,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  parallel = FALSE,
  future_args = list(strategy = "multisession", workers = supp_max),
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
parallel	toggle for parallel computing via future_lapply
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
...	Additional arguments supplied to Lm

Value

See tramvs

logLik.tramvs *logLik "tramvs"*

Description

logLik "tramvs"

Usage

```
## S3 method for class 'tramvs'
logLik(object, ...)
```

Arguments

object	object of class "tramvs"
...	additional arguments to logLik()

Value

Numeric vector containing log-likelihood of best model, see logLik.tram

mmltVS *Select optimal subset based on high dimensional BIC in mmlts*

Description

Select optimal subset based on high dimensional BIC in mmlts

Usage

```
mmltVS(
  mltargs,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  verbose = TRUE,
  parallel = FALSE,
  m0 = NULL,
  future_args = list(strategy = "multisession", workers = supp_max),
  ic_scale = 1,
  ...
)
```

Arguments

mltargs	Arguments passed to mmlt
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
verbose	show progress bar (default: TRUE)
parallel	toggle for parallel computing via future_lapply
m0	Transformation model for initialization
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
ic_scale	non-negative value multiplying the penalty term in the SIC (default: 1). ic_scale = 0.5 corresponds to the information criterion used in the **abess** package.
...	Currently ignored

Details

L0-penalized (i.e., best subset selection) multivariate transformation models using the abess algorithm.

Value

object of class "mmltvs", containing the regularization path (information criterion SIC and coefficients coefs), the best fit (best_fit) and all other models (all_fits)

---

plot.tramvs *Plot "tramvs" object*

Description

Plot "tramvs" object

Usage

```
## S3 method for class 'tramvs'
plot(x, which = c("tune", "path"), ...)
```

Arguments

x	object of class "tramvs"
which	plotting either the regularization path ("path") or the information criterion against the support size ("tune", default)
...	additional arguments to plot()

Value

Returns invisible(NULL)

PolrVS *Optimal subset selection in a Polr-type transformation model*

Description

Optimal subset selection in a Polr-type transformation model

Usage

```
PolrVS(
  formula,
  data,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  parallel = FALSE,
  future_args = list(strategy = "multisession", workers = supp_max),
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.

m_max	maximum number of iterating the splicing algorithm.
parallel	toggle for parallel computing via future_lapply
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
...	Additional arguments supplied to Polr

Value

See tramvs

---

predict.tramvs *Predict "tramvs"*

Description

Predict "tramvs"

Usage

```
## S3 method for class 'tramvs'
predict(object, ...)
```

Arguments

object	object of class "tramvs"
...	additional arguments to predict.tram()

Value

See predict.tram

---

print.tramvs *Print "tramvs"*

Description

Print "tramvs"

Usage

```
## S3 method for class 'tramvs'
print(x, ...)
```

Arguments

x	object of class "tramvs"
...	ignored

Value

"tramvs" object is returned invisibly

---

residuals.tramvs *Residuals "tramvs"*

Description

Residuals "tramvs"

Usage

```
## S3 method for class 'tramvs'
residuals(object, ...)
```

Arguments

object	object of class "tramvs"
...	additional arguments to residuals()

Value

Numeric vector containing residuals of best model, see residuals.tram

---

SIC *SIC generic*

Description

SIC generic

Usage

```
SIC(object, ...)
```

Arguments

object	Model to compute SIC from
...	for methods compatibility only

Value

Numeric vector (best_only = TRUE) or data.frame with SIC values

SIC.tramvs *SIC "tramvs"*

Description

SIC "tramvs"

Usage

```
## S3 method for class 'tramvs'
SIC(object, best_only = FALSE, ...)
```

Arguments

object	object of class "tramvs"
best_only	Wether to return the coefficients of the best model only (default: FALSE)
...	for methods compatibility only

Value

Numeric vector (best_only = TRUE) or data.frame with SIC values

simulate.tramvs *Simulate "tramvs"*

Description

Simulate "tramvs"

Usage

```
## S3 method for class 'tramvs'
simulate(object, nsim = 1, seed = NULL, ...)
```

Arguments

object	object of class "tramvs"
nsim	number of simulations
seed	random seed for simulation
...	additional arguments to simulate()

Value

See simulate.mlt

summary.tramvs *Summary "tramvs"*

Description

Summary "tramvs"

Usage

```
## S3 method for class 'tramvs'
summary(object, ...)
```

Arguments

object	object of class "tramvs"
...	ignored

Value

"tramvs" object is returned invisibly

support.tramvs *Support "tramvs"*

Description

Support "tramvs"

Usage

```
## S3 method for class 'tramvs'
support(object, ...)
```

Arguments

object	object of class "tramvs"
...	ignored

Value

Character vector containing active set of best fit

SurvregVS *Optimal subset selection in a Survreg model*

Description

Optimal subset selection in a Survreg model

Usage

```
SurvregVS(
  formula,
  data,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  parallel = FALSE,
  future_args = list(strategy = "multisession", workers = supp_max),
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.
parallel	toggle for parallel computing via future_lapply
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
...	Additional arguments supplied to Survreg

Value

See tramvs

tramvs *Select optimal subset based on high dimensional BIC*

Description

Select optimal subset based on high dimensional BIC

Usage

```
tramvs(
  formula,
  data,
  modFUN,
  mandatory = NULL,
  supp_max = NULL,
  k_max = NULL,
  thresh = NULL,
  init = TRUE,
  m_max = 10,
  m0 = NULL,
  verbose = TRUE,
  parallel = FALSE,
  future_args = list(strategy = "multisession", workers = supp_max),
  ic_scale = 1,
  ...
)
```

Arguments

formula	object of class "formula".
data	data frame containing the variables in the model.
modFUN	function for fitting a transformation model, e.g., BoxCox().
mandatory	formula of mandatory covariates, which will always be included and estimated in the model. Note that this also changes the intialization of the active set. The active set is then computed with regards to the model residuals of modFUN(mandatory, ...) instead of the unconditional model.
supp_max	maximum support which to call abess_tram with.
k_max	maximum splicing size, i.e., number of covariates to swap between active and inactive set, to consider during the splicing algorithm. Defaults to supp.
thresh	threshold when to stop splicing. Defaults to 0.01 * supp * log(p) * log(log(n)) / n, where p denotes the number of predictors and n the sample size.
init	initialize active set. Defaults to TRUE and initializes the active set with those covariates that are most correlated with score residuals of an unconditional modFUN(update(formula, . ~ 1)). If FALSE, the initial active set is drawn at random.
m_max	maximum number of iterating the splicing algorithm.

m0	Transformation model for initialization
verbose	show progress bar (default: TRUE)
parallel	toggle for parallel computing via future_lapply
future_args	arguments passed to plan; defaults to a "multisession" with supp_max workers
ic_scale	non-negative value multiplying the penalty term in the SIC (default: 1). ic_scale = 0.5 corresponds to the information criterion used in the **abess** package.
...	additional arguments supplied to modFUN.

Details

L0-penalized (i.e., best subset selection) transformation models using the abess algorithm.

Value

object of class "tramvs", containing the regularization path (information criterion SIC and coefficients coefs), the best fit (best_fit) and all other models (all_fits)

Examples

```
set.seed(24101968)
library("tramvs")

N <- 1e2
P <- 5
nz <- 3
beta <- rep(c(1, 0), c(nz, P - nz))
X <- matrix(rnorm(N * P), nrow = N, ncol = P)
Y <- 1 + X %*% beta + rnorm(N)

dat <- data.frame(y = Y, x = X)
res <- tramvs(y ~ ., data = dat, modFUN = Lm)
plot(res, type = "b")
plot(res, which = "path")
```

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