Package 'tidyfit'

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Title Regularized Linear Modeling with Tidy Data

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Description
An extension to the 'R' tidy data environment for automated machine learning. The package allows fitting and cross validation of linear regression and classification algorithms on grouped data.

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.2.3

URL https://tidyfit.residualmetrics.com,
https://github.com/jpfitzinger/tidyfit

Depends R (>= 3.5)

Imports broom, crayon, dials, dplyr, furrr, magrittr, MASS, methods, progressr, purrr, rlang, rsample, stats, tibble, tidyr, utils, yardstick

Suggests arm, bestglm, BMS, BoomSpikeSlab, COREelearn, e1071, gaselect, gets, ggplot2, glmnet, hfr, kableExtra, knitr, lme4, lmtest, lubridate, markdown, mboost, monomvn, mRMRe, MSwM, pls, quantreg, quantregForest, randomForest, sandwich, shrinkTVP, stringr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr

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NeedsCompilation no

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R topics documented:

`.fit.adalasso` *Adaptive Lasso regression or classification for* `tidyfit`

Description

Fits an adaptive Lasso regression or classification on a 'tidyFit' `R6` class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'adalasso'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- `lambda` *(L1 penalty)*
- `lambda_ridge` *(L2 penalty (default = 0.01) used in the first step to determine the penalty factor)*

Important method arguments (passed to `m`)

The adaptive Lasso is a weighted implementation of the Lasso algorithm, with covariate-specific weights obtained using an initial regression fit (in this case, a ridge regression with `lambda = lambda_ridge`, where `lambda_ridge` can be passed as an argument). The adaptive Lasso is computed using the `glmnet::glmnet` function. See `?glmnet` for more details. For classification pass `family = "binomial"` to `...` in `m` or use `classify`.

Implementation

Features are standardized by default with coefficients transformed to the original scale.

If no hyperparameter grid is passed (`is.null(control$lambda)`), `dials::grid_regular()` is used to determine a sensible default grid. The grid size is 100. Note that the grid selection tools provided by `glmnet::glmnet` cannot be used (e.g. `dfmax`). This is to guarantee identical grids across groups in the tibble.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Zou, H. (2006). The Adaptive Lasso and Its Oracle Properties. Journal of the American Statistical Association, 101(476), 1418-1429.

Jerome Friedman, Trevor Hastie, Robert Tibshirani (2010). Regularization Paths for Generalized Linear Models via Coordinate Descent. Journal of Statistical Software, 33(1), 1-22. URL https://www.jstatsoft.org/v33/i01/.

See Also

`.fit.lasso`, `.fit.enet`, `.fit.ridge` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("adalasso", Return ~ ., data, lambda = 0.5)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("adalasso", lambda = c(0.1, 0.5)),
               .mask = c("Date", "Industry"))
coef(fit)
```

.fit.bayes *Bayesian generalized linear regression for* `tidyfit`

Description

Fits a Bayesian regression on a 'tidyFit' `R6` class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'bayes'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to m)

The function provides a wrapper for `arm::bayesglm`. See `?bayesglm` for more details.

Implementation

No implementation notes

Value

A fitted 'tidyFit' class model.

A 'tibble'.

Author(s)

Johann Pfitzinger

References

Gelman A, Su Y (2021). *arm: Data Analysis Using Regression and Multilevel/Hierarchical Models*. R package version 1.12-2, https://CRAN.R-project.org/package=arm.

See Also

`.fit.glm` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("bayes", Return ~ ., data)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("bayes"), .mask = c("Date", "Industry"))
coef(fit)
```

`.fit.blasso` *Bayesian Lasso regression for* `tidyfit`

Description

Fits a Bayesian Lasso regression on a 'tidyFit' `R6` class. The function can be used with `regress`.

Usage

```
## S3 method for class 'blasso'
.fit(self, data = NULL)
```

Arguments

`self`	a tidyFit R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

The function provides a wrapper for `monomvn::blasso`. See `?blasso` for more details.

Implementation

Features are standardized by default with coefficients transformed to the original scale.

Value

A fitted tidyFit class model.

Author(s)

Johann Pfitzinger

References

Gramacy RB, (qpgen2/quadprog) wFcfCMaubBAT (2023). *monomvn: Estimation for MVN and Student-t Data with Monotone Missingness*. R package version 1.9-17, https://CRAN.R-project.org/package=monomvn.

See Also

`.fit.lasso`, `.fit.bridge` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("blasso", Return ~ ., data, T = 100)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("blasso", T = 100),
               .mask = c("Date", "Industry"))
coef(fit)
```

.fit.bma *Bayesian model averaging for* tidyfit

Description

Fits a Bayesian model averaging regression on a 'tidyFit' R6 class. The function can be used with regress.

Usage

```
## S3 method for class 'bma'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to m)

- iter (*number of iteration draws*)
- mcmc (*model sampler used (default 'bd')*)

The function provides a wrapper for BMS::bms. See ?bms for more details.

Implementation

The underlying function automatically generates plotting output, which is not suppressed.

Use coef(fit) to obtain posterior mean, standard deviation as well as posterior inclusion probabilities for the features.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Feldkircher, M. and S. Zeugner (2015). *Bayesian Model Averaging Employing Fixed and Flexible Priors: The BMS Package for R*, Journal of Statistical Software 68(4).

See Also

`.fit.bayes` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("bma", Return ~ `Mkt-RF` + HML + SMB + RMW + CMA, data)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("bma"), .mask = c("Date", "Industry"))
coef(fit)
```

.fit.boost *Gradient boosting regression for* tidyfit

Description

Fits a gradient boosting regression or classification on a 'tidyFit' R6 class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'boost'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- mstop (*number of boosting iterations*)
- nu (*step size*)

Important method arguments (passed to m)

The gradient boosting regression is performed using mboost::glmboost. See ?glmboost for more details.

Implementation

Features are standardized by default with coefficients transformed to the original scale.

If no hyperparameter grid is passed (is.null(control$mstop) and is.null(control$nu)), the default grid is used with mstop = c(100, 500, 1000, 5000) and nu = c(0.01, 0.05, 0.1, 0.15, 0.2, 0.25).

Value

A fitted 'tidyFit' class model.

A 'tibble'.

Author(s)

Johann Pfitzinger

References

T. Hothorn, P. Buehlmann, T. Kneib, M. Schmid, and B. Hofner (2022). mboost: Model-Based Boosting, R package version 2.9-7,https://CRAN.R-project.org/package=mboost.

See Also

m method

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("boost", Return ~ ., data, nu = 0.1, mstop = 100)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("boost", nu = c(0.1, 0.05), mstop = 100),
               .mask = c("Date", "Industry"))
coef(fit)
```

`.fit.bridge` *Bayesian ridge regression for* `tidyfit`

Description

Fits a Bayesian ridge regression on a 'tidyFit' `R6` class. The function can be used with `regress`.

Usage

```
## S3 method for class 'bridge'
.fit(self, data = NULL)
```

Arguments

`self`	a tidyFit R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

The function provides a wrapper for `monomvn::bridge`. See `?bridge` for more details.

Implementation

Features are standardized by default with coefficients transformed to the original scale.

Value

A fitted tidyFit class model.

Author(s)

Johann Pfitzinger

References

Gramacy RB, (qpgen2/quadprog) wFcfCMaubBAT (2023). *monomvn: Estimation for MVN and Student-t Data with Monotone Missingness*. R package version 1.9-17, https://CRAN.R-project.org/package=monomvn.

See Also

`.fit.ridge`, `.fit.blasso` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("bridge", Return ~ ., data, T = 100)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("bridge", T = 100),
               .mask = c("Date", "Industry"))
coef(fit)
```

.fit.chisq *Pearson's Chi-squared test for* tidyfit

Description

Calculates Pearson's Chi-squared test on a 'tidyFit' R6 class. The function can be used with classify.

Usage

```
## S3 method for class 'chisq'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to m)

The function provides a wrapper for stats::chisq.test. See ?chisq.test for more details.

Implementation

Results can be viewed using coef.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

See Also

`.fit.cor` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::mutate_at(data, dplyr::vars(-Date, -Industry), dplyr::ntile, n = 10)

# Within 'classify' function
fit <- classify(data, Return ~ ., m("chisq"), .mask = c("Date", "Industry"))
tidyr::unnest(coef(fit), model_info)
```

.fit.cor *Pearson's correlation for* tidyfit

Description

Calculates Pearson's correlation coefficient on a 'tidyFit' R6 class. The function can be used with `regress`.

Usage

```
## S3 method for class 'cor'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

The function provides a wrapper for `stats::cor.test`. See `?cor.test` for more details.

Implementation

Results can be viewed using `coef`.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

See Also

`.fit.chisq` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("cor", Return ~ `Mkt-RF` + HML + SMB, data)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("cor"), .mask = c("Date", "Industry"))
tidyr::unnest(coef(fit), model_info)
```

.fit.enet *ElasticNet regression or classification for* `tidyfit`

Description

Fits an ElasticNet regression or classification on a 'tidyFit' `R6` class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'enet'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- `lambda` *(penalty)*
- `alpha` *(L1-L2 mixing parameter)*

Important method arguments (passed to `m`)

The ElasticNet regression is estimated using `glmnet::glmnet`. See `?glmnet` for more details. For classification pass `family = "binomial"` to `...` in `m` or use `classify`.

Implementation

If the response variable contains more than 2 classes, a multinomial response is used automatically.

An intercept is always included and features are standardized with coefficients transformed to the original scale.

If no hyperparameter grid is passed (`is.null(control$lambda)` and `is.null(control$alpha)`), `dials::grid_regular()` is used to determine a sensible default grid. The grid size is 100 for `lambda` and 5 for `alpha`. Note that the grid selection tools provided by `glmnet::glmnet` cannot be used (e.g. `dfmax`). This is to guarantee identical grids across groups in the tibble.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Jerome Friedman, Trevor Hastie, Robert Tibshirani (2010). Regularization Paths for Generalized Linear Models via Coordinate Descent. Journal of Statistical Software, 33(1), 1-22. URL https://www.jstatsoft.org/v33/i01/.

See Also

`.fit.lasso`, `.fit.adalasso`, `.fit.ridge` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("enet", Return ~ ., data, lambda = c(0, 0.1), alpha = 0.5)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("enet", alpha = c(0, 0.5), lambda = c(0.1)),
               .mask = c("Date", "Industry"), .cv = "vfold_cv")
coef(fit)
```

`.fit.genetic` *Genetic algorithm with linear regression fitness evaluator for* `tidyfit`

Description

Fits a linear regression with variable selection using a genetic algorithm on a 'tidyFit' `R6` class. The function can be used with `regress`.

Usage

```
## S3 method for class 'genetic'
.fit(self, data = NULL)
```

Arguments

`self`	a tidyFit R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

- statistic
- populationSize
- numGenerations
- minVariables
- maxVariables

The function provides a wrapper for `gaselect::genAlg`. See `?genAlg` for more details.

Implementation

Control arguments are passed to gaselect::genAlgControl (the function automatically identifies which arguments are for the control object, and which for gaselect::genAlg).

gaselect::evaluatorLM is used as the evaluator with the relevant arguments automatically identified by the function.

Value

A fitted tidyFit class model.

Author(s)

Johann Pfitzinger

References

Kepplinger D (2023). *gaselect: Genetic Algorithm (GA) for Variable Selection from High-Dimensional Data*. R package version 1.0.21, https://CRAN.R-project.org/package=gaselect.

See Also

.fit.lm, .fit.bayes and m methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("genetic", Return ~ ., data)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("genetic"),
               .mask = c("Date", "Industry"))
coef(fit)
```

.fit.gets *General-to-specific regression for* tidyfit

Description

Fits a general-to-specific (GETS) regression on a 'tidyFit' R6 class. The function can be used with regress.

Usage

```
## S3 method for class 'gets'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

- `max.paths` *(Number of paths to search)*

The function provides a wrapper for `gets::gets`. See `?gets` for more details.

Implementation

Print output is suppressed by default. Use 'print.searchinfo = TRUE' for print output.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Pretis F, Reade JJ, Sucarrat G (2018). *Automated General-to-Specific (GETS) Regression Modeling and Indicator Saturation for Outliers and Structural Breaks.* Journal of Statistical Software 86(3), 1-44.

See Also

`.fit.robust`, `.fit.glm` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("gets", Return ~ `Mkt-RF` + HML + SMB, data)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("gets"), .mask = c("Date", "Industry"))
coef(fit)
```

`.fit.glm` *Generalized linear regression for* `tidyfit`

Description

Fits a linear or logistic regression on a 'tidyFit' `R6` class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'glm'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

The function provides a wrapper for `stats::glm`. See `?glm` for more details.

Implementation

No implementation notes

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

See Also

`.fit.lm` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data$Return <- ifelse(data$Return > 0, 1, 0)

# Stand-alone function
fit <- m("glm", Return ~ ., data)
fit

# Within 'classify' function
fit <- classify(data, Return ~ ., m("glm"), .mask = c("Date", "Industry"))
coef(fit)
```

.fit.glmm *Generalized linear mixed-effects model for* tidyfit

---

Description

Fits a linear or logistic mixed-effects model (GLMM) on a 'tidyFit' R6 class. The function can be used with regress and classify.

Usage

```
## S3 method for class 'glmm'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to m)

The function provides a wrapper for lme4::glmer. See ?glmer for more details.

Implementation

No implementation notes

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Douglas Bates, Martin Maechler, Ben Bolker, Steve Walker (2015). Fitting Linear Mixed-Effects Models Using lme4. Journal of Statistical Software, 67(1), 1-48. doi:10.18637/jss.v067.i01.

See Also

`.fit.glm` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data$Return <- ifelse(data$Return > 0, 1, 0)

# Estimate model with random effects
fit <- classify(data, Return ~ CMA + (CMA | Industry), logit = m("glmm"),
                .mask = "Date")
fit
```

.fit.hfr *Hierarchical feature regression for* tidyfit

Description

Fits a hierarchical feature regression on a 'tidyFit' R6 class. The function can be used with `regress`.

Usage

```
## S3 method for class 'hfr'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- kappa (*proportional size of regression graph*)

Important method arguments (passed to `m`)

The hierarchical feature regression is estimated using the `hfr::cv.hfr` function. See `?cv.hfr` for more details.

Implementation

Features are standardized by default with coefficients transformed to the original scale.

If no hyperparameter grid is provided (`is.null(control$kappa)`), the default is `seq(0, 1, by = 0.1)`.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Pfitzinger J (2022). *hfr: Estimate Hierarchical Feature Regression Models*. R package version 0.5.0, https://CRAN.R-project.org/package=hfr.

See Also

`.fit.plsr` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("hfr", Return ~ ., data, kappa = 0.5)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("hfr", kappa = c(0.1, 0.5)),
               .mask = c("Date", "Industry"))
coef(fit)
```

`.fit.lasso` *Lasso regression and classification for* `tidyfit`

Description

Fits a linear regression or classification with L1 penalty on a 'tidyFit' `R6` class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'lasso'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- `lambda` *(L1 penalty)*

Important method arguments (passed to `m`)

The Lasso regression is estimated using `glmnet::glmnet` with `alpha = 1`. See `?glmnet` for more details. For classification pass `family = "binomial"` to `...` in `m` or use `classify`.

Implementation

If the response variable contains more than 2 classes, a multinomial response is used automatically.

Features are standardized by default with coefficients transformed to the original scale.

If no hyperparameter grid is passed (`is.null(control$lambda)`), `dials::grid_regular()` is used to determine a sensible default grid. The grid size is 100. Note that the grid selection tools provided by `glmnet::glmnet` cannot be used (e.g. `dfmax`). This is to guarantee identical grids across groups in the tibble.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Jerome Friedman, Trevor Hastie, Robert Tibshirani (2010). Regularization Paths for Generalized Linear Models via Coordinate Descent. Journal of Statistical Software, 33(1), 1-22. URL https://www.jstatsoft.org/v33/i01/.

See Also

`.fit.enet`, `.fit.ridge`, `.fit.adalasso` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("lasso", Return ~ ., data, lambda = 0.5)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("lasso", lambda = c(0.1, 0.5)),
               .mask = c("Date", "Industry"))
coef(fit)
```

.fit.lm *Linear regression for* tidyfit

Description

Fits a linear regression on a 'tidyFit' R6 class. The function can be used with `regress`.

Usage

```
## S3 method for class 'lm'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to m)

The function provides a wrapper for `stats::lm`. See `?lm` for more details.

Implementation

An argument `vcov.` can be passed in control or to `...` in `m` to estimate the model with robust standard errors. `vcov.` can be one of "BS", "HAC", "HC" and "OPG" and is passed to the `sandwich` package.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

See Also

`.fit.robust`, `.fit.glm` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("lm", Return ~ `Mkt-RF` + HML + SMB, data)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("lm"), .mask = c("Date", "Industry"))
coef(fit)

# With robust standard errors
fit <- m("lm", Return ~ `Mkt-RF` + HML + SMB, data, vcov. = "HAC")
fit
```

`.fit.mrmr` *Minimum redundancy, maximum relevance feature selection for* `tidyfit`

Description

Selects features for continuous or (ordered) factor data using MRMR on a 'tidyFit' `R6` class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'mrmr'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

- feature_count (*number of features to select*)
- solution_count (*ensemble size*)

The MRMR algorithm is estimated using the `mRMRe::mRMR.ensemble` function. See `?mRMR.ensemble` for more details.

Implementation

Use with `regress` for regression problems and with `classify` for classification problems. The selected features can be obtained using `coef`.

The MRMR objects have no `predict` and related methods.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

De Jay N, Papillon-Cavanagh S, Olsen C, Bontempi G and Haibe-Kains B (2012). *mRMRe: an R package for parallelized mRMR ensemble feature selection*.

See Also

`m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::filter(data, Industry == "HiTec")
data <- dplyr::select(data, SMB, HML, RMW, CMA, Return)

## Not run:
fit <- m("mrmr", Return ~ ., data, feature_count = 2)

# Retrieve selected features
coef(fit)

## End(Not run)
```

.fit.mslm *Markov-Switching Regression for* `tidyfit`

Description

Fits a Markov-Switching regression on a 'tidyFit' `R6` class. The function can be used with `regress`.

Usage

```
## S3 method for class 'mslm'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

- k (the number of regimes)
- sw (logical vector indicating which coefficients switch)
- control (additional fitting parameters)

The function provides a wrapper for MSwM::msmFit. See ?msmFit for more details.

Implementation

Note that only the regression method with 'lm' is implemented at this stage.

An argument index_col can be passed, which allows a custom index to be added to coef(m("mslm")) (e.g. a date index).

If no sw argument is passed, all coefficients are permitted to switch between regimes.“

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Sanchez-Espigares JA, Lopez-Moreno A (2021). *MSwM: Fitting Markov Switching Models*. R package version 1.5, https://CRAN.R-project.org/package=MSwM.

See Also

.fit.tvp and m methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::filter(data, Industry == "HiTec", Date >= 201801)
data <- dplyr::select(data, -Industry)

ctr <- list(maxiter = 100, parallelization = FALSE)

# Stand-alone function
fit <- m("mslm", Return ~ HML, data, index_col = "Date", k = 2, control = ctr)
fit

# Within 'regress' function
fit <- regress(data, Return ~ HML,
               m("mslm", index_col = "Date", k = 2, control = ctr))
tidyr::unnest(coef(fit), model_info)
```

`.fit.pcr` *Principal Components Regression for* `tidyfit`

Description

Fits a principal components regression on a 'tidyFit' `R6` class. The function can be used with `regress`.

Usage

```
## S3 method for class 'pcr'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- `ncomp` *(number of components)*
- `ncomp_pct` *(number of components, percentage of features)*

Important method arguments (passed to `m`)

The principal components regression is fitted using `pls` package. See `?pcr` for more details.

Implementation

Covariates are standardized, with coefficients back-transformed to the original scale. An intercept is always included.

If no hyperparameter grid is passed (`is.null(control$ncomp) & is.null(control$ncomp_pct)`), the default is `ncomp_pct = seq(0, 1, length.out = 20)`, where 0 results in one component and 1 results in the number of features.

When 'jackknife = TRUE' is passed (and a 'validation' method is chosen), `coef` also returns the jack-knife standard errors, t-statistics and p-values.

Note that at present `pls` does not offer weighted implementations or non-gaussian response. The method can therefore only be used with `regress`

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Liland K, Mevik B, Wehrens R (2022). *pls: Partial Least Squares and Principal Component Regression*. R package version 2.8-1, https://CRAN.R-project.org/package=pls.

See Also

.fit.plsr and m methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::filter(data, Industry == "HiTec")
data <- dplyr::select(data, -Industry)

# Stand-alone function
fit <- m("pcr", Return ~ ., data, ncomp = 1:3)
fit

# Within 'regress' function
fit <- regress(data, Return ~ .,
               m("pcr", jackknife = TRUE, validation = "LOO", ncomp_pct = 0.5),
               .mask = c("Date"))
tidyr::unnest(coef(fit), model_info)
```

.fit.plsr *Partial Least Squares Regression for* tidyfit

Description

Fits a partial least squares regression on a 'tidyFit' R6 class. The function can be used with regress.

Usage

```
## S3 method for class 'plsr'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- `ncomp` *(number of components)*
- `ncomp_pct` *(number of components, percentage of features)*

Important method arguments (passed to `m`)

The partial least squares regression is fitted using `pls` package. See `?plsr` for more details.

Implementation

Covariates are standardized, with coefficients back-transformed to the original scale. An intercept is always included.

If no hyperparameter grid is passed (`is.null(control$ncomp) & is.null(control$ncomp_pct)`), the default is `ncomp_pct = seq(0, 1, length.out = 20)`, where 0 results in one component and 1 results in the number of features.

When 'jackknife = TRUE' is passed (and a 'validation' method is chosen), `coef` also returns the jack-knife standard errors, t-statistics and p-values.

Note that at present `pls` does not offer weighted implementations or non-gaussian response. The method can therefore only be used with `regress`

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Liland K, Mevik B, Wehrens R (2022). *pls: Partial Least Squares and Principal Component Regression*. R package version 2.8-1, https://CRAN.R-project.org/package=pls.

See Also

`.fit.pcr` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::filter(data, Industry == "HiTec")
data <- dplyr::select(data, -Industry)

# Stand-alone function
fit <- m("plsr", Return ~ ., data, ncomp = 1:3)
fit

# Within 'regress' function
```

```
fit <- regress(data, Return ~ .,
               m("pcr", jackknife = TRUE, validation = "LOO", ncomp_pct = 0.5),
               .mask = c("Date"))
tidyr::unnest(coef(fit), model_info)
```

`.fit.quantile` *Quantile regression for* `tidyfit`

Description

Fits a linear quantile regression on a 'tidyFit' `R6` class. The function can be used with `regress`.

Usage

```
## S3 method for class 'quantile'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

- `tau` (the quantile(s) to be estimated)

The function provides a wrapper for `quantreg::rq`. See `?rq` for more details. The argument `tau` is the chosen quantile (default `tau = 0.5`).

Implementation

No implementation notes

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Koenker R (2022). *quantreg: Quantile Regression*. R package version 5.94, https://CRAN.R-project.org/package=quantreg.

See Also

.fit.lm, .fit.bayes and m methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

fit <- regress(data, Return ~ .,
               m("quantile", tau = c(0.1, 0.5, 0.9)),
               .mask = c("Date", "Industry"))
coef(fit)
```

.fit.quantile_rf *Quantile regression forest for* tidyfit

Description

Fits a nonlinear quantile regression forest on a 'tidyFit' R6 class. The function can be used with regress.

Usage

```
## S3 method for class 'quantile_rf'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- ntree (*number of trees*)
- mtry (*number of variables randomly sampled at each split*)

Important method arguments (passed to m)

- tau (the quantile(s) to be estimated)

The function provides a wrapper for `quantregForest::quantregForest`. See `?quantregForest` for more details. The argument `tau` is the chosen quantile (default `tau = 0.5`). `tau` is passed directly to `m('quantile_rf', tau = c(0.1, 0.5, 0.9)` and is not passed to `predict` as in the `quantregForest::quantregForest` package. This is done to ensure a consistent interface with the quantile regression from `quantreg`.

Implementation

No implementation notes

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Meinshausen N (2017). *quantregForest: Quantile Regression Forests*. R package version 1.3-7, https://CRAN.R-project.org/package=quantregForest.

See Also

`.fit.quantile`, `.fit.rf` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::filter(data, Industry == "HiTec")
data <- dplyr::select(data, -Date, -Industry)

# Stand-alone function
fit <- m("quantile_rf", Return ~ ., data, tau = 0.5, ntree = 50)
fit

# Within 'regress' function
fit <- regress(data, Return ~ .,
               m("quantile_rf", tau = c(0.1, 0.5, 0.9), ntree = 50))
coef(fit)
```

`.fit.relief` *ReliefF and RReliefF feature selection algorithm for* `tidyfit`

Description

Selects features for continuous or factor data using ReliefF on a 'tidyFit' `R6` class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'relief'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

- estimator (*selection algorithm to use (default is 'ReliefFequalK')*)

The ReliefF algorithm is estimated using the `CORElearn::attrEval` function. See `?attrEval` for more details.

Implementation

Use with `regress` for regression problems and with `classify` for classification problems. `coef` returns the score for each feature. Select the required number of features with the largest scores.

The Relief objects have no `predict` and related methods.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Robnik-Sikonja M, Savicky P (2021). *CORElearn: Classification, Regression and Feature Evaluation*. R package version 1.56.0, https://CRAN.R-project.org/package=CORElearn.

See Also

.fit.mrmr and m methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::filter(data, Industry == "HiTec")
data <- dplyr::select(data, -Date, -Industry)

# Stand-alone function
fit <- m("relief", Return ~ ., data)
coef(fit)

# Within 'regress' function
fit <- regress(data, Return ~ ., m("relief"))
coef(fit)
```

.fit.rf *Random Forest regression or classification for* tidyfit

---

Description

Fits a random forest on a 'tidyFit' R6 class. The function can be used with regress and classify.

Usage

```
## S3 method for class 'rf'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- ntree (*number of trees*)
- mtry (*number of variables randomly sampled at each split*)

Important method arguments (passed to m)

The function provides a wrapper for randomForest::randomForest. See ?randomForest for more details.

Implementation

The random forest is always fit with `importance = TRUE`. The feature importance values are extracted using `coef()`.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Liaw, A. and Wiener, M. (2002). *Classification and Regression by randomForest.* R News 2(3), 18–22.

See Also

`.fit.svm`, `.fit.boost` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::filter(data, Industry == "HiTec")
data <- dplyr::select(data, -Date, -Industry)

# Stand-alone function
fit <- m("rf", Return ~ ., data)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("rf"))
tidyr::unnest(coef(fit), model_info)
```

.fit.ridge *Ridge regression and classification for* `tidyfit`

Description

Fits a linear regression or classification with L2 penalty on a 'tidyFit' `R6` class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'ridge'
.fit(self, data = NULL)
```

Arguments

self	a tidyFit R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- lambda *(L2 penalty)*

Important method arguments (passed to m)

The ridge regression is estimated using glmnet::glmnet with alpha = 0. See ?glmnet for more details. For classification pass family = "binomial" to ... in m or use classify.

Implementation

If the response variable contains more than 2 classes, a multinomial response is used automatically.

Features are standardized by default with coefficients transformed to the original scale.

If no hyperparameter grid is passed (is.null(control$lambda)), dials::grid_regular() is used to determine a sensible default grid. The grid size is 100. Note that the grid selection tools provided by glmnet::glmnet cannot be used (e.g. dfmax). This is to guarantee identical grids across groups in the tibble.

Value

A fitted tidyFit class model.

Author(s)

Johann Pfitzinger

References

Jerome Friedman, Trevor Hastie, Robert Tibshirani (2010). Regularization Paths for Generalized Linear Models via Coordinate Descent. Journal of Statistical Software, 33(1), 1-22. URL https://www.jstatsoft.org/v33/i01/.

See Also

.fit.lasso, .fit.adalasso, .fit.enet and m methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("ridge", Return ~ ., data, lambda = 0.5)
fit
```

```
# Within 'regress' function
fit <- regress(data, Return ~ ., m("ridge", lambda = c(0.1, 0.5)),
               .mask = c("Date", "Industry"))
coef(fit)
```

`.fit.robust` *Robust regression for* `tidyfit`

Description

Fits a robust linear regression on a 'tidyFit' `R6` class. The function can be used with `regress`.

Usage

```
## S3 method for class 'robust'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

- `method` (estimation algorithm, e.g. 'M', 'MM')

The function provides a wrapper for `MASS::rlm`. See `?rlm` for more details.

Implementation"

An argument `vcov.` can be passed in control or to `...` in `m` to estimate the model with robust standard errors. `vcov.` can be one of "BS", "HAC", "HC" and "OPG" and is passed to the `sandwich` package.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

W. N. Venables and B. D. Ripley (2002). *Modern Applied Statistics with S. 4th ed., Springer, New York.* URL https://www.stats.ox.ac.uk/pub/MASS4/.

See Also

`.fit.lm` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

fit <- regress(data, Return ~ ., m("robust"), .mask = c("Date", "Industry"))
coef(fit)

# With robust standard errors
fit <- m("robust", Return ~ `Mkt-RF` + HML + SMB, data, vcov. = "HAC")
tidyr::unnest(coef(fit), model_info)
```

.fit.spikeslab *Bayesian Spike and Slab regression or classification for* `tidyfit`

Description

Fits a Bayesian Spike and Slab regression or classification on a 'tidyFit' `R6` class. The function can be used with `regress` and `classify`.

Usage

```
## S3 method for class 'spikeslab'
.fit(self, data = NULL)
```

Arguments

`self`	a tidyFit R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

In the case of **regression**, arguments are passed to `BoomSpikeSlab::lm.spike` and `BoomSpikeSlab::SpikeSlabPrior`. Check those functions for details.

`BoomSpikeSlab::SpikeSlabPrior`

- expected.r2
- prior.df
- expected.model.size

`BoomSpikeSlab::lm.spike`

- niter

In the case of **classification**, arguments are passed to `BoomSpikeSlab::logit.spike` and `BoomSpikeSlab::SpikeSlabGlmP` Check those functions for details.

`BoomSpikeSlab::logit.spike`

- niter

I advise against the use of `BoomSpikeSlab::SpikeSlabGlmPrior` at the moment, since it appears to be buggy.

The function provides wrappers for `BoomSpikeSlab::lm.spike` and `BoomSpikeSlab::logit.spike`. See `?lm.spike` and `?logit.spike` for more details.

Implementation

Prior arguments are passed to `BoomSpikeSlab::SpikeSlabPrior` and `BoomSpikeSlab::SpikeSlabGlmPrior` (the function automatically identifies which arguments are for the prior, and which for `BoomSpikeSlab::lm.spike` or `BoomSpikeSlab::logit.spike`).

`BoomSpikeSlab::logit.spike` is automatically selected when using `classify`.

Value

A fitted tidyFit class model.

Author(s)

Johann Pfitzinger

References

Scott SL (2022). *BoomSpikeSlab: MCMC for Spike and Slab Regression*. R package version 1.2.5, https://CRAN.R-project.org/package=BoomSpikeSlab.

See Also

`.fit.lasso`, `.fit.blasso` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("spikeslab", Return ~ ., data, niter = 100)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("spikeslab", niter = 100),
               .mask = c("Date", "Industry"))
coef(fit)
```

.fit.subset *Best subset regression and classification for* tidyfit

---

Description

Fits a best subset regression or classification on a 'tidyFit' R6 class. The function can be used with regress and classify.

Usage

```
## S3 method for class 'subset'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to m)

- method (e.g. 'forward', 'backward')
- IC (information criterion, e.g. 'AIC')

The best subset regression is estimated using bestglm::bestglm which is a wrapper around leaps::regsubsets for the regression case, and performs an exhaustive search for the classification case. See ?bestglm for more details.

Implementation

Forward or backward selection can be performed by passing method = "forward" or method = "backward" to m.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

A.I. McLeod, Changjiang Xu and Yuanhao Lai (2020). *bestglm: Best Subset GLM and Regression Utilities. R package version 0.37.3.* URL https://CRAN.R-project.org/package=bestglm.

See Also

`.fit.lm` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("subset", Return ~ ., data, method = c("forward", "backward"))
tidyr::unnest(fit, settings)

# Within 'regress' function
fit <- regress(data, Return ~ ., m("subset", method = "forward"),
               .mask = c("Date", "Industry"))
coef(fit)
```

.fit.svm *Support vector regression or classification for* tidyfit

---

Description

Fits a support vector regression or classification on a 'tidyFit' R6 class. The function can be used with `regress` or `classify`.

Usage

```
## S3 method for class 'svm'
.fit(self, data = NULL)
```

Arguments

self	a 'tidyFit' R6 class.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

- cost (*cost of constraint violation*)
- epsilon (*epsilon in the insensitive-loss function*)

Important method arguments (passed to m)

The function provides a wrapper for e1071::svm. See ?svm for more details.

Implementation

The default value for the kernel argument is set to 'linear'. If set to a different value, no coefficients will be returned.

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Meyer D, Dimitriadou E, Hornik K, Weingessel A, Leisch F (2022). *e1071: Misc Functions of the Department of Statistics, Probability Theory Group (Formerly: E1071), TU Wien*. R package version 1.7-12, https://CRAN.R-project.org/package=e1071.

See Also

.fit.boost, .fit.lasso and m methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::filter(data, Industry == "HiTec")

# Stand-alone function
fit <- m("svm", Return ~ `Mkt-RF` + HML + SMB, data, cost = 0.1)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("svm", cost = 0.1),
               .mask = c("Date", "Industry"))
```

```
coef(fit)
```

`.fit.tvp` *Bayesian Time-Varying Regression for* `tidyfit`

Description

Fits a Bayesian time-varying regression on a 'tidyFit' `R6` class. The function can be used with `regress`.

Usage

```
## S3 method for class 'tvp'
.fit(self, data = NULL)
```

Arguments

`self`	a 'tidyFit' R6 class.
`data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).

Details

Hyperparameters:

None. Cross validation not applicable.

Important method arguments (passed to `m`)

- `mod_type`
- `niter` (number of MCMC iterations)

The function provides a wrapper for `shrinkTVP::shrinkTVP`. See `?shrinkTVP` for more details.

Implementation

An argument `index_col` can be passed, which allows a custom index to be added to `coef(m("tvp"))` (e.g. a date index, see Examples).

Value

A fitted 'tidyFit' class model.

Author(s)

Johann Pfitzinger

References

Peter Knaus, Angela Bitto-Nemling, Annalisa Cadonna and Sylvia Frühwirth-Schnatter (2021). *Shrinkage in the Time-Varying Parameter Model Framework Using the R Package shrinkTVP. Journal of Statistical Software 100(13), 1–32*. doi:10.18637/jss.v100.i13.

See Also

`.fit.bayes`, `.fit.mslm` and `m` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::filter(data, Industry == "HiTec")
data <- dplyr::select(data, -Industry)

# Within 'regress' function (using low niter for illustration)
fit <- regress(data, Return ~ ., m("tvp", niter = 50, index_col = "Date"))
tidyr::unnest(coef(fit), model_info)
```

`classify` *Classification on tidy data*

Description

This function is a wrapper to fit many different types of linear classification models on a (grouped) `tibble`.

Arguments

`.data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr). The data frame can be grouped.
`formula`	an object of class "formula": a symbolic description of the model to be fitted.
`...`	name-function pairs of models to be estimated. See 'Details'.
`.cv`	type of 'rsample' cross validation procedure to use to determine optimal hyper-parameter values. Default is `.cv = "none"`. See 'Details'.
`.cv_args`	additional settings to pass to the 'rsample' cross validation function.
`.weights`	optional name of column containing sample weights.
`.mask`	optional vector of columns names to ignore. Can be useful when using 'y ~ .' formula syntax.
`.return_slices`	logical. Should the output of individual cross validation slices be returned or only the final fit. Default is `.return_slices=FALSE`.

`.return_grid` logical. Should the output of the individual hyperparameter grids be returned or only the best fitting set of hyperparameters. Default is `.return_grid=FALSE`.

`.tune_each_group` logical. Should optimal hyperparameters be selected for each group or once across all groups. Default is `.tune_each_group=TRUE`.

`.force_cv` logical. Should models be evaluated across all cross validation slices, even if no hyperparameters are tuned. Default is `.force_cv=FALSE`.

Details

`classify` fits all models passed in `...` using the `m` function. The models can be passed as name-function pairs (e.g. `ols = m("lm")`) or without including a name.

Hyperparameters are tuned automatically using the '.cv' and '.cv_args' arguments, or can be passed to `m()` (e.g. `lasso = m("lasso", lambda = 0.5)`). See the individual model functions (`?m()`) for an overview of hyperparameters.

Cross validation is performed using the 'rsample' package with possible methods including

- 'initial_split' (simple train-test split)
- 'initial_time_split' (train-test split with retained order)
- 'vfold_cv' (aka kfold cross validation)
- 'loo_cv' (leave-one-out)
- 'rolling_origin' (generalized time series cross validation, e.g. rolling or expanding windows)
- 'sliding_window', 'sliding_index', 'sliding_period' (specialized time series splits)
- 'bootstraps'
- 'group_vfold_cv', 'group_bootstraps'

See package documentation for 'rsample' for all available methods.

The negative log loss is used to validate performance in the cross validation.

Note that arguments for weights are automatically passed to the functions by setting the '.weights' argument. Weights are also considered during cross validation by calculating weighted versions of the cross validation loss function.

`classify` can handle both binomial and multinomial response distributions, however not all underlying methods are capable of handling a multinomial response.

Value

A `tidyfit.models` frame containing model details for each group.

The **'tidyfit.models' frame** consists of 4 different components:

1. A group of identifying columns (e.g. model name, data groups, grid IDs)
2. A 'model_object' column, which contains the fitted model.
3. A nested 'settings' column containing model arguments and hyperparameters
4. Columns showing errors, warnings and messages (if applicable)

Coefficients, predictions, fitted values or residuals can be accessed using the built-in `coef`, `predict`, `fitted` and `resid` methods. Note that all coefficients are transformed to ensure comparability across methods.

Author(s)

Johann Pfitzinger

See Also

regress, coef.tidyfit.models and predict.tidyfit.models method

Examples

```
data <- tidyfit::Factor_Industry_Returns
data <- dplyr::mutate(data, Return = ifelse(Return > 0, 1, 0))
fit <- classify(data, Return ~ ., m("lasso", lambda = c(0.001, 0.1)), .mask = c("Date", "Industry"))

# Print the models frame
tidyr::unnest(fit, settings)

# View coefficients
coef(fit)
```

---

coef.tidyfit.models *Extract coefficients from a* tidyfit.models *frame*

Description

The function extracts and prepares coefficients from all models in a tidyfit.models frame and outputs a tidy frame of estimates.

Usage

```
## S3 method for class 'tidyfit.models'
coef(
  object,
  ...,
  .add_bootstrap_interval = FALSE,
  .bootstrap_alpha = 0.05,
  .keep_grid_id = FALSE
)
```

Arguments

object	model.frame created using regress, classify or m
...	currently not used
.add_bootstrap_interval	calculate bootstrap intervals for the parameters. See 'Details'.
.bootstrap_alpha	confidence level used for the bootstrap interval. Default is .bootstrap_alpha = 0.05.

`.keep_grid_id` boolean. By default the grid ID column is dropped, if there is only one unique setting per model or group. `.keep_grid_id = TRUE` ensures that the column is never dropped.

Details

The function uses the 'model_object' column in a `tidyfit.model` frame to return a data frame of estimated coefficients.

Results are 'tidied' using `broom::tidy` whenever possible.

All coefficients are transformed to ensure statistical comparability. For instance, standardized coefficients are always transformed back to the original data scale, naming conventions are harmonized etc.

Bootstrap intervals:
Bootstrap intervals can be calculated using `rsample::int_pctl`. Only set `.add_bootstrap_interval = TRUE` if you are using `.cv = "bootstraps"` in combination with `.return_slices = TRUE` to generate the model frame.

Value

A 'tibble'.

Author(s)

Johann Pfitzinger

See Also

`predict.tidyfit.models`, `fitted.tidyfit.models` and `residuals.tidyfit.models`

Examples

```
data <- tidyfit::Factor_Industry_Returns
fit <- regress(data, Return ~ ., m("lm"), .mask = c("Date", "Industry"))
coef(fit)
```

Factor_Industry_Returns

Industry-Factor Returns Data Set

Description

The data set includes monthly returns between 1963 and 2022 for 10 industries, as well as factor values for 5 Fama-French factors.

References

https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

`fitted.tidyfit.models` *Obtain fitted values from models in a* `tidyfit.models` *frame*

Description

The function generates fitted values for all models in a `tidyfit.models` frame and outputs a tidy frame.

Usage

```
## S3 method for class 'tidyfit.models'
fitted(object, ...)
```

Arguments

`object`	`model.frame` created using `regress`, `classify` or `m`
`...`	currently not used

Details

The function uses the 'model_object' column in a `tidyfit.model` frame to return fitted values for each model.

Value

A 'tibble'.

Author(s)

Johann Pfitzinger

See Also

`coef.tidyfit.models`, `predict.tidyfit.models` and `residuals.tidyfit.models`

Examples

```
data <- dplyr::group_by(tidyfit::Factor_Industry_Returns, Industry)
fit <- regress(data, Return ~ ., m("lm"), .mask = "Date")
fitted(fit)
```

m *Generic model wrapper for* tidyfit

Description

The function can fit various regression or classification models and returns the results as a tibble. m() can be used in conjunction with regress and classify, or as a stand-alone function.

Usage

```
m(model_method, formula = NULL, data = NULL, ...)
```

Arguments

model_method	The name of the method to fit. See Details.
formula	an object of class "formula": a symbolic description of the model to be fitted.
data	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr).
...	Additional arguments passed to the underlying method function (e.g. lm or glm).

Details

model_method specifies the model to fit to the data and can take one of several options:

Linear (generalized) regression or classification:

"lm" performs an OLS regression using stats::lm. See .fit.lm for details.

"glm" performs a generalized regression or classification using stats::glm. See .fit.glm for details.

"robust" performs a robust regression using MASS::rlm. See .fit.robust for details.

"quantile" performs a quantile regression using quantreg::rq. See .fit.quantile for details.

Regression and classification with L1 and L2 penalties:

"lasso" performs a linear regression or classification with L1 penalty using glmnet::glmnet. See .fit.lasso for details.

"ridge" performs a linear regression or classification with L2 penalty using glmnet::glmnet. See .fit.ridge for details.

"adalasso" performs an Adaptive Lasso regression or classification using glmnet::glmnet. See .fit.adalasso for details.

"enet" performs a linear regression or classification with L1 and L2 penalties using glmnet::glmnet. See .fit.enet for details.

Other Machine Learning:

"boost" performs gradient boosting regression or classification using mboost::glmboost. See .fit.boost for details.

"rf" performs a random forest regression or classification using randomForest::randomForest. See .fit.rf for details.

"svm" performs a support vector regression or classification using e1071::svm. See .fit.svm for details.

Factor regressions:

"pcr" performs a principal components regression using pls::pcr. See .fit.pcr for details.

"plsr" performs a partial least squares regression using pls::plsr. See .fit.plsr for details.

"hfr" performs a hierarchical feature regression using hfr::hfr. See .fit.hfr for details.

Best subset selection:

"subset" performs a best subset regression or classification using bestglm::bestglm (wrapper for leaps). See .fit.subset for details.

"gets" performs a general-to-specific regression using gets::gets. See .fit.gets for details.

Bayesian methods:

"bayes" performs a Bayesian generalized regression or classification using arm::bayesglm. See .fit.bayes for details.

"bridge" performs a Bayesian ridge regression using monomvn::bridge. See .fit.bridge for details.

"blasso" performs a Bayesian Lasso regression using monomvn::blasso. See .fit.blasso for details.

"spikeslab" performs a Bayesian Spike and Slab regression using BoomSpikeSlab::lm.spike. See .fit.spikeslab for details.

"bma" performs a Bayesian model averaging regression using BMS::bms. See .fit.bma for details.

"tvp" performs a Bayesian time-varying parameter regression using shrinkTVP::shrinkTVP. See .fit.tvp for details.

Mixed-effects modeling:

"glmm" performs a mixed-effects GLM using lme4::glmer. See .fit.glmm for details.

Specialized time series methods:

"mslm" performs a Markov-switching regression using MSwM::msmFit. See .fit.mslm for details.

Feature selection:

"cor" calculates Pearson's correlation coefficient using stats::cor.test. See .fit.cor for details.

"chisq" calculates Pearson's Chi-squared test using stats::chisq.test. See .fit.chisq for details.

"mrmr" performs a minimum redundancy, maximum relevance features selection routine using mRMRe::mRMR.ensemble. See .fit.mrmr for details.

"relief" performs a ReliefF feature selection routine using CORElearn::attrEval. See .fit.relief for details.

"genetic" performs a linear regression with feature selection using the genetic algorithm implemented in gaselect::genAlg. See .fit.genetic for details.

When called without formula and data arguments, the function returns a 'tidyfit.models' data frame with unfitted models.

Value

A 'tidyfit.models' data frame.

Author(s)

Johann Pfitzinger

See Also

`regress` and `classify` methods

Examples

```
# Load data
data <- tidyfit::Factor_Industry_Returns

# Stand-alone function
fit <- m("lm", Return ~ ., data)
fit

# Within 'regress' function
fit <- regress(data, Return ~ ., m("lm"), .mask = "Date")
fit
```

`predict.tidyfit.models`

Predict using a `tidyfit.models` *frame*

Description

The function generates predictions for all models in a `tidyfit.models` frame and outputs a tidy frame.

Usage

```
## S3 method for class 'tidyfit.models'
predict(object, newdata, ..., .keep_grid_id = FALSE)
```

Arguments

`object`	`model.frame` created using `regress`, `classify` or `m`
`newdata`	New values at which predictions are to made
`...`	currently not used
`.keep_grid_id`	boolean. By default the grid ID column is dropped, if there is only one unique setting per model or group. `.keep_grid_id = TRUE` ensures that the column is never dropped.

Details

The function uses the 'model_object' column in a `tidyfit.model` frame to return predictions using the `newdata` argument for each model.

When the response variable is found in `newdata`, it is automatically included as a 'truth' column.

Value

A 'tibble'.

Author(s)

Johann Pfitzinger

See Also

`coef.tidyfit.models`, `residuals.tidyfit.models` and `fitted.tidyfit.models`

Examples

```
data <- dplyr::group_by(tidyfit::Factor_Industry_Returns, Industry)
fit <- regress(data, Return ~ ., m("lm"), .mask = "Date")
predict(fit, data)
```

---

regress *Linear regression on tidy data*

Description

This function is a wrapper to fit many different types of linear regression models on a (grouped) `tibble`.

Arguments

`.data`	a data frame, data frame extension (e.g. a tibble), or a lazy data frame (e.g. from dbplyr or dtplyr). The data frame can be grouped.
`formula`	an object of class "formula": a symbolic description of the model to be fitted.
`...`	name-function pairs of models to be estimated. See 'Details'.
`.cv`	type of 'rsample' cross validation procedure to use to determine optimal hyper-parameter values. Default is `.cv = "none"`. See 'Details'.
`.cv_args`	additional settings to pass to the 'rsample' cross validation function.
`.weights`	optional name of column containing sample weights.
`.mask`	optional vector of columns names to ignore. Can be useful when using 'y ~ .' formula syntax.

`.return_slices` logical. Should the output of individual cross validation slices be returned or only the final fit. Default is `.return_slices=FALSE`.

`.return_grid` logical. Should the output of the individual hyperparameter grids be returned or only the best fitting set of hyperparameters. Default is `.return_grid=FALSE`.

`.tune_each_group` logical. Should optimal hyperparameters be selected for each group or once across all groups. Default is `.tune_each_group=TRUE`.

`.force_cv` logical. Should models be evaluated across all cross validation slices, even if no hyperparameters are tuned. Default is `.force_cv=FALSE`.

Details

`regress` fits all models passed in `...` using the `m` function. The models can be passed as name-function pairs (e.g. `ols = m("lm")`) or without including a name.

Hyperparameters are tuned automatically using the '.cv' and '.cv_args' arguments, or can be passed to `m()` (e.g. `lasso = m("lasso", lambda = 0.5)`). See the individual model functions (`?m()`) for an overview of hyperparameters.

Cross validation is performed using the 'rsample' package with possible methods including

- 'initial_split' (simple train-test split)
- 'initial_time_split' (train-test split with retained order)
- 'vfold_cv' (aka kfold cross validation)
- 'loo_cv' (leave-one-out)
- 'rolling_origin' (generalized time series cross validation, e.g. rolling or expanding windows)
- 'sliding_window', 'sliding_index', 'sliding_period' (specialized time series splits)
- 'bootstraps'
- 'group_vfold_cv', 'group_bootstraps'

See package documentation for 'rsample' for all available methods.

The mean squared error loss is used to validate performance in the cross validation.

Note that arguments for weights are automatically passed to the functions by setting the '.weights' argument. Weights are also considered during cross validation by calculating weighted versions of the cross validation loss function.

Value

A `tidyfit.models` frame containing model details for each group.

The **'tidyfit.models' frame** consists of 4 different components:

1. A group of identifying columns (e.g. model name, data groups, grid IDs)
2. A 'model_object' column, which contains the fitted model.
3. A nested 'settings' column containing model arguments and hyperparameters
4. Columns showing errors, warnings and messages (if applicable)

Coefficients, predictions, fitted values or residuals can be accessed using the built-in `coef`, `predict`, `fitted` and `resid` methods. Note that all coefficients are transformed to ensure comparability across methods.

Author(s)

Johann Pfitzinger

See Also

`classify`, `coef.tidyfit.models` and `predict.tidyfit.models` method

Examples

```
data <- tidyfit::Factor_Industry_Returns
fit <- regress(data, Return ~ ., m("lasso", lambda = c(0.001, 0.1)), .mask = c("Date", "Industry"))

# Print the models frame
tidyr::unnest(fit, settings)

# View coefficients
coef(fit)
```

`residuals.tidyfit.models` *Obtain residuals from models in a* `tidyfit.models` *frame*

Description

The function generates residuals for all models in a `tidyfit.models` frame and outputs a tidy frame.

Usage

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

Arguments

`object`	`model.frame` created using `regress`, `classify` or `m`
`...`	currently not used

Details

The function uses the 'model_object' column in a `tidyfit.model` frame to return residuals for each model.

Value

A 'tibble'.

Author(s)

Johann Pfitzinger

See Also

coef.tidyfit.models, predict.tidyfit.models and fitted.tidyfit.models

Examples

```
data <- dplyr::group_by(tidyfit::Factor_Industry_Returns, Industry)
fit <- regress(data, Return ~ ., m("lm"), .mask = "Date")
resid(fit)
```

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