

Package ‘mlr3proba’

January 8, 2020

Title Probabilistic Supervised Learning for 'mlr3'

Version 0.1.1

Description Provides extensions for probabilistic supervised learning for 'mlr3'. This includes extending the regression task to probabilistic and interval regression, adding a survival task, and other specialized models, predictions, and measures.

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URL <https://mlr3proba.mlr-org.com>,
<https://github.com/mlr-org/mlr3proba>

BugReports <https://github.com/mlr-org/mlr3proba/issues>

Depends R (>= 3.1.0)

Imports BBmisc, checkmate, data.table, distr6 (>= 1.3.1), mboost, mlr3 (>= 0.1.4), mlr3misc (>= 0.1.5), mlr3pipelines, paradox (>= 0.1.0), R6, survival

Suggests bibtext, flexsurv, gbm, glmnet, knitr, lgr, mlr3tuning, pec, penalized, randomForestSRC, ranger, riskRegression, rpart, simsurv, survAUC, survivalsvm, testthat

VignetteBuilder knitr

ByteCompile true

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RdMacros mlr3misc

Collate 'LearnerDensity.R' 'LearnerDensityHist.R'
'LearnerDensityKDE.R' 'LearnerProbreg.R'
'LearnerProbregGaussian.R' 'LearnerSurv.R'
'LearnerSurvBlackboost.R' 'LearnerSurvCVGlmnet.R'
'LearnerSurvCoxPH.R' 'predict_flexsurvreg.R'
'LearnerSurvFlexible.R' 'LearnerSurvGBM.R'

'LearnerSurvGamboost.R' 'LearnerSurvGlmboost.R'
 'LearnerSurvGlmnet.R' 'LearnerSurvKaplan.R'
 'LearnerSurvMboost.R' 'LearnerSurvNelson.R' 'predict_survreg.R'
 'LearnerSurvParametric.R' 'LearnerSurvPenalized.R'
 'LearnerSurvRandomForestSRC.R' 'LearnerSurvRanger.R'
 'LearnerSurvRpart.R' 'LearnerSurvSVM.R' 'MeasureDensity.R'
 'MeasureDensityLogloss.R' 'MeasureRegrLogloss.R'
 'MeasureSurv.R' 'MeasureSurvIntegrated.R' 'MeasureSurvAUC.R'
 'MeasureSurvBeggC.R' 'MeasureSurvChamblessAUC.R'
 'MeasureSurvGonenHellersC.R' 'MeasureSurvGraf.R'
 'MeasureSurvGrafSE.R' 'MeasureSurvHarrellC.R'
 'MeasureSurvHungAUC.R' 'MeasureSurvIntLogloss.R'
 'MeasureSurvIntLoglossSE.R' 'MeasureSurvLogloss.R'
 'MeasureSurvLoglossSE.R' 'MeasureSurvNagelkR2.R'
 'MeasureSurvOQuigleyR2.R' 'MeasureSurvSongAUC.R'
 'MeasureSurvSongTNR.R' 'MeasureSurvSongTPR.R'
 'MeasureSurvUnoAUC.R' 'MeasureSurvUnoC.R' 'MeasureSurvUnoTNR.R'
 'MeasureSurvUnoTPR.R' 'MeasureSurvXuR2.R'
 'PipeOpCrankCompositor.R' 'PipeOpDistrCompositor.R'
 'PredictionDensity.R' 'PredictionProbreg.R' 'PredictionSurv.R'
 'TaskDensity.R' 'TaskDensity_precip.R'
 'TaskGeneratorFriedman1Dens.R' 'TaskGeneratorSimsurv.R'
 'TaskProbreg.R' 'TaskSurv.R' 'TaskSurv_lung.R'
 'TaskSurv_rats.R' 'TaskSurv_unemployment.R' 'assertions.R'
 'check_subsetpattern.R' 'crankcompositor.R' 'distrcompositor.R'
 'helpers.R' 'integrated_scores.R' 'surv_logloss.R'
 'weighted_survival_score.R' 'zzz.R'

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mlr3proba-package *mlr3proba: Probabilistic Supervised Learning for 'mlr3'*

Description

Provides extensions for probabilistic supervised learning for 'mlr3'. This includes extending the regression task to probabilistic and interval regression, adding a survival task, and other specialized models, predictions, and measures.

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See Also

Useful links:

- <https://mlr3proba.ml-org.com>
- <https://github.com/mlr-org/mlr3proba>
- Report bugs at <https://github.com/mlr-org/mlr3proba/issues>

crankcompositor *Compose a Crank Predict Type for Survival Learners*

Description

This is a wrapper around the [PipeOpCrankCompositor](#) pipe operation, which simplifies graph creation.

Usage

```
crankcompositor(learner, method = c("mean", "median"), param_vals = list())
```

Arguments

learner	LearnerSurv object for which a crank is composed (or over-written)
method	One of mean or median; abbreviations allowed. Used to determine how crank is estimated from the predicted distr. Default is mean.
param_vals	Additional parameters to pass to the learner.

Details

For full details see [PipeOpCrankCompositor](#).

Value

[mlr3pipelines::GraphLearner](#)

Examples

```
library(mlr3)
library(mlr3pipelines)

task = tgen("simSurv")$generate(20)
ranger.crank = crankcompositor(learner = lrn("surv.coxph"),
                              method = "median")
resample(task, ranger.crank, rsmp("cv", folds = 2))$predictions()
```

distrcompositor

Compose a Distr Predict Type for Survival Learners

Description

This is a wrapper around the [PipeOpDistrCompositor](#) pipe operation, which simplifies graph creation.

Usage

```
distrcompositor(
  learner,
  estimator = c("kaplan", "nelson"),
  form = c("aft", "ph", "po"),
  overwrite = FALSE,
  param_vals = list()
)
```

Arguments

learner	LearnerSurv object for which a distr is composed (or over-written).
estimator	One of kaplan or nelson, corresponding to the Kaplan-Meier and Nelson-Aalen estimators respectively. Used to estimate the baseline survival distribution. Abbreviations allowed. Default is kaplan.
form	One of aft, ph, or po, corresponding to accelerated failure time, proportional hazards, and proportional odds respectively. Used to determine the form of the composed survival distribution. Default is aft.
overwrite	logical. If FALSE (default) then if the learner already has a distr, the compositor does nothing. If TRUE then the distr is overwritten by the compositor if already present, which may be required for changing the prediction distr from one model form to another.

`param_vals` Additional parameters to pass to the learner.

Details

For full details see [PipeOpDistrCompositor](#).

Value

[mlr3pipelines::GraphLearner](#)

Examples

```
library("mlr3")
library("mlr3pipelines")

task = tgen("simsurv")$generate(20)
cvglm.distr = distrcompositor(learner = lrn("surv.cvglmnet"),
                             estimator = "kaplan",
                             form = "aft")
resample(task, cvglm.distr,
         rsmpl("cv", folds = 2))$predictions()
```

LearnerSurv

Survival Learner

Description

This Learner specializes [mlr3::Learner](#) for survival problems. Predefined learners can be found in the [mlr3misc::Dictionary mlr3::mlr_learners](#).

Format

[R6::R6Class](#) object inheriting from [mlr3::Learner](#).

Construction

```
LearnerSurv$new(id, param_set = ParamSet$new(),
               predict_types = character(),
               feature_types = character(), properties = character(),
               packages = character())
```

For a description of the arguments, see [mlr3::Learner](#). `task_type` is set to "surv". Possible values for `predict_type` are "distr", "lp", and "crank".

Fields

See [mlr3::Learner](#).

Methods

See [mlr3::Learner](#).

Examples

```
library(mlr3)
ids = mlr_learners$keys("^surv")
ids

# get a specific learner from mlr_learners:
lrn = mlr_learners$get("surv.rpart")
print(lrn)
```

LearnerSurvBlackboost *Gradient Boosting with Regression Trees Survival Learner*

Description

Calls [mboost::blackboost\(\)](#).

- `lp` is predicted by [mboost::predict.mboost\(\)](#)
- `distr` is predicted by [mboost::survFit\(\)](#) which assumes a PH fit with a Breslow estimator
- `crank` is identical to `lp`

The `dist` parameter is specified slightly differently than in [mboost](#). Whereas the latter takes in objects, in this learner instead a string is specified in order to identify which distribution to use. As the default in [mboost](#) is the Gaussian family, which is not compatible with survival models, instead we have by default "coxph".

If the value given to the `Family` parameter is "custom.family" then an object of class [mboost::Family\(\)](#) needs to be passed to the `custom.family` parameter.

Format

[R6::R6Class\(\)](#) inheriting from [LearnerSurv](#).

Construction

```
LearnerSurvBlackboost$new()
mlr_learners$get("surv.blackboost")
lrn("surv.blackboost")
```

Meta Information

- Type: "surv"
- Predict Types: `distr`, `crank`, `lp`
- Feature Types: integer, numeric, factor
- Packages: **mboost distr6 survival partykit mvtnorm**

References

- Bühlmann P, Hothorn T (2007). “Boosting Algorithms: Regularization, Prediction and Model Fitting.” *Statistical Science*, **22**(4), 477–505. doi: [10.1214/07sts242](https://doi.org/10.1214/07sts242).
- Hothorn T, Hornik K, Zeileis A (2006). “Unbiased Recursive Partitioning: A Conditional Inference Framework.” *Journal of Computational and Graphical Statistics*, **15**(3), 651–674. doi: [10.1198/106186006x133933](https://doi.org/10.1198/106186006x133933).
- Freund Y, Schapire RE, others (1996). “Experiments with a new boosting algorithm.” In *In: Thirteenth International Conference on ML*, volume 96, 148–156. Citeseer.
- Friedman JH (2001). “Greedy Function Approximation: A Gradient Boosting Machine.” *The Annals of Statistics*, **29**(5), 1189–1232. <http://www.jstor.org/stable/2699986>.
- Ridgeway G (1999). “The state of boosting.” *Computing Science and Statistics*, 172–181.

See Also

Other survival learners: [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

Examples

```
library(mlr3)
task = tgen("simSurv")$generate(20)
learner = lrn("surv.blackboost")
resampling = rsmpl("cv", folds = 2)
resample(task, learner, resampling)
```

LearnerSurvCoxPH

Cox Proportional Hazards Survival Learner

Description

Calls `survival::coxph()`.

- `lp` is predicted by `survival::predict.coxph()`
- `distr` is predicted by `survival::survfit.coxph()`
- `crank` is identical to `lp`

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvCoxPH$new()
mlr_learners$get("surv.coxph")
lrn("surv.coxph")
```


Meta Information

- Type: "surv"
- Predict Types: distr, crank, lp
- Feature Types: logical, integer, numeric, factor
- Packages: **survival distr6**

References

Cox DR (1972). "Regression Models and Life-Tables." *Journal of the Royal Statistical Society: Series B (Methodological)*, **34**(2), 187–202. doi: [10.1111/j.25176161.1972.tb00899.x](https://doi.org/10.1111/j.25176161.1972.tb00899.x).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

LearnerSurvCVGlmnet *Cross-Validated GLM with Elastic Net Regularization Survival Learner*

Description

Calls `glmnet::cv.glmnet()`.

- lp is predicted by `glmnet::predict.cv.glmnet()`
- crank is identical to lp

Use [LearnerSurvGlmnet](#) and [LearnerSurvCVGlmnet](#) for glmnets without and with internal cross-validation, respectively. Tuning using the internal optimizer in [LearnerSurvCVGlmnet](#) may be more efficient when tuning lambda only. However, for tuning multiple hyperparameters, **mlr3tuning** and [LearnerSurvGlmnet](#) will likely give better results.

Format

`R6::R6Class()` inheriting from [LearnerSurv](#).

Construction

```
LearnerSurvCVGlmnet$new()  
mlr_learners$get("surv.cvglmnet")  
lrn("surv.cvglmnet")
```

Meta Information

- Type: "surv"
- Predict Types: crank, lp
- Feature Types: integer, numeric, factor
- Packages: **glmnet survival**

References

Friedman J, Hastie T, Tibshirani R (2010). "Regularization Paths for Generalized Linear Models via Coordinate Descent." *Journal of Statistical Software*, **33**(1). doi: [10.18637/jss.v033.i01](https://doi.org/10.18637/jss.v033.i01).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

LearnerSurvFlexible *Flexible Parametric Spline Survival Learner*

Description

Calls `flexsurv::flexsurvspline()`.

- lp is predicted by using an internally defined predict method, see details
- distr is predicted by using an internally defined predict method, see details
- crank is identical to lp

Parameter k is changed to 1 and scale is changed to odds, as these are more in line with the Royston/Parmer proposed models, and the package defaults are equivalent to fitting a parametric model and therefore [surv.parametric](#) should be used instead.

If fitting a model with $k = 0$ then consider using [surv.parametric](#) as this is likely to have more optimal results, and has more options for tuning.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Details

The `distr` prediction is estimated using the fitted custom distributions from `flexsurv::flexsurvspline()` and the estimated coefficients.

As flexible spline models estimate the baseline hazard as the intercept, the linear predictor, lp, can be calculated as in the classical setting. i.e. For fitted coefficients, $\beta = (\beta_0, \dots, \beta_P)$, and covariates $X^T = (X_0, \dots, X_P)^T$, where X_0 is a column of 1s: $lp = \beta X$.

Construction

```
LearnerSurvFlexible$new()
mlr_learners$get("surv.flexible")
lrn("surv.flexible")
```

Meta Information

- Type: "surv"
- Predict Types: distr, lp, crank
- Feature Types: logical, integer, factor, numeric
- Packages: **flexsurv survival distr6**

References

Royston P, Parmar MKB (2002). "Flexible parametric proportional-hazards and proportional-odds models for censored survival data, with application to prognostic modelling and estimation of treatment effects." *Statistics in Medicine*, **21**(15), 2175–2197. doi: [10.1002/sim.1203](https://doi.org/10.1002/sim.1203).

See Also

Dictionary of Learners: [mlr3::mlr_learners](#)

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

LearnerSurvGamboost *Gradient Boosting for Additive Models Survival Learner*

Description

Calls `mboost::gamboost()`.

- lp is predicted by `mboost::predict.mboost()`
- distr is predicted by `mboost::survFit()` which assumes a PH fit with a Breslow estimator
- crank is identical to lp

The `distr` parameter is specified slightly differently than in `mboost`. Whereas the latter takes in objects, in this learner instead a string is specified in order to identify which distribution to use. As the default in `mboost` is the Gaussian family, which is not compatible with survival models, instead we have by default "coxph".

If the value given to the `Family` parameter is "custom.family" then an object of class `mboost::Family()` needs to be passed to the `custom.family` parameter.

The only difference between `LearnerSurvGamboost` and `LearnerSurvMboost` is that the latter function allows one to specify default degrees of freedom for smooth effects specified via `baselearner = "bbs"`. In all other cases, degrees of freedom need to be set manually via a specific definition of the corresponding base-learner.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvGamboost$new()
mlr_learners$get("surv.gamboost")
lrn("surv.gamboost")
```

Meta Information

- Type: "surv"
- Predict Types: distr, crank, lp
- Feature Types: integer, numeric, factor, logical
- Packages: **mboost distr6 survival**

References

- Bühlmann P, Yu B (2003). “Boosting With the L2 Loss.” *Journal of the American Statistical Association*, **98**(462), 324–339. doi: [10.1198/016214503000125](https://doi.org/10.1198/016214503000125).
- Bühlmann P, Hothorn T (2007). “Boosting Algorithms: Regularization, Prediction and Model Fitting.” *Statistical Science*, **22**(4), 477–505. doi: [10.1214/07sts242](https://doi.org/10.1214/07sts242).
- Kneib T, Hothorn T, Tutz G (2008). “Variable Selection and Model Choice in Geoadditive Regression Models.” *Biometrics*, **65**(2), 626–634. doi: [10.1111/j.15410420.2008.01112.x](https://doi.org/10.1111/j.15410420.2008.01112.x).
- Schmid M, Hothorn T (2008). “Boosting additive models using component-wise P-Splines.” *Computational Statistics & Data Analysis*, **53**(2), 298–311. doi: [10.1016/j.csda.2008.09.009](https://doi.org/10.1016/j.csda.2008.09.009).
- Hothorn T, Bühlmann P, Kneib T, Schmid M, Hofner B (2010). “Model-based boosting 2.0.” *Journal of Machine Learning Research*, **11**(Aug), 2109–2113. <http://www.jmlr.org/papers/v11/hothorn10a.html>.
- Hofner B, Mayr A, Robinzonov N, Schmid M (2012). “Model-based boosting in R: a hands-on tutorial using the R package mboost.” *Computational Statistics*, **29**(1-2), 3–35. doi: [10.1007/s00180-01203825](https://doi.org/10.1007/s00180-01203825).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

Examples

```
library(mlr3)
task = tgen("simsurv")$generate(20)
learner = lrn("surv.gamboost")
learner$param_set$values = mlr3misc::insert_named(learner$param_set$values,
  list(dfbase = 3, center = TRUE, baselearner = "bols"))
```

```
resampling = rsmpl("cv", folds = 2)
resample(task, learner, resampling)
```

LearnerSurvGBM

Generalized Boosting Regression Modeling Survival Learner

Description

Calls `gbm::gbm()`.

- `lp` is predicted by `gbm::predict.gbm()`
- `crank` is identical to `lp`

Parameter `distribution` is set to `coxph` as this is the only distribution implemented in `gbm::gbm()` for survival analysis; parameter `keep.data` is set to `FALSE` for efficiency.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvGBM$new()
mlr_learners$get("surv.gbm")
lrn("surv.gbm")
```

Meta Information

- Type: "surv"
- Predict Types: crank, lp
- Feature Types: integer, numeric, factor, ordered
- Packages: **gbm**

References

Freund Y, Schapire RE (1997). "A Decision-Theoretic Generalization of On-Line Learning and an Application to Boosting." *Journal of Computer and System Sciences*, **55**(1), 119–139. doi: [10.1006/jcss.1997.1504](https://doi.org/10.1006/jcss.1997.1504).

Ridgeway G (1999). "The state of boosting." *Computing Science and Statistics*, 172–181.

Friedman J, Hastie T, Tibshirani R (2000). "Additive logistic regression: a statistical view of boosting (With discussion and a rejoinder by the authors)." *The Annals of Statistics*, **28**(2), 337–407. doi: [10.1214/aos/1016218223](https://doi.org/10.1214/aos/1016218223).

Friedman JH (2001). "Greedy Function Approximation: A Gradient Boosting Machine." *The Annals of Statistics*, **29**(5), 1189–1232. <http://www.jstor.org/stable/2699986>.

Friedman JH (2001). "Greedy Function Approximation: A Gradient Boosting Machine." *The Annals of Statistics*, **29**(5), 1189–1232. <http://www.jstor.org/stable/2699986>.

Friedman JH (2002). “Stochastic gradient boosting.” *Computational Statistics & Data Analysis*, **38**(4), 367–378. doi: [10.1016/s01679473\(01\)000652](https://doi.org/10.1016/s01679473(01)000652).

Kriegler B (2007). *Cost-Sensitive Stochastic Gradient Boosting Within a Quantitative Regression Framework*. Ph.D. thesis, University of California at Los Angeles. <https://dl.acm.org/citation.cfm?id=1354603>.

Burges CJ (2010). “From RankNet to LambdaRank to LambdaMART: An Overview.” Technical Report MSR-TR-2010-82, Microsoft Research. <https://www.microsoft.com/en-us/research/publication/from-ranknet-to-lambdarank-to-lambdamart-an-overview/>.

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

LearnerSurvGlmboost *Gradient Boosting with Component-wise Linear Models Survival Learner*

Description

Calls `mboost::glmboost()`.

- `lp` is predicted by `mboost::predict.mboost()`
- `distr` is predicted by `mboost::survFit()` which assumes a PH fit with a Breslow estimator
- `crank` is identical to `lp`

The `dist` parameter is specified slightly differently than in `mboost`. Whereas the latter takes in objects, in this learner instead a string is specified in order to identify which distribution to use. As the default in `mboost` is the Gaussian family, which is not compatible with survival models, instead we have by default “`coxph`”.

If the value given to the `Family` parameter is “`custom.family`” then an object of class `mboost::Family()` needs to be passed to the `custom.family` parameter.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvGlmboost$new()
mlr_learners$get("surv.glmboost")
lrn("surv.glmboost")
```

Meta Information

- Type: "surv"
- Predict Types: distr, crank, lp
- Feature Types: integer, numeric, factor, logical
- Packages: **mboost distr6 survival**

References

- Bühlmann P, Yu B (2003). “Boosting With the L2 Loss.” *Journal of the American Statistical Association*, **98**(462), 324–339. doi: [10.1198/016214503000125](https://doi.org/10.1198/016214503000125).
- Bühlmann P (2006). “Boosting for High-Dimensional Linear Models.” *The Annals of Statistics*, **34**(2), 559–583. <http://www.jstor.org/stable/25463430>.
- Bühlmann P, Hothorn T (2007). “Boosting Algorithms: Regularization, Prediction and Model Fitting.” *Statistical Science*, **22**(4), 477–505. doi: [10.1214/07sts242](https://doi.org/10.1214/07sts242).
- Hothorn T, Bühlmann P, Kneib T, Schmid M, Hofner B (2010). “Model-based boosting 2.0.” *Journal of Machine Learning Research*, **11**(Aug), 2109–2113. <http://www.jmlr.org/papers/v11/hothorn10a.html>.
- Hofner B, Mayr A, Robinzonov N, Schmid M (2012). “Model-based boosting in R: a hands-on tutorial using the R package mboost.” *Computational Statistics*, **29**(1-2), 3–35. doi: [10.1007/s00180-01203825](https://doi.org/10.1007/s00180-01203825).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

Examples

```
library(mlr3)
task = tgen("simsurv")$generate(20)
learner = lrn("surv.glmboost")
resampling = rsmp("cv", folds = 3)
resample(task, learner, resampling)
```

Description

Calls `glmnet::glmnet()`.

- `lp` is predicted by `glmnet::predict.glmnet()`
- `crank` is identical to `lp`

Use `LearnerSurvGlmnet` and `LearnerSurvCVGlmnet` for glmnets without and with internal cross-validation, respectively. Tuning using the internal optimizer in `LearnerSurvCVGlmnet` may be more efficient when tuning lambda only. However, for tuning multiple hyperparameters, `mlr3tuning` and `LearnerSurvGlmnet` will likely give better results.

Parameter `s` (value of the regularization parameter used for predictions) is set to the median of the lambda sequence by default, but needs to be tuned by the user.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvGlmnet$new()  
mlr_learners$get("surv.glmnet")  
lrn("surv.glmnet")
```

Meta Information

- Type: "surv"
- Predict Types: crank, lp
- Feature Types: integer, numeric, factor
- Packages: **glmnet survival**

References

Friedman J, Hastie T, Tibshirani R (2010). "Regularization Paths for Generalized Linear Models via Coordinate Descent." *Journal of Statistical Software*, **33**(1). doi: [10.18637/jss.v033.i01](https://doi.org/10.18637/jss.v033.i01).

See Also

Other survival learners: `LearnerSurvBlackboost`, `LearnerSurvCVGlmnet`, `LearnerSurvCoxPH`, `LearnerSurvFlexible`, `LearnerSurvGBM`, `LearnerSurvGamboost`, `LearnerSurvGlmboost`, `LearnerSurvKaplan`, `LearnerSurvMboost`, `LearnerSurvNelson`, `LearnerSurvParametric`, `LearnerSurvPenalized`, `LearnerSurvRandomForestSRC`, `LearnerSurvRanger`, `LearnerSurvRpart`, `LearnerSurvSVM`

LearnerSurvKaplan *Kaplan-Meier Estimator Survival Learner*

Description

Calls `survival::survfit()`.

- `distr` is predicted by estimating the survival function with `survival::survfit()`
- `crank` is predicted as the expectation of the survival distribution, `distr`

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvKaplan$new()  
mlr_learners$get("surv.kaplan")  
lrn("surv.kaplan")
```

Meta Information

- Type: "surv"
- Predict Types: crank, distr
- Feature Types: logical, integer, numeric, character, factor, ordered
- Packages: **survival distr6**

References

Kaplan EL, Meier P (1958). "Nonparametric Estimation from Incomplete Observations." *Journal of the American Statistical Association*, **53**(282), 457–481. doi: [10.1080/01621459.1958.10501452](https://doi.org/10.1080/01621459.1958.10501452).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

LearnerSurvMboost *Gradient Boosting for Generalized Additive Models Survival Learner*

Description

Calls `mboost::mboost()`.

- `lp` is predicted by `mboost::predict.mboost()`
- `distr` is predicted by `mboost::survFit()` which assumes a PH fit with a Breslow estimator
- `crank` is identical to `lp`

The `dist` parameter is specified slightly differently than in `mboost`. Whereas the latter takes in objects, in this learner instead a string is specified in order to identify which distribution to use. As the default in `mboost` is the Gaussian family, which is not compatible with survival models, instead we have by default "coxph".

If the value given to the `Family` parameter is "custom.family" then an object of class `mboost::Family()` needs to be passed to the `custom.family` parameter.

The only difference between `LearnerSurvGamboost` and `LearnerSurvMboost` is that the latter function allows one to specify default degrees of freedom for smooth effects specified via `baseLearner = "bbs"`. In all other cases, degrees of freedom need to be set manually via a specific definition of the corresponding base-learner.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvMboost$new()
mlr_learners$get("surv.mboost")
lrn("surv.mboost")
```

Meta Information

- Type: "surv"
- Predict Types: `distr`, `crank`, `lp`
- Feature Types: integer, numeric, factor, logical
- Packages: **mboost distr6 survival**

References

- Bühlmann P, Yu B (2003). "Boosting With the L2 Loss." *Journal of the American Statistical Association*, **98**(462), 324–339. doi: [10.1198/016214503000125](https://doi.org/10.1198/016214503000125).
- Bühlmann P, Hothorn T (2007). "Boosting Algorithms: Regularization, Prediction and Model Fitting." *Statistical Science*, **22**(4), 477–505. doi: [10.1214/07sts242](https://doi.org/10.1214/07sts242).

Bühlmann P, Hothorn T (2007). “Boosting Algorithms: Regularization, Prediction and Model Fitting.” *Statistical Science*, **22**(4), 477–505. doi: [10.1214/07sts242](https://doi.org/10.1214/07sts242).

Kneib T, Hothorn T, Tutz G (2008). “Variable Selection and Model Choice in Geoadditive Regression Models.” *Biometrics*, **65**(2), 626–634. doi: [10.1111/j.15410420.2008.01112.x](https://doi.org/10.1111/j.15410420.2008.01112.x).

Schmid M, Hothorn T (2008). “Boosting additive models using component-wise P-Splines.” *Computational Statistics & Data Analysis*, **53**(2), 298–311. doi: [10.1016/j.csda.2008.09.009](https://doi.org/10.1016/j.csda.2008.09.009).

Hothorn T, Bühlmann P, Kneib T, Schmid M, Hofner B (2010). “Model-based boosting 2.0.” *Journal of Machine Learning Research*, **11**(Aug), 2109–2113. <http://www.jmlr.org/papers/v11/hothorn10a.html>.

Hofner B, Mayr A, Robinsonov N, Schmid M (2012). “Model-based boosting in R: a hands-on tutorial using the R package mboost.” *Computational Statistics*, **29**(1-2), 3–35. doi: [10.1007/s00180-01203825](https://doi.org/10.1007/s00180-01203825).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

Examples

```
library(mlr3)
task = tgen("simSurv")$generate(20)
learner = lrn("surv.mboost")
learner$param_set$values = mlr3misc::insert_named(learner$param_set$values,
  list(center = TRUE, baselearner = "bols"))
resampling = rsmp("cv", folds = 2)
resample(task, learner, resampling)
```

LearnerSurvNelson

Nelson-Aalen Estimator Survival Learner

Description

Calls `survival::survfit()`.

- `distr` is predicted by estimating the cumulative hazard function with `survival::survfit()`
- `crank` is predicted as the expectation of the survival distribution, `distr`

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvNelson$new()
mlr_learners$get("surv.nelson")
lrn("surv.nelson")
```

Meta Information

- Type: "surv"
- Predict Types: crank, distr
- Feature Types: logical, integer, numeric, character, factor, ordered
- Packages: **survival distr6**

References

- Nelson W (1969). "Hazard Plotting for Incomplete Failure Data." *Journal of Quality Technology*, **1**(1), 27–52. doi: [10.1080/00224065.1969.11980344](https://doi.org/10.1080/00224065.1969.11980344).
- Nelson W (1972). "Theory and Applications of Hazard Plotting for Censored Failure Data." *Technometrics*, **14**(4), 945–966. doi: [10.1080/00401706.1972.10488991](https://doi.org/10.1080/00401706.1972.10488991).
- Aalen O (1978). "Nonparametric Inference for a Family of Counting Processes." *The Annals of Statistics*, **6**(4), 701–726. <http://www.jstor.org/stable/2958850>.

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

LearnerSurvParametric *Fully Parametric Survival Learner*

Description

Calls `survival::survreg()`.

- lp is predicted by using an internally defined predict method, see details
- distr is predicted by using an internally defined predict method, see details
- crank is identical to lp

This learner allows you to choose a distribution and a model form to compose a predicted survival probability distribution. Note: Just because any combination of distribution and model form is possible, this does not mean it will necessarily be sensible or interpretable.

Format

`R6::R6Class()` inheriting from [LearnerSurv](#).

Details

The internal predict method is implemented in `mlr3proba`, which is more efficient for composition to distributions than `survival::predict.survreg()`.

`lp` is predicted using the formula $lp = X\beta$ where X are the variables in the test data set and β are the fitted coefficients.

The distribution `distr` is composed using the `lp` and specifying a model form in the `type` hyperparameter. These are as follows, with respective survival functions,

- Accelerated Failure Time (aft)

$$S(t) = S_0\left(\frac{t}{\exp(lp)}\right)$$

- Proportional Hazards (ph)

$$S(t) = S_0(t)^{\exp(lp)}$$

- Proportional Odds (po)

$$S(t) = \frac{S_0(t)}{\exp(-lp) + (1 - \exp(-lp))S_0(t)}$$

where S_0 is the estimated baseline survival distribution (in this case with a given parametric form), and lp is the predicted linear predictor.

Construction

```
LearnerSurvParametric$new()
mlr_learners$get("surv.parametric")
lrn("surv.parametric")
```

Meta Information

- Type: "surv"
- Predict Types: distr, lp, crank
- Feature Types: logical, integer, numeric, factor
- Packages: **survival distr6**

References

Kalbfleisch JD, Prentice RL (2002). *The Statistical Analysis of Failure Time Data*. John Wiley & Sons, Inc. doi: [10.1002/9781118032985](https://doi.org/10.1002/9781118032985).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSF](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

Description

Calls `penalized::penalized()`.

- `distr` is predicted using `penalized::predict()`
- `crank` is predicted as the expectation of the survival distribution, `distr`

The `penalized` and `unpenalized` arguments in the learner are implemented slightly differently than in `penalized::penalized()`. Here, there is no parameter for `penalized` but instead it is assumed that every variable is penalized unless stated in the `unpenalized` parameter, see examples.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvPenalized$new()
mlr_learners$get("surv.penalized")
lrn("surv.penalized")
```

Meta Information

- Type: "surv"
- Predict Types: `distr`, `crank`
- Feature Types: integer, numeric, factor, ordered
- Packages: **penalized distr6**

References

Goeman JJ (2009). "L1 Penalized Estimation in the Cox Proportional Hazards Model." *Biometrical Journal*, NA–NA. doi: [10.1002/bimj.200900028](https://doi.org/10.1002/bimj.200900028).

See Also

Dictionary of Learners: `mlr3::mlr_learners`

Other survival learners: `LearnerSurvBlackboost`, `LearnerSurvCVGlmnet`, `LearnerSurvCoxPH`, `LearnerSurvFlexible`, `LearnerSurvGBM`, `LearnerSurvGamboost`, `LearnerSurvGlmboost`, `LearnerSurvGlmnet`, `LearnerSurvKaplan`, `LearnerSurvMboost`, `LearnerSurvNelson`, `LearnerSurvParametric`, `LearnerSurvRandomForest`, `LearnerSurvRanger`, `LearnerSurvRpart`, `LearnerSurvSVM`

Examples

```

library(mlr3)
task = tgen("simSurv")$generate(20)
learner = lrn("surv.penalized")
resampling = rsm("cv", folds = 2)
resample(task, learner, resampling)

# specifying penalized and unpenalized variables
task = tgen("simSurv")$generate(20)
learner = lrn("surv.penalized", unpenalized = c("height"))
learner$train(task)
learner$model@penalized
learner$model@unpenalized

```

LearnerSurvRandomForestSRC

RandomForestSRC Survival Forest Survival Learner

Description

Calls `randomForestSRC::rfsrc()`.

- `distr` is predicted using `randomForestSRC::predict.rfsrc()`
- `crank` is predicted as the expectation of the survival distribution, `distr`

`randomForestSRC::predict.rfsrc()` returns both cumulative hazard function (`chf`) and survival function (`surv`) but uses different estimators to derive these. `chf` uses a bootstrapped Nelson-Aalen estimator, (Ishwaran, 2008) whereas `surv` uses a bootstrapped Kaplan-Meier estimator <https://kogalur.github.io/randomForestSRC/theory.html>. The choice of which estimator to use is given by the extra estimator hyper-parameter, default is `nelson`.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```

LearnerSurvRandomForestSRC$new()
mlr_learners$get("surv.randomForestSRC")
lrn("surv.randomForestSRC")

```

Meta Information

- Type: "surv"
- Predict Types: `crank`, `distr`
- Feature Types: logical, integer, numeric, factor, ordered
- Packages: **randomForestSRC** **distr6**

References

Ishwaran H. and Kogalur U.B. (2019). Fast Unified Random Forests for Survival, Regression, and Classification (RF-SRC), R package version 2.9.1.

Ishwaran H, Kogalur UB, Blackstone EH, Lauer MS, others (2008). “Random survival forests.” *The annals of applied statistics*, **2**(3), 841–860.

Breiman L (2001). “Random Forests.” *Machine Learning*, **45**(1), 5–32. ISSN 1573-0565, doi: [10.1023/A:1010933404324](https://doi.org/10.1023/A:1010933404324).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

LearnerSurvRanger

Ranger Survival Forest Survival Learner

Description

Calls `ranger::ranger()`.

- `distr` is predicted using `ranger::predict.ranger()`
- `crank` is predicted as the expectation of the survival distribution, `distr`

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvRanger$new()
mlr_learners$get("surv.ranger")
lrn("surv.ranger")
```

Meta Information

- Type: "surv"
- Predict Types: `distr`, `crank`
- Feature Types: logical, integer, numeric, character, factor, ordered
- Packages: **ranger distr6**

References

- Wright MN, Ziegler A (2017). “ranger: A Fast Implementation of Random Forests for High Dimensional Data in C++ and R.” *Journal of Statistical Software*, **77**(1), 1–17. doi: [10.18637/jss.v077.i01](https://doi.org/10.18637/jss.v077.i01).
- Breiman L (2001). “Random Forests.” *Machine Learning*, **45**(1), 5–32. ISSN 1573-0565, doi: [10.1023/A:1010933404324](https://doi.org/10.1023/A:1010933404324).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRpart](#), [LearnerSurvSVM](#)

LearnerSurvRpart	<i>Rpart Survival Forest Survival Learner</i>
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Description

Calls `rpart::rpart()`.

- `distr` is predicted using `pec::pecRpart()` and `pec::predictSurvProb()`
- `crank` is predicted as the expectation of the survival distribution, `distr`

Parameter `xval` is set to 0 in order to save some computation time.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvRpart$new()
mlr_learners$get("surv.rpart")
lrn("surv.rpart")
```

Meta Information

- Type: "surv"
- Predict Types: crank, distr
- Feature Types: logical, integer, numeric, character, factor, ordered
- Packages: **rpart distr6 survival**

References

- Breiman L, Friedman JH, Olshen RA, Stone CJ (1984). *Classification And Regression Trees*. Routledge. doi: [10.1201/9781315139470](https://doi.org/10.1201/9781315139470).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvSVM](#)

LearnerSurvSVM	<i>Regression, Ranking and Hybrid Support Vector Machines Survival Learner</i>
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Description

Calls `survivalsvm::survivalsvm()`.

- `crank` is predicted by `survivalsvm::predict.survivalsvm()`

Four possible SVMs can be implemented, dependent on the `type` parameter. These correspond to predicting the survival time via regression (`regression`), predicting a continuous rank (`vanbelle1`, `vanbelle2`), or a hybrid of the two (`hybrid`). Whichever type is chosen determines how the `crank` predict type is calculated, but in any case all can be considered a valid continuous ranking.

To be in line with the Van Belle papers and to prevent the learner crashing without user-set parameters, the default `diff.meth` is set to `diffmeth3` with `gamma.mu` equal to 0.1.

Format

`R6::R6Class()` inheriting from `LearnerSurv`.

Construction

```
LearnerSurvSVM$new()
mlr_learners$get("surv.svm")
lrn("surv.svm")
```

Meta Information

- Type: "surv"
- Predict Types: crank
- Feature Types: integer, numeric
- Packages: **survivalsvm**

References

Belle VV, Pelckmans K, Huffel SV, Suykens JAK (2010). "Improved performance on high-dimensional survival data by application of Survival-SVM." *Bioinformatics*, **27**(1), 87–94. doi: [10.1093/bioinformatics/btq617](https://doi.org/10.1093/bioinformatics/btq617).

Belle VV, Pelckmans K, Huffel SV, Suykens JA (2011). "Support vector methods for survival analysis: a comparison between ranking and regression approaches." *Artificial Intelligence in Medicine*, **53**(2), 107–118. doi: [10.1016/j.artmed.2011.06.006](https://doi.org/10.1016/j.artmed.2011.06.006).

See Also

Other survival learners: [LearnerSurvBlackboost](#), [LearnerSurvCVGlmnet](#), [LearnerSurvCoxPH](#), [LearnerSurvFlexible](#), [LearnerSurvGBM](#), [LearnerSurvGamboost](#), [LearnerSurvGlmboost](#), [LearnerSurvGlmnet](#), [LearnerSurvKaplan](#), [LearnerSurvMboost](#), [LearnerSurvNelson](#), [LearnerSurvParametric](#), [LearnerSurvPenalized](#), [LearnerSurvRandomForestSRC](#), [LearnerSurvRanger](#), [LearnerSurvRpart](#)

MeasureSurv

Survival Measure

Description

This measure specializes [mlr3::Measure](#) for survival problems. Predefined measures can be found in the [mlr3misc::Dictionary mlr3::mlr_measures](#).

Format

[R6::R6Class](#) object inheriting from [mlr3::Measure](#).

Construction

```
MeasureSurv$new(id, range, minimize, aggregator = NULL,  
                properties = character(), predict_type = "distr",  
                task_properties = character(), packages = character())
```

For a description of the arguments, see [mlr3::Measure](#). The `task_type` is set to "surv". Possible values for `predict_type` are "distr", "lp", and "crank".

Fields

See [Measure](#).

Methods

See [Measure](#).

See Also

Example survival measures: [surv.graf](#), [surv.harrellC](#).

MeasureSurvBeggC

Begg's C-Index Survival Measure

Description

Calls `survAUC::BeggC()`.

Assumes Cox PH model specification.

Format

`R6::R6Class()` inheriting from `MeasureSurv`.

Details

All measures implemented from `survAUC` should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `m1r3proba`.

Construction

```
MeasureSurvBeggC$new()  
m1r_measures$get("surv.beggC")  
msr("surv.beggC")
```

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: 1p

Fields

See `MeasureSurv`, as well as all variables passed to the constructor.

References

Begg CB, Cramer LD, Venkatraman ES, Rosai J (2000). "Comparing tumour staging and grading systems: a case study and a review of the issues, using thymoma as a model." *Statistics in Medicine*, **19**(15), 1997–2014. doi: [10.1002/10970258\(20000815\)19:15<1997::aidsim511>3.0.co;2c](https://doi.org/10.1002/10970258(20000815)19:15<1997::aidsim511>3.0.co;2c).

See Also

Other survival measures: [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLogLossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNage1kR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other Concordance survival measures: [MeasureSurvGonenC](#), [MeasureSurvHarrellC](#), [MeasureSurvUnoC](#)

 MeasureSurvChamblessAUC

Chambless and Diao's AUC Survival Measure

Description

Calls `survAUC::AUC.cd()`.

Assumes Cox PH model specification.

Format

`R6::R6Class()` inheriting from `MeasureSurvAUC/MeasureSurv`.

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `mlr3proba`.

Construction

```
MeasureSurvChamblessAUC$new(integrated = TRUE, times)
mlr_measures$get("surv.chamblessAUC")
msr("surv.chamblessAUC")
```

- `integrated` :: `logical(1)`
If `TRUE` (default), returns the integrated score; otherwise, not integrated.
- `times` :: `vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: 1p

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Chambless LE, Diao G (2006). “Estimation of time-dependent area under the ROC curve for long-term risk prediction.” *Statistics in Medicine*, **25**(20), 3474–3486. doi: [10.1002/sim.2299](https://doi.org/10.1002/sim.2299).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNagelker2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other AUC survival measures: [MeasureSurvHungAUC](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#)

MeasureSurvGonenC *Gonen and Heller’s C-Index Survival Measure*

Description

Calls `survAUC: :GHCI()`.

Assumes Cox PH model specification.

Format

`R6: :R6Class()` inheriting from [MeasureSurv](#).

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `m1r3proba`.

Construction

```
MeasureSurvGonenC$new()
m1r_measures$get("surv.gonenC")
msr("surv.gonenC")
```

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: 1p

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Gönen M, Heller G (2005). “Concordance probability and discriminatory power in proportional hazards regression.” *Biometrika*, **92**(4), 965–970. doi: [10.1093/biomet/92.4.965](https://doi.org/10.1093/biomet/92.4.965).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLogLossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNagle1kR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other Concordance survival measures: [MeasureSurvBeggC](#), [MeasureSurvHarrellC](#), [MeasureSurvUnoC](#)

 MeasureSurvGraf

Integrated Graf Score Survival Measure

Description

Calculates the Integrated Graf Score, aka integrated Brier score or squared loss.

For an individual who dies at time t , with predicted Survival function, S , the Graf Score at time t^* is given by

$$L(S, t|t^*) = [(S(t^*))^2]I(t \leq t^*, \delta = 1)(1/G(t)) + [((1 - S(t^*))^2)I(t > t^*)(1/G(t^*))]$$

where G is the Kaplan-Meier estimate of the censoring distribution.

Note: If comparing the integrated graf score to other packages, e.g. `pec::pec()`, then method = 2 should be used, however the results may still be very slightly different as this package uses `survfit` to estimate the censoring distribution, in line with the Graf 1999 paper. Whereas some other packages use `prodlm` with `reverse = TRUE` (meaning Kaplan-Meier is not used).

If `integrated == FALSE` then the sample mean is taken for the single specified times, t^* , and the returned score is given by

$$L(S, t|t^*) = \frac{1}{N} \sum_{i=1}^N L(S_i, t_i|t^*)$$

where N is the number of observations, S_i is the predicted survival function for individual i and t_i is their true survival time.

If `integrated == TRUE` then an approximation to integration is made by taking the mean over all T unique time-points, and then the sample mean over all N observations.

$$L(S) = \frac{1}{NT} \sum_{i=1}^N \sum_{j=1}^T L(S_i, t_i|t_j^*)$$

Format

[R6::R6Class\(\)](#) inheriting from [MeasureSurvIntegrated/MeasureSurv](#).

Construction

```
MeasureSurvGraf$new(integrated = TRUE, times, method = 2)
mlr_measures$get("surv.graf")
msr("surv.graf")
```

- `integrated :: logical(1)`
If TRUE (default), returns the integrated score; otherwise, not integrated.
- `times :: vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.

Meta Information

- Type: "surv"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: `distr`

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Graf E, Schmoor C, Sauerbrei W, Schumacher M (1999). "Assessment and comparison of prognostic classification schemes for survival data." *Statistics in Medicine*, **18**(17-18), 2529–2545. doi: [10.1002/\(sici\)10970258\(19990915/30\)18:17/18<2529::aidsim274>3.0.co;25](https://doi.org/10.1002/(sici)10970258(19990915/30)18:17/18<2529::aidsim274>3.0.co;25).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNaglelR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other Probabilistic survival measures: [MeasureSurvGrafSE](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#)

MeasureSurvGrafSE *Standard Error of Integrated Graf Score Survival Measure*

Description

Calculates the standard error of [MeasureSurvGraf](#).

If `integrated == FALSE` then the standard error of the loss, L , is approximated via,

$$se(L) = sd(L)/\sqrt{N}$$

where N are the number of observations in the test set, and sd is the standard deviation.

If `integrated == TRUE` then correlations between time-points need to be taken into account, therefore

$$se(L) = \sqrt{\frac{\sum_{i=1}^M \sum_{j=1}^M \Sigma_{i,j}}{NT^2}}$$

where $\Sigma_{i,j}$ is the sample covariance matrix over M distinct time-points.

Format

[R6::R6Class\(\)](#) inheriting from [MeasureSurvIntegrated/MeasureSurv](#).

Construction

```
MeasureSurvGrafSE$new(integrated = TRUE, times)
mlr_measures$get("surv.grafSE")
msr("surv.grafSE")
```

- `integrated :: logical(1)`
If `TRUE` (default), returns the integrated score; otherwise, not integrated.
- `times :: vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.

Meta Information

- Type: "surv"
- Range: $[0, \infty)$
- Minimize: `TRUE`
- Required prediction: `distr`

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Graf E, Schmoor C, Sauerbrei W, Schumacher M (1999). "Assessment and comparison of prognostic classification schemes for survival data." *Statistics in Medicine*, **18**(17-18), 2529–2545. doi: [10.1002/\(sici\)10970258\(19990915/30\)18:17/18<2529::aidsim274>3.0.co;25](https://doi.org/10.1002/(sici)10970258(19990915/30)18:17/18<2529::aidsim274>3.0.co;25).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNaglelR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other Probabilistic survival measures: [MeasureSurvGraf](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#)

MeasureSurvHarrellC *Harrell's C-Index Survival Measure*

Description

Calculates Harrell's C, equivalent to the Fortran implementation in **Hmisc**.

Format

`R6::R6Class()` inheriting from [MeasureSurv](#).

Construction

```
MeasureSurvHarrellC$new()
mlr_measures$get("surv.harrellC")
msr("surv.harrellC")
```

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: crank

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Harrell FE, Califf RM, Pryor DB, Lee KL, Rosati RA (1982). "Evaluating the yield of medical tests." *Jama*, **247**(18), 2543–2546.

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNagle1kR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other Concordance survival measures: [MeasureSurvBeggC](#), [MeasureSurvGonenC](#), [MeasureSurvUnoC](#)

MeasureSurvHungAUC *Hung and Chiang's AUC Survival Measure*

Description

Calls `survAUC::AUC.hc()`.
Assumes random censoring.

Format

`R6::R6Class()` inheriting from `MeasureSurvAUC/MeasureSurv`.

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `m1r3proba`.

Construction

```
MeasureSurvHungAUC$new(integrated = TRUE, times)
m1r_measures$get("surv.hungAUC")
msr("surv.hungAUC")
```

- `integrated::logical(1)`
If TRUE (default), returns the integrated score; otherwise, not integrated.
- `times::vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: 1p

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Hung H, Chiang C (2010). “Estimation methods for time-dependent AUC models with survival data.” *The Canadian Journal of Statistics / La Revue Canadienne de Statistique*, **38**(1), 8–26. <http://www.jstor.org/stable/27805213>.

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNaglelkr2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other AUC survival measures: [MeasureSurvChamblessAUC](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#)

MeasureSurvIntLogloss *Integrated Log loss Survival Measure*

Description

Calculates the integrated logarithmic (log), loss, aka integrated cross entropy.

For an individual who dies at time t , with predicted Survival function, S , the probabilistic log loss at time t^* is given by

$$L(S, t|t^*) = -[\log(1 - S(t^*))I(t \leq t^*, \delta = 1)(1/G(t))] - [\log(S(t^*))I(t > t^*)(1/G(t^*))]$$

where G is the Kaplan-Meier estimate of the censoring distribution.

If `integrated == FALSE` then the sample mean is taken for the single specified times, t^* , and the returned score is given by

$$L(S, t|t^*) = \frac{1}{N} \sum_{i=1}^N L(S_i, t_i|t^*)$$

where N is the number of observations, S_i is the predicted survival function for individual i and t_i is their true survival time.

If `integrated == TRUE` then an approximation to integration is made by taking the mean over all T unique time-points, and then the sample mean over all N observations.

$$L(S) = \frac{1}{NT} \sum_{i=1}^N \sum_{j=1}^T L(S_i, t_i|t_j^*)$$

Format

[R6::R6Class\(\)](#) inheriting from [MeasureSurvIntegrated/MeasureSurv](#).

Construction

```
MeasureSurvIntLogloss$new(integrated = TRUE, times, eps = 1e-15, method = 2)
mlr_measures$get("surv.intlogloss")
msr("surv.intlogloss")
```

- `integrated` :: `logical(1)`
If TRUE (default), returns the integrated score; otherwise, not integrated.
- `times` :: `vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.
- `eps` :: `numeric(1)`
Very small number to set zero-valued predicted probabilities to, in order to prevent errors in `log(0)` calculation.

Meta Information

- Type: "surv"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: `distr`

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

As well as

- `eps` :: `numeric(1)`
Very small number to set zero-valued predicted probabilities to, in order to prevent errors in `log(0)` calculation.

References

Graf E, Schmoor C, Sauerbrei W, Schumacher M (1999). "Assessment and comparison of prognostic classification schemes for survival data." *Statistics in Medicine*, **18**(17-18), 2529–2545. doi: [10.1002/\(sici\)10970258\(19990915/30\)18:17/18<2529::aidsim274>3.0.co;25](https://doi.org/10.1002/(sici)10970258(19990915/30)18:17/18<2529::aidsim274>3.0.co;25).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNagelkerR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other Probabilistic survival measures: [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#)

 MeasureSurvIntLoglossSE

Standard Error of Integrated Log loss Survival Measure

Description

Calculates the standard error of [MeasureSurvIntLogloss](#).

If `integrated == FALSE` then the standard error of the loss, L , is approximated via,

$$se(L) = sd(L)/\sqrt{N}$$

where N are the number of observations in the test set, and sd is the standard deviation.

If `integrated == TRUE` then correlations between time-points need to be taken into account, therefore

$$se(L) = \sqrt{\frac{\sum_{i=1}^M \sum_{j=1}^M \Sigma_{i,j}}{NT^2}}$$

where $\Sigma_{i,j}$ is the sample covariance matrix over M distinct time-points.

Format

[R6::R6Class\(\)](#) inheriting from [MeasureSurvIntegrated/MeasureSurv](#).

Construction

```
MeasureSurvIntLoglossSE$new(integrated = TRUE, times, eps = 1e-15)
mlr_measures$get("surv.intloglossSE")
msr("surv.intloglossSE")
```

- `integrated :: logical(1)`
If TRUE (default), returns the integrated score; otherwise, not integrated.
- `times :: vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.
- `eps :: numeric(1)`
Very small number to set zero-valued predicted probabilities to, in order to prevent errors in `log(0)` calculation.

Meta Information

- Type: "surv"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: `distr`

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

As well as

- `eps` :: numeric(1)
Very small number to set zero-valued predicted probabilities to, in order to prevent errors in `log(0)` calculation.

References

Graf E, Schmoor C, Sauerbrei W, Schumacher M (1999). “Assessment and comparison of prognostic classification schemes for survival data.” *Statistics in Medicine*, **18**(17-18), 2529–2545. doi: [10.1002/\(sici\)10970258\(19990915/30\)18:17/18<2529::aidsim274>3.0.co;25](https://doi.org/10.1002/(sici)10970258(19990915/30)18:17/18<2529::aidsim274>3.0.co;25).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNagelkR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other Probabilistic survival measures: [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#)

MeasureSurvLogloss *Log loss Survival Measure*

Description

Calculates the cross-entropy, or logarithmic (log), loss.

The logloss, in the context of probabilistic predictions, is defined as the negative log probability density function, f , evaluated at the observation time, t ,

$$L(f, t) = -\log(f(t))$$

Censored observations in the test set are ignored.

Format

`R6::R6Class()` inheriting from [MeasureSurv](#).

Construction

```
MeasureSurvLogloss$new(eps = 1e-15)
mlr_measures$get("surv.logloss")
msr("surv.logloss")
```

- `eps` :: `numeric(1)`
Very small number to set zero-valued predicted probabilities to, in order to prevent errors in `log(0)` calculation.

Meta Information

- Type: "surv"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: `distr`

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

As well as

- `eps` :: `numeric(1)`
Very small number to set zero-valued predicted probabilities to, in order to prevent errors in `log(0)` calculation.

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvNagelkR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other Probabilistic survival measures: [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#)

MeasureSurvLoglossSE *Standard Error of Log loss Survival Measure*

Description

Calculates the standard error of [MeasureSurvLogloss](#).

The standard error of the Logloss, L , is approximated via,

$$se(L) = sd(L) / \sqrt{N}$$

where N are the number of observations in the test set, and sd is the standard deviation.

Censored observations in the test set are ignored.

Format

`R6::R6Class()` inheriting from `MeasureSurvLogloss/MeasureSurv`.

Construction

```
MeasureSurvLoglossSE$new(eps = 1e-15)
mlr_measures$get("surv.loglossSE")
msr("surv.loglossSE")
```

- `eps` :: `numeric(1)`
Very small number to set zero-valued predicted probabilities to, in order to prevent errors in `log(0)` calculation.

Meta Information

- Type: "surv"
- Range: $[0, \infty)$
- Minimize: TRUE
- Required prediction: `distr`

Fields

See `MeasureSurv`, as well as all variables passed to the constructor.

See Also

Other survival measures: `MeasureSurvBeggC`, `MeasureSurvChamblessAUC`, `MeasureSurvGonenC`, `MeasureSurvGrafSE`, `MeasureSurvGraf`, `MeasureSurvHarrellC`, `MeasureSurvHungAUC`, `MeasureSurvIntLoglossSE`, `MeasureSurvIntLogloss`, `MeasureSurvLogloss`, `MeasureSurvNagelkR2`, `MeasureSurvOQuigleyR2`, `MeasureSurvSongAUC`, `MeasureSurvSongTNR`, `MeasureSurvSongTPR`, `MeasureSurvUnoAUC`, `MeasureSurvUnoC`, `MeasureSurvUnoTNR`, `MeasureSurvUnoTPR`, `MeasureSurvXuR2`

Other Probabilistic survival measures: `MeasureSurvGrafSE`, `MeasureSurvGraf`, `MeasureSurvIntLoglossSE`, `MeasureSurvIntLogloss`, `MeasureSurvLogloss`

`MeasureSurvNagelkR2` *Nagelkerke's R2 Survival Measure*

Description

Calls `survAUC::Nagelk()`.

Assumes Cox PH model specification.

Format

`R6::R6Class()` inheriting from `MeasureSurv`.

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `mlr3proba`.

Construction

```
MeasureSurvNagelkR2$new()
mlr_measures$get("surv.nagelkR2")
msr("surv.nagelkR2")
```

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: 1p

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Nagelkerke NJ, others (1991). "A note on a general definition of the coefficient of determination." *Biometrika*, **78**(3), 691–692.

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLogLossSE](#), [MeasureSurvLogloss](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other R2 survival measures: [MeasureSurvOQuigleyR2](#), [MeasureSurvXuR2](#)

MeasureSurvOQuigleyR2 *O'Quigley, Xu, and Stare's R2 Survival Measure*

Description

Calls `survAUC::OXs()`.

Assumes Cox PH model specification.

Format

`R6::R6Class()` inheriting from [MeasureSurv](#).

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `mlr3proba`.

Construction

```
MeasureSurvOQuigleyR2$new()
mlr_measures$get("surv.oquigleyR2")
msr("surv.oquigleyR2")
```

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: 1p

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

O'Quigley J, Xu R, Stare J (2005). "Explained randomness in proportional hazards models." *Statistics in Medicine*, **24**(3), 479–489. doi: [10.1002/sim.1946](https://doi.org/10.1002/sim.1946).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLogLossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNagle1kR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other R2 survival measures: [MeasureSurvNagle1kR2](#), [MeasureSurvXuR2](#)

MeasureSurvSongAUC *Song and Zhou's AUC Survival Measure*

Description

Calls `survAUC::AUC.sh()`.

Assumes Cox PH model specification.

Format

`R6::R6Class()` inheriting from `MeasureSurvAUC/MeasureSurv`.

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `mlr3proba`.

Construction

```
MeasureSurvSongAUC$new(integrated = TRUE, times, type = c("incident", "cumulative"))
mlr_measures$get("surv.songAUC")
msr("surv.songAUC")
```

- `integrated` :: `logical(1)`
If TRUE (default), returns the integrated score; otherwise, not integrated.
- `times` :: `vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.
- `type` :: `character(1)`
Determines the type of score, one of: 'cumulative', 'incident'. Default 'incident'.

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: 1p

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Song X, Zhou X (2008). "A semiparametric approach for the covariate specific ROC curve with survival outcome." *Statistica Sinica*, **18**(3), 947–65. <http://www.jstor.org/stable/24308524>.

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLogLossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNageIkR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other AUC survival measures: [MeasureSurvChamblessAUC](#), [MeasureSurvHungAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#)

Description

Calls `survAUC::spec.sh()`.

Assumes Cox PH model specification.

`times` and `lp_thresh` are arbitrarily set to 0 to prevent crashing, these should be further specified.

Format

`R6::R6Class()` inheriting from `MeasureSurvAUC/MeasureSurv`.

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `m1r3proba`.

Construction

```
MeasureSurvSongTNR$new(times = 0, lp_thresh = 0)
mlr_measures$get("surv.songTNR")
msr("surv.songTNR")
```

- `times` :: `vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.
- `lp_thresh` :: `numeric(1)`
Determines where to threshold the linear predictor for calculating the TPR/TNR.

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: lp

Fields

See `MeasureSurv`, as well as all variables passed to the constructor.

References

Song X, Zhou X (2008). “A semiparametric approach for the covariate specific ROC curve with survival outcome.” *Statistica Sinica*, **18**(3), 947–65. <http://www.jstor.org/stable/24308524>.

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNaglekR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other AUC survival measures: [MeasureSurvChamblessAUC](#), [MeasureSurvHungAUC](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#)

MeasureSurvSongTPR *Song and Zhou's TPR Survival Measure*

Description

Calls `survAUC::sens.sh()`.

Assumes Cox PH model specification.

`times` and `lp_thresh` are arbitrarily set to 0 to prevent crashing, these should be further specified.

Format

`R6::R6Class()` inheriting from `MeasureSurvAUC/MeasureSurv`.

Details

All measures implemented from `survAUC` should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `m1r3proba`.

Construction

```
MeasureSurvSongTPR$new(times = 0, lp_thresh = 0, type = c("incident", "cumulative"))
m1r_measures$get("surv.songTPR")
msr("surv.songTPR")
```

- `times` :: `vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.
- `lp_thresh` :: `numeric(1)`
Determines where to threshold the linear predictor for calculating the TPR/TNR.

- `type` :: character(1)
Determines the type of score, one of: 'cumulative', 'incident'. Default 'incident'.

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: 1p

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Song X, Zhou X (2008). "A semiparametric approach for the covariate specific ROC curve with survival outcome." *Statistica Sinica*, **18**(3), 947–65. <http://www.jstor.org/stable/24308524>.

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNaglekR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other AUC survival measures: [MeasureSurvChamblessAUC](#), [MeasureSurvHungAUC](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#)

MeasureSurvUnoAUC *Uno's AUC Survival Measure*

Description

Calls `survAUC::AUC.uno()`.

Assumes random censoring.

Format

`R6::R6Class()` inheriting from `MeasureSurvAUC/MeasureSurv`.

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `m1r3proba`.

Construction

```
MeasureSurvUnoAUC$new(integrated = TRUE, times)
mlr_measures$get("surv.unoAUC")
msr("surv.unoAUC")
```

- `integrated` :: `logical(1)`
If TRUE (default), returns the integrated score; otherwise, not integrated.
- `times` :: `vector()`
If `integrated == TRUE` then a vector of time-points over which to integrate the score. If `integrated == FALSE` then a single time point at which to return the score.

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: lp

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Uno H, Cai T, Tian L, Wei LJ (2007). "Evaluating Prediction Rules for Year Survivors With Censored Regression Models." *Journal of the American Statistical Association*, **102**(478), 527–537. doi: [10.1198/016214507000000149](https://doi.org/10.1198/016214507000000149).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNaglekR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other AUC survival measures: [MeasureSurvChamblessAUC](#), [MeasureSurvHungAUC](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#)

MeasureSurvUnoC *Uno's C-Index Survival Measure*

Description

Calls `survAUC::UnoC()`.

Assumes random censoring.

Format

`R6::R6Class()` inheriting from `MeasureSurv`.

Details

All measures implemented from `survAUC` should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `mlr3proba`.

Construction

```
MeasureSurvUnoC$new()  
mlr_measures$get("surv.unoC")  
msr("surv.unoC")
```

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: crank

Fields

See `MeasureSurv`, as well as all variables passed to the constructor.

References

Uno H, Cai T, Pencina MJ, D'Agostino RB, Wei LJ (2011). "On the C-statistics for evaluating overall adequacy of risk prediction procedures with censored survival data." *Statistics in Medicine*, n/a–n/a. doi: [10.1002/sim.4154](https://doi.org/10.1002/sim.4154).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLogLossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNage1kR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other Concordance survival measures: [MeasureSurvBeggC](#), [MeasureSurvGonenC](#), [MeasureSurvHarrellC](#)

MeasureSurvUnoTNR *Uno's TNR Survival Measure*

Description

Calls `survAUC::spec.uno()`.

Assumes random censoring.

`times` and `lp_thresh` are arbitrarily set to 0 to prevent crashing, these should be further specified.

Format

`R6::R6Class()` inheriting from `MeasureSurvAUC/MeasureSurv`.

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `mlr3proba`.

Construction

```
MeasureSurvUnoTNR$new(times = 0, lp_thresh = 0)
mlr_measures$get("surv.unoTNR")
msr("surv.unoTNR")
```

- `times::vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.
- `lp_thresh::numeric(1)`
Determines where to threshold the linear predictor for calculating the TPR/TNR.

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: lp

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Uno H, Cai T, Tian L, Wei LJ (2007). “Evaluating Prediction Rules for Year Survivors With Censored Regression Models.” *Journal of the American Statistical Association*, **102**(478), 527–537. doi: [10.1198/016214507000000149](https://doi.org/10.1198/016214507000000149).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLogLossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNage1kR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTPR](#), [MeasureSurvXuR2](#)

Other AUC survival measures: [MeasureSurvChamblessAUC](#), [MeasureSurvHungAUC](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoTPR](#)

MeasureSurvUnoTPR	<i>Uno's TPR Survival Measure</i>
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Description

Calls `survAUC::sens.uno()`.

Assumes random censoring.

`times` and `lp_thresh` are arbitrarily set to 0 to prevent crashing, these should be further specified.

Format

`R6::R6Class()` inheriting from `MeasureSurvAUC/MeasureSurv`.

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `m1r3proba`.

Construction

```
MeasureSurvUnoTPR$new(times = 0, lp_thresh = 0)
m1r_measures$get("surv.unoTPR")
msr("surv.unoTPR")
```

- `times::vector()`
If `integrate == TRUE` then a vector of time-points over which to integrate the score. If `integrate == FALSE` then a single time point at which to return the score.

- `lp_thresh` :: `numeric(1)`
Determines where to threshold the linear predictor for calculating the TPR/TNR.

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: lp

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Uno H, Cai T, Tian L, Wei LJ (2007). "Evaluating Prediction Rules for Year Survivors With Censored Regression Models." *Journal of the American Statistical Association*, **102**(478), 527–537. doi: [10.1198/016214507000000149](https://doi.org/10.1198/016214507000000149).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLogLossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNage1kR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvXuR2](#)

Other AUC survival measures: [MeasureSurvChamblessAUC](#), [MeasureSurvHungAUC](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoTNR](#)

MeasureSurvXuR2

Xu and O'Quigley's R2 Survival Measure

Description

Calls `survAUC::X0()`.

Assumes Cox PH model specification.

Format

`R6::R6Class()` inheriting from [MeasureSurv](#).

Details

All measures implemented from **survAUC** should be used with care, we are aware of problems in implementation that sometimes cause fatal errors in R. In future updates these measures will all be re-written and implemented directly in `m1r3proba`.

Construction

```
MeasureSurvXuR2$new()
mlr_measures$get("surv.xuR2")
msr("surv.xuR2")
```

Meta Information

- Type: "surv"
- Range: [0, 1]
- Minimize: FALSE
- Required prediction: 1p

Fields

See [MeasureSurv](#), as well as all variables passed to the constructor.

References

Xu R, O'Quigley J (1999). "A R2 type measure of dependence for proportional hazards models." *Journal of Nonparametric Statistics*, **12**(1), 83–107. doi: [10.1080/10485259908832799](https://doi.org/10.1080/10485259908832799).

See Also

Other survival measures: [MeasureSurvBeggC](#), [MeasureSurvChamblessAUC](#), [MeasureSurvGonenC](#), [MeasureSurvGrafSE](#), [MeasureSurvGraf](#), [MeasureSurvHarrellC](#), [MeasureSurvHungAUC](#), [MeasureSurvIntLoglossSE](#), [MeasureSurvIntLogloss](#), [MeasureSurvLoglossSE](#), [MeasureSurvLogloss](#), [MeasureSurvNage1kR2](#), [MeasureSurvOQuigleyR2](#), [MeasureSurvSongAUC](#), [MeasureSurvSongTNR](#), [MeasureSurvSongTPR](#), [MeasureSurvUnoAUC](#), [MeasureSurvUnoC](#), [MeasureSurvUnoTNR](#), [MeasureSurvUnoTPR](#)

Other R2 survival measures: [MeasureSurvNage1kR2](#), [MeasureSurvOQuigleyR2](#)

mlr_tasks_lung

Lung Cancer Survival Task

Description

A survival task for the [survival::lung](#) data set. Column "sex" has been converted to a factor, all others have been converted to integer.

Format

[R6::R6Class](#) inheriting from [TaskSurv](#).

Construction

```
mlr3::mlr_tasks$get("lung")
mlr3::tsk("lung")
```

See Also

[Dictionary of Tasks: mlr3::mlr_tasks](#)

mlr_tasks_rats *Rats Survival Task*

Description

A survival task for the [survival::rats](#) data set. Column "sex" has been converted to a factor, all others have been converted to integer.

Format

[R6::R6Class](#) inheriting from [TaskSurv](#).

Construction

```
mlr3::mlr_tasks$get("rats")  
mlr3::tsk("rats")
```

See Also

[Dictionary of Tasks: mlr3::mlr_tasks](#)

mlr_tasks_unemployment *Unemployment Duration Task*

Description

A survival task for the "UnempDur" data set in package **Ecdat**. Contains the following columns of the original data set: "spell" (time), "censor1" (status), "age", "ui", "logwage", and "tenure".

Format

[R6::R6Class](#) inheriting from [TaskSurv](#).

Construction

```
mlr3::mlr_tasks$get("unemployment")  
mlr3::tsk("unemployment")
```

See Also

[Dictionary of Tasks: mlr3::mlr_tasks](#)

 PipeOpCrankCompositor *PipeOpCrankCompositor*

Description

Uses a predicted `distr` in a [PredictionSurv](#) to estimate (or 'compose') a crank prediction.

Format

[R6Class](#) inheriting from [PipeOp](#).

Construction

```
PipeOpCrankCompositor$new(id = "crankcompose", param_vals = list(method = "mean"))
```

- `id` :: `character(1)`
Identifier of the resulting object, default "crankcompose".
- `param_vals` :: `named list`
List of hyperparameter settings, overwriting the hyperparameter settings that would otherwise be set during construction. Default `list()`.

Input and Output Channels

[PipeOpCrankCompositor](#) has one input channel named "input", which takes `NULL` during training and [PredictionSurv](#) during prediction.

[PipeOpCrankCompositor](#) has one output channel named "output", producing `NULL` during training and a [PredictionSurv](#) during prediction.

The output during prediction is the [PredictionSurv](#) from the "pred" input but with the crank predict type overwritten by the given estimation method.

State

The `$state` is left empty (`list()`).

Parameters

- `method` :: `character(1)`
Determines what method should be used to produce a continuous ranking from the distribution. One of `median` or `mean` corresponding to the respective functions in the predicted survival distribution. Note that for models with a proportional hazards form, the ranking implied by `mean` and `median` will be identical (but not the value of crank itself). Default is `mean`.

Internals

The `median` or `mean` will use analytical expressions if possible but if not they are calculated using [distr6::median.Distribution](#) or [distr6::mean.Distribution](#) respectively.

Fields

Only fields inherited from [PipeOp](#).

Methods

Only methods inherited from [PipeOp](#).

See Also

[mlr3pipelines::PipeOp](#) and [crankcompositor](#)

Other survival compositors: [PipeOpDistrCompositor](#)

Examples

```
library(mlr3)
library(mlr3pipelines)
set.seed(1)

# Three methods to predict a `crank` from `surv.rpart`
task = tgen("simsurv")$generate(30)

# Method 1 - Train and predict separately then compose
learn = lrn("surv.coxph")$train(task)$predict(task)
poc = po("crankcompose", param_vals = list(method = "mean"))
poc$predict(list(learn))

# Examples not run to save run-time.
## Not run:
# Method 2 - Create a graph manually
gr = Graph$new()$
  add_pipeop(po("learner", lrn("surv.ranger")))$
  add_pipeop(po("crankcompose"))$
  add_edge("surv.ranger", "crankcompose")
gr$train(task)
gr$predict(task)

# Method 3 - Syntactic sugar: Wrap the learner in a graph
ranger.crank = crankcompositor(learner = lrn("surv.ranger"),
                              method = "median")
resample(task, ranger.crank, rsmp("cv", folds = 2))$predictions()

## End(Not run)
```


Description

Estimates (or 'composes') a survival distribution from a predicted baseline distr and a crank or lp from two [PredictionSurv](#)s.

Compositor Assumptions:

- The baseline distr is a discrete estimator, i.e. [LearnerSurvKaplan](#) or [LearnerSurvNelson](#)
- The composed distr is of a linear form
- If lp is missing then crank is equivalent

These assumptions are strong and may not be reasonable. Future updates will upgrade this compositor to be more flexible.

Format

[R6Class](#) inheriting from [PipeOp](#).

Construction

```
PipeOpDistrCompositor$new(id = "distrcompose", param_vals = list())
```

- `id` :: character(1)
Identifier of the resulting object, default "distrcompose".
- `param_vals` :: named list
List of hyperparameter settings, overwriting the hyperparameter settings that would otherwise be set during construction. Default `list()`.

Input and Output Channels

[PipeOpDistrCompositor](#) has two input channels, "base" and "pred". Both input channels take NULL during training and [PredictionSurv](#) during prediction.

[PipeOpDistrCompositor](#) has one output channel named "output", producing NULL during training and a [PredictionSurv](#) during prediction.

The output during prediction is the [PredictionSurv](#) from the "pred" input but with an extra (or overwritten) column for distr predict type; which is composed from the distr of "base" and lp or crank of "pred".

State

The `$state` is left empty (`list()`).

Parameters

The parameters are:

- `form` :: character(1)
Determines the form that the predicted linear survival model should take. This is either, accelerated-failure time, aft, proportional hazards, ph, or proportional odds, po. Default aft.

- `overwrite :: logical(1)`
If FALSE (default) then if the "pred" input already has a `distr`, the compositor does nothing and returns the given [PredictionSurv](#). If TRUE then the `distr` is overwritten with the `distr` composed from `lp/crank` - this is useful for changing the prediction `distr` from one model form to another.

Internals

The respective forms above have respective survival distributions:

$$aft : S(t) = S_0\left(\frac{t}{\exp(lp)}\right)$$

$$ph : S(t) = S_0(t)^{\exp(lp)}$$

$$po : S(t) = \frac{S_0(t)}{\exp(-lp) + (1 - \exp(-lp))S_0(t)}$$

where S_0 is the estimated baseline survival distribution, and lp is the predicted linear predictor. If the input model does not predict a linear predictor then `crank` is assumed to be the `lp` - **this may be a strong and unreasonable assumption.**

Fields

Only fields inherited from [PipeOp](#).

Methods

Only methods inherited from [PipeOp](#).

See Also

[mlr3pipelines::PipeOp](#) and [distrcompositor](#)

Other survival compositors: [PipeOpCrankCompositor](#)

Examples

```
library(mlr3)
library(mlr3pipelines)
set.seed(42)

# Three methods to transform the cox ph predicted `distr` to an
# accelerated failure time model
task = tgen("simsurv")$generate(30)

# Method 1 - Train and predict separately then compose
base = lrn("surv.kaplan")$train(task)$predict(task)
pred = lrn("surv.coxph")$train(task)$predict(task)
pod = po("distrcompose", param_vals = list(form = "aft", overwrite = TRUE))
pod$predict(list(base = base, pred = pred))

# Examples not run to save run-time.
```

```
## Not run:
# Method 2 - Create a graph manually
gr = Graph$new()$
  add_pipeop(po("learner", lrn("surv.kaplan")))$
  add_pipeop(po("learner", lrn("surv.glmnet")))$
  add_pipeop(po("distrcompose"))$
  add_edge("surv.kaplan", "distrcompose", dst_channel = "base")$
  add_edge("surv.glmnet", "distrcompose", dst_channel = "pred")
gr$train(task)$gr$predict(task)

# Method 3 - Syntactic sugar: Wrap the learner in a graph.
cvglm.distr = distrcompositor(learner = lrn("surv.cvglmnet"),
                             estimator = "kaplan",
                             form = "aft")
cvglm.distr$fit(task)$predict(task)

## End(Not run)
```

PredictionSurv

Prediction Object for Survival

Description

This object stores the predictions returned by a learner of class [LearnerSurv](#).

The `task_type` is set to "surv".

Format

[R6::R6Class](#) object inheriting from [mlr3::Prediction](#).

Construction

```
PredictionSurv$new(task = NULL, row_ids = task$row_ids, truth = task$truth(),
                  crank = NULL, distr = NULL, lp = NULL)
```

- `task` :: [TaskSurv](#)
Task, used to extract defaults for `row_ids` and `truth`.
- `row_ids` :: (`integer()` | `character()`)
Row ids of the task. Per default, these are extracted from the task.
- `truth` :: `survival::Surv()`
Observed survival times. Per default, these are extracted from the task.
- `crank` :: `numeric()`
Vector of continuous ranks. One element for each observation in the test set. For a pair of continuous ranks, a higher rank indicates that the observation is more likely to experience the event. Used in discrimination measures like [surv.harrellC](#).
- `distr` :: `distr6::Distribution()`
[VectorDistribution](#) from [distr6](#). Each individual distribution in the vector represents the random variable 'survival time' for an individual observation. Used in measures like [surv.graf](#).

- `lp :: numeric()`
Vector of linear predictor scores. One element for each observation in the test set. $lp = X\beta$ where X is a matrix of covariates and β is a vector of estimated coefficients. Used in discrimination measures like [surv.harrellC](#).

Fields

See [mlr3::Prediction](#).

The field `task_type` is set to "surv".

Examples

```
library(mlr3)
task = tgen("simsurv")$generate(20)
learner = mlr_learners$get("surv.rpart")
p = learner$train(task)$predict(task)
head(as.data.table(p))
```

TaskGeneratorSimsurv *Survival Task Generator for Package 'simsurv'*

Description

A [mlr3::TaskGenerator](#) calling [simsurv::simsurv\(\)](#) from package [simsurv](#).

This generator currently only exposes a small subset of the flexibility of [simsurv](#), and just creates a small data set with the following numerical covariates:

- `treatment`: Bernoulli distributed with log hazard ratio -0.5 .
- `height`: Normally distributed with log hazard ratio 1 .
- `weight`: normally distributed with log hazard ratio 0 .

See [simsurv::simsurv\(\)](#) for an explanation of the hyperparameters.

Format

[R6::R6Class](#) inheriting from [mlr3::TaskGenerator](#).

Construction

```
TaskGeneratorSimsurv$new()
mlr_task_generators$get("simsurv")
tgen("simsurv")
```

See Also

Dictionary of TaskGenerators: [mlr3::mlr_task_generators](#)

Examples

```
generator = mlr3::mlr_task_generators$get("simSurv")
task = generator$generate(20)
task$head()
```

TaskSurv

*Survival Task***Description**

This task specializes [mlr3::Task](#) and [mlr3::TaskSupervised](#) for possibly-censored survival problems. The target is comprised of survival times and an event indicator. Predefined tasks are stored in [mlr3::mlr_tasks](#).

The `task_type` is set to "surv".

Format

[R6::R6Class](#) object inheriting from [Task/TaskSupervised](#).

Construction

```
TaskSurv$new(id, backend, time, event, time2,
  type = c("right", "left", "counting", "interval", "interval2", "mstate"))
```

- `id` :: `character(1)`
Name of the task.
- `backend` :: [DataBackend](#)
- `time` :: `numeric()`
Event time if data is right censored. Starting time if interval censored.
- `event` :: `integer() | logical()`
Event indicator. If data is right censored then "0"/FALSE means alive (no event), "1"/TRUE means dead (event). If type is "interval" then "0" means right censored, "1" means dead (event), "2" means left censored, and "3" means interval censored. If type is "interval2" then event is ignored.
- `time2` :: `numeric()`
Ending time for interval censored data. Ignored otherwise.
- `type` :: `character()`
Type of censoring. Default is 'right' censoring.

Fields

All fields from [mlr3::TaskSupervised](#), and additionally:

- `censtype` :: `character()`
Returns the type of censoring, one of "right", "left", "counting", "interval", "interval2" or "mstate".

Methods

See [mlr3::TaskSupervised](#).

Examples

```
library(mlr3)
lung = mlr3misc::load_dataset("lung", package = "survival")
lung$status = (lung$status == 2L)
b = as_data_backend(lung)
task = TaskSurv$new("lung", backend = b, time = "time",
  event = "status")

task$target_names
task$feature_names
task$formula()
task$truth()
```

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