

# Package ‘RemixAutoML’

February 27, 2021

**Title** Remix Automated Machine Learning

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**Description** R package for the automation of machine learning, forecasting, feature engineering, model evaluation, model interpretation, data generation, and recommenders. Built using data.table for all tabular data-related tasks.

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**URL** <https://github.com/AdrianAntico/RemixAutoML>

**BugReports** <https://github.com/AdrianAntico/RemixAutoML/issues>

**Depends** R (>= 3.5.0)

**Imports** arules, bit64, catboost, combinat, data.table, doParallel, e1071, fBasics, foreach, forecast, ggplot2, grid, h2o, itertools, lime, lubridate, methods, MLmetrics, monreg, nortest, parallel, pROC, RColorBrewer, recommenderlab, Rfast, scatterplot3d, stats, stringr, timeDate, tsoutliers, wordcloud, xgboost

**Suggests** knitr, rmarkdown, sde, testthat, fpp, gridExtra

**VignetteBuilder** knitr

**Additional\_repositories** <https://github.com/catboost/catboost/tree/master/catboost/R-package>

**Contact** Adrian Antico

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**Language** en-US

**LazyData** true

**NeedsCompilation** no

**RoxygenNote** 7.1.1

**SystemRequirements** Java (>= 7.0)

**Author** Adrian Antico [aut, cre], Douglas Pestana [ctb]

**ByteCompile** TRUE

**R topics documented:**

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RemixAutoML-package	<i>Automated Machine Learning Remixed</i>
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## Description

Automated Machine Learning Remixed for real-world use-cases. The package utilizes data.table under the hood for all data wrangling like operations so it's super fast and memory efficient. All ML methods are available in R or Python. The forecasting functions are unique and state of the art. There are feature engineering functions in this package that you cannot find anywhere else.

## Details

See the github README for details and examples [www.github.com/AdrianAntico/RemixAutoML](http://www.github.com/AdrianAntico/RemixAutoML)

## Author(s)

Adrian Antico, [adrianantico@gmail.com](mailto:adrianantico@gmail.com), Douglas Pestana

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AutoArfima	<i>AutoArfima</i>
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## Description

AutoArfima is a multi-armed bandit model testing framework for AR and SAR NNets. Randomized probability matching is the underlying bandit algorithm. Model evaluation is done by blending the training error and the validation error from testing the model on out of sample data. The bandit algorithm compares the performance of the current build against the previous builds which starts with the classic nnetar model from the forecast package. Depending on how many lags, seasonal lags, and fourier pairs you test the number of combinations of features to test begins to approach 10,000 different combinations of settings. The function tests out transformations, differencing, and variations of the lags, seasonal lags, and fourier pairs. The parameter space is broken up into various buckets that are increasing in sophistication. The bandit algorithm samples from those buckets and based on many rounds of testing it determines which buckets to generate samples from more

frequently based on the models performance coming from that bucket. All of the models have performance data collected on them and a final rebuild is initiated when a winner is found. The rebuild process begins by retraining the model with the settings that produced the best performance. If the model fails to build, for whatever reason, the next best buildable model is rebuilt.

## Usage

```
AutoArfima(
  data,
  FilePath = NULL,
  TargetVariableName,
  DateColumnName,
  TimeAggLevel = "week",
  EvaluationMetric = "MAE",
  NumHoldOutPeriods = 5L,
  NumFCPeriods = 5L,
  MaxLags = 5L,
  MaxMovingAverages = 5L,
  TrainWeighting = 0.5,
  MaxConsecutiveFails = 12L,
  MaxNumberModels = 100L,
  MaxRunTimeMinutes = 10L,
  NumberCores = max(1L, min(4L, parallel::detectCores() - 2L))
)
```

## Arguments

<code>data</code>	Source data.table
<code>FilePath</code>	NULL to return nothing. Provide a file path to save the model and xregs if available
<code>TargetVariableName</code>	Name of your time series target variable
<code>DateColumnName</code>	Name of your date column
<code>TimeAggLevel</code>	Choose from "year", "quarter", "month", "week", "day", "hour"
<code>EvaluationMetric</code>	Choose from MAE, MSE, and MAPE
<code>NumHoldOutPeriods</code>	Number of time periods to use in the out of sample testing
<code>NumFCPeriods</code>	Number of periods to forecast
<code>MaxLags</code>	A single value of the max number of lags to use in the internal auto.arima of tbats
<code>MaxMovingAverages</code>	A single value of the max number of moving averages to use in the internal auto.arima of arfima
<code>TrainWeighting</code>	Model ranking is based on a weighted average of training metrics and out of sample metrics. Supply the weight of the training metrics, such as 0.50 for 50 percent.
<code>MaxConsecutiveFails</code>	When a new best model is found MaxConsecutiveFails resets to zero. Indicated the number of model attempts without a new winner before terminating the procedure.

**MaxNumberModels**      Indicate the maximum number of models to test.  
**MaxRunTimeMinutes**      Indicate the maximum number of minutes to wait for a result.  
**NumberCores**      Default max(1L, min(4L, parallel::detectCores()-2L))

### Author(s)

Adrian Antico

### See Also

Other Automated Time Series: [AutoBanditNNet\(\)](#), [AutoBanditSarima\(\)](#), [AutoCatBoostFreqSizeScoring\(\)](#), [AutoETS\(\)](#), [AutoH2oGBMFreqSizeScoring\(\)](#), [AutoTBATS\(\)](#), [AutoTS\(\)](#)

### Examples

```
## Not run:
# Create fake data
data <- RemixAutoML::FakeDataGenerator(TimeSeries = TRUE, TimeSeriesTimeAgg = "days")

# Build model
Output <- RemixAutoML::AutoArfima(
  data,
  FilePath = NULL,
  TargetVariableName = "Weekly_Sales",
  DateColumnName = "Date",
  TimeAggLevel = "weeks",
  EvaluationMetric = "MAE",
  NumHoldOutPeriods = 5L,
  NumFCPeriods = 5L,
  MaxLags = 5L,
  MaxMovingAverages = 5L,
  TrainWeighting = 0.50,
  MaxConsecutiveFails = 12L,
  MaxNumberModels = 100L,
  MaxRunTimeMinutes = 10L,
  NumberCores = max(1L, min(4L, parallel::detectCores()-2L)))

# Output
Output$ForecastPlot
Output$Forecast
Output$PerformanceGrid

## End(Not run)
```

## Description

AutoBanditNNet is a multi-armed bandit model testing framework for AR and SAR NNets. Randomized probability matching is the underlying bandit algorithm. Model evaluation is done by blending the training error and the validation error from testing the model on out of sample data. The bandit algorithm compares the performance of the current build against the previous builds which starts with the classic nnetar model from the forecast package. Depending on how many lags, seasonal lags, and fourier pairs you test the number of combinations of features to test begins to approach 10,000 different combinations of settings. The function tests out transformations, differencing, and variations of the lags, seasonal lags, and fourier pairs. The parameter space is broken up into various buckets that are increasing in sophistication. The bandit algorithm samples from those buckets and based on many rounds of testing it determines which buckets to generate samples from more frequently based on the models performance coming from that bucket. All of the models have performance data collected on them and a final rebuild is initiated when a winner is found. The rebuild process begins by retraining the model with the settings that produced the best performance. If the model fails to build, for whatever reason, the next best buildable model is rebuilt.

## Usage

```
AutoBanditNNet(
  data,
  FilePath = NULL,
  TargetVariableName,
  DateColumnName,
  TimeAggLevel = "week",
  EvaluationMetric = "MAE",
  NumHoldOutPeriods = 5L,
  NumFCPeriods = 5L,
  MaxLags = 5L,
  MaxSeasonalLags = 1L,
  MaxFourierPairs = 2L,
  TrainWeighting = 0.5,
  MaxConsecutiveFails = 12L,
  MaxNumberModels = 100L,
  MaxRunTimeMinutes = 10L,
  NumberCores = max(1L, min(4L, parallel::detectCores() - 2L)),
  Debug = FALSE
)
```

## Arguments

data	Source data.table
FilePath	NULL to return nothing. Provide a file path to save the model and xregs if available
TargetVariableName	Name of your time series target variable
DateColumnName	Name of your date column
TimeAggLevel	Choose from "year", "quarter", "month", "week", "day", "hour"
EvaluationMetric	Choose from MAE, MSE, and MAPE
NumHoldOutPeriods	Number of time periods to use in the out of sample testing



NumFCPeriods	Number of periods to forecast
MaxLags	A single value of the max number of lags to test
MaxSeasonalLags	A single value of the max number of seasonal lags to test
MaxFourierPairs	A single value of the max number of fourier pairs to test
TrainWeighting	Model ranking is based on a weighted average of training metrics and out of sample metrics. Supply the weight of the training metrics, such as 0.50 for 50 percent.
MaxConsecutiveFails	When a new best model is found MaxConsecutiveFails resets to zero. Indicated the number of model attempts without a new winner before terminating the procedure.
MaxNumberModels	Indicate the maximum number of models to test.
MaxRunTimeMinutes	Indicate the maximum number of minutes to wait for a result
NumberCores	Default max(1L, min(4L, parallel::detectCores()-2L))
Debug	Set to TRUE to print some steps

**Author(s)**

Adrian Antico

**See Also**

Other Automated Time Series: [AutoArfima\(\)](#), [AutoBanditSarima\(\)](#), [AutoCatBoostFreqSizeScoring\(\)](#), [AutoETS\(\)](#), [AutoH2oGBMFreqSizeScoring\(\)](#), [AutoTBATS\(\)](#), [AutoTS\(\)](#)

**Examples**

```
## Not run:
# Create fake data
data <- RemixAutoML::FakeDataGenerator(TimeSeries = TRUE, TimeSeriesTimeAgg = "days")

# Build models
Output <- RemixAutoML::AutoBanditNNet(
  data = data,
  FilePath = NULL,
  TargetVariableName = "Weekly_Sales",
  DateColumnName = "Date",
  TimeAggLevel = "day",
  EvaluationMetric = "MAE",
  NumHoldOutPeriods = 5L,
  NumFCPeriods = 5L,
  MaxLags = 5L,
  MaxSeasonalLags = 1L,
  MaxFourierPairs = 2L,
  TrainWeighting = 0.50,
  MaxConsecutiveFails = 12L,
  MaxNumberModels = 100L,
  MaxRunTimeMinutes = 10L,
  NumberCores = max(1L, min(4L, parallel::detectCores()-2L)),
```

```

    Debug = FALSE)

# Output
Output$ForecastPlot
Output$Forecast
Output$PerformanceGrid

## End(Not run)

```

---

AutoBanditSarima

*AutoBanditSarima*


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## Description

AutoBanditSarima is a multi-armed bandit model testing framework for SARIMA. Randomized probability matching is the underlying bandit algorithm. Model evaluation is done by blending the training error and the validation error from testing the model on out of sample data. The bandit algorithm compares the performance of the current build against the previous builds which starts with the classic auto.arima from the forecast package. Depending on how many lags, moving averages, seasonal lags and moving averages you test the number of combinations of features to test begins to approach 100,000 different combinations of settings. The function tests out transformations, differencing, and variations of the lags and moving averages. The parameter space is broken up into various buckets that are increasing in sophistication. The bandit algorithm samples from those buckets and based on many rounds of testing it determines which buckets to generate samples from more frequently based on the models performance coming from that bucket. All of the models have performance data collected on them and a final rebuild is initiated when a winner is found. The rebuild process begins by retraining the model with the settings that produced the best performance. If the model fails to build, for whatever reason, the next best buildable model is rebuilt.

## Usage

```

AutoBanditSarima(
  data,
  FilePath = NULL,
  ByDataType = TRUE,
  TargetVariableName,
  DateColumnName,
  TimeAggLevel = "week",
  EvaluationMetric = "MAE",
  NumHoldOutPeriods = 5L,
  NumFCPeriods = 5L,
  MaxLags = 5L,
  MaxSeasonallLags = 0L,
  MaxMovingAverages = 5L,
  MaxSeasonalMovingAverages = 0L,
  MaxFourierPairs = 2L,
  TrainWeighting = 0.5,
  MaxConsecutiveFails = 25L,
  MaxNumberModels = 100L,
  MaxRunTimeMinutes = 10L,
  NumberCores = max(1L, min(4L, parallel::detectCores() - 2L)),
  DebugMode = FALSE
)

```

**Arguments**

<code>data</code>	Source data.table
<code>FilePath</code>	NULL to return nothing. Provide a file path to save the model and xregs if available
<code>ByDataType</code>	TRUE returns the best model from the four base sets of possible models. FALSE returns the best model.
<code>TargetVariableName</code>	Name of your time series target variable
<code>DateColumnName</code>	Name of your date column
<code>TimeAggLevel</code>	Choose from "year", "quarter", "month", "week", "day", "hour"
<code>EvaluationMetric</code>	Choose from MAE, MSE, and MAPE
<code>NumHoldOutPeriods</code>	Number of time periods to use in the out of sample testing
<code>NumFCPeriods</code>	Number of periods to forecast
<code>MaxLags</code>	A single value of the max number of lags to test
<code>MaxSeasonalLags</code>	A single value of the max number of seasonal lags to test
<code>MaxMovingAverages</code>	A single value of the max number of moving averages to test
<code>MaxSeasonalMovingAverages</code>	A single value of the max number of seasonal moving averages to test
<code>MaxFourierPairs</code>	A single value of the max number of fourier pairs to test
<code>TrainWeighting</code>	Model ranking is based on a weighted average of training metrics and out of sample metrics. Supply the weight of the training metrics, such as 0.50 for 50 percent.
<code>MaxConsecutiveFails</code>	When a new best model is found MaxConsecutiveFails resets to zero. Indicated the number of model attempts without a new winner before terminating the procedure.
<code>MaxNumberModels</code>	Indicate the maximum number of models to test.
<code>MaxRunTimeMinutes</code>	Indicate the maximum number of minutes to wait for a result.
<code>NumberCores</code>	Default max(1L, min(4L, parallel::detectCores()-2L))
<code>DebugMode</code>	Set to TRUE to get print outs of particular steps helpful in tracing errors

**Value**

data.table containing historical values and the forecast values along with the grid tuning results in full detail, as a second data.table

**Author(s)**

Adrian Antico

## See Also

Other Automated Time Series: [AutoArfima\(\)](#), [AutoBanditNNet\(\)](#), [AutoCatBoostFreqSizeScoring\(\)](#), [AutoETS\(\)](#), [AutoH2oGBMFreqSizeScoring\(\)](#), [AutoTBATS\(\)](#), [AutoTS\(\)](#)

## Examples

```
## Not run:
# Create fake data
data <- RemixAutoML::FakeDataGenerator(TimeSeries = TRUE, TimeSeriesTimeAgg = "days")

# Build models
Output <- RemixAutoML::AutoBanditSarima(
  data = data,
  FilePath = NULL,
  ByDataType = FALSE,
  TargetVariableName = "Weekly_Sales",
  DateColumnName = "Date",
  TimeAggLevel = "1min",
  EvaluationMetric = "MAE",
  NumHoldOutPeriods = 12L,
  NumFCPeriods = 16L,
  MaxLags = 10L,
  MaxSeasonalLags = 0L,
  MaxMovingAverages = 3L,
  MaxSeasonalMovingAverages = 0L,
  MaxFourierPairs = 2L,
  TrainWeighting = 0.50,
  MaxConsecutiveFails = 50L,
  MaxNumberModels = 100L,
  MaxRunTimeMinutes = 10L,
  NumberCores Default max(1L, min(4L, parallel::detectCores()-2L)),
  DebugMode = FALSE)

# Output
Output$ForecastPlot
Output$Forecast
Output$PerformanceGrid
Output$errorLagMA2x2

## End(Not run)
```

## Description

AutoCatBoostCARMA Multivariate Forecasting with calendar variables, Holiday counts, holiday lags, holiday moving averages, differencing, transformations, interaction-based categorical encoding using target variable and features to generate various time-based aggregated lags, moving averages, moving standard deviations, moving skewness, moving kurtosis, moving quantiles, parallelized interaction-based fourier pairs by grouping variables, and Trend Variables.

**Usage**

```

AutoCatBoostCARMA(
  data,
  TimeWeights = NULL,
  NonNegativePred = FALSE,
  RoundPreds = FALSE,
  TrainOnFull = FALSE,
  TargetColumnName = "Target",
  DateColumnName = "DateTime",
  HierarchGroups = NULL,
  GroupVariables = NULL,
  FC_Periods = 30,
  TimeUnit = "week",
  TimeGroups = c("weeks", "months"),
  PDFOutputPath = NULL,
  SaveDataPath = NULL,
  NumOfParDepPlots = 10L,
  TargetTransformation = FALSE,
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit"),
  AnomalyDetection = NULL,
  XREGS = NULL,
  Lags = c(1L:5L),
  MA_Periods = c(2L:5L),
  SD_Periods = NULL,
  Skew_Periods = NULL,
  Kurt_Periods = NULL,
  Quantile_Periods = NULL,
  Quantiles_Selected = c("q5", "q95"),
  Difference = TRUE,
  FourierTerms = 6L,
  CalendarVariables = c("minute", "hour", "wday", "mday", "yday", "week", "isoweek",
    "month", "quarter", "year"),
  HolidayVariable = c("USPublicHolidays", "EasterGroup", "ChristmasGroup",
    "OtherEcclesticalFeasts"),
  HolidayLags = 1L,
  HolidayMovingAverages = 1L:2L,
  TimeTrendVariable = FALSE,
  ZeroPadSeries = NULL,
  DataTruncate = FALSE,
  SplitRatios = c(0.7, 0.2, 0.1),
  PartitionType = "timeseries",
  TaskType = "GPU",
  NumGPU = 1,
  DebugMode = FALSE,
  EvalMetric = "RMSE",
  EvalMetricValue = 1.5,
  LossFunction = "RMSE",
  LossFunctionValue = 1.5,
  GridTune = FALSE,
  PassInGrid = NULL,
  ModelCount = 100,

```

```

MaxRunsWithoutNewWinner = 50,
MaxRunMinutes = 24L * 60L,
Langevin = FALSE,
DiffusionTemperature = 10000,
NTrees = 1000,
L2_Leaf_Reg = 3,
LearningRate = NULL,
RandomStrength = 1,
BorderCount = 254,
Depth = 6,
RSM = 1,
BootStrapType = NULL,
GrowPolicy = "SymmetricTree",
Timer = TRUE,
ModelSizeReg = 0.5,
FeatureBorderType = "GreedyLogSum",
SamplingUnit = "Group",
SubSample = NULL,
ScoreFunction = "Cosine",
MinDataInLeaf = 1
)

```

### Arguments

data	Supply your full series data set here
TimeWeights	Supply a value that will be multiplied by the time trend value
NonNegativePred	TRUE or FALSE
RoundPreds	Rounding predictions to an integer value. TRUE or FALSE. Defaults to FALSE
TrainOnFull	Set to TRUE to train on full data
TargetColumnName	List the column name of your target variables column. E.g. "Target"
DateColumnName	List the column name of your date column. E.g. "DateTime"
HierarchGroups	Vector of hierarchy categorical columns.
GroupVariables	Defaults to NULL. Use NULL when you have a single series. Add in Group-Variables when you have a series for every level of a group or multiple groups.
FC_Periods	Set the number of periods you want to have forecasts for. E.g. 52 for weekly data to forecast a year ahead
TimeUnit	List the time unit your data is aggregated by. E.g. "1min", "5min", "10min", "15min", "30min", "hour", "day", "week", "month", "quarter", "year".
TimeGroups	Select time aggregations for adding various time aggregated GDL features.
PDFOutputPath	NULL or a path file to output PDFs to a specified folder
SaveDataPath	NULL Or supply a path. Data saved will be called 'ModelID'_data.csv
NumOfParDepPlots	Supply a number for the number of partial dependence plots you want returned
TargetTransformation	TRUE or FALSE. If TRUE, select the methods in the Methods arg you want tested. The best one will be applied.

Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
AnomalyDetection	NULL for not using the service. Other, provide a list, e.g. AnomalyDetection = list("tstat_high" = 4, "tstat_low" = -4)
XREGS	Additional data to use for model development and forecasting. Data needs to be a complete series which means both the historical and forward looking values over the specified forecast window needs to be supplied.
Lags	Select the periods for all lag variables you want to create. E.g. c(1:5,52) or list("day" = c(1:10), "weeks" = c(1:4))
MA_Periods	Select the periods for all moving average variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
SD_Periods	Select the periods for all moving standard deviation variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
Skew_Periods	Select the periods for all moving skewness variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
Kurt_Periods	Select the periods for all moving kurtosis variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
Quantile_Periods	Select the periods for all moving quantiles variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
Quantiles_Selected	Select from the following "q5", "q10", "q15", "q20", "q25", "q30", "q35", "q40", "q45", "q50", "q55", "q60", "q65", "q70", "q75", "q80", "q85", "q90", "q95"
Difference	Puts the I in ARIMA for single series and grouped series.
FourierTerms	Set to the max number of pairs. E.g. 2 means to generate two pairs for by each group level and interations if hierarchy is enabled.
CalendarVariables	NULL, or select from "minute", "hour", "wday", "mday", "yday", "week", "isoweek", "month", "quarter", "year"
HolidayVariable	NULL, or select from "USPublicHolidays", "EasterGroup", "ChristmasGroup", "OtherEcclesticalFeasts"
HolidayLags	Number of lags to build off of the holiday count variable.
HolidayMovingAverages	Number of moving averages to build off of the holiday count variable.
TimeTrendVariable	Set to TRUE to have a time trend variable added to the model. Time trend is numeric variable indicating the numeric value of each record in the time series (by group). Time trend starts at 1 for the earliest point in time and increments by one for each success time point.
ZeroPadSeries	NULL to do nothing. Otherwise, set to "maxmax", "minmax", "maxmin", "minmin". See <a href="#">TimeSeriesFill</a> for explanations of each type
DataTruncate	Set to TRUE to remove records with missing values from the lags and moving average features created
SplitRatios	E.g c(0.7,0.2,0.1) for train, validation, and test sets

PartitionType	Select "random" for random data partitioning "timeseries" for partitioning by time frames
TaskType	Default is "GPU" but you can also set it to "CPU"
NumGPU	Defaults to 1. If CPU is set this argument will be ignored.
DebugMode	Defaults to FALSE. Set to TRUE to get a print statement of each high level comment in function
EvalMetric	Select from "RMSE", "MAE", "MAPE", "Poisson", "Quantile", "LogLinQuantile", "Lq", "NumErrors", "SMAPE", "R2", "MSLE", "MedianAbsoluteError"
EvalMetricValue	Used when EvalMetric accepts an argument. See <a href="#">AutoCatBoostRegression</a>
LossFunction	Used in model training for model fitting. Select from 'RMSE', 'MAE', 'Quantile', 'LogLinQuantile', 'MAPE', 'Poisson', 'PairLogitPairwise', 'Tweedie', 'QueryRMSE'
LossFunctionValue	Used when LossFunction accepts an argument. See <a href="#">AutoCatBoostRegression</a>
GridTune	Set to TRUE to run a grid tune
PassInGrid	Defaults to NULL
ModelCount	Set the number of models to try in the grid tune
MaxRunsWithoutNewWinner	Default is 50
MaxRunMinutes	Default is 60*60
Langevin	Enables the Stochastic Gradient Langevin Boosting mode. If TRUE and TaskType == "GPU" then TaskType will be converted to "CPU"
DiffusionTemperature	Default is 10000
NTrees	Select the number of trees you want to have built to train the model
L2_Leaf_Reg	l2 reg parameter
LearningRate	Defaults to NULL. Catboost will dynamically define this if L2_Leaf_Reg is NULL and RMSE is chosen (otherwise catboost will default it to 0.03). Then you can pull it out of the model object and pass it back in should you wish.
RandomStrength	Default is 1
BorderCount	Default is 254
Depth	Depth of catboost model
RSM	CPU only. If TaskType is GPU then RSM will not be used
BootStrapType	If NULL, then if TaskType is GPU then Bayesian will be used. If CPU then MVS will be used. If MVS is selected when TaskType is GPU, then BootStrapType will be switched to Bayesian
GrowPolicy	Default is SymmetricTree. Others include Lossguide and Depthwise
Timer	Set to FALSE to turn off the updating print statements for progress
ModelSizeReg	Defaults to 0.5. Set to 0 to allow for bigger models. This is for models with high cardinality categorical features. Values greater than 0 will shrink the model and quality will decline but models won't be huge.
FeatureBorderType	Defaults to "GreedyLogSum". Other options include: Median, Uniform, UniformAndQuantiles, MaxLogSum, MinEntropy



SamplingUnit	Default is Group. Other option is Object. if GPU is selected, this will be turned off unless the loss_function is YetiRankPairWise
SubSample	Can use if BootstrapType is neither Bayesian nor No. Pass NULL to use Cat-boost default. Used for bagging.
ScoreFunction	Default is Cosine. CPU options are Cosine and L2. GPU options are Cosine, L2, NewtonL2, and NewtonCosine (not available for Lossguide)
MinDataInLeaf	Defaults to 1. Used if GrowPolicy is not SymmetricTree

**Value**

See examples

**Author(s)**

Adrian Antico

**See Also**

Other Automated Panel Data Forecasting: [AutoCatBoostHurdleCARMA\(\)](#), [AutoCatBoostVectorCARMA\(\)](#), [AutoH2OCARMA\(\)](#), [AutoXGBoostCARMA\(\)](#)

**Examples**

```
## Not run:

# Set up your output file path for saving results as a .csv
Path <- "C:/YourPathHere"

# Run on GPU or CPU (some options in the grid tuning force usage of CPU for some runs)
TaskType = "GPU"

# Define number of CPU threads to allow data.table to utilize
data.table::setDTthreads(percent = max(1L, parallel::detectCores()-2L))

# Load data
data <- data <- data.table::fread("https://www.dropbox.com/s/2str3ek4f4cheqi/walmart_train.csv?dl=1")

# Ensure series have no missing dates (also remove series with more than 25% missing values)
data <- RemixAutoML::TimeSeriesFill(
  data,
  DateColumnName = "Date",
  GroupVariables = c("Store", "Dept"),
  TimeUnit = "weeks",
  FillType = "maxmax",
  MaxMissingPercent = 0.25,
  SimpleImpute = TRUE)

# Set negative numbers to 0
data <- data[, Weekly_Sales := data.table::fifelse(Weekly_Sales < 0, 0, Weekly_Sales)]

# Remove IsHoliday column
data[, IsHoliday := NULL]

# Create xregs (this is the include the categorical variables instead of utilizing only the interaction of them)
xregs <- data[, .SD, .SDcols = c("Date", "Store", "Dept")]
```

```

# Change data types
data[, "]:= (Store = as.character(Store), Dept = as.character(Dept))]
xregs[, "]:= (Store = as.character(Store), Dept = as.character(Dept))]

# Subset data so we have an out of time sample
data1 <- data.table::copy(data[, ID := 1L:.N, by = c("Store","Dept")][ID <= 125L][, ID := NULL])
data[, ID := NULL]

# Define values for SplitRatios and FCWindow Args
N1 <- data1[, .N, by = c("Store","Dept")][1L, N]
N2 <- xregs[, .N, by = c("Store","Dept")][1L, N]

# Setup Grid Tuning & Feature Tuning data.table using a cross join of vectors
Tuning <- data.table::CJ(
  TimeWeights = c("None",0.999),
  MaxTimeGroups = c("weeks","months"),
  TargetTransformation = c("TRUE","FALSE"),
  Difference = c("TRUE","FALSE"),
  HoldoutTrain = c(6,18),
  Langevin = c("TRUE","FALSE"),
  NTrees = c(2500,5000),
  Depth = c(6,9),
  RandomStrength = c(0.75,1),
  L2_Leaf_Reg = c(3.0,4.0),
  RSM = c(0.75,"NULL"),
  GrowPolicy = c("SymmetricTree","Lossguide","Depthwise"),
  BootstrapType = c("Bayesian","MVS","No"))

# Remove options that are not compatible with GPU (skip over this otherwise)
Tuning <- Tuning[Langevin == "TRUE" | (Langevin == "FALSE" & RSM == "NULL" & BootstrapType %in% c("Bayesian","No"))]

# Randomize order of Tuning data.table
Tuning <- Tuning[order(runif(.N))]

# Load grid results and remove rows that have already been tested
if(file.exists(file.path(Path, "Walmart_CARMA_Metrics.csv"))) {
  Metrics <- data.table::fread(file.path(Path, "Walmart_CARMA_Metrics.csv"))
  temp <- data.table::rbindlist(list(Metrics,Tuning), fill = TRUE)
  temp <- unique(temp, by = c(4:(ncol(temp)-1)))
  Tuning <- temp[is.na(RunTime)][, .SD, .SDcols = names(Tuning)]
  rm(Metrics,temp)
}

# Define the total number of runs
TotalRuns <- Tuning[,.N]

# Kick off feature + grid tuning
for(Run in seq_len(TotalRuns)) {

  # Print run number
  for(zz in seq_len(100)) print(Run)

  # Use fresh data for each run
  xregs_new <- data.table::copy(xregs)
  data_new <- data.table::copy(data1)

```

```

# Timer start
StartTime <- Sys.time()

# Run carma system
CatBoostResults <- RemixAutoML::AutoCatBoostCARMA(

  # data args
  data = data_new,
  TimeWeights = if(Tuning[Run, TimeWeights] == "None") NULL else as.numeric(Tuning[Run, TimeWeights]),
  TargetColumnName = "Weekly_Sales",
  DateColumnName = "Date",
  HierarchGroups = NULL,
  GroupVariables = c("Store", "Dept"),
  TimeUnit = "weeks",
  TimeGroups = if(Tuning[Run, MaxTimeGroups] == "weeks") "weeks" else if(Tuning[Run, MaxTimeGroups] == "months") "months",

  # Production args
  TrainOnFull = TRUE,
  SplitRatios = c(1 - Tuning[Run, HoldoutTrain] / N2, Tuning[Run, HoldoutTrain] / N2),
  PartitionType = "random",
  FC_Periods = N2-N1,
  TaskType = TaskType,
  NumGPU = 1,
  Timer = TRUE,
  DebugMode = TRUE,

  # Target variable transformations
  TargetTransformation = as.logical(Tuning[Run, TargetTransformation]),
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", "Logit"),
  Difference = as.logical(Tuning[Run, Difference]),
  NonNegativePred = TRUE,
  RoundPreds = FALSE,

  # Calendar-related features
  CalendarVariables = c("week", "wom", "month", "quarter"),
  HolidayVariable = c("USPublicHolidays"),
  HolidayLags = c(1,2,3),
  HolidayMovingAverages = c(2,3),

  # Lags, moving averages, and other rolling stats
  Lags = if(Tuning[Run, MaxTimeGroups] == "weeks") c(1,2,3,4,5,8,9,12,13,51,52,53) else if(Tuning[Run, MaxTimeGroups] == "months") c(1,2,3,4,5,8,9,12,13,51,52,53),
  MA_Periods = if(Tuning[Run, MaxTimeGroups] == "weeks") c(2,3,4,5,8,9,12,13,51,52,53) else if(Tuning[Run, MaxTimeGroups] == "months") c(2,3,4,5,8,9,12,13,51,52,53),
  SD_Periods = NULL,
  Skew_Periods = NULL,
  Kurt_Periods = NULL,
  Quantile_Periods = NULL,
  Quantiles_Selected = NULL,

  # Bonus features
  AnomalyDetection = NULL,
  XREGS = xregs_new,
  FourierTerms = 0,
  TimeTrendVariable = TRUE,
  ZeroPadSeries = NULL,
  DataTruncate = FALSE,

  # ML grid tuning args

```

```

GridTune = FALSE,
PassInGrid = NULL,
ModelCount = 5,
MaxRunsWithoutNewWinner = 50,
MaxRunMinutes = 60*60,

# ML evaluation output
PDFOutputPath = NULL,
SaveDataPath = NULL,
NumOfParDepPlots = 0L,

# ML loss functions
EvalMetric = "RMSE",
EvalMetricValue = 1,
LossFunction = "RMSE",
LossFunctionValue = 1,

# ML tuning args
NTrees = Tuning[Run, NTrees],
Depth = Tuning[Run, Depth],
L2_Leaf_Reg = Tuning[Run, L2_Leaf_Reg],
LearningRate = 0.03,
Langevin = as.logical(Tuning[Run, Langevin]),
DiffusionTemperature = 10000,
RandomStrength = Tuning[Run, RandomStrength],
BorderCount = 254,
RSM = if(Tuning[Run, RSM] == "NULL") NULL else as.numeric(Tuning[Run, RSM]),
GrowPolicy = Tuning[Run, GrowPolicy],
BootStrapType = Tuning[Run, BootStrapType],
ModelSizeReg = 0.5,
FeatureBorderType = "GreedyLogSum",
SamplingUnit = "Group",
SubSample = NULL,
ScoreFunction = "Cosine",
MinDataInLeaf = 1)

# Timer End
EndTime <- Sys.time()

# Prepare data for evaluation
Results <- CatBoostResults$Forecast
data.table::setnames(Results, "Weekly_Sales", "bla")
Results <- merge(Results, data, by = c("Store", "Dept", "Date"), all = FALSE)
Results <- Results[is.na(bla)][, bla := NULL]

# Create totals and subtotals
Results <- data.table::groupingsets(
  x = Results,
  j = list(Predictions = sum(Predictions), Weekly_Sales = sum(Weekly_Sales)),
  by = c("Date", "Store", "Dept"),
  sets = list(c("Date", "Store", "Dept"), c("Store", "Dept"), "Store", "Dept", "Date"))

# Fill NAs with "Total" for totals and subtotals
for(cols in c("Store", "Dept")) Results[, eval(cols) := data.table::fifelse(is.na(get(cols)), "Total", get(cols))]

# Add error measures
Results[, Weekly_MAE := abs(Weekly_Sales - Predictions)]

```

```

Results[, Weekly_MAPE := Weekly_MAE / Weekly_Sales]

# Weekly results
Weekly_MAPE <- Results[, list(Weekly_MAPE = mean(Weekly_MAPE)), by = list(Store,Dept)]

# Monthly results
temp <- data.table::copy(Results)
temp <- temp[, Date := lubridate::floor_date(Date, unit = "months")]
temp <- temp[, lapply(.SD, sum), by = c("Date", "Store", "Dept"), .SDcols = c("Predictions", "Weekly_Sales")]
temp[, Monthly_MAE := abs(Weekly_Sales - Predictions)]
temp[, Monthly_MAPE := Monthly_MAE / Weekly_Sales]
Monthly_MAPE <- temp[, list(Monthly_MAPE = mean(Monthly_MAPE)), by = list(Store,Dept)]

# Collect metrics for Total (feel free to switch to something else or no filter at all)
Metrics <- data.table::data.table(
  RunNumber = Run,
  Total_Weekly_MAPE = Weekly_MAPE[Store == "Total" & Dept == "Total", Weekly_MAPE],
  Total_Monthly_MAPE = Monthly_MAPE[Store == "Total" & Dept == "Total", Monthly_MAPE],
  Tuning[Run],
  RunTime = EndTime - StartTime)

# Append to file (not overwrite)
data.table::fwrite(Metrics, file = file.path(Path, "Walmart_CARMA_Metrics.csv"), append = TRUE)

# Remove objects (clear space before new runs)
rm(CatBoostResults, Results, temp, Weekly_MAE, Weekly_MAPE, Monthly_MAE, Monthly_MAPE)

# Garbage collection because of GPU
gc()
}

## End(Not run)

```

---

## AutoCatBoostClassifier

*AutoCatBoostClassifier is an automated catboost model grid-tuning classifier and evaluation system*

---

### Description

AutoCatBoostClassifier is an automated modeling function that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train, validation, and test sets (if not supplied). Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions (on test data), an ROC plot, evaluation plot, evaluation metrics, variable importance, partial dependence calibration plots, partial dependence calibration box plots, and column names used in model fitting. You can download the catboost package using devtools, via: `devtools::install_github('catboost/catboost', subdir = 'catboost/R-package')`

### Usage

```
AutoCatBoostClassifier(
```

```

data,
TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
TargetColumnName = NULL,
FeatureColNames = NULL,
PrimaryDateColumn = NULL,
ClassWeights = c(1, 1),
CostMatrixWeights = c(1, 0, 0, 1),
IDcols = NULL,
task_type = "GPU",
NumGPUs = 1,
eval_metric = "MCC",
loss_function = NULL,
model_path = NULL,
metadata_path = NULL,
SaveInfoToPDF = FALSE,
ModelID = "FirstModel",
NumOfParDepPlots = 0L,
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
PassInGrid = NULL,
GridTune = FALSE,
MaxModelsInGrid = 30L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 24L * 60L,
Shuffles = 1L,
BaselineComparison = "default",
MetricPeriods = 10L,
langevin = FALSE,
diffusion_temperature = 10000,
Trees = 50L,
Depth = 6,
LearningRate = NULL,
L2_Leaf_Reg = 3,
RandomStrength = 1,
BorderCount = 128,
RSM = NULL,
BootstrapType = NULL,
GrowPolicy = NULL,
model_size_reg = 0.5,
feature_border_type = "GreedyLogSum",
sampling_unit = "Group",
subsample = NULL,
score_function = "Cosine",
min_data_in_leaf = 1
)

```

## Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data and skip over evaluation steps

ValidationData	This is your holdout data set used in modeling either refine your hyperparameters. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TestData	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TargetColumnName	Either supply the target column name OR the column number where the target is located, but not mixed types. Note that the target column needs to be a 0   1 numeric variable.
FeatureColNames	Either supply the feature column names OR the column number where the target is located, but not mixed types. Also, not zero-indexed.
PrimaryDateColumn	Supply a date or datetime column for catboost to utilize time as its basis for handling categorical features, instead of random shuffling
ClassWeights	Supply a vector of weights for your target classes. E.g. c(0.25, 1) to weight your 0 class by 0.25 and your 1 class by 1.
CostMatrixWeights	A vector with 4 elements c(True Positive Cost, False Negative Cost, False Positive Cost, True Negative Cost). Default c(1,0,0,1),
IDcols	A vector of column names or column numbers to keep in your data but not include in the modeling.
task_type	Set to "GPU" to utilize your GPU for training. Default is "CPU".
NumGPUs	Numeric. If you have 4 GPUs supply 4 as a value.
eval_metric	This is the metric used inside catboost to measure performance on validation data during a grid-tune. "AUC" is the default. 'Logloss', 'CrossEntropy', 'Precision', 'Recall', 'F1', 'BalancedAccuracy', 'BalancedErrorRate', 'MCC', 'Accuracy', 'CtrFactor', 'AUC', 'BrierScore', 'HingeLoss', 'HammingLoss', 'ZeroOneLoss', 'Kappa', 'WKappa', 'LogLikelihoodOfPrediction', 'TotalF1', 'PairLogit', 'PairLogitPairwise', 'PairAccuracy', 'QueryCrossEntropy', 'QuerySoftMax', 'PFound', 'NDCG', 'AverageGain', 'PrecisionAt', 'RecallAt', 'MAP'
loss_function	Default is NULL. Select the loss function of choice. c("MultiRMSE", 'Logloss', 'CrossEntropy', 'Lq',
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
SaveInfoToPDF	Set to TRUE to save modeling information to PDF. If model_path or metadata_path aren't defined then output will be saved to the working directory
ModelID	A character string to name your model and output
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)
ReturnModelObjects	Set to TRUE to output all modeling objects. E.g. plots and evaluation metrics
SaveModelObjects	Set to TRUE to return all modeling objects to your environment

PassInGrid	Defaults to NULL. Pass in a single row of grid from a previous output as a data.table (they are collected as data.tables)
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
MaxModelsInGrid	Number of models to test from grid options.
MaxRunsWithoutNewWinner	A number
MaxRunMinutes	In minutes
Shuffles	Numeric. List a number to let the program know how many times you want to shuffle the grids for grid tuning
BaselineComparison	Set to either "default" or "best". Default is to compare each successive model build to the baseline model using max trees (from function args). Best makes the comparison to the current best model.
MetricPeriods	Number of trees to build before evaluating intermediate metrics. Default is 10L
langevin	TRUE or FALSE. TRUE enables
diffusion_temperature	Default value is 10000
Trees	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the trees numbers you want to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1000L, 10000L, 1000L)
Depth	Bandit grid partitioned Number, or vector for depth to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(4L, 16L, 2L)
LearningRate	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the LearningRate values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.01,0.02,0.03,0.04)
L2_Leaf_Reg	Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the L2_Leaf_Reg values to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1.0, 10.0, 1.0)
RandomStrength	A multiplier of randomness added to split evaluations. Default value is 1 which adds no randomness.
BorderCount	Number of splits for numerical features. Catboost defaults to 254 for CPU and 128 for GPU
RSM	CPU only. Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the RSM values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.80, 0.85, 0.90, 0.95, 1.0)
BootStrapType	Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the BootStrapType values to test. For running grid tuning, a NULL value supplied will mean these values are tested c("Bayesian", "Bernoulli", "Poisson", "MVS", "No")
GrowPolicy	Random testing. NULL, character, or vector for GrowPolicy to test. For grid tuning, supply a vector of values. For running grid tuning, a NULL value supplied will mean these values are tested c("SymmetricTree", "Depthwise", "Loss-guide")



model_size_reg	Defaults to 0.5. Set to 0 to allow for bigger models. This is for models with high cardinality categorical features. Values greater than 0 will shrink the model and quality will decline but models won't be huge.
feature_border_type	Defaults to "GreedyLogSum". Other options include: Median, Uniform, UniformAndQuantiles, MaxLogSum, MinEntropy
sampling_unit	Default is Group. Other option is Object. if GPU is selected, this will be turned off unless the loss_function is YetiRankPairWise
subsample	Default is NULL. Catboost will turn this into 0.66 for BootstrapTypes Poisson and Bernoulli. 0.80 for MVS. Doesn't apply to others.
score_function	Default is Cosine. CPU options are Cosine and L2. GPU options are Cosine, L2, NewtonL2, and NewtonCosine (not available for Lossguide)
min_data_in_leaf	Default is 1. Cannot be used with SymmetricTree is GrowPolicy

**Value**

Saves to file and returned in list: VariableImportance.csv, Model (the model), ValidationData.csv, ROC\_Plot.png, EvaluationPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Binary Classification: [AutoH2oDRFClassifier\(\)](#), [AutoH2oGAMClassifier\(\)](#), [AutoH2oGBMClassifier\(\)](#), [AutoH2oGLMClassifier\(\)](#), [AutoH2oMLClassifier\(\)](#), [AutoXGBoostClassifier\(\)](#)

**Examples**

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 10000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = TRUE,
  MultiClass = FALSE)

# Run function
TestModel <- RemixAutoML::AutoCatBoostClassifier(

  # GPU or CPU and the number of available GPUs
  task_type = "GPU",
  NumGPUs = 1,

  # Metadata args
  ModelID = "Test_Model_1",
  model_path = normalizePath("./"),
  metadata_path = normalizePath("./"),
```

```

SaveModelObjects = FALSE,
ReturnModelObjects = TRUE,
SaveInfoToPDF = FALSE,

# Data args
data = data,
TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
TargetColumnName = "Adrian",
FeatureColNames = names(data)[!names(data) %in%
  c("IDcol_1", "IDcol_2", "Adrian")],
PrimaryDateColumn = NULL,
ClassWeights = c(1L, 1L),
IDcols = c("IDcol_1", "IDcol_2"),

# Evaluation args
CostMatrixWeights = c(1, 0, 0, 1),
eval_metric = "AUC",
loss_function = "Logloss",
MetricPeriods = 10L,
NumOfParDepPlots = ncol(data) - 1L - 2L,

# Grid tuning args
PassInGrid = NULL,
GridTune = TRUE,
MaxModelsInGrid = 30L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 24L * 60L,
Shuffles = 4L,
BaselineComparison = "default",

# ML args
Trees = seq(100L, 500L, 50L),
Depth = seq(4L, 8L, 1L),
LearningRate = seq(0.01, 0.10, 0.01),
L2_Leaf_Reg = seq(1.0, 10.0, 1.0),
RandomStrength = 1,
BorderCount = 128,
RSM = c(0.80, 0.85, 0.90, 0.95, 1.0),
BootStrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
GrowPolicy = c("SymmetricTree", "Depthwise", "Lossguide"),
langevin = FALSE,
diffusion_temperature = 10000,
model_size_reg = 0.5,
feature_border_type = "GreedyLogSum",
sampling_unit = "Group",
subsample = NULL,
score_function = "Cosine",
min_data_in_leaf = 1)

# Output
TestModel$Model
TestModel$ValidationData
TestModel$ROC_Plot
TestModel$EvaluationPlot
TestModel$EvaluationMetrics

```

```

TestModel$VariableImportance
TestModel$InteractionImportance
TestModel$ShapValuesDT
TestModel$VI_Plot
TestModel$PartialDependencePlots
TestModel$GridMetrics
TestModel$ColNames

## End(Not run)

```

---

AutoCatBoostFreqSizeScoring

*AutoCatBoostFreqSizeScoring is for scoring the models build with AutoCatBoostSizeFreqDist()*

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## Description

AutoCatBoostFreqSizeScoring is for scoring the models build with AutoCatBoostSizeFreqDist(). It will return the predicted values for every quantile model for both distributions for 1 to the max forecast periods you provided to build the scoring data.

## Usage

```

AutoCatBoostFreqSizeScoring(
  ScoringData,
  TargetColumnNames = NULL,
  FeatureColumnNames = NULL,
  IDcols = NULL,
  CountQuantiles = seq(0.1, 0.9, 0.1),
  SizeQuantiles = seq(0.1, 0.9, 0.1),
  ModelPath = NULL,
  ModelIDs = c("CountModel", "SizeModel"),
  KeepFeatures = TRUE
)

```

## Arguments

ScoringData	The scoring data returned from IntermittentDemandScoringDataGenerator()
TargetColumnNames	A character or numeric vector of the target names. E.g. c("Counts", "TARGET_qty")
FeatureColumnNames	A character vector of column names or column numbers
IDcols	ID columns you want returned with the data that is not a model feature
CountQuantiles	A numerical vector of the quantiles used in model building
SizeQuantiles	A numerical vector of the quantiles used in model building
ModelPath	The path file to where you models were saved
ModelIDs	The ID's used in model building
KeepFeatures	Set to TRUE to return the features with the predicted values

**Value**

Returns a list of CountData scores, SizeData scores, along with count and size prediction column names

**Author(s)**

Adrian Antico

**See Also**

Other Automated Time Series: [AutoArfima\(\)](#), [AutoBanditNNet\(\)](#), [AutoBanditSarima\(\)](#), [AutoETS\(\)](#), [AutoH2oGBMFreqSizeScoring\(\)](#), [AutoTBATS\(\)](#), [AutoTS\(\)](#)

**Examples**

```
## Not run:
FinalData <- AutoCatBoostFreqSizeScoring(
  ScoringData,
  TargetColumnNames = c("Counts", "TARGET_qty"),
  FeatureColumnNames = 1:ncol(ScoringData),
  IDcols = NULL,
  CountQuantiles = seq(0.10, 0.90, 0.10),
  SizeQuantiles = seq(0.10, 0.90, 0.10),
  ModelPath = getwd(),
  ModelIDs = c("CountModel", "SizeModel"),
  KeepFeatures = TRUE)

## End(Not run)
```

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AutoCatBoostHurdleCARMA

*AutoCatBoostHurdleCARMA*

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**Description**

AutoCatBoostHurdleCARMA is an intermittent demand, Multivariate Forecasting algorithms with calendar variables, Holiday counts, holiday lags, holiday moving averages, differencing, transformations, interaction-based categorical encoding using target variable and features to generate various time-based aggregated lags, moving averages, moving standard deviations, moving skewness, moving kurtosis, moving quantiles, parallelized interaction-based fourier pairs by grouping variables, and Trend Variables.

**Usage**

```
AutoCatBoostHurdleCARMA(
  data,
  NonNegativePred = FALSE,
  Threshold = NULL,
  RoundPreds = FALSE,
  TrainOnFull = FALSE,
  TargetColumnName = "Target",
  DateColumnName = "DateTime",
```

```

HierarchGroups = NULL,
GroupVariables = NULL,
FC_Periods = 30,
TimeUnit = "week",
TimeGroups = c("weeks", "months"),
NumOfParDepPlots = 10L,
TargetTransformation = FALSE,
Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
  "Logit"),
AnomalyDetection = NULL,
XREGS = NULL,
Lags = c(1L:5L),
MA_Periods = c(2L:5L),
SD_Periods = NULL,
Skew_Periods = NULL,
Kurt_Periods = NULL,
Quantile_Periods = NULL,
Quantiles_Selected = c("q5", "q95"),
Difference = TRUE,
FourierTerms = 6L,
CalendarVariables = c("second", "minute", "hour", "wday", "mday", "yday", "week",
  "wom", "isoweek", "month", "quarter", "year"),
HolidayVariable = c("USPublicHolidays", "EasterGroup", "ChristmasGroup",
  "OtherEccelesticalFeasts"),
HolidayLags = 1L,
HolidayMovingAverages = 1L:2L,
TimeTrendVariable = FALSE,
ZeroPadSeries = NULL,
DataTruncate = FALSE,
SplitRatios = c(0.7, 0.2, 0.1),
TaskType = "GPU",
NumGPU = 1,
EvalMetric = "RMSE",
GridTune = FALSE,
PassInGrid = NULL,
ModelCount = 100,
MaxRunsWithoutNewWinner = 50,
MaxRunMinutes = 24L * 60L,
NTrees = list(classifier = seq(1000, 2000, 100), regression = seq(1000, 2000, 100)),
Depth = list(classifier = seq(6, 10, 1), regression = seq(6, 10, 1)),
LearningRate = list(classifier = seq(0.01, 0.25, 0.01), regression = seq(0.01, 0.25,
  0.01)),
L2_Leaf_Reg = list(classifier = 3:6, regression = 3:6),
RandomStrength = list(classifier = 1:10, regression = 1:10),
BorderCount = list(classifier = seq(32, 256, 16), regression = seq(32, 256, 16)),
BootStrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
PartitionType = "timeseries",
Timer = TRUE,
DebugMode = FALSE
)

```

**Arguments**

data	Supply your full series data set here
NonNegativePred	TRUE or FALSE
Threshold	Select confusion matrix measure to optimize for pulling in threshold. Choose from "MCC", "Acc", "TPR", "TNR", "FNR", "FPR", "FDR", "FOR", "F1_Score", "F2_Score", "F0.5_Score", "NPV", "PPV", "ThreatScore", "Utility"
RoundPreds	Rounding predictions to an integer value. TRUE or FALSE. Defaults to FALSE
TrainOnFull	Set to TRUE to train on full data
TargetColumnName	List the column name of your target variables column. E.g. "Target"
DateColumnName	List the column name of your date column. E.g. "DateTime"
HierarchGroups	Vector of hierachy categorical columns.
GroupVariables	Defaults to NULL. Use NULL when you have a single series. Add in Group-Variables when you have a series for every level of a group or multiple groups.
FC_Periods	Set the number of periods you want to have forecasts for. E.g. 52 for weekly data to forecast a year ahead
TimeUnit	List the time unit your data is aggregated by. E.g. "1min", "5min", "10min", "15min", "30min", "hour", "day", "week", "month", "quarter", "year".
TimeGroups	Select time aggregations for adding various time aggregated GDL features.
NumOfParDepPlots	Supply a number for the number of partial dependence plots you want returned
TargetTransformation	Run AutoTransformationCreate() to find best transformation for the target variable. Tests YeoJohnson, BoxCox, and Asigh (also Asin and Logit for proportion target variables).
Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
AnomalyDetection	NULL for not using the service. Other, provide a list, e.g. AnomalyDetection = list("tstat_high" = 4, tstat_low = -4)
XREGS	Additional data to use for model development and forecasting. Data needs to be a complete series which means both the historical and forward looking values over the specified forecast window needs to be supplied.
Lags	Select the periods for all lag variables you want to create. E.g. c(1:5,52)
MA_Periods	Select the periods for all moving average variables you want to create. E.g. c(1:5,52)
SD_Periods	Select the periods for all moving standard deviation variables you want to create. E.g. c(1:5,52)
Skew_Periods	Select the periods for all moving skewness variables you want to create. E.g. c(1:5,52)
Kurt_Periods	Select the periods for all moving kurtosis variables you want to create. E.g. c(1:5,52)

Quantile_Periods	Select the periods for all moving quantiles variables you want to create. E.g. <code>c(1:5,52)</code>
Quantiles_Selected	Select from the following "q5", "q10", "q15", "q20", "q25", "q30", "q35", "q40", "q45", "q50", "q55", "q60", "q65", "q70", "q75", "q80", "q85", "q90", "q95"
Difference	Puts the I in ARIMA for single series and grouped series.
FourierTerms	Set to the max number of pairs. E.g. 2 means to generate two pairs for by each group level and iterations if hierarchy is enabled.
CalendarVariables	NULL, or select from "second", "minute", "hour", "wday", "mday", "yday", "week", "isoweek", "month", "quarter", "year"
HolidayVariable	NULL, or select from "USPublicHolidays", "EasterGroup", "ChristmasGroup", "OtherEcclesticalFeasts"
HolidayLags	Number of lags to build off of the holiday count variable.
HolidayMovingAverages	Number of moving averages to build off of the holiday count variable.
TimeTrendVariable	Set to TRUE to have a time trend variable added to the model. Time trend is numeric variable indicating the numeric value of each record in the time series (by group). Time trend starts at 1 for the earliest point in time and increments by one for each success time point.
ZeroPadSeries	Set to "all", "inner", or NULL. See TimeSeriesFill for explanation
DataTruncate	Set to TRUE to remove records with missing values from the lags and moving average features created
SplitRatios	E.g <code>c(0.7,0.2,0.1)</code> for train, validation, and test sets
TaskType	Default is "GPU" but you can also set it to "CPU"
NumGPU	Defaults to 1. If CPU is set this argument will be ignored.
EvalMetric	Select from "RMSE", "MAE", "MAPE", "Poisson", "Quantile", "LogLinQuantile", "Lq", "NumErrors", "SMAPE", "R2", "MSLE", "MedianAbsoluteError"
GridTune	Set to TRUE to run a grid tune
PassInGrid	Defaults to NULL
ModelCount	Set the number of models to try in the grid tune
MaxRunsWithoutNewWinner	Default is 50
MaxRunMinutes	Default is 60*60
NTrees	Select the number of trees you want to have built to train the model
Depth	Depth of catboost model
LearningRate	<code>learning_rate</code>
L2_Leaf_Reg	<code>l2 reg parameter</code>
RandomStrength	Default is 1
BorderCount	Default is 254
BootstrapType	Select from Catboost list

PartitionType	Select "random" for random data partitioning "timeseries" for partitioning by time frames
Timer	Set to FALSE to turn off the updating print statements for progress
DebugMode	Defaults to FALSE. Set to TRUE to get a print statement of each high level comment in function

### Value

Returns a data.table of original series and forecasts, the catboost model objects (everything returned from AutoCatBoostRegression()), a time series forecast plot, and transformation info if you set TargetTransformation to TRUE. The time series forecast plot will plot your single series or aggregate your data to a single series and create a plot from that.

### Author(s)

Adrian Antico

### See Also

Other Automated Panel Data Forecasting: [AutoCatBoostCARMA\(\)](#), [AutoCatBoostVectorCARMA\(\)](#), [AutoH2OCARMA\(\)](#), [AutoXGBoostCARMA\(\)](#)

### Examples

```
## Not run:

# Single group variable and xregs ----

# Load Walmart Data from Dropbox----
data <- data.table::fread(
  "https://www.dropbox.com/s/2str3ek4f4cheqi/walmart_train.csv?dl=1")

# Subset for Stores / Departments With Full Series
data <- data[, Counts := .N, by = c("Store", "Dept")][Counts == 143][
  , Counts := NULL]

# Subset Columns (remove IsHoliday column)----
keep <- c("Store", "Dept", "Date", "Weekly_Sales")
data <- data[, .keep]
data <- data[Store == 1][, Store := NULL]
xregs <- data.table::copy(data)
data.table::setnames(xregs, "Dept", "GroupVar")
data.table::setnames(xregs, "Weekly_Sales", "Other")
data <- data[as.Date(Date) < as.Date('2012-09-28')]

# Add zeros for testing
data[runif(.N) < 0.25, Weekly_Sales := 0]

# Build forecast
CatBoostResults <- RemixAutoML::AutoCatBoostHurdleCARMA(

# data args
data = data, # TwoGroup_Data,
TargetColumnName = "Weekly_Sales",
DateColumnName = "Date",
```



```

HierarchGroups = NULL,
GroupVariables = c("Dept"),
TimeUnit = "weeks",
TimeGroups = c("weeks", "months"),

# Production args
TrainOnFull = FALSE,
SplitRatios = c(1 - 20 / 138, 10 / 138, 10 / 138),
PartitionType = "random",
FC_Periods = 4,
Timer = TRUE,
DebugMode = TRUE,

# Target transformations
TargetTransformation = TRUE,
Methods = c("BoxCox", "Asinh", "Asin", "Log",
  "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),
Difference = FALSE,
NonNegativePred = FALSE,
RoundPreds = FALSE,

# Date features
CalendarVariables = c("week", "wom", "month", "quarter"),
HolidayVariable = c("USPublicHolidays",
  "EasterGroup",
  "ChristmasGroup", "OtherEcclesticalFeasts"),
HolidayLags = 1,
HolidayMovingAverages = 1:2,

# Time series features
Lags = list("weeks" = seq(2L, 10L, 2L),
  "months" = c(1:3)),
MA_Periods = list("weeks" = seq(2L, 10L, 2L),
  "months" = c(2,3)),
SD_Periods = NULL,
Skew_Periods = NULL,
Kurt_Periods = NULL,
Quantile_Periods = NULL,
Quantiles_Selected = c("q5", "q95"),

# Bonus features
AnomalyDetection = NULL,
XREGS = xregs,
FourierTerms = 2,
TimeTrendVariable = TRUE,
ZeroPadSeries = NULL,
DataTruncate = FALSE,

# ML Args
NumOfParDepPlots = 100L,
EvalMetric = "RMSE",
GridTune = FALSE,
PassInGrid = NULL,
ModelCount = 5,
TaskType = "GPU",
NumGPU = 1,
MaxRunsWithoutNewWinner = 50,

```

```

MaxRunMinutes = 60*60,
NTrees = 2500,
L2_Leaf_Reg = 3.0,
LearningRate = list("classifier" = seq(0.01,0.25,0.01), "regression" = seq(0.01,0.25,0.01)),
RandomStrength = 1,
BorderCount = 254,
BootstrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
Depth = 6)

# Two group variables and xregs

# Load Walmart Data from Dropbox----
data <- data.table::fread(
  "https://www.dropbox.com/s/2str3ek4f4cheqi/walmart_train.csv?dl=1")

# Subset for Stores / Departments With Full Series
data <- data[, Counts := .N, by = c("Store", "Dept")][Counts == 143][
  , Counts := NULL]

# Put negative values at 0
data[, Weekly_Sales := data.table::fifelse(Weekly_Sales < 0, 0, Weekly_Sales)]

# Subset Columns (remove IsHoliday column)----
keep <- c("Store", "Dept", "Date", "Weekly_Sales")
data <- data[, ..keep]
data <- data[Store %in% c(1,2)]

xregs <- data.table::copy(data)
xregs[, GroupVar := do.call(paste, c(.SD, sep = " ")), .SDcols = c("Store", "Dept")]
xregs[, c("Store", "Dept") := NULL]
data.table::setnames(xregs, "Weekly_Sales", "Other")
xregs[, Other := jitter(Other, factor = 25)]
data <- data[as.Date(Date) < as.Date('2012-09-28')]

# Add some zeros for testing
data[runif(.N) < 0.25, Weekly_Sales := 0]

# Build forecast
Output <- RemixAutoML::AutoCatBoostHurdleCARMA(

  # data args
  data = data,
  TargetColumnName = "Weekly_Sales",
  DateColumnName = "Date",
  HierarchGroups = NULL,
  GroupVariables = c("Store", "Dept"),
  TimeUnit = "weeks",
  TimeGroups = c("weeks", "months"),

  # Production args
  TrainOnFull = TRUE,
  SplitRatios = c(1 - 20 / 138, 10 / 138, 10 / 138),
  PartitionType = "random",
  FC_Periods = 4,
  Timer = TRUE,
  DebugMode = TRUE,

```

```

# Target transformations
TargetTransformation = TRUE,
Methods = c("BoxCox", "Asinh", "Asin", "Log",
            "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),
Difference = FALSE,
NonNegativePred = FALSE,
Threshold = NULL,
RoundPreds = FALSE,

# Date features
CalendarVariables = c("week", "wom", "month", "quarter"),
HolidayVariable = c("USPublicHolidays",
                   "EasterGroup",
                   "ChristmasGroup", "OtherEcclesticalFeasts"),
HolidayLags = 1,
HolidayMovingAverages = 1:2,

# Time series features
Lags = list("weeks" = seq(2L, 10L, 2L),
            "months" = c(1:3)),
MA_Periods = list("weeks" = seq(2L, 10L, 2L),
                  "months" = c(2,3)),
SD_Periods = NULL,
Skew_Periods = NULL,
Kurt_Periods = NULL,
Quantile_Periods = NULL,
Quantiles_Selected = c("q5", "q95"),

# Bonus features
AnomalyDetection = NULL,
XREGS = xregs,
FourierTerms = 2,
TimeTrendVariable = TRUE,
ZeroPadSeries = NULL,
DataTruncate = FALSE,

# ML Args
NumOfParDepPlots = 100L,
EvalMetric = "RMSE",
GridTune = FALSE,
PassInGrid = NULL,
ModelCount = 5,
TaskType = "GPU",
NumGPU = 1,
MaxRunsWithoutNewWinner = 50,
MaxRunMinutes = 60*60,
NTrees = list("classifier" = seq(1000,2000,100), "regression" = seq(1000,2000,100)),
Depth = list("classifier" = seq(6,10,1), "regression" = seq(6,10,1)),
LearningRate = list("classifier" = seq(0.01,0.25,0.01), "regression" = seq(0.01,0.25,0.01)),
L2_Leaf_Reg = list("classifier" = 3.0:6.0, "regression" = 3.0:6.0),
RandomStrength = list("classifier" = 1:10, "regression" = 1:10),
BorderCount = list("classifier" = seq(32,256,16), "regression" = seq(32,256,16)),
BootstrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No")

## End(Not run)

```

---

AutoCatBoostHurdleModel

*AutoCatBoostHurdleModel for generalized hurdle modeling*


---

## Description

AutoCatBoostHurdleModel for generalized hurdle modeling. Check out the Readme.Rd on github for more background.

## Usage

```
AutoCatBoostHurdleModel(
  data = NULL,
  TimeWeights = NULL,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  Buckets = 0L,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  PrimaryDateColumn = NULL,
  IDcols = NULL,
  TransformNumericColumns = NULL,
  Methods = c("BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Logit", "YeoJohnson"),
  ClassWeights = NULL,
  SplitRatios = c(0.7, 0.2, 0.1),
  task_type = "GPU",
  ModelID = "ModelTest",
  Paths = NULL,
  MetaDataPaths = NULL,
  SaveModelObjects = FALSE,
  ReturnModelObjects = TRUE,
  NumOfParDepPlots = 10L,
  PassInGrid = NULL,
  GridTune = FALSE,
  BaselineComparison = "default",
  MaxModelsInGrid = 1L,
  MaxRunsWithoutNewWinner = 20L,
  MaxRunMinutes = 60L * 60L,
  Shuffles = 2L,
  MetricPeriods = 25L,
  Langevin = FALSE,
  DiffusionTemperature = 10000,
  Trees = list(classifier = seq(1000, 2000, 100), regression = seq(1000, 2000, 100)),
  Depth = list(classifier = seq(6, 10, 1), regression = seq(6, 10, 1)),
  RandomStrength = list(classifier = seq(1, 10, 1), regression = seq(1, 10, 1)),
  BorderCount = list(classifier = seq(32, 256, 16), regression = seq(32, 256, 16)),
  LearningRate = list(classifier = seq(0.01, 0.25, 0.01), regression = seq(0.01, 0.25,
    0.01)),
  L2_Leaf_Reg = list(classifier = seq(3, 10, 1), regression = seq(1, 10, 1)),
  RSM = list(classifier = c(0.8, 0.85, 0.9, 0.95, 1), regression = c(0.8, 0.85, 0.9,
```

```

    0.95, 1)),
  BootstrapType = list(classifier = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
    regression = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No")),
  GrowPolicy = list(classifier = c("SymmetricTree", "Depthwise", "Lossguide"),
    regression = c("SymmetricTree", "Depthwise", "Lossguide"))
)

```

## Arguments

<code>data</code>	Source training data. Do not include a column that has the class labels for the buckets as they are created internally.
<code>TimeWeights</code>	Supply a value that will be multiplied by the time trend value
<code>TrainOnFull</code>	Set to TRUE to use all data
<code>ValidationData</code>	Source validation data. Do not include a column that has the class labels for the buckets as they are created internally.
<code>TestData</code>	Source test data. Do not include a column that has the class labels for the buckets as they are created internally.
<code>Buckets</code>	A numeric vector of the buckets used for subsetting the data. NOTE: the final Bucket value will first create a subset of data that is less than the value and a second one thereafter for data greater than the bucket value.
<code>TargetColumnName</code>	Supply the column name or number for the target variable
<code>FeatureColNames</code>	Supply the column names or number of the features (not included the Primary-DateColumn)
<code>PrimaryDateColumn</code>	Supply a date column if the data is functionally related to it
<code>IDcols</code>	Includes PrimaryDateColumn and any other columns you want returned in the validation data with predictions
<code>TransformNumericColumns</code>	Transform numeric column inside the AutoCatBoostRegression() function
<code>Methods</code>	Choose transformation methods
<code>ClassWeights</code>	Utilize these for the classifier model
<code>SplitRatios</code>	Supply vector of partition ratios. For example, c(0.70,0.20,0,10).
<code>task_type</code>	Set to "GPU" or "CPU"
<code>ModelID</code>	Define a character name for your models
<code>Paths</code>	The path to your folder where you want your model information saved
<code>MetaDataPaths</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to Paths.
<code>SaveModelObjects</code>	Set to TRUE to save the model objects to file in the folders listed in Paths
<code>ReturnModelObjects</code>	TRUE to return the models
<code>NumOfParDepPlots</code>	Set to pull back N number of partial dependence calibration plots.
<code>PassInGrid</code>	Pass in a grid for changing up the parameter settings for catboost
<code>GridTune</code>	Set to TRUE if you want to grid tune the models

```

BaselineComparison      = "default",
MaxModelsInGrid         = 1L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes           = 60L*60L,
Shuffles                = 2L,
MetricPeriods           = 25L,
Langevin                 TRUE or FALSE
DiffusionTemperature     Default 10000

Trees                   Provide a named list to have different number of trees for each model. Trees =
                        list("classifier" = seq(1000,2000,100), "regression" = seq(1000,2000,100))

Depth                   = seq(4L, 8L, 1L),
RandomStrength          1
BorderCount             128
LearningRate            = seq(0.01,0.10,0.01),
L2_Leaf_Reg             = seq(1.0, 10.0, 1.0),
RSM                     = c(0.80, 0.85, 0.90, 0.95, 1.0),
BootStrapType           = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
GrowPolicy              = c("SymmetricTree", "Depthwise", "Lossguide")

```

### Value

Returns AutoCatBoostRegression() model objects: VariableImportance.csv, Model, ValidationData.csv, EvaluationPlot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, and catboost-grid

### Author(s)

Adrian Antico

### See Also

Other Supervised Learning - Compound: [AutoCatBoostSizeFreqDist\(\)](#), [AutoH2oDRFHurdleModel\(\)](#), [AutoH2oGBMHurdleModel\(\)](#), [AutoH2oGBMSizeFreqDist\(\)](#), [AutoXGBoostHurdleModel\(\)](#)

### Examples

```

## Not run:
Output <- RemixAutoML::AutoCatBoostHurdleModel(

  # Operationalization
  task_type = "GPU",
  ModelID = "ModelTest",
  SaveModelObjects = FALSE,
  ReturnModelObjects = TRUE,

```

```

# Data related args
data = data,
TimeWeights = NULL,
TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
Buckets = 0L,
TargetColumnName = NULL,
FeatureColNames = NULL,
PrimaryDateColumn = NULL,
IDcols = NULL,

# Metadata args
Paths = normalizePath("./"),
MetaDataPaths = NULL,
TransformNumericColumns = NULL,
Methods =
  c("BoxCox", "Asinh", "Asin", "Log",
    "LogPlus1", "Logit", "YeoJohnson"),
ClassWeights = NULL,
SplitRatios = c(0.70, 0.20, 0.10),
NumOfParDepPlots = 10L,

# Grid tuning setup
PassInGrid = NULL,
GridTune = FALSE,
BaselineComparison = "default",
MaxModelsInGrid = 1L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 60L*60L,
Shuffles = 2L,
MetricPeriods = 25L,

# Bandit grid args
Langevin = FALSE,
DiffusionTemperature = 10000,
Trees = list("classifier" = seq(1000,2000,100),
             "regression" = seq(1000,2000,100)),
Depth = list("classifier" = seq(6,10,1),
             "regression" = seq(6,10,1)),
RandomStrength = list("classifier" = seq(1,10,1),
                     "regression" = seq(1,10,1)),
BorderCount = list("classifier" = seq(32,256,16),
                  "regression" = seq(32,256,16)),
LearningRate = list("classifier" = seq(0.01,0.25,0.01),
                  "regression" = seq(0.01,0.25,0.01)),
L2_Leaf_Reg = list("classifier" = seq(3.0,10.0,1.0),
                  "regression" = seq(1.0,10.0,1.0)),
RSM = list("classifier" = c(0.80, 0.85, 0.90, 0.95, 1.0),
          "regression" = c(0.80, 0.85, 0.90, 0.95, 1.0)),
BootStrapType = list("classifier" = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
                   "regression" = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No")),
GrowPolicy = list("classifier" = c("SymmetricTree", "Depthwise", "Lossguide"),
                 "regression" = c("SymmetricTree", "Depthwise", "Lossguide"))

## End(Not run)

```

---

AutoCatBoostMultiClass

*AutoCatBoostMultiClass is an automated catboost model grid-tuning multinomial classifier and evaluation system*

---

## Description

AutoCatBoostMultiClass is an automated modeling function that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation metrics, variable importance, and column names used in model fitting. You can download the catboost package using devtools, via: `devtools::install_github('catboost/catboost', subdir = 'catboost/R-package')`.

## Usage

```
AutoCatBoostMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  PrimaryDateColumn = NULL,
  ClassWeights = NULL,
  IDcols = NULL,
  task_type = "GPU",
  NumGPUs = 1,
  eval_metric = "MultiClassOneVsAll",
  loss_function = "MultiClassOneVsAll",
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  PassInGrid = NULL,
  GridTune = FALSE,
  MaxModelsInGrid = 30L,
  MaxRunsWithoutNewWinner = 20L,
  MaxRunMinutes = 24L * 60L,
  grid_eval_metric = "Accuracy",
  Shuffles = 1L,
  BaselineComparison = "default",
  MetricPeriods = 10L,
  langevin = FALSE,
  diffusion_temperature = 10000,
  Trees = 50L,
  Depth = 6,
  LearningRate = NULL,
  L2_Leaf_Reg = NULL,
```



```

RandomStrength = 1,
BorderCount = 128,
RSM = NULL,
BootStrapType = NULL,
GrowPolicy = NULL,
model_size_reg = 0.5,
feature_border_type = "GreedyLogSum",
sampling_unit = "Group",
subsample = NULL,
score_function = "Cosine",
min_data_in_leaf = 1
)

```

### Arguments

data	This is your data set for training and testing your model
TrainOnFull	Set to TRUE to train on full data and skip over evaluation steps
ValidationData	This is your holdout data set used in modeling either refine your hyperparameters. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TestData	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TargetColumnName	Either supply the target column name OR the column number where the target is located, but not mixed types. Note that the target column needs to be a 0   1 numeric variable.
FeatureColNames	Either supply the feature column names OR the column number where the target is located, but not mixed types. Also, not zero-indexed.
PrimaryDateColumn	Supply a date or datetime column for catboost to utilize time as its basis for handling categorical features, instead of random shuffling
ClassWeights	Supply a vector of weights for your target classes. E.g. c(0.25, 1) to weight your 0 class by 0.25 and your 1 class by 1.
IDcols	A vector of column names or column numbers to keep in your data but not include in the modeling.
task_type	Set to "GPU" to utilize your GPU for training. Default is "CPU".
NumGPUs	Set to 1, 2, 3, etc.
eval_metric	Internal bandit metric. Select from 'MultiClass', 'MultiClassOneVsAll', 'AUC', 'TotalF1', 'MCC', 'Accuracy', 'HingeLoss', 'HammingLoss', 'ZeroOneLoss', 'Kappa', 'WKappa'
loss_function	Select from 'MultiClass' or 'MultiClassOneVsAll'
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
ModelID	A character string to name your model and output
ReturnModelObjects	Set to TRUE to output all modeling objects. E.g. plots and evaluation metrics

SaveModelObjects	Set to TRUE to return all modeling objects to your environment
PassInGrid	Defaults to NULL. Pass in a single row of grid from a previous output as a data.table (they are collected as data.tables)
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
MaxModelsInGrid	Number of models to test from grid options.
MaxRunsWithoutNewWinner	A number
MaxRunMinutes	In minutes
grid_eval_metric	For evaluating models within grid tuning. Choices include, "accuracy", "microauc", "logloss"
Shuffles	Numeric. List a number to let the program know how many times you want to shuffle the grids for grid tuning
BaselineComparison	Set to either "default" or "best". Default is to compare each successive model build to the baseline model using max trees (from function args). Best makes the comparison to the current best model.
MetricPeriods	Number of trees to build before evaluating intermediate metrics. Default is 10L
langevin	TRUE or FALSE. Enable stochastic gradient langevin boosting
diffusion_temperature	Default is 10000 and is only used when langevin is set to TRUE
Trees	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the trees numbers you want to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1000L, 10000L, 1000L)
Depth	Bandit grid partitioned. Number, or vector for depth to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(4L, 16L, 2L)
LearningRate	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the LearningRate values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.01,0.02,0.03,0.04)
L2_Leaf_Reg	Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the L2_Leaf_Reg values to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1.0, 10.0, 1.0)
RandomStrength	A multiplier of randomness added to split evaluations. Default value is 1 which adds no randomness.
BorderCount	Number of splits for numerical features. Catboost defaults to 254 for CPU and 128 for GPU
RSM	CPU only. Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the RSM values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.80, 0.85, 0.90, 0.95, 1.0)
BootStrapType	Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the BootStrapType values to test. For running grid tuning, a NULL value supplied will mean these values are tested c("Bayesian", "Bernoulli", "Poisson", "MVS", "No")

GrowPolicy	Random testing. NULL, character, or vector for GrowPolicy to test. For grid tuning, supply a vector of values. For running grid tuning, a NULL value supplied will mean these values are tested c("SymmetricTree", "Depthwise", "Loss-guide")
model_size_reg	Defaults to 0.5. Set to 0 to allow for bigger models. This is for models with high cardinality categorical features. Values greater than 0 will shrink the model and quality will decline but models won't be huge.
feature_border_type	Defaults to "GreedyLogSum". Other options include: Median, Uniform, UniformAndQuantiles, MaxLogSum, MinEntropy
sampling_unit	Default is Group. Other option is Object. if GPU is selected, this will be turned off unless the loss_function is YetiRankPairWise
subsample	Default is NULL. Catboost will turn this into 0.66 for BootstrapTypes Poisson and Bernoulli. 0.80 for MVS. Doesn't apply to others.
score_function	Default is Cosine. CPU options are Cosine and L2. GPU options are Cosine, L2, NewtonL2, and NewtonCosine (not available for Lossguide)
min_data_in_leaf	Default is 1. Cannot be used with SymmetricTree is GrowPolicy

**Value**

Saves to file and returned in list: VariableImportance.csv, Model (the model), ValidationData.csv, EvaluationMetrics.csv, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Multiclass Classification: [AutoH2oDRFMultiClass\(\)](#), [AutoH2oGAMMultiClass\(\)](#), [AutoH2oGBMMultiClass\(\)](#), [AutoH2oGLMMultiClass\(\)](#), [AutoH2oMLMultiClass\(\)](#), [AutoXGBoostMultiClass\(\)](#)

**Examples**

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 10000L,
  ID = 2L,
  ZIP = 0L,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = TRUE)

# Run function
TestModel <- RemixAutoML::AutoCatBoostMultiClass(

  # GPU or CPU and the number of available GPUs
  task_type = "GPU",
  NumGPUs = 1,
```

```

# Metadata args
ModelID = "Test_Model_1",
model_path = normalizePath("./"),
metadata_path = normalizePath("./"),
SaveModelObjects = FALSE,
ReturnModelObjects = TRUE,

# Data args
data = data,
TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
TargetColumnName = "Adrian",
FeatureColNames = names(data)[!names(data) %in%
  c("IDcol_1", "IDcol_2", "Adrian")],
PrimaryDateColumn = NULL,
ClassWeights = c(1L, 1L, 1L, 1L, 1L),
IDcols = c("IDcol_1", "IDcol_2"),

# Model evaluation
eval_metric = "MCC",
loss_function = "MultiClassOneVsAll",
grid_eval_metric = "Accuracy",
MetricPeriods = 10L,

# Grid tuning args
PassInGrid = NULL,
GridTune = TRUE,
MaxModelsInGrid = 30L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 24L*60L,
Shuffles = 4L,
BaselineComparison = "default",

# ML args
langevin = FALSE,
diffusion_temperature = 10000,
Trees = seq(100L, 500L, 50L),
Depth = seq(4L, 8L, 1L),
LearningRate = seq(0.01, 0.10, 0.01),
L2_Leaf_Reg = seq(1.0, 10.0, 1.0),
RandomStrength = 1,
BorderCount = 254,
RSM = c(0.80, 0.85, 0.90, 0.95, 1.0),
BootStrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
GrowPolicy = c("SymmetricTree", "Depthwise", "Lossguide"),
model_size_reg = 0.5,
feature_border_type = "GreedyLogSum",
sampling_unit = "Group",
subsample = NULL,
score_function = "Cosine",
min_data_in_leaf = 1)

# Output
TestModel$Model
TestModel$ValidationData

```

```

TestModel$EvaluationMetrics
TestModel$Evaluation
TestModel$VI_Plot
TestModel$VariableImportance
TestModel$InteractionImportance
TestModel$GridMetrics
TestModel$ColNames = Names
TestModel$TargetLevels

## End(Not run)

```

---

AutoCatBoostRegression

*AutoCatBoostRegression is an automated catboost model grid-tuning classifier and evaluation system*

---

## Description

AutoCatBoostRegression is an automated modeling function that runs a variety of steps. First, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation boxplot, evaluation metrics, variable importance, partial dependence calibration plots, partial dependence calibration box plots, and column names used in model fitting. You can download the catboost package using devtools, via: `devtools::install_github('catboost/catboost', subdir = 'catboost/R-package')`

## Usage

```

AutoCatBoostRegression(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  Weights = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  PrimaryDateColumn = NULL,
  DummifyCols = FALSE,
  IDcols = NULL,
  TransformNumericColumns = NULL,
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit"),
  task_type = "GPU",
  NumGPUs = 1,
  eval_metric = "RMSE",
  eval_metric_value = 1.5,
  loss_function = "RMSE",
  loss_function_value = 1.5,
  model_path = NULL,
  metadata_path = NULL,
  SaveInfoToPDF = FALSE,
  ModelID = "FirstModel",

```

```

NumOfParDepPlots = 0L,
EvalPlots = TRUE,
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
PassInGrid = NULL,
GridTune = FALSE,
MaxModelsInGrid = 30L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 24L * 60L,
Shuffles = 1L,
BaselineComparison = "default",
MetricPeriods = 10L,
langevin = FALSE,
diffusion_temperature = 10000,
Trees = 500L,
Depth = 9,
L2_Leaf_Reg = 3,
RandomStrength = 1,
BorderCount = 254,
LearningRate = NULL,
RSM = 1,
BootStrapType = NULL,
GrowPolicy = "SymmetricTree",
model_size_reg = 0.5,
feature_border_type = "GreedyLogSum",
sampling_unit = "Group",
subsample = NULL,
score_function = "Cosine",
min_data_in_leaf = 1
)

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data and skip over evaluation steps
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>Weights</code>	Weights vector for train.pool in catboost
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>PrimaryDateColumn</code>	Supply a date or datetime column for catboost to utilize time as its basis for handling categorical features, instead of random shuffling

DummifyCols	Logical. Will coerce to TRUE if loss_function or eval_metric is set to 'Multi-RMSE'.
IDcols	A vector of column names or column numbers to keep in your data but not include in the modeling.
TransformNumericColumns	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
task_type	Set to "GPU" to utilize your GPU for training. Default is "CPU".
NumGPUs	Set to 1, 2, 3, etc.
eval_metric	Select from 'RMSE', 'MAE', 'MAPE', 'R2', 'Poisson', 'MedianAbsoluteError', 'SMAPE', 'MSLE', 'NumErrors', 'FairLoss', 'Tweedie', 'Huber', 'LogLinQuantile', 'Quantile', 'Lq', 'Expectile'
eval_metric_value	Used with the specified eval_metric. See <a href="https://catboost.ai/docs/concepts/loss-functions-regression.html">https://catboost.ai/docs/concepts/loss-functions-regression.html</a>
loss_function	Used in model training for model fitting. 'MAPE', 'MAE', 'RMSE', 'Poisson', 'Tweedie', 'Huber', 'LogLinQuantile', 'Quantile', 'Lq', 'Expectile'
loss_function_value	Used with the specified loss function if an associated value is required. 'Tweedie', 'Huber', 'LogLinQuantile', 'Quantile', 'Lq', 'Expectile'. See <a href="https://catboost.ai/docs/concepts/loss-functions-regression.html">https://catboost.ai/docs/concepts/loss-functions-regression.html</a>
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
SaveInfoToPDF	Set to TRUE to save modeling information to PDF. If model_path or metadata_path aren't defined then output will be saved to the working directory
ModelID	A character string to name your model and output
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)
EvalPlots	Defaults to TRUE. Set to FALSE to not generate and return these objects.
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
PassInGrid	Defaults to NULL. Pass in a single row of grid from a previous output as a data.table (they are collected as data.tables)
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
MaxModelsInGrid	Number of models to test from grid options

MaxRunsWithoutNewWinner	Number of models built before calling it quits
MaxRunMinutes	Maximum number of minutes to let this run
Shuffles	Number of times to randomize grid possibilities
BaselineComparison	Set to either "default" or "best". Default is to compare each successive model build to the baseline model using max trees (from function args). Best makes the comparison to the current best model.
MetricPeriods	Number of periods to use between Catboost evaluations
langevin	Set to TRUE to enable
diffusion_temperature	Defaults to 10000
Trees	Standard + Grid Tuning. Bandit grid partitioned. The maximum number of trees you want in your models
Depth	Standard + Grid Tuning. Bandit grid partitioned. Number, or vector for depth to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(4L, 16L, 2L)
L2_Leaf_Reg	Standard + Grid Tuning. Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the L2_Leaf_Reg values to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1.0, 10.0, 1.0)
RandomStrength	Standard + Grid Tuning. A multiplier of randomness added to split evaluations. Default value is 1 which adds no randomness.
BorderCount	Standard + Grid Tuning. Number of splits for numerical features. Catboost defaults to 254 for CPU and 128 for GPU
LearningRate	Standard + Grid Tuning. Default varies if RMSE, MultiClass, or Logloss is utilized. Otherwise default is 0.03. Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the LearningRate values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.01,0.02,0.03,0.04)
RSM	CPU only. Standard + Grid Tuning. If GPU is set, this is turned off. Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the RSM values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.80, 0.85, 0.90, 0.95, 1.0)
BootStrapType	Standard + Grid Tuning. NULL value to default to catboost default (Bayesian for GPU and MVS for CPU). Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the BootStrapType values to test. For running grid tuning, a NULL value supplied will mean these values are tested c("Bayesian", "Bernoulli", "Poisson", "MVS", "No")
GrowPolicy	Standard + Grid Tuning. Catboost default of SymmetricTree. Random testing. Default "SymmetricTree", character, or vector for GrowPolicy to test. For grid tuning, supply a vector of values. For running grid tuning, a NULL value supplied will mean these values are tested c("SymmetricTree", "Depthwise", "Lossguide")
model_size_reg	Defaults to 0.5. Set to 0 to allow for bigger models. This is for models with high cardinality categorical features. Values greater than 0 will shrink the model and quality will decline but models won't be huge.



feature_border_type	Defaults to "GreedyLogSum". Other options include: Median, Uniform, UniformAndQuantiles, MaxLogSum, MinEntropy
sampling_unit	Default is Group. Other option is Object. if GPU is selected, this will be turned off unless the loss_function is YetiRankPairWise
subsample	Default is NULL. Catboost will turn this into 0.66 for BootstrapTypes Poisson and Bernoulli. 0.80 for MVS. Doesn't apply to others.
score_function	Default is Cosine. CPU options are Cosine and L2. GPU options are Cosine, L2, NewtonL2, and NewtonCosine (not available for Lossguide)
min_data_in_leaf	Default is 1. Cannot be used with SymmetricTree is GrowPolicy

### Value

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, EvaluationPlot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, catboostgrid, and a transformation details file.

### Author(s)

Adrian Antico

### See Also

Other Automated Supervised Learning - Regression: [AutoH2oDRFRegression\(\)](#), [AutoH2oGAMRegression\(\)](#), [AutoH2oGBMRegression\(\)](#), [AutoH2oGLMRegression\(\)](#), [AutoH2oMLRegression\(\)](#), [AutoXGBoostRegression\(\)](#)

### Examples

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 10000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Run function
TestModel <- RemixAutoML::AutoCatBoostRegression(

  # GPU or CPU and the number of available GPUs
  task_type = "GPU",
  NumGPUs = 1,

  # Metadata args
  ModelID = "Test_Model_1",
  model_path = normalizePath("./"),
  metadata_path = normalizePath("./"),
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,
```

```

ReturnModelObjects = TRUE,

# Data args
data = data,
TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
Weights = NULL,
TargetColumnName = "Adrian",
FeatureColNames = names(data)[!names(data) %in%
  c("IDcol_1", "IDcol_2", "Adrian")],
PrimaryDateColumn = NULL,
DummifyCols = FALSE,
IDcols = c("IDcol_1", "IDcol_2"),
TransformNumericColumns = "Adrian",
Methods = c("BoxCox", "Asinh", "Asin", "Log",
  "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),

# Model evaluation
eval_metric = "RMSE",
eval_metric_value = 1.5,
loss_function = "RMSE",
loss_function_value = 1.5,
MetricPeriods = 10L,
NumOfParDepPlots = ncol(data)-1L-2L,
EvalPlots = TRUE,

# Grid tuning args
PassInGrid = NULL,
GridTune = FALSE,
MaxModelsInGrid = 30L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 60*60,
Shuffles = 4L,
BaselineComparison = "default",

# ML args
langevin = FALSE,
diffusion_temperature = 10000,
Trees = 1000,
Depth = 6,
L2_Leaf_Reg = 3.0,
RandomStrength = 1,
BorderCount = 128,
LearningRate = NULL,
RSM = 1,
BootstrapType = NULL,
GrowPolicy = "SymmetricTree",
model_size_reg = 0.5,
feature_border_type = "GreedyLogSum",
sampling_unit = "Group",
subsample = NULL,
score_function = "Cosine",
min_data_in_leaf = 1)

# Output
TestModel$Model

```

```

TestModel$ValidationData
TestModel$EvaluationPlot
TestModel$EvaluationBoxPlot
TestModel$EvaluationMetrics
TestModel$VariableImportance
TestModel$InteractionImportance
TestModel$ShapValuesDT
TestModel$VI_Plot
TestModel$PartialDependencePlots
TestModel$PartialDependenceBoxPlots
TestModel$GridList
TestModel$ColNames
TestModel$TransformationResults

## End(Not run)

```

---

AutoCatBoostScoring	<i>AutoCatBoostScoring</i>
---------------------	----------------------------

---

## Description

AutoCatBoostScoring is an automated scoring function that compliments the AutoCatBoost model training functions. This function requires you to supply features for scoring. It will run ModelDataPrep() to prepare your features for catboost data conversion and scoring.

## Usage

```

AutoCatBoostScoring(
  TargetType = NULL,
  ScoringData = NULL,
  FeatureColumnNames = NULL,
  FactorLevelsList = NULL,
  IDcols = NULL,
  OneHot = FALSE,
  ReturnShapValues = FALSE,
  ModelObject = NULL,
  ModelPath = NULL,
  ModelID = NULL,
  ReturnFeatures = TRUE,
  MultiClassTargetLevels = NULL,
  TransformNumeric = FALSE,
  BackTransNumeric = FALSE,
  TargetColumnName = NULL,
  TransformationObject = NULL,
  TransID = NULL,
  TransPath = NULL,
  MDP_Impute = TRUE,
  MDP_CharToFactor = TRUE,
  MDP_RemoveDates = TRUE,
  MDP_MissFactor = "0",
  MDP_MissNum = -1,
  RemoveModel = FALSE
)

```

**Arguments**

TargetType	Set this value to "regression", "classification", "multiclass", or "multiregression" to score models built using AutoCatBoostRegression(), AutoCatBoostClassify() or AutoCatBoostMultiClass().
ScoringData	This is your data.table of features for scoring. Can be a single row or batch.
FeatureColumnNames	Supply either column names or column numbers used in the AutoCatBoostRegression() function
FactorLevelsList	List of factors levels to DummifyDT()
IDcols	Supply ID column numbers for any metadata you want returned with your predicted values
OneHot	Passed to DummifyD
ReturnShapValues	Set to TRUE to return a data.table of feature contributions to all predicted values generated
ModelObject	Supply the model object directly for scoring instead of loading it from file. If you supply this, ModelID and ModelPath will be ignored.
ModelPath	Supply your path file used in the AutoCatBoost__() function
ModelID	Supply the model ID used in the AutoCatBoost__() function
ReturnFeatures	Set to TRUE to return your features with the predicted values.
MultiClassTargetLevels	For use with AutoCatBoostMultiClass(). If you saved model objects then this scoring function will locate the target levels file. If you did not save model objects, you can supply the target levels returned from AutoCatBoostMultiClass().
TransformNumeric	Set to TRUE if you have features that were transformed automatically from an Auto__Regression() model AND you haven't already transformed them.
BackTransNumeric	Set to TRUE to generate back-transformed predicted values. Also, if you return features, those will also be back-transformed.
TargetColumnName	Input your target column name used in training if you are utilizing the transformation service
TransformationObject	Set to NULL if you didn't use transformations or if you want the function to pull from the file output from the Auto__Regression() function. You can also supply the transformation data.table object with the transformation details versus having it pulled from file.
TransID	Set to the ID used for saving the transformation data.table object or set it to the ModelID if you are pulling from file from a build with Auto__Regression().
TransPath	Set the path file to the folder where your transformation data.table detail object is stored. If you used the Auto__Regression() to build, set it to the same path as ModelPath.
MDP_Impute	Set to TRUE if you did so for modeling and didn't do so before supplying ScoringData in this function

MDP_CharToFactor	Set to TRUE to turn your character columns to factors if you didn't do so to your ScoringData that you are supplying to this function
MDP_RemoveDates	Set to TRUE if you have date of timestamp columns in your ScoringData
MDP_MissFactor	If you set MDP_Impute to TRUE, supply the character values to replace missing values with
MDP_MissNum	If you set MDP_Impute to TRUE, supply a numeric value to replace missing values with
RemoveModel	Set to TRUE if you want the model removed immediately after scoring

**Value**

A data.table of predicted values with the option to return model features as well.

**Author(s)**

Adrian Antico

**See Also**

Other Automated Model Scoring: [AutoH2OMLScoring\(\)](#), [AutoH2OModeler\(\)](#), [AutoHurdleScoring\(\)](#), [AutoXGBoostScoring\(\)](#), [IntermittentDemandScoringDataGenerator\(\)](#)

**Examples**

```
## Not run:

# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 10000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Train a Multiple Regression Model (two target variables)
TestModel <- RemixAutoML::AutoCatBoostRegression(

  # GPU or CPU and the number of available GPUs
  task_type = "GPU",
  NumGPUs = 1,

  # Metadata arguments
  ModelID = "Test_Model_1",
  model_path = normalizePath("./"),
  metadata_path = NULL,
  SaveModelObjects = FALSE,
  ReturnModelObjects = TRUE,

  # Data arguments
  data = data,
  TrainOnFull = FALSE,
```

```

ValidationData = NULL,
TestData = NULL,
Weights = NULL,
DummifyCols = FALSE,
TargetColumnName = c("Adrian", "Independent_Variable1"),
FeatureColNames = names(data)[!names(data) %in%
  c("IDcol_1", "IDcol_2", "Adrian")],
PrimaryDateColumn = NULL,
IDcols = c("IDcol_1", "IDcol_2"),
TransformNumericColumns = NULL,
Methods = c("BoxCox", "Asinh", "Asin", "Log", "LogPlus1",
  "Logit", "YeoJohnson"),

# Model evaluation
eval_metric = "MultiRMSE",
eval_metric_value = 1.5,
loss_function = "MultiRMSE",
loss_function_value = 1.5,
MetricPeriods = 10L,
NumOfParDepPlots = ncol(data)-1L-2L,
EvalPlots = TRUE,

# Grid tuning
PassInGrid = NULL,
GridTune = FALSE,
MaxModelsInGrid = 100L,
MaxRunsWithoutNewWinner = 100L,
MaxRunMinutes = 60*60,
Shuffles = 4L,
BaselineComparison = "default",

# ML Args
langevin = TRUE,
diffusion_temperature = 10000,
Trees = 250,
Depth = 6,
L2_Leaf_Reg = 3.0,
RandomStrength = 1,
BorderCount = 128,
LearningRate = seq(0.01, 0.10, 0.01),
RSM = c(0.80, 0.85, 0.90, 0.95, 1.0),
BootStrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
GrowPolicy = c("SymmetricTree", "Depthwise", "Lossguide"))

# Output
TestModel$Model
TestModel$ValidationData
TestModel$EvaluationPlot
TestModel$EvaluationBoxPlot
TestModel$EvaluationMetrics
TestModel$VariableImportance
TestModel$InteractionImportance
TestModel$ShapValuesDT
TestModel$VI_Plot
TestModel$PartialDependencePlots
TestModel$PartialDependenceBoxPlots
TestModel$GridList

```

```

TestModel$ColNames
TestModel$TransformationResults

# Score a multiple regression model
Preds <- RemixAutoML::AutoCatBoostScoring(
  TargetType = "multiregression",
  ScoringData = data,
  FeatureColumnNames = names(data)[!names(data) %in%
    c("IDcol_1", "IDcol_2", "Adrian")],
  FactorLevelsList = TestModel$FactorLevelsList,
  IDcols = c("IDcol_1", "IDcol_2"),
  OneHot = FALSE,
  ReturnShapValues = TRUE,
  ModelObject = TestModel$Model,
  ModelPath = NULL, #normalizePath("./"),
  ModelID = "Test_Model_1",
  ReturnFeatures = TRUE,
  MultiClassTargetLevels = NULL,
  TransformNumeric = FALSE,
  BackTransNumeric = FALSE,
  TargetColumnName = NULL,
  TransformationObject = NULL,
  TransID = NULL,
  TransPath = NULL,
  MDP_Impute = TRUE,
  MDP_CharToFactor = TRUE,
  MDP_RemoveDates = TRUE,
  MDP_MissFactor = "0",
  MDP_MissNum = -1,
  RemoveModel = FALSE)

## End(Not run)

```

---

AutoCatBoostSizeFreqDist

*AutoCatBoostSizeFreqDist*


---

## Description

AutoCatBoostSizeFreqDist for building size and frequency distributions via quantile regressions. Size (or severity) and frequency (or count) quantile regressions are build. Use this with the Auto-QuantileGibbsSampler function to simulate the joint distribution.

## Usage

```

AutoCatBoostSizeFreqDist(
  CountData = NULL,
  SizeData = NULL,
  CountQuantiles = seq(0.1, 0.9, 0.1),
  SizeQuantiles = seq(0.1, 0.9, 0.1),
  AutoTransform = TRUE,
  DataPartitionRatios = c(0.75, 0.2, 0.05),
  StratifyColumnNames = NULL,

```

```

NTrees = 1500,
TaskType = "GPU",
EvalMetric = "Quantile",
GridTune = FALSE,
GridEvalMetric = "mae",
CountTargetColumnName = NULL,
SizeTargetColumnName = NULL,
CountFeatureColNames = NULL,
SizeFeatureColNames = NULL,
CountIDcols = NULL,
SizeIDcols = NULL,
ModelIDs = c("CountModel", "SizeModel"),
MaxModelsGrid = 5,
ModelPath = NULL,
MetaDataPath = NULL,
NumOfParDepPlots = 0
)

```

### Arguments

CountData	This is your CountData generated from the IntermittentDemandBootStrapper() function
SizeData	This is your SizeData generated from the IntermittentDemandBootStrapper() function
CountQuantiles	The default are deciles, i.e. seq(0.10,0.90,0.10). More granularity the better, but it will take longer to run.
SizeQuantiles	The default are deciles, i.e. seq(0.10,0.90,0.10). More granularity the better, but it will take longer to run.
AutoTransform	Set to FALSE not to have the your target variables automatically transformed for the best normalization.
DataPartitionRatios	The default is c(0.75,0.20,0.05). With CatBoost, you should allocate a decent amount to the validation data (second input). Three inputs are required.
StratifyColumnNames	Specify grouping variables to stratify by
NTrees	Default is 1500. If the best model utilizes all trees, you should consider increasing the argument.
TaskType	The default is set to "GPU". If you do not have a GPU, set it to "CPU".
EvalMetric	Set to "Quantile". Alternative quantile methods may become available in the future.
GridTune	The default is set to FALSE. If you set to TRUE, make sure to specify MaxModelsGrid to a number greater than 1.
GridEvalMetric	The default is set to "mae". Choose from 'poisson', 'mae', 'mape', 'mse', 'msle', 'kl', 'cs', 'r2'.
CountTargetColumnName	Column names or column numbers
SizeTargetColumnName	Column names or column numbers
CountFeatureColNames	Column names or column numbers



SizeFeatureColNames	Column names or column numbers
CountIDcols	Column names or column numbers
SizeIDcols	Column names or column numbers
ModelIDs	A two element character vector. E.g. c("CountModel","SizeModel")
MaxModelsGrid	Set to a number greater than 1 if GridTune is set to TRUE
ModelPath	This path file is where all your models will be stored. If you leave MetaDataPath NULL, the evaluation metadata will also be stored here. If you leave this NULL, the function will not run.
MetaDataPath	A separate path to store the model metadata for evaluation.
NumOfParDepPlots	Set to a number greater than or equal to 1 to see the relationships between your features and targets.

**Value**

This function does not return anything. It can only store your models and model evaluation metadata to file.

**Author(s)**

Adrian Antico

**See Also**

Other Supervised Learning - Compound: [AutoCatBoostHurdleModel\(\)](#), [AutoH2oDRFHurdleModel\(\)](#), [AutoH2oGBMHurdleModel\(\)](#), [AutoH2oGBMSizeFreqDist\(\)](#), [AutoXGBoostHurdleModel\(\)](#)

**Examples**

```
## Not run:
AutoCatBoostSizeFreqDist(
  CountData = CountData,
  SizeData = SizeData,
  CountQuantiles = seq(0.10,0.90,0.10),
  SizeQuantiles = seq(0.10,0.90,0.10),
  AutoTransform = TRUE,
  DataPartitionRatios = c(0.75,0.20,0.05),
  StratifyColumnNames = NULL,
  NTrees = 1500,
  TaskType = "GPU",
  EvalMetric = "Quantile",
  GridTune = FALSE,
  GridEvalMetric = "mae",
  CountTargetColumnName = "Counts",
  SizeTargetColumnName = "Target_qty",
  CountFeatureColNames = 2:ncol(CountData),
  SizeFeatureColNames = 2:ncol(SizeData),
  CountIDcols = NULL,
  SizeIDcols = NULL,
  ModelIDs = c("CountModel","SizeModel"),
  MaxModelsGrid = 5,
  ModelPath = getwd(),
```

```

MetaDataPath = paste0(getwd(), "/ModelMetaData"),
NumOfParDepPlots = 1)

## End(Not run)

```

---

AutoCatBoostVectorCARMA

*AutoCatBoostVectorCARMA*


---

## Description

AutoCatBoostVectorCARMA Multiple Regression, Multivariate Forecasting with calendar variables, Holiday counts, holiday lags, holiday moving averages, differencing, transformations, interaction-based categorical encoding using target variable and features to generate various time-based aggregated lags, moving averages, moving standard deviations, moving skewness, moving kurtosis, moving quantiles, parallelized interaction-based fourier pairs by grouping variables, and Trend Variables.

## Usage

```

AutoCatBoostVectorCARMA(
  data,
  TimeWeights = NULL,
  NonNegativePred = FALSE,
  RoundPreds = FALSE,
  TrainOnFull = FALSE,
  TargetColumnName = "Target",
  DateColumnName = "DateTime",
  HierarchGroups = NULL,
  GroupVariables = NULL,
  FC_Periods = 30,
  TimeUnit = "week",
  TimeGroups = c("weeks", "months"),
  NumOfParDepPlots = 10L,
  TargetTransformation = FALSE,
  Methods = c("BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Logit", "YeoJohnson"),
  AnomalyDetection = NULL,
  XREGS = NULL,
  Lags = c(1L:5L),
  MA_Periods = c(2L:5L),
  SD_Periods = NULL,
  Skew_Periods = NULL,
  Kurt_Periods = NULL,
  Quantile_Periods = NULL,
  Quantiles_Selected = c("q5", "q95"),
  Difference = TRUE,
  FourierTerms = 6L,
  CalendarVariables = c("second", "minute", "hour", "wday", "mday", "yday", "week",
    "isoweek", "month", "quarter", "year"),
  HolidayVariable = c("USPublicHolidays", "EasterGroup", "ChristmasGroup",
    "OtherEcclesticalFeasts"),

```

```

HolidayLags = 1L,
HolidayMovingAverages = 1L:2L,
TimeTrendVariable = FALSE,
ZeroPadSeries = NULL,
DataTruncate = FALSE,
SplitRatios = c(0.7, 0.2, 0.1),
TaskType = "GPU",
NumGPU = 1,
EvalMetric = "RMSE",
EvalMetricValue = 1.5,
LossFunction = "RMSE",
LossFunctionValue = 1.5,
GridTune = FALSE,
PassInGrid = NULL,
ModelCount = 100,
MaxRunsWithoutNewWinner = 50,
MaxRunMinutes = 24L * 60L,
Langevin = FALSE,
DiffusionTemperature = 10000,
NTrees = 1000,
L2_Leaf_Reg = 3,
RandomStrength = 1,
BorderCount = 254,
Depth = 6,
BootStrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
PartitionType = "timeseries",
Timer = TRUE,
DebugMode = FALSE
)

```

### Arguments

<code>data</code>	Supply your full series data set here
<code>TimeWeights</code>	NULL or a value.
<code>NonNegativePred</code>	TRUE or FALSE
<code>RoundPreds</code>	Rounding predictions to an integer value. TRUE or FALSE. Defaults to FALSE
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>TargetColumnName</code>	List the column names of your target variables column. E.g. <code>c("Target1", "Target2", ..., "TargetN")</code>
<code>DateColumnName</code>	List the column name of your date column. E.g. "DateTime"
<code>HierarchGroups</code>	Vector of hierarchy categorical columns.
<code>GroupVariables</code>	Defaults to NULL. Use NULL when you have a single series. Add in Group-Variables when you have a series for every level of a group or multiple groups.
<code>FC_Periods</code>	Set the number of periods you want to have forecasts for. E.g. 52 for weekly data to forecast a year ahead
<code>TimeUnit</code>	List the time unit your data is aggregated by. E.g. "1min", "5min", "10min", "15min", "30min", "hour", "day", "week", "month", "quarter", "year".
<code>TimeGroups</code>	Select time aggregations for adding various time aggregated GDL features.

NumOfParDepPlots	Supply a number for the number of partial dependence plots you want returned
TargetTransformation	Run AutoTransformationCreate() to find best transformation for the target variable. Tests YeoJohnson, BoxCox, and Asigh (also Asin and Logit for proportion target variables).
Methods	Transformation options to test which include "BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Logit", "YeoJohnson"
AnomalyDetection	NULL for not using the service. Other, provide a list, e.g. AnomalyDetection = list("tstat_high" = 4, tstat_low = -4)
XREGS	Additional data to use for model development and forecasting. Data needs to be a complete series which means both the historical and forward looking values over the specified forecast window needs to be supplied.
Lags	Select the periods for all lag variables you want to create. E.g. c(1:5,52)
MA_Periods	Select the periods for all moving average variables you want to create. E.g. c(1:5,52)
SD_Periods	Select the periods for all moving standard deviation variables you want to create. E.g. c(1:5,52)
Skew_Periods	Select the periods for all moving skewness variables you want to create. E.g. c(1:5,52)
Kurt_Periods	Select the periods for all moving kurtosis variables you want to create. E.g. c(1:5,52)
Quantile_Periods	Select the periods for all moving quantiles variables you want to create. E.g. c(1:5,52)
Quantiles_Selected	Select from the following "q5", "q10", "q15", "q20", "q25", "q30", "q35", "q40", "q45", "q50", "q55", "q60", "q65", "q70", "q75", "q80", "q85", "q90", "q95"
Difference	Puts the I in ARIMA for single series and grouped series.
FourierTerms	Set to the max number of pairs. E.g. 2 means to generate two pairs for by each group level and iterations if hierarchy is enabled.
CalendarVariables	NULL, or select from "second", "minute", "hour", "wday", "mday", "yday", "week", "isoweek", "month", "quarter", "year"
HolidayVariable	NULL, or select from "USPublicHolidays", "EasterGroup", "ChristmasGroup", "OtherEcclesticalFeasts"
HolidayLags	Number of lags to build off of the holiday count variable.
HolidayMovingAverages	Number of moving averages to build off of the holiday count variable.
TimeTrendVariable	Set to TRUE to have a time trend variable added to the model. Time trend is numeric variable indicating the numeric value of each record in the time series (by group). Time trend starts at 1 for the earliest point in time and increments by one for each success time point.
ZeroPadSeries	Set to "all", "inner", or NULL. See TimeSeriesFill for explanation

DataTruncate	Set to TRUE to remove records with missing values from the lags and moving average features created
SplitRatios	E.g c(0.7,0.2,0.1) for train, validation, and test sets
TaskType	Has to CPU for now. If catboost makes GPU available for "MultiRMSE" then it will be enabled. If you set to GPU the function will coerce it back to CPU.
NumGPU	Defaults to 1. If CPU is set this argument will be ignored.
EvalMetric	"MultiRMSE" only. If catboost updates this I'll add more later
EvalMetricValue	Placeholder for later
LossFunction	"MultiRMSE" only. If catboost updates this I'll add more later
LossFunctionValue	Placeholder for later
GridTune	Set to TRUE to run a grid tune
PassInGrid	Defaults to NULL
ModelCount	Set the number of models to try in the grid tune
MaxRunsWithoutNewWinner	Default is 50
MaxRunMinutes	Default is 60*60
Langevin	TRUE or FALSE
DiffusionTemperature	Default value of 10000
NTrees	Select the number of trees you want to have built to train the model
L2_Leaf_Reg	l2 reg parameter
RandomStrength	Default is 1
BorderCount	Default is 254
Depth	Depth of catboost model
BootstrapType	Select from Catboost list
PartitionType	Select "random" for random data partitioning "timeseries" for partitioning by time frames
Timer	Set to FALSE to turn off the updating print statements for progress
DebugMode	Defaults to FALSE. Set to TRUE to get a print statement of each high level comment in function

**Value**

Returns a data.table of original series and forecasts, the catboost model objects (everything returned from AutoCatBoostRegression()), a time series forecast plot, and transformation info if you set TargetTransformation to TRUE. The time series forecast plot will plot your single series or aggregate your data to a single series and create a plot from that.

**Author(s)**

Adrian Antico

**See Also**

Other Automated Panel Data Forecasting: [AutoCatBoostCARMA\(\)](#), [AutoCatBoostHurdleCARMA\(\)](#), [AutoH2OCARMA\(\)](#), [AutoXGBoostCARMA\(\)](#)

## Examples

```
## Not run:
# Two group variables and xregs

# Load Walmart Data from Dropbox----
data <- data.table::fread(
  "https://www.dropbox.com/s/2str3ek4f4cheqi/walmart_train.csv?dl=1")

# Filter out zeros
data <- data[Weekly_Sales != 0]

# Subset for Stores / Departments With Full Series
data <- data[, Counts := .N, by = c("Store","Dept")][Counts == 143][
  , Counts := NULL]

# Subset Columns (remove IsHoliday column)----
keep <- c("Store","Dept","Date","Weekly_Sales")
data <- data[, ..keep]
data <- data[Store %in% c(1,2)]
xregs <- data.table::copy(data)
xregs[, GroupVar := do.call(paste, c(.SD, sep = " ")), .SDcols = c("Store","Dept")]
xregs[, c("Store","Dept") := NULL]
data.table::setnames(xregs, "Weekly_Sales", "Other")
xregs[, Other := jitter(Other, factor = 25)]
data <- data[as.Date(Date) < as.Date('2012-09-28')]

# Vector CARMA testing
data[, Weekly_Profit := Weekly_Sales * 0.75]

# Build forecast
CatBoostResults <- RemixAutoML::AutoCatBoostVectorCARMA(

  # data args
  data = data, # TwoGroup_Data,
  TimeWeights = NULL,
  TargetColumnName = c("Weekly_Sales","Weekly_Profit"),
  DateColumnName = "Date",
  HierarchGroups = NULL,
  GroupVariables = c("Store","Dept"),
  TimeUnit = "weeks",
  TimeGroups = c("weeks","months"),

  # Production args
  TrainOnFull = TRUE,
  SplitRatios = c(1 - 10 / 138, 10 / 138),
  PartitionType = "random",
  FC_Periods = 4,
  Timer = TRUE,
  DebugMode = TRUE,

  # Target transformations
  TargetTransformation = TRUE,
  Methods = c("BoxCox", "Asinh", "Asin", "Log",
    "LogPlus1", "Logit", "YeoJohnson"),
  Difference = FALSE,
  NonNegativePred = FALSE,
```

```

RoundPreds = FALSE,

# Date features
CalendarVariables = c("week", "month", "quarter"),
HolidayVariable = c("USPublicHolidays",
                    "EasterGroup",
                    "ChristmasGroup", "OtherEcclesticalFeasts"),
HolidayLags = 1,
HolidayMovingAverages = 1:2,

# Time series features
Lags = list("weeks" = seq(2L, 10L, 2L),
            "months" = c(1:3)),
MA_Periods = list("weeks" = seq(2L, 10L, 2L),
                  "months" = c(2,3)),
SD_Periods = NULL,
Skew_Periods = NULL,
Kurt_Periods = NULL,
Quantile_Periods = NULL,
Quantiles_Selected = c("q5", "q95"),

# Bonus features
AnomalyDetection = NULL,
XREGS = xregs,
FourierTerms = 2,
TimeTrendVariable = TRUE,
ZeroPadSeries = NULL,
DataTruncate = FALSE,

# ML Args
NumOfParDepPlots = 100L,
EvalMetric = "MultiRMSE",
EvalMetricValue = 1.5,
LossFunction = "MultiRMSE",
LossFunctionValue = 1.5,
GridTune = FALSE,
PassInGrid = NULL,
ModelCount = 5,
TaskType = "GPU",
NumGPU = 1,
MaxRunsWithoutNewWinner = 50,
MaxRunMinutes = 60*60,
Langevin = FALSE,
DiffusionTemperature = 10000,
NTrees = 2500,
L2_Leaf_Reg = 3.0,
RandomStrength = 1,
BorderCount = 254,
BootStrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
Depth = 6)

## End(Not run)

```

**Description**

Generate correlation analysis over a data set

**Usage**

```
AutoCorrAnalysis(
  data = NULL,
  CorVars = NULL,
  SkipCorVars = NULL,
  ByGroupVars = NULL,
  DataSampleRate = 0.5,
  MinRows = 30,
  KeepSignificantVars = TRUE,
  PValAdjMethod = "holm",
  RobustCalc = TRUE,
  PartialCorr = FALSE,
  BayesianCorr = FALSE
)
```

**Arguments**

data	data.table
CorVars	Can leave NULL or supply column names you want to analyze
SkipCorVars	Can leave NULL or supply column names you want to skip
ByGroupVars	Categorical variables to run correlation analysis by

**Author(s)**

Adrian Antico

**See Also**

Other EDA: [AutoWordFreq\(\)](#), [BNLearnArcStrength\(\)](#), [ProblematicFeatures\(\)](#)

**Examples**

```
## Not run:
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 10000L,
  ID = 2L,
  FactorCount = 2L,
  AddDate = TRUE,
  ZIP = 2L,
  TimeSeries = FALSE,
  ChainLadder = FALSE,
  Classification = TRUE,
  MultiClass = FALSE)

# Run Analysis
data <- RemixAutoML::AutoCorrAnalysis(
  data = data,
  CorVars = NULL,
  SkipCorVars = c("IDcol_1", "IDcol_2", "DateTime"),
```



```

    ByGroupVars = "Factor_1",
    DataSampleRate = 0.50,
    MinRows = 30,
    KeepSignificantVars = TRUE,
    PValAdjMethod = "holm",
    RobustCalc = TRUE,
    PartialCorr = FALSE,
    BayesianCorr = FALSE)

## End(Not run)

```

---

AutoDataDictionaries    *AutoDataDictionaries*

---

## Description

AutoDataDictionaries is a function to return data dictionary data in table form

## Usage

```

AutoDataDictionaries(
  Type = "sqlserver",
  DBConnection,
  DDType = 1L,
  Query = NULL,
  ASIS = FALSE,
  CloseChannel = TRUE
)

```

## Arguments

Type	= "sqlserver" is currently the only system supported
DBConnection	This is a ODBC connection object for sql server
DDType	Select from 1 - 6 based on this article
Query	Supply a query
ASIS	Set to TRUE to pull in values without coercing types
CloseChannel	Set to TRUE to disconnect

## Author(s)

Adrian Antico

## See Also

Other Database: [SQL\\_ClearTable\(\)](#), [SQL\\_DropTable\(\)](#), [SQL\\_Query\\_Push\(\)](#), [SQL\\_Query\(\)](#), [SQL\\_SaveTable\(\)](#), [SQL\\_Server\\_BulkPull\(\)](#), [SQL\\_Server\\_BulkPush\(\)](#), [SQL\\_Server\\_DBConnection\(\)](#), [SQL\\_UpdateTable\(\)](#)

---

AutoDataPartition	<i>AutoDataPartition</i>
-------------------	--------------------------

---

## Description

This function will take your ratings matrix and model and score your data in parallel.

## Usage

```
AutoDataPartition(
  data,
  NumDataSets = 3L,
  Ratios = c(0.7, 0.2, 0.1),
  PartitionType = "random",
  StratifyColumnNames = NULL,
  StratifyNumericTarget = NULL,
  StratTargetPrecision = 3L,
  TimeColumnName = NULL
)
```

## Arguments

<code>data</code>	Source data to do your partitioning on
<code>NumDataSets</code>	The number of total data sets you want built
<code>Ratios</code>	A vector of values for how much data each data set should get in each split. E.g. <code>c(0.70, 0.20, 0.10)</code>
<code>PartitionType</code>	Set to either "random", "timeseries", or "time". With "random", your data will be partitioned randomly (with stratified sampling if column names are supplied). With "timeseries", you can partition by time with a stratify option (so long as you have an equal number of records for each strata). With "time" you will have data sets generated so that the training data contains the earliest records in time, validation data the second earliest, test data the third earliest, etc.
<code>StratifyColumnNames</code>	Supply column names of categorical features to use in a stratified sampling procedure for partitioning the data. Partition type must be "random" to use this option
<code>StratifyNumericTarget</code>	Supply a column name that is numeric. Use for "random" PartitionType, you can stratify your numeric variable by splitting up based on percRank to ensure a proper allocation of extreme values in your created data sets.
<code>StratTargetPrecision</code>	For "random" PartitionType and when StratifyNumericTarget is not null, precision will be the number of decimals used in the percentile calculation. If you supply a value of 1, deciles will be used. For a value of 2, percentiles will be used. Larger values are supported.
<code>TimeColumnName</code>	Supply a date column name or a name of a column with an ID for sorting by time such that the smallest number is the earliest in time.

**Value**

Returns a list of data.tables

**Author(s)**

Adrian Antico and Douglas Pestana

**See Also**

Other Feature Engineering: [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
# Create fake data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Run data partitioning function
dataSets <- RemixAutoML::AutoDataPartition(
  data,
  NumDataSets = 3L,
  Ratios = c(0.70, 0.20, 0.10),
  PartitionType = "random",
  StratifyColumnNames = NULL,
  StratifyNumericTarget = NULL,
  StratTargetPrecision = 1L,
  TimeColumnName = NULL)

# Collect data
TrainData <- dataSets$TrainData
ValidationData <- dataSets$ValidationData
TestData <- dataSets$TestData
```

---

AutoETS

*AutoETS*


---

**Description**

AutoETS is a multi-armed bandit model testing framework for AR and SAR NNetS. Randomized probability matching is the underlying bandit algorithm. Model evaluation is done by blending the training error and the validation error from testing the model on out of sample data. The bandit algorithm compares the performance of the current build against the previous builds which starts

with the classic `nnetar` model from the `forecast` package. Depending on how many lags, seasonal lags, and fourier pairs you test the number of combinations of features to test begins to approach 10,000 different combinations of settings. The function tests out transformations, differencing, and variations of the lags, seasonal lags, and fourier pairs. The parameter space is broken up into various buckets that are increasing in sophistication. The bandit algorithm samples from those buckets and based on many rounds of testing it determines which buckets to generate samples from more frequently based on the models performance coming from that bucket. All of the models have performance data collected on them and a final rebuild is initiated when a winner is found. The rebuild process begins by retraining the model with the settings that produced the best performance. If the model fails to build, for whatever reason, the next best buildable model is rebuilt.

## Usage

```
AutoETS(
  data,
  FilePath = NULL,
  TargetVariableName,
  DateColumnName,
  TimeAggLevel = "week",
  EvaluationMetric = "MAE",
  NumHoldOutPeriods = 5L,
  NumFCPeriods = 5L,
  TrainWeighting = 0.5,
  MaxConsecutiveFails = 12L,
  MaxNumberModels = 100L,
  MaxRunTimeMinutes = 10L,
  NumberCores = max(1L, min(4L, parallel::detectCores() - 2L))
)
```

## Arguments

<code>data</code>	Source data.table
<code>FilePath</code>	NULL to return nothing. Provide a file path to save the model and xregs if available
<code>TargetVariableName</code>	Name of your time series target variable
<code>DateColumnName</code>	Name of your date column
<code>TimeAggLevel</code>	Choose from "year", "quarter", "month", "week", "day", "hour"
<code>EvaluationMetric</code>	Choose from MAE, MSE, and MAPE
<code>NumHoldOutPeriods</code>	Number of time periods to use in the out of sample testing
<code>NumFCPeriods</code>	Number of periods to forecast
<code>TrainWeighting</code>	Model ranking is based on a weighted average of training metrics and out of sample metrics. Supply the weight of the training metrics, such as 0.50 for 50 percent.
<code>MaxConsecutiveFails</code>	When a new best model is found <code>MaxConsecutiveFails</code> resets to zero. Indicated the number of model attempts without a new winner before terminating the procedure.

**MaxNumberModels**  
 Indicate the maximum number of models to test.

**MaxRunTimeMinutes**  
 Indicate the maximum number of minutes to wait for a result.

**NumberCores**      Default `max(1L, min(4L, parallel::detectCores()-2L))`

**Author(s)**

Adrian Antico

**See Also**

Other Automated Time Series: [AutoArfima\(\)](#), [AutoBanditNNet\(\)](#), [AutoBanditSarima\(\)](#), [AutoCatBoostFreqSizeScoring\(\)](#), [AutoH2oGBMFreqSizeScoring\(\)](#), [AutoTBATS\(\)](#), [AutoTS\(\)](#)

**Examples**

```
## Not run:
# Create fake data
data <- RemixAutoML::FakeDataGenerator(TimeSeries = TRUE, TimeSeriesTimeAgg = "days")

# Build model
Output <- RemixAutoML::AutoETS(
  data,
  FilePath = NULL,
  TargetVariableName = "Weekly_Sales",
  DateColumnName = "Date",
  TimeAggLevel = "weeks",
  EvaluationMetric = "MAE",
  NumHoldOutPeriods = 5L,
  NumFCPeriods = 5L,
  TrainWeighting = 0.50,
  MaxConsecutiveFails = 12L,
  MaxNumberModels = 100L,
  MaxRunTimeMinutes = 10L,
  NumberCores = max(1L, min(4L, parallel::detectCores()-2L)))

# Output
Output$ForecastPlot
Output$Forecast
Output$PerformanceGrid

## End(Not run)
```

---

AutoFourierFeatures      *AutoFourierFeatures*

---

**Description**

#' AutoFourierFeatures

Usage

```
AutoFourierFeatures(  
  data,  
  FourierPairs = NULL,  
  FCPeriods = NULL,  
  Time_Unit = NULL,  
  TargetColumn = NULL,  
  DateColumn = NULL,  
  GroupVariable = NULL,  
  xregs = NonGroupDateNames  
)
```

Arguments

data	The source data
FourierPairs	A number indicating the max number of fourier pairs that will be built
FCPeriods	Number of periods
Time_Unit	Agg level
TargetColumn	The name of your target column
DateColumn	The name of your date column
GroupVariable	The name of your group variable
xregs	Extra data to merge in

Author(s)

Adrian Antico

See Also

Other Feature Engineering Helper: [ID\\_BuildTrainDataSets\(\)](#), [ID\\_MetadataGenerator\(\)](#), [ID\\_TrainingDataGenerator\(\)](#), [ID\\_TrainingDataGenerator\(\)](#)

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AutoH2OCARMA	<i>Feature Rich ML Panel Forecasting</i>
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Description

AutoH2OCARMA Mutlivariate Forecasting with calendar variables, Holiday counts, holiday lags, holiday moving averages, differencing, transformations, interaction-based categorical encoding using target variable and features to generate various time-based aggregated lags, moving averages, moving standard deviations, moving skewness, moving kurtosis, moving quantiles, parallelized interaction-based fourier pairs by grouping variables, and Trend Variables.

**Usage**

```

AutoH2OCARMA(
  AlgoType = "drf",
  ExcludeAlgos = "XGBoost",
  data,
  TrainOnFull = FALSE,
  TargetColumnName = "Target",
  PDFOutputPath = NULL,
  SaveDataPath = NULL,
  WeightsColumn = NULL,
  NonNegativePred = FALSE,
  RoundPreds = FALSE,
  DateColumnName = "DateTime",
  GroupVariables = NULL,
  HierarchGroups = NULL,
  TimeUnit = "week",
  TimeGroups = c("weeks", "months"),
  FC_Periods = 30,
  PartitionType = "timeseries",
  MaxMem = {      gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06))), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  Timer = TRUE,
  DebugMode = FALSE,
  TargetTransformation = FALSE,
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit"),
  XREGS = NULL,
  Lags = c(1:5),
  MA_Periods = c(1:5),
  SD_Periods = NULL,
  Skew_Periods = NULL,
  Kurt_Periods = NULL,
  Quantile_Periods = NULL,
  Quantiles_Selected = NULL,
  AnomalyDetection = NULL,
  Difference = TRUE,
  FourierTerms = 6,
  CalendarVariables = c("second", "minute", "hour", "wday", "mday", "yday", "week",
    "wom", "isoweek", "month", "quarter", "year"),
  HolidayVariable = c("USPublicHolidays", "EasterGroup", "ChristmasGroup",
    "OtherEcclesticalFeasts"),
  HolidayLags = 1,
  HolidayMovingAverages = 1:2,
  TimeTrendVariable = FALSE,
  DataTruncate = FALSE,
  ZeroPadSeries = NULL,
  SplitRatios = c(0.7, 0.2, 0.1),
  EvalMetric = "rmse",
  NumOfParDepPlots = 0L,
  GridTune = FALSE,

```

```

ModelCount = 1,
NTrees = 1000,
LearnRate = 0.1,
LearnRateAnnealing = 1,
GridStrategy = "Cartesian",
MaxRuntimeSecs = 60 * 60 * 24,
StoppingRounds = 10,
MaxDepth = 20,
SampleRate = 0.632,
MTries = -1,
ColSampleRate = 1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
CategoricalEncoding = "AUTO",
HistogramType = "AUTO",
Distribution = "gaussian",
Link = "identity",
RandomDistribution = NULL,
RandomLink = NULL,
Solver = "AUTO",
Alpha = NULL,
Lambda = NULL,
LambdaSearch = FALSE,
NLambdas = -1,
Standardize = TRUE,
RemoveCollinearColumns = FALSE,
InterceptInclude = TRUE,
NonNegativeCoefficients = FALSE,
RandomColNumbers = NULL,
InteractionColNumbers = NULL
)

```

### Arguments

AlgoType	Select from "dfr" for RandomForecast, "gbm" for gradient boosting, "glm" for generalized linear model, "automl" for H2O's AutoML algo, and "gam" for H2O's Generalized Additive Model.
ExcludeAlgos	For use when AlgoType = "AutoML". Selections include "DRF", "GLM", "XGBoost", "GBM", "DeepL" and "StackedEnsemble"
data	Supply your full series data set here
TrainOnFull	Set to TRUE to train on full data
TargetColumnName	List the column name of your target variables column. E.g. "Target"
PDFOutputPath	NULL or a path file to output PDFs to a specified folder
SaveDataPath	NULL Or supply a path. Data saved will be called 'ModelID'_data.csv
WeightsColumn	NULL



NonNegativePred	TRUE or FALSE
RoundPreds	Rounding predictions to an integer value. TRUE or FALSE. Defaults to FALSE
DateColumnName	List the column name of your date column. E.g. "DateTime"
GroupVariables	Defaults to NULL. Use NULL when you have a single series. Add in GroupVariables when you have a series for every level of a group or multiple groups.
HierarchGroups	Vector of hierachy categorical columns.
TimeUnit	List the time unit your data is aggregated by. E.g. "1min", "5min", "10min", "15min", "30min", "hour", "day", "week", "month", "quarter", "year".
TimeGroups	Select time aggregations for adding various time aggregated GDL features.
FC_Periods	Set the number of periods you want to have forecasts for. E.g. 52 for weekly data to forecast a year ahead
PartitionType	Select "random" for random data partitioning "time" for partitioning by time frames
MaxMem	Set to the maximum amount of memory you want to allow for running this function. Default is "32G".
NThreads	Set to the number of threads you want to dedicate to this function.
Timer	Set to FALSE to turn off the updating print statements for progress
DebugMode	Defaults to FALSE. Set to TRUE to get a print statement of each high level comment in function
TargetTransformation	Run AutoTransformationCreate() to find best transformation for the target variable. Tests YeoJohnson, BoxCox, and Asigh (also Asin and Logit for proportion target variables).
Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
XREGS	Additional data to use for model development and forecasting. Data needs to be a complete series which means both the historical and forward looking values over the specified forecast window needs to be supplied.
Lags	Select the periods for all lag variables you want to create. E.g. c(1:5,52) or list("day" = c(1:10), "weeks" = c(1:4))
MA_Periods	Select the periods for all moving average variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
SD_Periods	Select the periods for all moving standard deviation variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
Skew_Periods	Select the periods for all moving skewness variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
Kurt_Periods	Select the periods for all moving kurtosis variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
Quantile_Periods	Select the periods for all moving quantiles variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))
Quantiles_Selected	Select from the following c("q5", "q10", "q15", "q20", "q25", "q30", "q35", "q40", "q45", "q50", "q55", "q60", "q65", "q70", "q75", "q80", "q85", "q90", "q95", "q99")

AnomalyDetection	NULL for not using the service. Other, provide a list, e.g. AnomalyDetection = list("tstat_high" = 4, tstat_low = -4)
Difference	Puts the I in ARIMA for single series and grouped series.
FourierTerms	Set to the max number of pairs. E.g. 2 means to generate two pairs for by each group level and interactions if hierarchy is enabled.
CalendarVariables	NULL, or select from "second", "minute", "hour", "wday", "mday", "yday", "week", "isoweek", "month", "quarter", "year"
HolidayVariable	NULL, or select from "USPublicHolidays", "EasterGroup", "ChristmasGroup", "OtherEcclesticalFeasts"
HolidayLags	Number of lags to build off of the holiday count variable.
HolidayMovingAverages	Number of moving averages to build off of the holiday count variable.
TimeTrendVariable	Set to TRUE to have a time trend variable added to the model. Time trend is numeric variable indicating the numeric value of each record in the time series (by group). Time trend starts at 1 for the earliest point in time and increments by one for each success time point.
DataTruncate	Set to TRUE to remove records with missing values from the lags and moving average features created
ZeroPadSeries	NULL to do nothing. Otherwise, set to "maxmax", "minmax", "maxmin", "minmin". See <a href="#">TimeSeriesFill</a> for explanations of each type
SplitRatios	E.g c(0.7,0.2,0.1) for train, validation, and test sets
EvalMetric	Select from "RMSE", "MAE", "MAPE", "Poisson", "Quantile", "LogLinQuantile", "Lq", "SMAPE", "R2", "MSLE", "MedianAbsoluteError"
NumOfParDepPlots	Set to zeros if you do not want any returned. Can set to a very large value and it will adjust to the max number of features if it's too high
GridTune	Set to TRUE to run a grid tune
ModelCount	Set the number of models to try in the grid tune
NTrees	Select the number of trees you want to have built to train the model
LearnRate	Default 0.10, models available include gbm
LearnRateAnnealing	Default 1, models available include gbm
GridStrategy	Default "Cartesian", models available include
MaxRuntimeSecs	Default 60*60*24, models available include
StoppingRounds	Default 10, models available include
MaxDepth	Default 20, models available include drf, gbm
SampleRate	Default 0.632, models available include drf, gbm
MTries	Default 1, models available include drf
ColSampleRate	Default 1, model available include gbm
ColSampleRatePerTree	Default 1, models available include drf, gbm

ColSampleRatePerTreeLevel	Default 1, models available include drf, gbm
MinRows	Default 1, models available include drf, gbm
NBins	Default 20, models available include drf, gbm
NBinsCats	Default 1024, models available include drf, gbm
NBinsTopLevel	Default 1024, models available include drf, gbm
CategoricalEncoding	Default "AUTO". Choices include : "AUTO", "Enum", "OneHotInternal", "OneHotExplicit", "Binary", "Eigen", "LabelEncoder", "Sort-ByResponse", "Enum-Limited"
HistogramType	Default "AUTO". Select from "AUTO", "UniformAdaptive", "Random", "QuantilesGlobal", "RoundRobin"
Distribution	Model family
Link	Link for model family
RandomDistribution	Default NULL
RandomLink	Default NULL
Solver	Model optimizer
Alpha	Default NULL
Lambda	Default NULL
LambdaSearch	Default FALSE,
NLambdas	Default -1
Standardize	Default TRUE
RemoveCollinearColumns	Default FALSE
InterceptInclude	Default TRUE
NonNegativeCoefficients	Default FALSE
RandomColNumbers	NULL
InteractionColNumbers	NULL

**Value**

See examples

**Author(s)**

Adrian Antico

**See Also**

Other Automated Panel Data Forecasting: [AutoCatBoostCARMA\(\)](#), [AutoCatBoostHurdleCARMA\(\)](#), [AutoCatBoostVectorCARMA\(\)](#), [AutoXGBoostCARMA\(\)](#)

**Examples**

```
## Not run:

# Load data
data <- data.table::fread("https://www.dropbox.com/s/2str3ek4f4cheqi/walmart_train.csv?dl=1")

# Ensure series have no missing dates (also remove series with more than 25% missing values)
data <- RemixAutoML::TimeSeriesFill(
  data,
  DateColumnName = "Date",
  GroupVariables = c("Store", "Dept"),
  TimeUnit = "weeks",
  FillType = "maxmax",
  MaxMissingPercent = 0.25,
  SimpleImpute = TRUE)

# Set negative numbers to 0
data <- data[, Weekly_Sales := data.table::fifelse(Weekly_Sales < 0, 0, Weekly_Sales)]

# Remove IsHoliday column
data[, IsHoliday := NULL]

# Create xregs (this is to include the categorical variables instead of utilizing only the interaction of them)
xregs <- data[, .SD, .SDcols = c("Date", "Store", "Dept")]

# Change data types
data[, "Date" := as.character(Date)]
xregs[, "Date" := as.character(Date)]

# Build forecast
Results <- RemixAutoML::AutoH2OCARMA(

  # Data Artifacts
  AlgoType = "drf",
  ExcludeAlgos = NULL,
  data = data,
  TargetColumnName = "Weekly_Sales",
  DateColumnName = "Date",
  HierarchGroups = NULL,
  GroupVariables = c("Dept"),
  TimeUnit = "week",
  TimeGroups = c("weeks", "months"),

  # Data Wrangling Features
  SplitRatios = c(1 - 10 / 138, 10 / 138),
  PartitionType = "random",

  # Production args
  FC_Periods = 4L,
  TrainOnFull = FALSE,
  MaxMem = {gc(); paste0(as.character(floor(max(32, as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo))))))},
  NThreads = parallel::detectCores(),
  PDFOutputPath = NULL,
  SaveDataPath = NULL,
  Timer = TRUE,
  DebugMode = TRUE,
```

```

# Target Transformations
TargetTransformation = FALSE,
Methods = c("BoxCox", "Asinh", "Asin", "Log",
  "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),
Difference = FALSE,
NonNegativePred = FALSE,
RoundPreds = FALSE,

# Calendar features
CalendarVariables = c("week", "wom", "month", "quarter", "year"),
HolidayVariable = c("USPublicHolidays", "EasterGroup",
  "ChristmasGroup", "OtherEcclesticalFeasts"),
TimeTrendVariable = TRUE,
HolidayLags = 1:7,
HolidayMovingAverages = 2:7,

# Time series features
Lags = list("weeks" = c(1:4), "months" = c(1:3)),
MA_Periods = list("weeks" = c(2:8), "months" = c(6:12)),
SD_Periods = NULL,
Skew_Periods = NULL,
Kurt_Periods = NULL,
Quantile_Periods = NULL,
Quantiles_Selected = NULL,

# Bonus Features
XREGS = NULL,
FourierTerms = 2L,
AnomalyDetection = NULL,
ZeroPadSeries = NULL,
DataTruncate = FALSE,

# ML evaluation args
EvalMetric = "RMSE",
NumOfParDepPlots = 0L,

# ML grid tuning args
GridTune = FALSE,
GridStrategy = "Cartesian",
ModelCount = 5,
MaxRuntimeSecs = 60*60*24,
StoppingRounds = 10,

# ML Args
NTrees = 1000L,
MaxDepth = 20,
SampleRate = 0.632,
MTries = -1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO",

```

```

RandomColNumbers = NULL,
InteractionColNumbers = NULL,
WeightsColumn = NULL,

# ML args
Distribution = "gaussian",
Link = "identity",
RandomDistribution = NULL,
RandomLink = NULL,
Solver = "AUTO",
Alpha = NULL,
Lambda = NULL,
LambdaSearch = FALSE,
NLambdas = -1,
Standardize = TRUE,
RemoveCollinearColumns = FALSE,
InterceptInclude = TRUE,
NonNegativeCoefficients = FALSE)

UpdateMetrics <-
  Results$ModelInformation$EvaluationMetrics[
    Metric == "MSE", MetricValue := sqrt(MetricValue)]
print(UpdateMetrics)

# Get final number of trees actually used
Results$Model@model$model_summary$number_of_internal_trees

# Inspect performance
Results$ModelInformation$EvaluationMetricsByGroup[order(-R2_Metric)]
Results$ModelInformation$EvaluationMetricsByGroup[order(MAE_Metric)]
Results$ModelInformation$EvaluationMetricsByGroup[order(MSE_Metric)]
Results$ModelInformation$EvaluationMetricsByGroup[order(MAPE_Metric)]

## End(Not run)

```

---

AutoH2oDRFClassifier    *AutoH2oDRFClassifier is an automated H2O modeling framework with grid-tuning and model evaluation*

---

## Description

AutoH2oDRFClassifier is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation metrics, variable importance, partial dependence calibration plots, and column names used in model fitting.

## Usage

```

AutoH2oDRFClassifier(
  data,
  TrainOnFull = FALSE,

```

```

ValidationData = NULL,
TestData = NULL,
TargetColumnName = NULL,
FeatureColNames = NULL,
WeightsColumn = NULL,
MaxMem = {      gc()
  paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
    intern = TRUE))/1e+06)), "G") },
NThreads = max(1L, parallel::detectCores() - 2L),
model_path = NULL,
metadata_path = NULL,
ModelID = "FirstModel",
NumOfParDepPlots = 3L,
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
SaveInfoToPDF = FALSE,
IfSaveModel = "mojo",
H2OShutdown = FALSE,
H2OStartUp = TRUE,
GridTune = FALSE,
GridStrategy = "Cartesian",
MaxRuntimeSecs = 60 * 60 * 24,
StoppingRounds = 10,
MaxModelsInGrid = 2,
eval_metric = "auc",
CostMatrixWeights = c(1, 0, 0, 1),
Trees = 50L,
MaxDepth = 20L,
SampleRate = 0.632,
MTries = -1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO"
)

```

### Arguments

data	This is your data set for training and testing your model
TrainOnFull	Set to TRUE to train on full data
ValidationData	This is your holdout data set used in modeling either refine your hyperparameters.
TestData	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TargetColumnName	Either supply the target column name OR the column number where the target is located (but not mixed types). Note that the target column needs to be a 0   1

	numeric variable.
FeatureColNames	Either supply the feature column names OR the column number where the target is located (but not mixed types)
WeightsColumn	Column name of a weights column
MaxMem	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
NThreads	Set the number of threads you want to dedicate to the model building
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
ModelID	A character string to name your model and output
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create.
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
SaveInfoToPDF	Set to TRUE to save modeling information to PDF. If model_path or metadata_path aren't defined then output will be saved to the working directory
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
H2OShutdown	Set to TRUE to shutdown H2O after running the function
H2OStartup	Defaults to TRUE which means H2O will be started inside the function
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	Default "Cartesian"
MaxRuntimeSecs	Default 86400
StoppingRounds	Default 10
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
eval_metric	This is the metric used to identify best grid tuned model. Choose from "AUC" or "logloss"
CostMatrixWeights	A vector with 4 elements c(True Positive Cost, False Negative Cost, False Positive Cost, True Negative Cost). Default c(1,0,0,1),
Trees	The maximum number of trees you want in your models
MaxDepth	Default 20
SampleRate	Default 0.632
MTries	Default -1 means it will default to number of features divided by 3
ColSampleRatePerTree	Default 1
ColSampleRatePerTreeLevel	Default 1



MinRows	Default 1
NBinsCats	Default 1024
NBinsTopLevel	Default 1024
HistogramType	Default "AUTO"
CategoricalEncoding	Default "AUTO"

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Binary Classification: [AutoCatBoostClassifier\(\)](#), [AutoH2oGAMClassifier\(\)](#), [AutoH2oGBMClassifier\(\)](#), [AutoH2oGLMClassifier\(\)](#), [AutoH2oMLClassifier\(\)](#), [AutoXGBoostClassifier\(\)](#)

**Examples**

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000L,
  ID = 2L,
  ZIP = 0L,
  AddDate = FALSE,
  Classification = TRUE,
  MultiClass = FALSE)

TestModel <- RemixAutoML::AutoH2oDRFClassifier(

  # Compute management args
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", int
  NThreads = max(1L, parallel::detectCores() - 2L),
  IfSaveModel = "mojo",
  H2OShutdown = FALSE,
  H2OStartUp = TRUE,

  # Model evaluation args
  eval_metric = "auc",
  NumOfParDepPlots = 3L,
  CostMatrixWeights = c(1,0,0,1),

  # Metadata args
  model_path = normalizePath("./"),
  metadata_path = NULL,
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
```

```

SaveInfoToPDF = FALSE,

# Data args
data,
TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
TargetColumnName = "Adrian",
FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
WeightsColumn = NULL,

# Grid Tuning Args
GridStrategy = "Cartesian",
GridTune = FALSE,
MaxModelsInGrid = 10,
MaxRuntimeSecs = 60*60*24,
StoppingRounds = 10,

# Model args
Trees = 50L,
MaxDepth = 20,
SampleRate = 0.632,
MTries = -1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO")

## End(Not run)

```

---

AutoH2oDRFHurdleModel *AutoH2oDRFHurdleModel is generalized hurdle modeling framework*

---

## Description

AutoH2oDRFHurdleModel is generalized hurdle modeling framework

## Usage

```

AutoH2oDRFHurdleModel(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  Buckets = 0L,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  TransformNumericColumns = NULL,
  SplitRatios = c(0.7, 0.2, 0.1),
  ModelID = "ModelTest",

```

```

Paths = NULL,
MetaDataPaths = NULL,
SaveModelObjects = TRUE,
IfSaveModel = "mojo",
MaxMem = {      gc()
  paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
    intern = TRUE))/1e+06)), "G") },
NThreads = max(1L, parallel::detectCores() - 2L),
Trees = 1000L,
GridTune = TRUE,
MaxModelsInGrid = 1L,
NumOfParDepPlots = 10L,
PassInGrid = NULL
)

```

### Arguments

data	Source training data. Do not include a column that has the class labels for the buckets as they are created internally.
TrainOnFull	Set to TRUE to train on full data
ValidationData	Source validation data. Do not include a column that has the class labels for the buckets as they are created internally.
TestData	Source test data. Do not include a column that has the class labels for the buckets as they are created internally.
Buckets	A numeric vector of the buckets used for subsetting the data. NOTE: the final Bucket value will first create a subset of data that is less than the value and a second one thereafter for data greater than the bucket value.
TargetColumnName	Supply the column name or number for the target variable
FeatureColNames	Supply the column names or number of the features (not included the Primary-DateColumn)
TransformNumericColumns	Transform numeric column inside the AutoCatBoostRegression() function
SplitRatios	Supply vector of partition ratios. For example, c(0.70,0.20,0,10).
ModelID	Define a character name for your models
Paths	The path to your folder where you want your model information saved
MetaDataPaths	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to Paths.
SaveModelObjects	Set to TRUE to save the model objects to file in the folders listed in Paths
IfSaveModel	Save as "mojo" or "standard"
MaxMem	Set the maximum memory your system can provide
NThreads	Set the number of threads you want to dedicate to the model building
Trees	Default 1000
GridTune	Set to TRUE if you want to grid tune the models
MaxModelsInGrid	Set to a numeric value for the number of models to try in grid tune

NumOfParDepPlots      Set to pull back N number of partial dependence calibration plots.

PassInGrid      Pass in a grid for changing up the parameter settings for catboost

### Value

Returns AutoXGBoostRegression() model objects: VariableImportance.csv, Model, Validation-Data.csv, EvaluationPlot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, and the grid used

### See Also

Other Supervised Learning - Compound: [AutoCatBoostHurdleModel\(\)](#), [AutoCatBoostSizeFreqDist\(\)](#), [AutoH2oGBMHurdleModel\(\)](#), [AutoH2oGBMSizeFreqDist\(\)](#), [AutoXGBoostHurdleModel\(\)](#)

### Examples

```
## Not run:
Output <- AutoH2oDRFHurdleModel(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  Buckets = 1L,
  TargetColumnName = "Target_Variable",
  FeatureColNames = 4:ncol(data),
  TransformNumericColumns = NULL,
  SplitRatios = c(0.7, 0.2, 0.1),
  NThreads = max(1L, parallel::detectCores()-2L),
  ModelID = "ModelID",
  Paths = NULL,
  MetaDataPaths = NULL,
  SaveModelObjects = TRUE,
  IfSaveModel = "mojo",
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", intern=TRUE)))
  NThreads = max(1L, parallel::detectCores()-2L),
  Trees = 1000L,
  GridTune = FALSE,
  MaxModelsInGrid = 1L,
  NumOfParDepPlots = 10L,
  PassInGrid = NULL)

## End(Not run)
```

---

AutoH2oDRFMultiClass      *AutoH2oDRFMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation*

---

## Description

AutoH2oDRFMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation metrics, confusion matrix, and variable importance.

## Usage

```
AutoH2oDRFMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  WeightsColumn = NULL,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  IfSaveModel = "mojo",
  MaxMem = { gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06))), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  H2OShutdown = FALSE,
  H2OStartUp = TRUE,
  eval_metric = "logloss",
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  MaxRuntimeSecs = 60 * 60 * 24,
  StoppingRounds = 10,
  MaxModelsInGrid = 2,
  Trees = 50,
  MaxDepth = 20L,
  SampleRate = 0.632,
  MTries = -1,
  ColSampleRatePerTree = 1,
  ColSampleRatePerTreeLevel = 1,
  MinRows = 1,
  NBins = 20,
  NBinsCats = 1024,
  NBinsTopLevel = 1024,
  HistogramType = "AUTO",
  CategoricalEncoding = "AUTO"
)
```

**Arguments**

data	This is your data set for training and testing your model
TrainOnFull	Set to TRUE to train on full data
ValidationData	This is your holdout data set used in modeling either refine your hyperparameters.
TestData	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TargetColumnName	Either supply the target column name OR the column number where the target is located (but not mixed types).
FeatureColNames	Either supply the feature column names OR the column number where the target is located (but not mixed types)
WeightsColumn	Column name of a weights column
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
MaxMem	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
NThreads	Set the number of threads you want to dedicate to the model building
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
ModelID	A character string to name your model and output
H2OShutdown	Set to TRUE to have H2O shutdown after running this function
H2OStartup	Defaults to TRUE which means H2O will be started inside the function
eval_metric	This is the metric used to identify best grid tuned model. Choose from "logloss", "r2", "RMSE", "MSE"
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	Default "Cartesian"
MaxRuntimeSecs	Default 86400
StoppingRounds	Default 10
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
Trees	The maximum number of trees you want in your models
MaxDepth	Default 20
SampleRate	Default 0.632
MTries	Default -1 means it will default to number of features divided by 3
ColSampleRatePerTree	Default 1

ColSampleRatePerTreeLevel	Default 1
MinRows	Default 1
NBins	Default 20
NBinsCats	Default 1024
NBinsTopLevel	Default 1024
HistogramType	Default "AUTO"
CategoricalEncoding	Default "AUTO"

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Metrics.csv, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Multiclass Classification: [AutoCatBoostMultiClass\(\)](#), [AutoH2oGAMMultiClass\(\)](#), [AutoH2oGBMMultiClass\(\)](#), [AutoH2oGLMMultiClass\(\)](#), [AutoH2oMLMultiClass\(\)](#), [AutoXGBoostMultiClass\(\)](#)

**Examples**

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000L,
  ID = 2L,
  ZIP = 0L,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = TRUE)

# Run function
TestModel <- RemixAutoML::AutoH2oDRFMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
  WeightsColumn = NULL,
  eval_metric = "logloss",
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", inte
  NThreads = max(1, parallel::detectCores()-2)},
  model_path = normalizePath("./"),
  metadata_path = file.path(normalizePath("./")),
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
```

```

SaveModelObjects = FALSE,
IfSaveModel = "mojo",
H2OShutdown = FALSE,
H2OStartUp = TRUE,

# Grid Tuning Args
GridStrategy = "Cartesian",
GridTune = FALSE,
MaxModelsInGrid = 10,
MaxRuntimeSecs = 60*60*24,
StoppingRounds = 10,

# ML args
Trees = 50,
MaxDepth = 20,
SampleRate = 0.632,
MTries = -1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO")

## End(Not run)

```

---

AutoH2oDRFRegression	<i>AutoH2oDRFRegression is an automated H2O modeling framework with grid-tuning and model evaluation</i>
----------------------	--

---

## Description

AutoH2oDRFRegression is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation boxplot, evaluation metrics, variable importance, partial dependence calibration plots, partial dependence calibration box plots, and column names used in model fitting.

## Usage

```

AutoH2oDRFRegression(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  WeightsColumn = NULL,
  MaxMem = {      gc()

```



```

paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
intern = TRUE))/1e+06)), "G") },
NThreads = max(1, parallel::detectCores() - 2),
H2OShutdown = TRUE,
H2OStartUp = TRUE,
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
SaveInfoToPDF = FALSE,
IfSaveModel = "mojo",
model_path = NULL,
metadata_path = NULL,
ModelID = "FirstModel",
TransformNumericColumns = NULL,
Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
"Logit"),
NumOfParDepPlots = 3,
eval_metric = "RMSE",
GridTune = FALSE,
GridStrategy = "Cartesian",
MaxRuntimeSecs = 60 * 60 * 24,
StoppingRounds = 10,
MaxModelsInGrid = 2,
Trees = 50,
MaxDepth = 20,
SampleRate = 0.632,
MTries = -1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO"
)

```

### Arguments

data	This is your data set for training and testing your model
TrainOnFull	Set to TRUE to train on full data
ValidationData	This is your holdout data set used in modeling either refine your hyperparameters.
TestData	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TargetColumnName	Either supply the target column name OR the column number where the target is located (but not mixed types).
FeatureColNames	Either supply the feature column names OR the column number where the target is located (but not mixed types)
WeightsColumn	Column name of a weights column

MaxMem	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
NThreads	Set the number of threads you want to dedicate to the model building
H2OShutdown	Set to TRUE to shutdown H2O inside the function
H2OStartUp	Defaults to TRUE which means H2O will be started inside the function
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
SaveInfoToPDF	Set to TRUE to save insights to PDF
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
ModelID	A character string to name your model and output
TransformNumericColumns	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)
eval_metric	This is the metric used to identify best grid tuned model. Choose from "MSE", "RMSE", "MAE", "RMSLE"
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	Default "Cartesian"
MaxRuntimeSecs	Default 86400
StoppingRounds	Default 10
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
Trees	The maximum number of trees you want in your models
MaxDepth	Default 20
SampleRate	Default 0.632
MTries	Default -1 means it will default to number of features divided by 3
ColSampleRatePerTree	Default 1
ColSampleRatePerTreeLevel	Default 1
MinRows	Default 1

NBins	Default 20
NBinsCats	Default 1024
NBinsTopLevel	Default 1024
HistogramType	Default "AUTO". Select from "AUTO", "UniformAdaptive", "Random", "QuantilesGlobal", "RoundRobin"
CategoricalEncoding	Default "AUTO"

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, GridList, and Transformation metadata

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Regression: [AutoCatBoostRegression\(\)](#), [AutoH2oGAMRegression\(\)](#), [AutoH2oGBMRegression\(\)](#), [AutoH2oGLMRegression\(\)](#), [AutoH2oMLRegression\(\)](#), [AutoXGBoostRegression\(\)](#)

**Examples**

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Run function
TestModel <- RemixAutoML::AutoH2oDRFRegression(

  # Compute management
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", int
  NThreads = max(1L, parallel::detectCores() - 2L),
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  IfSaveModel = "mojo",

  # Model evaluation:
  eval_metric = "RMSE",
  NumOfParDepPlots = 3,

  # Metadata arguments:
  model_path = normalizePath("./"),
  metadata_path = NULL,
  ModelID = "FirstModel",
```

```

ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
SaveInfoToPDF = FALSE,

# Data Args
data = data,
TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
TargetColumnName = "Adrian",
FeatureColNames = names(data)[!names(data) %in%
  c("IDcol_1", "IDcol_2", "Adrian")],
WeightsColumn = NULL,
TransformNumericColumns = NULL,
Methods = c("BoxCox", "Asinh", "Asin", "Log",
  "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),

# Grid Tuning Args
GridStrategy = "Cartesian",
GridTune = FALSE,
MaxModelsInGrid = 10,
MaxRuntimeSecs = 60*60*24,
StoppingRounds = 10,

# ML Args
Trees = 50,
MaxDepth = 20,
SampleRate = 0.632,
MTries = -1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO")

## End(Not run)

```

---

AutoH2oGAMClassifier	<i>AutoH2oGAMClassifier is an automated H2O modeling framework with grid-tuning and model evaluation</i>
----------------------	--

---

## Description

AutoH2oGAMClassifier is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation metrics, variable importance, partial dependence calibration plots, and column names used in model fitting.

**Usage**

```

AutoH2oGAMClassifier(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  WeightsColumn = NULL,
  GamColNames = NULL,
  Distribution = "binomial",
  Link = "logit",
  eval_metric = "auc",
  CostMatrixWeights = c(1, 0, 0, 1),
  MaxMem = {      gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06)), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  NumOfParDepPlots = 3,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = FALSE,
  H2OStartUp = TRUE,
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  StoppingRounds = 10,
  MaxRunTimeSecs = 3600 * 24 * 7,
  MaxModelsInGrid = 2,
  num_knots = NULL,
  keep_gam_cols = TRUE,
  Solver = "AUTO",
  Alpha = 0.5,
  Lambda = NULL,
  LambdaSearch = FALSE,
  NLambdas = -1,
  Standardize = TRUE,
  RemoveCollinearColumns = FALSE,
  InterceptInclude = TRUE,
  NonNegativeCoefficients = FALSE
)

```

**Arguments**

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.

TestData	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TargetColumnName	Either supply the target column name OR the column number where the target is located (but not mixed types). Note that the target column needs to be a 0   1 numeric variable.
FeatureColNames	Either supply the feature column names OR the column number where the target is located (but not mixed types)
WeightsColumn	Weighted classification
GamColNames	GAM column names. Up to 9 features
Distribution	"binomial", "quasibinomial"
Link	identity, logit, log, inverse, tweedie
eval_metric	This is the metric used to identify best grid tuned model. Choose from "AUC" or "logloss"
CostMatrixWeights	A vector with 4 elements c(True Positive Cost, False Negative Cost, False Positive Cost, True Negative Cost). Default c(1,0,0,1),
MaxMem	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
NThreads	Set the number of threads you want to dedicate to the model building
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
ModelID	A character string to name your model and output
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create.
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
SaveInfoToPDF	Set to TRUE to save modeling information to PDF. If model_path or metadata_path aren't defined then output will be saved to the working directory
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
H2OShutdown	Set to TRUE to shutdown H2O after running the function
H2OStartUp	Set to TRUE to start up H2O inside function
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	"RandomDiscrete" or "Cartesian"
StoppingRounds	Iterations in grid tuning
MaxRunTimeSecs	Max run time in seconds
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)

num_knots	Numeric values for gam
keep_gam_cols	Logical
Solver	Default "AUTO". Options include "IRLSM", "L_BFGS", "COORDINATE_DESCENT_NAIVE", "COORDINATE_DESCENT", "GRADIENT_DESCENT_LH", "GRADIENT_DESCENT_SQERR"
Alpha	Default 0.5 Otherwise supply a value between 0 and 1. 1 is equivalent to Lasso regression. 0 is equivalent to Ridge regression. Inbetween for a blend of the two.
Lambda	Default NULL. Regularization strength.
LambdaSearch	Default FALSE.
NLambdas	Default -1
Standardize	Default TRUE. Standardize numerical columns
RemoveCollinearColumns	Default FALSE. Removes some of the linearly dependent columns
InterceptInclude	Default TRUE
NonNegativeCoefficients	Default FALSE

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Binary Classification: [AutoCatBoostClassifier\(\)](#), [AutoH2oDRFClassifier\(\)](#), [AutoH2oGBMClassifier\(\)](#), [AutoH2oGLMClassifier\(\)](#), [AutoH2oMLClassifier\(\)](#), [AutoXGBoostClassifier\(\)](#)

**Examples**

```
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = TRUE,
  MultiClass = FALSE)

# Define GAM Columns to use - up to 9 are allowed
GamCols <- names(which(unlist(lapply(data, is.numeric))))
GamCols <- GamCols[!GamCols %in% c("Adrian", "IDcol_1", "IDcol_2")]
GamCols <- GamCols[1L:(min(9L, length(GamCols)))]

# Run function
```

```

TestModel <- RemixAutoML::AutoH2oGAMClassifier(

  # Compute management
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", inter
  NThreads = max(1, parallel::detectCores()-2),
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  IfSaveModel = "mojo",

  # Model evaluation args
  CostMatrixWeights = c(1,0,0,1),
  eval_metric = "auc",
  NumOfParDepPlots = 3,

  # Metadata arguments:
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,

  # Data args
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2","Adrian")],
  WeightsColumn = NULL,
  GamColNames = GamCols,

  # ML args
  num_knots = NULL,
  keep_gam_cols = TRUE,
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  StoppingRounds = 10,
  MaxRunTimeSecs = 3600 * 24 * 7,
  MaxModelsInGrid = 10,
  Distribution = "binomial",
  Link = "logit",
  Solver = "AUTO",
  Alpha = 0.5,
  Lambda = NULL,
  LambdaSearch = FALSE,
  NLambdas = -1,
  Standardize = TRUE,
  RemoveCollinearColumns = FALSE,
  InterceptInclude = TRUE,
  NonNegativeCoefficients = FALSE)

```

---

AutoH2oGAMMultiClass	<i>AutoH2oGAMMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation</i>
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---



## Description

AutoH2oGAMMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation metrics, confusion matrix, and variable importance.

## Usage

```
AutoH2oGAMMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  WeightsColumn = NULL,
  GamColNames = NULL,
  eval_metric = "logloss",
  MaxMem = { gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06)), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = FALSE,
  H2OStartUp = TRUE,
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  StoppingRounds = 10,
  MaxRunTimeSecs = 3600 * 24 * 7,
  MaxModelsInGrid = 2,
  Distribution = "multinomial",
  Link = "Family_Default",
  num_knots = NULL,
  keep_gam_cols = TRUE,
  Solver = "AUTO",
  Alpha = 0.5,
  Lambda = NULL,
  LambdaSearch = FALSE,
  NLambdas = -1,
  Standardize = TRUE,
  RemoveCollinearColumns = FALSE,
  InterceptInclude = TRUE,
  NonNegativeCoefficients = FALSE
)
```

**Arguments**

data	This is your data set for training and testing your model
TrainOnFull	Set to TRUE to train on full data
ValidationData	This is your holdout data set used in modeling either refine your hyperparameters.
TestData	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TargetColumnName	Either supply the target column name OR the column number where the target is located (but not mixed types).
FeatureColNames	Either supply the feature column names OR the column number where the target is located (but not mixed types)
WeightsColumn	Weighted classification
GamColNames	GAM column names. Up to 9 features
eval_metric	This is the metric used to identify best grid tuned model. Choose from "logloss", "r2", "RMSE", "MSE"
MaxMem	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
NThreads	Set the number of threads you want to dedicate to the model building
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
ModelID	A character string to name your model and output
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
H2OShutdown	Set to TRUE to have H2O shutdown after running this function
H2OStartUp	Set to TRUE to start up H2O inside function
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	"RandomDiscrete" or "Cartesian"
StoppingRounds	Iterations in grid tuning
MaxRunTimeSecs	Max run time in seconds
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
num_knots	Numeric values for gam
keep_gam_cols	Logical
Solver	Default "AUTO". Options include "IRLSM", "L_BFGS", "COORDINATE_DESCENT_NAIVE", "COORDINATE_DESCENT", "GRADIENT_DESCENT_LH", "GRADIENT_DESCENT_SQERR"

Alpha	Default 0.5 Otherwise supply a value between 0 and 1. 1 is equivalent to Lasso regression. 0 is equivalent to Ridge regression. Inbetween for a blend of the two.
Lambda	Default NULL. Regularization strength.
LambdaSearch	Default FALSE.
NLambdas	Default -1
Standardize	Default TRUE. Standardize numerical columns
RemoveCollinearColumns	Default FALSE. Removes some of the linearly dependent columns
InterceptInclude	Default TRUE
NonNegativeCoefficients	Default FALSE

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Metrics.csv, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Multiclass Classification: [AutoCatBoostMultiClass\(\)](#), [AutoH2oDRFMultiClass\(\)](#), [AutoH2oGBMMultiClass\(\)](#), [AutoH2oGLMMultiClass\(\)](#), [AutoH2oMLMultiClass\(\)](#), [AutoXGBoostMultiClass\(\)](#)

**Examples**

```
# Create some dummy correlated data with numeric and categorical features
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000L,
  ID = 2L,
  ZIP = 0L,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = TRUE)

# Define GAM Columns to use - up to 9 are allowed
GamCols <- names(which(unlist(lapply(data, is.numeric))))
GamCols <- GamCols[!GamCols %in% c("Adrian", "IDcol_1", "IDcol_2")]
GamCols <- GamCols[1L:(min(9L, length(GamCols)))]

# Run function
TestModel <- RemixAutoML::AutoH2oGAMMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
```

```

WeightsColumn = NULL,
GamColNames = GamCols,
eval_metric = "logloss",
MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", inte
NThreads = max(1, parallel::detectCores()-2),
model_path = normalizePath("./"),
metadata_path = NULL,
ModelID = "FirstModel",
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
IfSaveModel = "mojo",
H2OShutdown = FALSE,
H2OStartUp = TRUE,

# ML args
num_knots = NULL,
keep_gam_cols = TRUE,
GridTune = FALSE,
GridStrategy = "Cartesian",
StoppingRounds = 10,
MaxRunTimeSecs = 3600 * 24 * 7,
MaxModelsInGrid = 10,
Distribution = "multinomial",
Link = "Family_Default",
Solver = "AUTO",
Alpha = 0.5,
Lambda = NULL,
LambdaSearch = FALSE,
NLambdas = -1,
Standardize = TRUE,
RemoveCollinearColumns = FALSE,
InterceptInclude = TRUE,
NonNegativeCoefficients = FALSE)

```

---

AutoH2oGAMRegression     *AutoH2oGAMRegression is an automated H2O modeling framework  
with grid-tuning and model evaluation*

---

## Description

AutoH2oGAMRegression is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation boxplot, evaluation metrics, variable importance, partial dependence calibration plots, partial dependence calibration box plots, and column names used in model fitting.

## Usage

```

AutoH2oGAMRegression(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,

```

```

TestData = NULL,
TargetColumnName = NULL,
FeatureColNames = NULL,
InteractionColNumbers = NULL,
WeightsColumn = NULL,
GamColNames = NULL,
Distribution = "gaussian",
Link = "identity",
TweedieLinkPower = NULL,
TweedieVariancePower = NULL,
TransformNumericColumns = NULL,
Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
  "Logit"),
eval_metric = "RMSE",
MaxMem = {      gc()
  paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
    intern = TRUE))/1e+06)), "G") },
NThreads = max(1, parallel::detectCores() - 2),
model_path = NULL,
metadata_path = NULL,
ModelID = "FirstModel",
NumOfParDepPlots = 3,
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
SaveInfoToPDF = FALSE,
IfSaveModel = "mojo",
H2OShutdown = TRUE,
H2OStartUp = TRUE,
GridTune = FALSE,
GridStrategy = "Cartesian",
StoppingRounds = 10,
MaxRunTimeSecs = 3600 * 24 * 7,
MaxModelsInGrid = 2,
num_knots = NULL,
keep_gam_cols = TRUE,
Solver = "AUTO",
Alpha = 0.5,
Lambda = NULL,
LambdaSearch = FALSE,
NLambdas = -1,
Standardize = TRUE,
RemoveCollinearColumns = FALSE,
InterceptInclude = TRUE,
NonNegativeCoefficients = FALSE
)

```

### Arguments

data	This is your data set for training and testing your model
TrainOnFull	Set to TRUE to train on full data
ValidationData	This is your holdout data set used in modeling either refine your hyperparameters.

TestData	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
TargetColumnName	Either supply the target column name OR the column number where the target is located (but not mixed types).
FeatureColNames	Either supply the feature column names OR the column number where the target is located (but not mixed types)
InteractionColNumbers	Column numbers of the features you want to be pairwise interacted
WeightsColumn	Column name of a weights column
GamColNames	GAM column names. Up to 9 features
Distribution	: "AUTO", "gaussian", "binomial", "quasi-binomial", "ordinal", "multinomial", "poisson", "gamma", "tweedie", "negative-binomial", "fractionalbinomial"
Link	"family_default", "identity", "logit", "log", "inverse", "tweedie", "ologit"
TweedieLinkPower	See h2o docs for background
TweedieVariancePower	See h2o docs for background
TransformNumericColumns	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
eval_metric	This is the metric used to identify best grid tuned model. Choose from "MSE", "RMSE", "MAE", "RMSLE"
MaxMem	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
NThreads	Set the number of threads you want to dedicate to the model building
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
ModelID	A character string to name your model and output
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
SaveInfoToPDF	Set to TRUE to save insights to PDF
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object

H2OShutdown	Set to TRUE to shutdown H2O inside the function
H2OStartUp	Defaults to TRUE which means H2O will be started inside the function
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	"RandomDiscrete" or "Cartesian"
StoppingRounds	Iterations in grid tuning
MaxRunTimeSecs	Max run time in seconds
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
num_knots	Numeric values for gam
keep_gam_cols	Logical
Solver	Default "AUTO". Options include "IRLSM", "L_BFGS", "COORDINATE_DESCENT_NAIVE", "COORDINATE_DESCENT", "GRADIENT_DESCENT_LH", "GRADIENT_DESCENT_SQERR"
Alpha	Default 0.5 Otherwise supply a value between 0 and 1. 1 is equivalent to Lasso regression. 0 is equivalent to Ridge regression. Inbetween for a blend of the two.
Lambda	Default NULL. Regularization strength.
LambdaSearch	Default FALSE.
NLambdas	Default -1
Standardize	Default TRUE. Standardize numerical columns
RemoveCollinearColumns	Default FALSE. Removes some of the linearly dependent columns
InterceptInclude	Default TRUE
NonNegativeCoefficients	Default FALSE

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, GridList, and Transformation metadata

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Regression: [AutoCatBoostRegression\(\)](#), [AutoH2oDRFRegression\(\)](#), [AutoH2oGBMRegression\(\)](#), [AutoH2oGLMRegression\(\)](#), [AutoH2oMLRegression\(\)](#), [AutoXGBoostRegression\(\)](#)

**Examples**

```

# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Define GAM Columns to use - up to 9 are allowed
GamCols <- names(which(unlist(lapply(data, is.numeric))))
GamCols <- GamCols[!GamCols %in% c("Adrian", "IDcol_1", "IDcol_2")]
GamCols <- GamCols[1L:(min(9L, length(GamCols)))]

# Run function
TestModel <- RemixAutoML::AutoH2oGAMRegression(

  # Compute management
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", inter
  NThreads = max(1, parallel::detectCores()-2),
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  IfSaveModel = "mojo",

  # Model evaluation:
  eval_metric = "RMSE",
  NumOfParDepPlots = 3,

  # Metadata arguments:
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,

  # Data arguments:
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in%
                                c("IDcol_1", "IDcol_2", "Adrian")],
  InteractionColNumbers = NULL,
  WeightsColumn = NULL,
  GamColNames = GamCols,
  TransformNumericColumns = NULL,
  Methods = c("BoxCox", "Asinh", "Asin", "Log",
              "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),

  # Model args
  num_knots = NULL,

```



```

keep_gam_cols = TRUE,
GridTune = FALSE,
GridStrategy = "Cartesian",
StoppingRounds = 10,
MaxRunTimeSecs = 3600 * 24 * 7,
MaxModelsInGrid = 10,
Distribution = "gaussian",
Link = "Family_Default",
TweedieLinkPower = NULL,
TweedieVariancePower = NULL,
Solver = "AUTO",
Alpha = 0.5,
Lambda = NULL,
LambdaSearch = FALSE,
NLambdas = -1,
Standardize = TRUE,
RemoveCollinearColumns = FALSE,
InterceptInclude = TRUE,
NonNegativeCoefficients = FALSE)

```

---

AutoH2oGBMClassifier     *AutoH2oGBMClassifier is an automated H2O modeling framework with grid-tuning and model evaluation*

---

## Description

AutoH2oGBMClassifier is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation metrics, variable importance, partial dependence calibration plots, and column names used in model fitting.

## Usage

```

AutoH2oGBMClassifier(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  WeightsColumn = NULL,
  MaxMem = { gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06)), "G") },
  NThreads = max(1L, parallel::detectCores() - 2L),
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  NumOfParDepPlots = 3L,

```

```

ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
SaveInfoToPDF = FALSE,
IfSaveModel = "mojo",
H2OShutdown = FALSE,
H2OStartUp = TRUE,
GridStrategy = "Cartesian",
MaxRuntimeSecs = 60 * 60 * 24,
StoppingRounds = 10,
MaxModelsInGrid = 2,
eval_metric = "auc",
CostMatrixWeights = c(1, 0, 0, 1),
Trees = 50L,
GridTune = FALSE,
LearnRate = 0.1,
LearnRateAnnealing = 1,
Distribution = "bernoulli",
MaxDepth = 20,
SampleRate = 0.632,
ColSampleRate = 1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO"
)

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>WeightsColumn</code>	Column name of a weights column
<code>MaxMem</code>	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
<code>NThreads</code>	Set to the maximum amount of threads you want to use for this function
<code>model_path</code>	A character string of your path file to where you want your output saved

metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
ModelID	A character string to name your model and output
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
SaveInfoToPDF	Set to TRUE to save modeling information to PDF. If model_path or metadata_path aren't defined then output will be saved to the working directory
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
H2OShutdown	Set to TRUE to shutdown H2O inside the function
H2OStartUp	Defaults to TRUE which means H2O will be started inside the function
GridStrategy	Default "Cartesian"
MaxRuntimeSecs	Default 60*60*24
StoppingRounds	Number of runs
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
eval_metric	This is the metric used to identify best grid tuned model. Choose from "auc", "logloss", "aucpr", "lift_top_group", "misclassification", "mean_per_class_error"
CostMatrixWeights	A vector with 4 elements c(True Positive Cost, False Negative Cost, False Positive Cost, True Negative Cost). Default c(1,0,0,1),
Trees	The maximum number of trees you want in your models
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
LearnRate	Default 0.10
LearnRateAnnealing	Default 1
Distribution	Choose from "AUTO", "bernoulli", and "quasibinomial"
MaxDepth	Default 20
SampleRate	Default 0.632
ColSampleRate	Default 1
ColSampleRatePerTree	Default 1
ColSampleRatePerTreeLevel	Default 1
MinRows	Default 1
NBins	Default 20
NBinsCats	Default 1024
NBinsTopLevel	Default 1024
HistogramType	Default "AUTO"
CategoricalEncoding	Default "AUTO"

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Binary Classification: [AutoCatBoostClassifier\(\)](#), [AutoH2oDRFClassifier\(\)](#), [AutoH2oGAMClassifier\(\)](#), [AutoH2oGLMClassifier\(\)](#), [AutoH2oMLClassifier\(\)](#), [AutoXGBoostClassifier\(\)](#)

**Examples**

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000L,
  ID = 2L,
  ZIP = 0L,
  AddDate = FALSE,
  Classification = TRUE,
  MultiClass = FALSE)

TestModel <- RemixAutoML::AutoH2oGBMClassifier(

  # Compute management
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", int
  NThreads = max(1, parallel::detectCores()-2),
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  IfSaveModel = "mojo",

  # Model evaluation
  CostMatrixWeights = c(1,0,0,1),
  eval_metric = "auc",
  NumOfParDepPlots = 3,

  # Metadata arguments:
  model_path = normalizePath("./"),
  metadata_path = file.path(normalizePath("./")),
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,

  # Data arguments
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
```

```

WeightsColumn = NULL,

# ML grid tuning args
GridTune = FALSE,
GridStrategy = "Cartesian",
MaxRuntimeSecs = 60*60*24,
StoppingRounds = 10,
MaxModelsInGrid = 2,

# Model args
Trees = 50,
LearnRate = 0.10,
LearnRateAnnealing = 1,
Distribution = "bernoulli",
MaxDepth = 20,
SampleRate = 0.632,
ColSampleRate = 1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO")

## End(Not run)

```

---

AutoH2oGBMFreqSizeScoring

*AutoH2oGBMFreqSizeScoring is for scoring the models build with  
AutoH2oGBMSizeFreqDist()*

---

## Description

AutoH2oGBMFreqSizeScoring is for scoring the models build with AutoH2oGBMSizeFreqDist(). It will return the predicted values for every quantile model for both distributions for 1 to the max forecast periods you provided to build the scoring data.

## Usage

```

AutoH2oGBMFreqSizeScoring(
  ScoringData,
  TargetColumnNames = NULL,
  CountQuantiles = seq(0.1, 0.9, 0.1),
  SizeQuantiles = seq(0.1, 0.9, 0.1),
  ModelPath = NULL,
  ModelIDs = c("CountModel", "SizeModel"),
  JavaOptions = "-Xmx1g -XX:ReservedCodeCacheSize=256m",
  KeepFeatures = TRUE
)

```

**Arguments**

ScoringData	The scoring data returned from IntermittentDemandScoringDataGenerator()
TargetColumnNames	A character or numeric vector of the target names. E.g. c("Counts","TARGET_qty")
CountQuantiles	A numerical vector of the quantiles used in model building
SizeQuantiles	A numerical vector of the quantiles used in model building
ModelPath	The path file to where you models were saved
ModelIDs	The ID's used in model building
JavaOptions	For mojo scoring '-Xmx1g -XX:ReservedCodeCacheSize=256m',
KeepFeatures	Set to TRUE to return the features with the predicted values

**Value**

Returns a list of CountData scores, SizeData scores, along with count and size prediction column names

**Author(s)**

Adrian Antico

**See Also**

Other Automated Time Series: [AutoArfima\(\)](#), [AutoBanditNNet\(\)](#), [AutoBanditSarima\(\)](#), [AutoCatBoostFreqSizeScoring\(\)](#), [AutoETS\(\)](#), [AutoTBATS\(\)](#), [AutoTS\(\)](#)

**Examples**

```
## Not run:
FinalData <- AutoH2oGBMFreqSizeScoring(
  ScoringData,
  TargetColumnNames = c("Counts","TARGET_qty"),
  CountQuantiles = seq(0.10,0.90,0.10),
  SizeQuantiles = seq(0.10,0.90,0.10),
  ModelPath = getwd(),
  ModelIDs = c("CountModel","SizeModel"),
  JavaOptions = '-Xmx1g -XX:ReservedCodeCacheSize=256m',
  KeepFeatures = TRUE)

## End(Not run)
```

---

AutoH2oGBMHurdleModel *AutoH2oGBMHurdleModel is generalized hurdle modeling framework*

---

**Description**

AutoH2oGBMHurdleModel is generalized hurdle modeling framework

**Usage**

```

AutoH2oGBMHurdleModel(
  data,
  ValidationData = NULL,
  TestData = NULL,
  Buckets = 0L,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  TransformNumericColumns = NULL,
  Distribution = "gaussian",
  SplitRatios = c(0.7, 0.2, 0.1),
  ModelID = "ModelTest",
  Paths = NULL,
  MetaDataPaths = NULL,
  SaveModelObjects = TRUE,
  IfSaveModel = "mojo",
  MaxMem = {      gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06))), "G") },
  NThreads = max(1L, parallel::detectCores() - 2L),
  Trees = 1000L,
  GridTune = TRUE,
  MaxModelsInGrid = 1L,
  NumOfParDepPlots = 10L,
  PassInGrid = NULL
)

```

**Arguments**

<code>data</code>	Source training data. Do not include a column that has the class labels for the buckets as they are created internally.
<code>ValidationData</code>	Source validation data. Do not include a column that has the class labels for the buckets as they are created internally.
<code>TestData</code>	Source test data. Do not include a column that has the class labels for the buckets as they are created internally.
<code>Buckets</code>	A numeric vector of the buckets used for subsetting the data. NOTE: the final Bucket value will first create a subset of data that is less than the value and a second one thereafter for data greater than the bucket value.
<code>TargetColumnName</code>	Supply the column name or number for the target variable
<code>FeatureColNames</code>	Supply the column names or number of the features (not included the Primary-DateColumn)
<code>TransformNumericColumns</code>	Transform numeric column inside the <code>AutoCatBoostRegression()</code> function
<code>Distribution</code>	Set to the distribution of choice based on H2O regression documents.
<code>SplitRatios</code>	Supply vector of partition ratios. For example, <code>c(0.70,0.20,0.10)</code> .
<code>ModelID</code>	Define a character name for your models
<code>Paths</code>	The path to your folder where you want your model information saved

MetaDataPaths	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to Paths.
SaveModelObjects	Set to TRUE to save the model objects to file in the folders listed in Paths
IfSaveModel	Save as "mojo" or "standard"
MaxMem	Set the maximum memory your system can provide
NThreads	Set the number of threads you want to dedicate to the model building
Trees	Default 1000
GridTune	Set to TRUE if you want to grid tune the models
MaxModelsInGrid	Set to a numeric value for the number of models to try in grid tune
NumOfParDepPlots	Set to pull back N number of partial dependence calibration plots.
PassInGrid	Pass in a grid for changing up the parameter settings for catboost

### Value

Returns AutoXGBoostRegression() model objects: VariableImportance.csv, Model, Validation-Data.csv, EvaluationPlot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, and the grid used

### See Also

Other Supervised Learning - Compound: [AutoCatBoostHurdleModel\(\)](#), [AutoCatBoostSizeFreqDist\(\)](#), [AutoH2oDRFHurdleModel\(\)](#), [AutoH2oGBMSizeFreqDist\(\)](#), [AutoXGBoostHurdleModel\(\)](#)

### Examples

```
Output <- RemixAutoML::AutoH2oGBMHurdleModel(
  data,
  ValidationData = NULL,
  TestData = NULL,
  Buckets = 1L,
  TargetColumnName = "Target_Variable",
  FeatureColNames = 4L:ncol(data),
  TransformNumericColumns = NULL,
  Distribution = "gaussian",
  SplitRatios = c(0.7, 0.2, 0.1),
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk 'MemFree/ {print $2}' /proc/meminfo", intern=TRUE)))
  NThreads = max(1L, parallel::detectCores()-2L),
  ModelID = "ModelID",
  Paths = normalizePath("./"),
  MetaDataPaths = NULL,
  SaveModelObjects = TRUE,
  IfSaveModel = "mojo",
  Trees = 1000L,
  GridTune = FALSE,
  MaxModelsInGrid = 1L,
  NumOfParDepPlots = 10L,
  PassInGrid = NULL)
```



---

AutoH2oGBMMultiClass	<i>AutoH2oGBMMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation</i>
----------------------	--

---

## Description

AutoH2oGBMMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation metrics, confusion matrix, and variable importance.

## Usage

```
AutoH2oGBMMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  WeightsColumn = NULL,
  MaxMem = {      gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE)))/1e+06)), "G") },
  NThreads = max(1L, parallel::detectCores() - 2L),
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  NumOfParDepPlots = 3L,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  MaxRuntimeSecs = 60 * 60 * 24,
  StoppingRounds = 10,
  MaxModelsInGrid = 2,
  eval_metric = "auc",
  Trees = 50L,
  LearnRate = 0.1,
  LearnRateAnnealing = 1,
  Distribution = "multinomial",
  MaxDepth = 20,
  SampleRate = 0.632,
  MTries = -1,
  ColSampleRate = 1,
  ColSampleRatePerTree = 1,
```

```

ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO"
)

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>WeightsColumn</code>	Column name of a weights column
<code>MaxMem</code>	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
<code>NThreads</code>	Set to the maximum amount of threads you want to use for this function
<code>model_path</code>	A character string of your path file to where you want your output saved
<code>metadata_path</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to <code>model_path</code> .
<code>ModelID</code>	A character string to name your model and output
<code>NumOfParDepPlots</code>	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)
<code>ReturnModelObjects</code>	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
<code>SaveModelObjects</code>	Set to TRUE to return all modeling objects to your environment
<code>IfSaveModel</code>	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
<code>H2OShutdown</code>	Set to TRUE to shutdown H2O inside the function
<code>H2OStartUp</code>	Defaults to TRUE which means H2O will be started inside the function
<code>GridTune</code>	Set to TRUE to run a grid tuning procedure. Set a number in <code>MaxModelsInGrid</code> to tell the procedure how many models you want to test.
<code>GridStrategy</code>	Default "Cartesian"

MaxRuntimeSecs	Default 60*60*24
StoppingRounds	Number of runs
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
eval_metric	This is the metric used to identify best grid tuned model. Choose from "auc", "logloss"
Trees	The maximum number of trees you want in your models
LearnRate	Default 0.10
LearnRateAnnealing	Default 1
Distribution	Choose from "multinomial". Placeholder in more options get added
MaxDepth	Default 20
SampleRate	Default 0.632
ColSampleRate	Default 1
ColSampleRatePerTree	Default 1
ColSampleRatePerTreeLevel	Default 1
MinRows	Default 1
NBins	Default 20
NBinsCats	Default 1024
NBinsTopLevel	Default 1024
HistogramType	Default "AUTO"
CategoricalEncoding	Default "AUTO"
TransformNumericColumns	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
SaveInfoToPDF	Set to TRUE to save insights to PDF

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Metrics.csv, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Multiclass Classification: [AutoCatBoostMultiClass\(\)](#), [AutoH2oDRFMultiClass\(\)](#), [AutoH2oGAMMultiClass\(\)](#), [AutoH2oGLMMultiClass\(\)](#), [AutoH2oMLMultiClass\(\)](#), [AutoXGBoostMultiClass\(\)](#)

**Examples**

```

# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = TRUE)

# Run function
TestModel <- RemixAutoML::AutoH2oGBMMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
  WeightsColumn = NULL,
  eval_metric = "logloss",
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", inte
  NThreads = max(1, parallel::detectCores()-2)},
  model_path = normalizePath("./"),
  metadata_path = file.path(normalizePath("./")),
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,

  # Model args
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  MaxRuntimeSecs = 60*60*24,
  StoppingRounds = 10,
  MaxModelsInGrid = 2,
  Trees = 50,
  LearnRate = 0.10,
  LearnRateAnnealing = 1,
  eval_metric = "RMSE",
  Distribution = "multinomial",
  MaxDepth = 20,
  SampleRate = 0.632,
  ColSampleRate = 1,
  ColSampleRatePerTree = 1,
  ColSampleRatePerTreeLevel = 1,
  MinRows = 1,
  NBins = 20,
  NBinsCats = 1024,
  NBinsTopLevel = 1024,
  HistogramType = "AUTO",
  CategoricalEncoding = "AUTO")

```

---

AutoH2oGBMRegression	<i>AutoH2oGBMRegression is an automated H2O modeling framework with grid-tuning and model evaluation</i>
----------------------	--

---

## Description

AutoH2oGBMRegression is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation boxplot, evaluation metrics, variable importance, partial dependence calibration plots, partial dependence calibration box plots, and column names used in model fitting.

## Usage

```
AutoH2oGBMRegression(
  data,
  TrainOnFull = FALSE,
  ValidationData,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  WeightsColumn = NULL,
  TransformNumericColumns = NULL,
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit"),
  MaxMem = {      gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06))), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  NumOfParDepPlots = 3,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  MaxRuntimeSecs = 60 * 60 * 24,
  StoppingRounds = 10,
  MaxModelsInGrid = 2,
  eval_metric = "RMSE",
  Trees = 50,
  LearnRate = 0.1,
  LearnRateAnnealing = 1,
  Alpha = NULL,
  Distribution = "poisson",
```

```

MaxDepth = 20,
SampleRate = 0.632,
MTries = -1,
ColSampleRate = 1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO"
)

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>WeightsColumn</code>	Column name of a weights column
<code>TransformNumericColumns</code>	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
<code>Methods</code>	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
<code>MaxMem</code>	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
<code>NThreads</code>	Set to the mamimum amount of threads you want to use for this function
<code>model_path</code>	A character string of your path file to where you want your output saved
<code>metadata_path</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to <code>model_path</code> .
<code>ModelID</code>	A character string to name your model and output
<code>NumOfParDepPlots</code>	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)

ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
SaveInfoToPDF	Set to TRUE to save insights to PDF
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
H2OShutdown	Set to TRUE to shutdown H2O inside the function
H2OStartUp	Defaults to TRUE which means H2O will be started inside the function
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	Default "Cartesian"
MaxRuntimeSecs	Default 60*60*24
StoppingRounds	Number of runs
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
eval_metric	This is the metric used to identify best grid tuned model. Choose from "MSE", "RMSE", "MAE", "RMSLE"
Trees	The maximum number of trees you want in your models
LearnRate	Default 0.10
LearnRateAnnealing	Default 1
Alpha	This is the quantile value you want to use for quantile regression. Must be a decimal between 0 and 1.
Distribution	Choose from gaussian", "poisson", "gamma", "tweedie", "laplace", "quantile", "huber"
MaxDepth	Default 20
SampleRate	Default 0.632
ColSampleRate	Default 1
ColSampleRatePerTree	Default 1
ColSampleRatePerTreeLevel	Default 1
MinRows	Default 1
NBins	Default 20
NBinsCats	Default 1024
NBinsTopLevel	Default 1024
HistogramType	Default "AUTO"
CategoricalEncoding	Default "AUTO"

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, GridList, and metadata

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Regression: [AutoCatBoostRegression\(\)](#), [AutoH2oDRFRegression\(\)](#), [AutoH2oGAMRegression\(\)](#), [AutoH2oGLMRegression\(\)](#), [AutoH2oMLRegression\(\)](#), [AutoXGBoostRegression\(\)](#)

**Examples**

```
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Run function
TestModel <- RemixAutoML::AutoH2oGBMRegression(

  # Compute management
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", int
  NThreads = max(1, parallel::detectCores()-2),
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  IfSaveModel = "mojo",

  # Model evaluation
  NumOfParDepPlots = 3,

  # Metadata arguments:
  model_path = normalizePath("./"),
  metadata_path = file.path(normalizePath("./")),
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,

  # Data arguments
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
  WeightsColumn = NULL,
  TransformNumericColumns = NULL,
  Methods = c("BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),

  # ML grid tuning args
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  MaxRuntimeSecs = 60*60*24,
```



```

StoppingRounds = 10,
MaxModelsInGrid = 2,

# Model args
Trees = 50,
LearnRate = 0.10,
LearnRateAnnealing = 1,
eval_metric = "RMSE",
Alpha = NULL,
Distribution = "poisson",
MaxDepth = 20,
SampleRate = 0.632,
ColSampleRate = 1,
ColSampleRatePerTree = 1,
ColSampleRatePerTreeLevel = 1,
MinRows = 1,
NBins = 20,
NBinsCats = 1024,
NBinsTopLevel = 1024,
HistogramType = "AUTO",
CategoricalEncoding = "AUTO")

```

---

AutoH2oGBMSIZEFreqDist

*AutoH2oGBMSIZEFreqDist for building size and frequency distributions via quantile regressions*

---

## Description

AutoH2oGBMSIZEFreqDist for building size and frequency distributions via quantile regressions.

Size (or severity) and frequency (or count) quantile regressions are build. Use this with the ID\_SingleLevelGibbsSampler function to simulate the joint distribution.

## Usage

```

AutoH2oGBMSIZEFreqDist(
  CountData = NULL,
  SizeData = NULL,
  CountQuantiles = seq(0.1, 0.9, 0.1),
  SizeQuantiles = seq(0.1, 0.9, 0.1),
  AutoTransform = TRUE,
  DataPartitionRatios = c(0.75, 0.2, 0.05),
  StratifyColumnName = NULL,
  StratifyTargets = FALSE,
  NTrees = 1500,
  MaxMem = { gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06)), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  EvalMetric = "Quantile",
  GridTune = FALSE,
  CountTargetColumnName = NULL,

```

```

    SizeTargetColumnName = NULL,
    CountFeatureColNames = NULL,
    SizeFeatureColNames = NULL,
    ModelIDs = c("CountModel", "SizeModel"),
    MaxModelsGrid = 5,
    ModelPath = NULL,
    MetaDataPath = NULL,
    NumOfParDepPlots = 0
)

```

### Arguments

CountData	This is your CountData generated from the IntermittentDemandBootStrapper() function
SizeData	This is your SizeData generated from the IntermittentDemandBootStrapper() function
CountQuantiles	The default are deciles, i.e. seq(0.10,0.90,0.10). More granularity the better, but it will take longer to run.
SizeQuantiles	The default are deciles, i.e. seq(0.10,0.90,0.10). More granularity the better, but it will take longer to run.
AutoTransform	Set to FALSE not to have the your target variables automatically transformed for the best normalization.
DataPartitionRatios	The default is c(0.75,0.20,0.05). With CatBoost, you should allocate a decent amount to the validation data (second input). Three inputs are required.
StratifyColumnName	You can specify grouping columns to stratify by
StratifyTargets	Set to TRUE to stratify by the target variables to ensure the a more even allocation for potentially highly skewed data
NTrees	Default is 1500. If the best model utilizes all trees, you should consider increasing the argument.
MaxMem	The max memory allocation. E.g. "28G"
NThreads	The max threads to use. E.g. 4
EvalMetric	Set to "Quantile". Alternative quantile methods may become available in the future.
GridTune	The default is set to FALSE. If you set to TRUE, make sure to specify MaxModelsGrid to a number greater than 1.
CountTargetColumnName	Column names or column numbers
SizeTargetColumnName	Column names or column numbers
CountFeatureColNames	Column names or column numbers
SizeFeatureColNames	Column names or column numbers
ModelIDs	A two element character vector. E.g. c("CountModel","SizeModel")
MaxModelsGrid	Set to a number greater than 1 if GridTune is set to TRUE

ModelPath	This path file is where all your models will be stored. If you leave MetaDataPath NULL, the evaluation metadata will also be stored here. If you leave this NULL, the function will not run.
MetaDataPath	A separate path to store the model metadata for evaluation.
NumOfParDepPlots	Set to a number greater than or equal to 1 to see the relationships between your features and targets.

### Value

This function does not return anything. It can only store your models and model evaluation metadata to file.

### Author(s)

Adrian Antico

### See Also

Other Supervised Learning - Compound: [AutoCatBoostHurdleModel\(\)](#), [AutoCatBoostSizeFreqDist\(\)](#), [AutoH2oDRFHurdleModel\(\)](#), [AutoH2oGBMHurdleModel\(\)](#), [AutoXGBoostHurdleModel\(\)](#)

### Examples

```
AutoH2oGBMSizeFreqDist(
  CountData = NULL,
  SizeData = NULL,
  CountQuantiles = seq(0.10,0.90,0.10),
  SizeQuantiles = seq(0.10,0.90,0.10),
  AutoTransform = TRUE,
  DataPartitionRatios = c(0.75,0.20,0.05),
  StratifyColumnName = NULL,
  StratifyTargets = FALSE,
  NTrees = 1500,
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk 'MemFree/ {print $2}' /proc/meminfo", intern=TRUE)))
  NThreads = max(1, parallel::detectCores()-2),
  EvalMetric = "Quantile",
  GridTune = FALSE,
  CountTargetColumnName = NULL,
  SizeTargetColumnName = NULL,
  CountFeatureColNames = NULL,
  SizeFeatureColNames = NULL,
  ModelIDs = c("CountModel","SizeModel"),
  MaxModelsGrid = 5,
  ModelPath = NULL,
  MetaDataPath = NULL,
  NumOfParDepPlots = 0)
```

---

AutoH2oGLMClassifier	<i>AutoH2oGLMClassifier is an automated H2O modeling framework with grid-tuning and model evaluation</i>
----------------------	--

---

## Description

AutoH2oGLMClassifier is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation metrics, variable importance, partial dependence calibration plots, and column names used in model fitting.

## Usage

```
AutoH2oGLMClassifier(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  RandomColNumbers = NULL,
  InteractionColNumbers = NULL,
  WeightsColumn = NULL,
  MaxMem = {      gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06)), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  model_path = NULL,
  metadata_path = NULL,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  TransformNumericColumns = NULL,
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit"),
  MaxModelsInGrid = 2,
  NumOfParDepPlots = 3,
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  StoppingRounds = 10,
  MaxRunTimeSecs = 3600 * 24 * 7,
  Distribution = "binomial",
  Link = "logit",
  eval_metric = "auc",
```

```

CostMatrixWeights = c(1, 0, 0, 1),
RandomDistribution = NULL,
RandomLink = NULL,
Solver = "AUTO",
Alpha = 0.5,
Lambda = NULL,
LambdaSearch = FALSE,
NLambdas = -1,
Standardize = TRUE,
RemoveCollinearColumns = FALSE,
InterceptInclude = TRUE,
NonNegativeCoefficients = FALSE
)

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>RandomColNumbers</code>	Random effects column number indices
<code>InteractionColNumbers</code>	Column numbers of the features you want to be pairwise interacted
<code>WeightsColumn</code>	Column name of a weights column
<code>MaxMem</code>	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
<code>NThreads</code>	Set the number of threads you want to dedicate to the model building
<code>ModelID</code>	A character string to name your model and output
<code>ReturnModelObjects</code>	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
<code>model_path</code>	A character string of your path file to where you want your output saved
<code>metadata_path</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
<code>SaveModelObjects</code>	Set to TRUE to return all modeling objects to your environment
<code>SaveInfoToPDF</code>	Set to TRUE to save modeling information to PDF. If model_path or metadata_path aren't defined then output will be saved to the working directory
<code>IfSaveModel</code>	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object

H2OShutdown	Set to TRUE to shutdown H2O inside the function
H2OStartUp	Defaults to TRUE which means H2O will be started inside the function
TransformNumericColumns	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	"RandomDiscrete" or "Cartesian"
StoppingRounds	Iterations in grid tuning
MaxRunTimeSecs	Max run time in seconds
Distribution	"binomial", "fractionalbinomial", "quasibinomial"
eval_metric	This is the metric used to identify best grid tuned model. Choose from "auc"
CostMatrixWeights	A vector with 4 elements c(True Positive Cost, False Negative Cost, False Positive Cost, True Negative Cost). Default c(1,0,0,1),
RandomDistribution	Random effects family. Defaults NULL, otherwise it will run a hierarchical glm
RandomLink	Random effects link. Defaults NULL, otherwise it will run a hierarchical glm
Solver	Default "AUTO". Options include "IRLSM", "L_BFGS", "COORDINATE_DESCENT_NAIVE", "COORDINATE_DESCENT", "GRADIENT_DESCENT_LH", "GRADIENT_DESCENT_SQERR"
Alpha	Default 0.5 Otherwise supply a value between 0 and 1. 1 is equivalent to Lasso regression. 0 is equivalent to Ridge regression. Inbetween for a blend of the two.
Lambda	Default NULL. Regularization strength.
LambdaSearch	Default FALSE.
NLambdas	Default -1
Standardize	Default TRUE. Standardize numerical columns
RemoveCollinearColumns	Default FALSE. Removes some of the linearly dependent columns
InterceptInclude	Default TRUE
NonNegativeCoefficients	Default FALSE
link	identity, logit, log, inverse, tweedie

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Binary Classification: [AutoCatBoostClassifier\(\)](#), [AutoH2oDRFClassifier\(\)](#), [AutoH2oGAMClassifier\(\)](#), [AutoH2oGBMClassifier\(\)](#), [AutoH2oMLClassifier\(\)](#), [AutoXGBoostClassifier\(\)](#)

**Examples**

```
# Create some dummy correlated data with numeric and categorical features
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000L,
  ID = 2L,
  ZIP = 0L,
  AddDate = FALSE,
  Classification = TRUE,
  MultiClass = FALSE)

# Run function
TestModel <- RemixAutoML::AutoH2oGLMClassifier(

  # Compute management
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", int
  NThreads = max(1, parallel::detectCores()-2),
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  IfSaveModel = "mojo",

  # Model evaluation args
  CostMatrixWeights = c(1,0,0,1),
  eval_metric = "auc",
  NumOfParDepPlots = 3,

  # Metadata args
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,

  # Data args
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in%
```

```

      c("IDcol_1", "IDcol_2", "Adrian")],
  RandomColNumbers = NULL,
  InteractionColNumbers = NULL,
  WeightsColumn = NULL,
  TransformNumericColumns = NULL,
  Methods = c("BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),

  # ML args
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  StoppingRounds = 10,
  MaxRunTimeSecs = 3600 * 24 * 7,
  MaxModelsInGrid = 10,
  Distribution = "binomial",
  Link = "logit",
  RandomDistribution = NULL,
  RandomLink = NULL,
  Solver = "AUTO",
  Alpha = 0.5,
  Lambda = NULL,
  LambdaSearch = FALSE,
  NLambdas = -1,
  Standardize = TRUE,
  RemoveCollinearColumns = FALSE,
  InterceptInclude = TRUE,
  NonNegativeCoefficients = FALSE)

```

---

AutoH2oGLMMultiClass	<i>AutoH2oGLMMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation</i>
----------------------	--

---

## Description

AutoH2oGLMMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation metrics, confusion matrix, and variable importance.

## Usage

```

AutoH2oGLMMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  RandomColNumbers = NULL,
  InteractionColNumbers = NULL,
  WeightsColumn = NULL,

```



```

MaxMem = {      gc()
  paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
    intern = TRUE))/1e+06)), "G") },
NThreads = max(1, parallel::detectCores() - 2),
ModelID = "FirstModel",
ReturnModelObjects = TRUE,
model_path = NULL,
metadata_path = NULL,
SaveModelObjects = FALSE,
SaveInfoToPDF = FALSE,
IfSaveModel = "mojo",
H2OShutdown = TRUE,
H2OStartUp = TRUE,
TransformNumericColumns = NULL,
Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
  "Logit"),
MaxModelsInGrid = 2,
NumOfParDepPlots = 3,
GridTune = FALSE,
GridStrategy = "Cartesian",
StoppingRounds = 10,
MaxRunTimeSecs = 3600 * 24 * 7,
Distribution = "multinomial",
Link = "family_default",
eval_metric = "logloss",
RandomDistribution = NULL,
RandomLink = NULL,
Solver = "AUTO",
Alpha = 0.5,
Lambda = NULL,
LambdaSearch = FALSE,
NLambdas = -1,
Standardize = TRUE,
RemoveCollinearColumns = FALSE,
InterceptInclude = TRUE,
NonNegativeCoefficients = FALSE
)

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target

	is located (but not mixed types)
RandomColNumbers	Random effects column number indices
InteractionColNumbers	Column numbers of the features you want to be pairwise interacted
WeightsColumn	Column name of a weights column
MaxMem	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
NThreads	Set the number of threads you want to dedicate to the model building
ModelID	A character string to name your model and output
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
SaveInfoToPDF	Set to TRUE to save insights to PDF
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
H2OShutdown	Set to TRUE to shutdown H2O inside the function
H2OStartup	Defaults to TRUE which means H2O will be started inside the function
TransformNumericColumns	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	"RandomDiscrete" or "Cartesian"
StoppingRounds	Iterations in grid tuning
MaxRunTimeSecs	Max run time in seconds
Distribution	"multinomial"
eval_metric	This is the metric used to identify best grid tuned model. Choose from "logloss"
RandomDistribution	Random effects family. Defaults NULL, otherwise it will run a hierarchical glm
RandomLink	Random effects link. Defaults NULL, otherwise it will run a hierarchical glm

Solver	Default "AUTO". Options include "IRLSM", "L_BFGS", "COORDINATE_DESCENT_NAIVE", "COORDINATE_DESCENT", "GRADIENT_DESCENT_LH", "GRADIENT_DESCENT_SQERR
Alpha	Default 0.5 Otherwise supply a value between 0 and 1. 1 is equivalent to Lasso regression. 0 is equivalent to Ridge regression. Inbetween for a blend of the two.
Lambda	Default NULL. Regularization strength.
LambdaSearch	Default FALSE.
NLambdas	Default -1
Standardize	Default TRUE. Standardize numerical columns
RemoveCollinearColumns	Default FALSE. Removes some of the linearly dependent columns
InterceptInclude	Default TRUE
NonNegativeCoefficients	Default FALSE
link	"family_default"

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Metrics.csv, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Multiclass Classification: [AutoCatBoostMultiClass\(\)](#), [AutoH2oDRFMultiClass\(\)](#), [AutoH2oGAMMultiClass\(\)](#), [AutoH2oGBMMultiClass\(\)](#), [AutoH2oMLMultiClass\(\)](#), [AutoXGBoostMultiClass\(\)](#)

**Examples**

```
# Create some dummy correlated data with numeric and categorical features
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000L,
  ID = 2L,
  ZIP = 0L,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = TRUE)

# Run function
TestModel <- RemixAutoML::AutoH2oGLMMultiClass(

  # Compute management
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", int
  NThreads = max(1, parallel::detectCores()-2),
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  IfSaveModel = "mojo",
```

```

# Model evaluation:
eval_metric = "logloss",
NumOfParDepPlots = 3,

# Metadata arguments:
model_path = NULL,
metadata_path = NULL,
ModelID = "FirstModel",
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
SaveInfoToPDF = FALSE,

# Data arguments:
data = data,
TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
TargetColumnName = "Adrian",
FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
RandomColNumbers = NULL,
InteractionColNumbers = NULL,
WeightsColumn = NULL,
TransformNumericColumns = NULL,
Methods = c("BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),

# Model args
GridTune = FALSE,
GridStrategy = "Cartesian",
StoppingRounds = 10,
MaxRunTimeSecs = 3600 * 24 * 7,
MaxModelsInGrid = 10,
Distribution = "multinomial",
Link = "family_default",
RandomDistribution = NULL,
RandomLink = NULL,
Solver = "AUTO",
Alpha = 0.5,
Lambda = NULL,
LambdaSearch = FALSE,
NLambdas = -1,
Standardize = TRUE,
RemoveCollinearColumns = FALSE,
InterceptInclude = TRUE,
NonNegativeCoefficients = FALSE)

```

---

AutoH2oGLMRegression	<i>AutoH2oGLMRegression is an automated H2O modeling framework with grid-tuning and model evaluation</i>
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---

## Description

AutoH2oGLMRegression is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, the function will run a random grid tune over N number

of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation boxplot, evaluation metrics, variable importance, partial dependence calibration plots, partial dependence calibration box plots, and column names used in model fitting.

## Usage

```
AutoH2oGLMRegression(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  RandomColNumbers = NULL,
  InteractionColNumbers = NULL,
  WeightsColumn = NULL,
  MaxMem = {      gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06)), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  model_path = NULL,
  metadata_path = NULL,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  TransformNumericColumns = NULL,
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit"),
  NumOfParDepPlots = 3,
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  StoppingRounds = 10,
  MaxRunTimeSecs = 3600 * 24 * 7,
  MaxModelsInGrid = 2,
  Distribution = "gaussian",
  Link = "identity",
  TweedieLinkPower = NULL,
  TweedieVariancePower = NULL,
  eval_metric = "RMSE",
  RandomDistribution = NULL,
  RandomLink = NULL,
  Solver = "AUTO",
  Alpha = 0.5,
  Lambda = NULL,
  LambdaSearch = FALSE,
  NLambdas = -1,
  Standardize = TRUE,
  RemoveCollinearColumns = FALSE,
```

```

    InterceptInclude = TRUE,
    NonNegativeCoefficients = FALSE
  )

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>RandomColNumbers</code>	Random effects column number indices
<code>InteractionColNumbers</code>	Column numbers of the features you want to be pairwise interacted
<code>WeightsColumn</code>	Column name of a weights column
<code>MaxMem</code>	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
<code>NThreads</code>	Set the number of threads you want to dedicate to the model building
<code>ModelID</code>	A character string to name your model and output
<code>ReturnModelObjects</code>	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
<code>model_path</code>	A character string of your path file to where you want your output saved
<code>metadata_path</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to <code>model_path</code> .
<code>SaveModelObjects</code>	Set to TRUE to return all modeling objects to your environment
<code>SaveInfoToPDF</code>	Set to TRUE to save insights to PDF
<code>IfSaveModel</code>	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
<code>H2OShutdown</code>	Set to TRUE to shutdown H2O inside the function
<code>H2OStartup</code>	Defaults to TRUE which means H2O will be started inside the function
<code>TransformNumericColumns</code>	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
<code>Methods</code>	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.

NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
GridStrategy	"RandomDiscrete" or "Cartesian"
StoppingRounds	Iterations in grid tuning
MaxRunTimeSecs	Max run time in seconds
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
Distribution	"AUTO", "gaussian", "poisson", "gamma", "tweedie", "negativebinomial"
Link	"family_default", "identity", "log", "inverse", "tweedie"
TweedieLinkPower	See h2o docs for background
TweedieVariancePower	See h2o docs for background
eval_metric	This is the metric used to identify best grid tuned model. Choose from "MSE", "RMSE", "MAE", "RMSLE"
RandomDistribution	Random effects family. Defaults NULL, otherwise it will run a hierarchical glm
RandomLink	Random effects link. Defaults NULL, otherwise it will run a hierarchical glm
Solver	Default "AUTO". Options include "IRLSM", "L_BFGS", "COORDINATE_DESCENT_NAIVE", "COORDINATE_DESCENT", "GRADIENT_DESCENT_LH", "GRADIENT_DESCENT_SQERR"
Alpha	Default 0.5 Otherwise supply a value between 0 and 1. 1 is equivalent to Lasso regression. 0 is equivalent to Ridge regression. Inbetween for a blend of the two.
Lambda	Default NULL. Regularization strength.
LambdaSearch	Default FALSE.
NLambdas	Default -1
Standardize	Default TRUE. Standardize numerical columns
RemoveCollinearColumns	Default FALSE. Removes some of the linearly dependent columns
InterceptInclude	Default TRUE
NonNegativeCoefficients	Default FALSE

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, GridList, and Transformation metadata

**Author(s)**

Adrian Antico

## See Also

Other Automated Supervised Learning - Regression: [AutoCatBoostRegression\(\)](#), [AutoH2oDRFRegression\(\)](#), [AutoH2oGAMRegression\(\)](#), [AutoH2oGBMRegression\(\)](#), [AutoH2oMLRegression\(\)](#), [AutoXGBoostRegression\(\)](#)

## Examples

```
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Run function
TestModel <- RemixAutoML::AutoH2oGLMRegression(

  # Compute management
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", int
  NThreads = max(1, parallel::detectCores()-2),
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  IfSaveModel = "mojo",

  # Model evaluation:
  eval_metric = "RMSE",
  NumOfParDepPlots = 3,

  # Metadata arguments:
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,

  # Data arguments:
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in%
    c("IDcol_1", "IDcol_2", "Adrian")],
  RandomColNumbers = NULL,
  InteractionColNumbers = NULL,
  WeightsColumn = NULL,
  TransformNumericColumns = NULL,
  Methods = c("BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),

  # Model args
  GridTune = FALSE,
  GridStrategy = "Cartesian",
  StoppingRounds = 10,
```



```

MaxRunTimeSecs = 3600 * 24 * 7,
MaxModelsInGrid = 10,
Distribution = "gaussian",
Link = "identity",
TweedieLinkPower = NULL,
TweedieVariancePower = NULL,
RandomDistribution = NULL,
RandomLink = NULL,
Solver = "AUTO",
Alpha = 0.5,
Lambda = NULL,
LambdaSearch = FALSE,
NLambdas = -1,
Standardize = TRUE,
RemoveCollinearColumns = FALSE,
InterceptInclude = TRUE,
NonNegativeCoefficients = FALSE)

```

---

AutoH2oMLClassifier	<i>AutoH2oMLClassifier is an automated H2O modeling framework with grid-tuning and model evaluation</i>
---------------------	---

---

## Description

AutoH2oMLClassifier is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation metrics, variable importance, partial dependence calibration plots, and column names used in model fitting.

## Usage

```

AutoH2oMLClassifier(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  ExcludeAlgos = NULL,
  eval_metric = "auc",
  CostMatrixWeights = c(1, 0, 0, 1),
  MaxMem = {      gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06)), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  MaxModelsInGrid = 2,
  model_path = NULL,
  metadata_path = NULL,

```

```

ModelID = "FirstModel",
NumOfParDepPlots = 3,
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
IfSaveModel = "mojo",
H2OShutdown = TRUE,
H2OStartUp = TRUE
)

```

## Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types). Note that the target column needs to be a 0   1 numeric variable.
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>ExcludeAlgos</code>	"DRF","GLM","XGBoost","GBM","DeepLearning" and "StackedEnsemble"
<code>eval_metric</code>	This is the metric used to identify best grid tuned model. Choose from "AUC" or "logloss"
<code>CostMatrixWeights</code>	A vector with 4 elements c(True Positive Cost, False Negative Cost, False Positive Cost, True Negative Cost). Default c(1,0,0,1),
<code>MaxMem</code>	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
<code>NThreads</code>	Set the number of threads you want to dedicate to the model building
<code>MaxModelsInGrid</code>	Number of models to test from grid options (1080 total possible options)
<code>model_path</code>	A character string of your path file to where you want your output saved
<code>metadata_path</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
<code>ModelID</code>	A character string to name your model and output
<code>NumOfParDepPlots</code>	Tell the function the number of partial dependence calibration plots you want to create.
<code>ReturnModelObjects</code>	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
<code>SaveModelObjects</code>	Set to TRUE to return all modeling objects to your environment
<code>IfSaveModel</code>	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
<code>H2OShutdown</code>	Set to TRUE to shutdown H2O after running the function
<code>H2OStartUp</code>	Set to FALSE

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Binary Classification: [AutoCatBoostClassifier\(\)](#), [AutoH2oDRFCClassifier\(\)](#), [AutoH2oGAMClassifier\(\)](#), [AutoH2oGBMClassifier\(\)](#), [AutoH2oGLMClassifier\(\)](#), [AutoXGBoostClassifier\(\)](#)

**Examples**

```
# Create some dummy correlated data with numeric and categorical features
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000L,
  ID = 2L,
  ZIP = 0L,
  AddDate = FALSE,
  Classification = TRUE,
  MultiClass = FALSE)

TestModel <- RemixAutoML::AutoH2oMLClassifier(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
  ExcludeAlgos = NULL,
  eval_metric = "auc",
  CostMatrixWeights = c(1,0,0,1),
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", intern=TRUE)))
  NThreads = max(1, parallel::detectCores()-2),
  MaxModelsInGrid = 10,
  model_path = normalizePath("./"),
  metadata_path = normalizePath("./"),
  ModelID = "FirstModel",
  NumOfParDepPlots = 3,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE)
```

---

AutoH2oMLMultiClass	<i>AutoH2oMLMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation</i>
---------------------	---

---

## Description

AutoH2oDRFMultiClass is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation metrics, confusion matrix, and variable importance.

## Usage

```
AutoH2oMLMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  ExcludeAlgos = NULL,
  eval_metric = "logloss",
  MaxMem = { gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE))/1e+06)), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  MaxModelsInGrid = 2,
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE
)
```

## Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).

FeatureColNames	Either supply the feature column names OR the column number where the target is located (but not mixed types)
ExcludeAlgos	"DRF","GLM","XGBoost","GBM","DeepLearning" and "StackedEnsemble"
eval_metric	This is the metric used to identify best grid tuned model. Choose from "logloss", "r2", "RMSE", "MSE"
MaxMem	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
NThreads	Set the number of threads you want to dedicate to the model building
MaxModelsInGrid	Number of models to test from grid options (1080 total possible options)
model_path	A character string of your path file to where you want your output saved
metadata_path	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
ModelID	A character string to name your model and output
ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
H2OShutdown	Set to TRUE to have H2O shutdown after running this function
H2OStartUp	Set to FALSE

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Metrics.csv, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Multiclass Classification: [AutoCatBoostMultiClass\(\)](#), [AutoH2oDRFMultiClass\(\)](#), [AutoH2oGAMMultiClass\(\)](#), [AutoH2oGBMMultiClass\(\)](#), [AutoH2oGLMMultiClass\(\)](#), [AutoXGBoostMultiClass\(\)](#)

**Examples**

```
# Create some dummy correlated data with numeric and categorical features
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = TRUE)
```

```
# Run function
TestModel <- RemixerAutoML::AutoH2oMLMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
  ExcludeAlgos = NULL,
  eval_metric = "logloss",
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", inte
  NThreads = max(1, parallel::detectCores()-2),
  MaxModelsInGrid = 10,
  model_path = normalizePath("./"),
  metadata_path = normalizePath("./"),
  ModelID = "FirstModel",
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE)
```

---

AutoH2oMLRegression	<i>AutoH2oMLRegression is an automated H2O modeling framework with grid-tuning and model evaluation</i>
---------------------	---

---

## Description

AutoH2oMLRegression is an automated H2O modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation boxplot, evaluation metrics, variable importance, partial dependence calibration plots, partial dependence calibration box plots, and column names used in model fitting.

## Usage

```
AutoH2oMLRegression(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  ExcludeAlgos = NULL,
  TransformNumericColumns = NULL,
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit"),
  eval_metric = "RMSE",
  MaxMem = {
    gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
```

```

        intern = TRUE))/1e+06)), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  NumOfParDepPlots = 3,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,
  IfSaveModel = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE
)

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>ExcludeAlgos</code>	"DRF", "GLM", "XGBoost", "GBM", "DeepLearning" and "StackedEnsemble"
<code>TransformNumericColumns</code>	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
<code>Methods</code>	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.
<code>eval_metric</code>	This is the metric used to identify best grid tuned model. Choose from "MSE", "RMSE", "MAE", "RMSLE"
<code>MaxMem</code>	Set the maximum amount of memory you'd like to dedicate to the model run. E.g. "32G"
<code>NThreads</code>	Set the number of threads you want to dedicate to the model building
<code>model_path</code>	A character string of your path file to where you want your output saved
<code>metadata_path</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to model_path.
<code>ModelID</code>	A character string to name your model and output
<code>NumOfParDepPlots</code>	Tell the function the number of partial dependence calibration plots you want to create. Calibration boxplots will only be created for numerical features (not dummy variables)

ReturnModelObjects	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
SaveInfoToPDF	Set to TRUE to save insights to PDF
IfSaveModel	Set to "mojo" to save a mojo file, otherwise "standard" to save a regular H2O model object
H2OShutdown	Set to TRUE to shutdown H2O inside the function
H2OStartUp	Defaults to TRUE which means H2O will be started inside the function

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, GridList, and Transformation metadata

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Regression: [AutoCatBoostRegression\(\)](#), [AutoH2oDRFRegression\(\)](#), [AutoH2oGAMRegression\(\)](#), [AutoH2oGBMRegression\(\)](#), [AutoH2oGLMRegression\(\)](#), [AutoXGBoostRegression\(\)](#)

**Examples**

```
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Run function
TestModel <- RemixAutoML::AutoH2oMLRegression(

  # Compute management
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", int
  NThreads = max(1, parallel::detectCores()-2),
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  IfSaveModel = "mojo",

  # Model evaluation:
  # 'eval_metric' is the measure catboost uses when
  #   evaluating on holdout data during its bandit style
  #   process
  # 'NumOfParDepPlots' Number of partial dependence
  #   calibration plots generated.
```



```

# A value of 3 will return plots for the top 3 variables
# based on variable importance
# Won't be returned if GrowPolicy is either
# "Depthwise" or "Lossguide" is used
# Can run the RemixAutoML::ParDepCalPlots() with
# the outputted ValidationData
eval_metric = "RMSE",
NumOfParDepPlots = 3,

# Metadata arguments:
# 'ModelID' is used to create part of the file names
# generated when saving to file'
# 'model_path' is where the minimal model objects
# for scoring will be stored
# 'ModelID' will be the name of the saved model object
# 'metadata_path' is where model evaluation and model
# interpretation files are saved
# objects saved to model_path if metadata_path is null
# Saved objects include:
# 'ModelID_ValidationData.csv' is the supplied or
# generated TestData with predicted values
# 'ModelID_VariableImportance.csv' is the variable
# importance.
# This won't be saved to file if GrowPolicy is either
# "Depthwise" or "Lossguide" was used
# Results of all model builds including parameter
# settings, bandit probs, and grid IDs
# 'ModelID_EvaluationMetrics.csv' which contains MSE,
# MAE, MAPE, R2
model_path = NULL,
metadata_path = NULL,
ModelID = "FirstModel",
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
SaveInfoToPDF = FALSE,

# Data arguments:
# 'TrainOnFull' is to train a model with 100
# percent of your data.
# That means no holdout data will be used for evaluation
# If ValidationData and TestData are NULL and TrainOnFull
# is FALSE then data will be split 70 20 10
# 'PrimaryDateColumn' is a date column in data that is
# meaningful when sorted.
# CatBoost categorical treatment is enhanced when supplied
# 'IDcols' are columns in your data that you don't use for
# modeling but get returned with ValidationData
# 'TransformNumericColumns' is for transforming your target
# variable. Just supply the name of it
TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
TargetColumnName = "Adrian",
FeatureColNames = names(data)[!names(data) %in% c("IDcol_1", "IDcol_2", "Adrian")],
TransformNumericColumns = NULL,
Methods = c("BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),

```

```
# Model args
ExcludeAlgos = NULL)
```

---

AutoH2OMLScoring	<i>AutoH2OMLScoring is an automated scoring function that compliments the AutoH2o model training functions.</i>
------------------	---

---

## Description

AutoH2OMLScoring is an automated scoring function that compliments the AutoH2oGBM\_\_() and AutoH2oDRF\_\_() models training functions. This function requires you to supply features for scoring. It will run ModelDataPrep() to prepare your features for H2O data conversion and scoring.

## Usage

```
AutoH2OMLScoring(
  ScoringData = NULL,
  ModelObject = NULL,
  ModelType = "mojo",
  H2OShutdown = TRUE,
  H2OStartup = TRUE,
  MaxMem = { gc()
    paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo",
      intern = TRUE)))/1e+06)), "G") },
  NThreads = max(1, parallel::detectCores() - 2),
  JavaOptions = "-Xmx1g -XX:ReservedCodeCacheSize=256m",
  ModelPath = NULL,
  ModelID = NULL,
  ReturnFeatures = TRUE,
  TransformNumeric = FALSE,
  BackTransNumeric = FALSE,
  TargetColumnName = NULL,
  TransformationObject = NULL,
  TransID = NULL,
  TransPath = NULL,
  MDP_Impute = TRUE,
  MDP_CharToFactor = TRUE,
  MDP_RemoveDates = TRUE,
  MDP_MissFactor = "0",
  MDP_MissNum = -1
)
```

## Arguments

ScoringData	This is your data.table of features for scoring. Can be a single row or batch.
ModelObject	Supply a model object from AutoH2oDRF__()
ModelType	Set to either "mojo" or "standard" depending on which version you saved
H2OShutdown	Set to TRUE to shutdown H2O inside the function.
H2OStartup	Defaults to TRUE which means H2O will be started inside the function

MaxMem	Set to you dedicated amount of memory. E.g. "28G"
NThreads	Default set to max(1, parallel::detectCores()-2)
JavaOptions	Change the default to your machines specification if needed. Default is '-Xmx1g -XX:ReservedCodeCacheSize=256m',
ModelPath	Supply your path file used in the AutoH2o__() function
ModelID	Supply the model ID used in the AutoH2o__() function
ReturnFeatures	Set to TRUE to return your features with the predicted values.
TransformNumeric	Set to TRUE if you have features that were transformed automatically from an Auto__Regression() model AND you haven't already transformed them.
BackTransNumeric	Set to TRUE to generate back-transformed predicted values. Also, if you return features, those will also be back-transformed.
TargetColumnName	Input your target column name used in training if you are utilizing the transformation service
TransformationObject	Set to NULL if you didn't use transformations or if you want the function to pull from the file output from the Auto__Regression() function. You can also supply the transformation data.table object with the transformation details versus having it pulled from file.
TransID	Set to the ID used for saving the transformation data.table object or set it to the ModelID if you are pulling from file from a build with Auto__Regression().
TransPath	Set the path file to the folder where your transformation data.table detail object is stored. If you used the Auto__Regression() to build, set it to the same path as ModelPath.
MDP_Impute	Set to TRUE if you did so for modeling and didn't do so before supplying ScoringData in this function
MDP_CharToFactor	Set to TRUE to turn your character columns to factors if you didn't do so to your ScoringData that you are supplying to this function
MDP_RemoveDates	Set to TRUE if you have date of timestamp columns in your ScoringData
MDP_MissFactor	If you set MDP_Impute to TRUE, supply the character values to replace missing values with
MDP_MissNum	If you set MDP_Impute to TRUE, supply a numeric value to replace missing values with

**Value**

A data.table of predicted values with the option to return model features as well.

**Author(s)**

Adrian Antico

**See Also**

Other Automated Model Scoring: [AutoCatBoostScoring\(\)](#), [AutoH2OModeler\(\)](#), [AutoHurdleScoring\(\)](#), [AutoXGBoostScoring\(\)](#), [IntermittentDemandScoringDataGenerator\(\)](#)

## Examples

```
## Not run:
Preds <- AutoH2OMLScoring(
  ScoringData = data,
  ModelObject = NULL,
  ModelType = "mojo",
  H2OShutdown = TRUE,
  H2OStartUp = TRUE,
  MaxMem = {gc();paste0(as.character(floor(as.numeric(system("awk '/MemFree/ {print $2}' /proc/meminfo", intern=TRUE)))
  NThreads = max(1, parallel::detectCores()-2),
  JavaOptions = '-Xmx1g -XX:ReservedCodeCacheSize=256m',
  ModelPath = normalizePath("./"),
  ModelID = "ModelTest",
  ReturnFeatures = TRUE,
  TransformNumeric = FALSE,
  BackTransNumeric = FALSE,
  TargetColumnName = NULL,
  TransformationObject = NULL,
  TransID = NULL,
  TransPath = NULL,
  MDP_Impute = TRUE,
  MDP_CharToFactor = TRUE,
  MDP_RemoveDates = TRUE,
  MDP_MissFactor = "0",
  MDP_MissNum = -1)

## End(Not run)
```

## Description

Steps in the function include: See details below for information on using this function.

## Usage

```
AutoH2OModeler(
  Construct,
  max_memory = "28G",
  ratios = 0.8,
  BL_Trees = 500,
  nthreads = 1,
  model_path = NULL,
  MaxRuntimeSeconds = 3600,
  MaxModels = 30,
  TrainData = NULL,
  TestData = NULL,
  SaveToFile = FALSE,
  ReturnObjects = TRUE
)
```

## Arguments

Construct	Core instruction file for automation (see Details below for more information on this)
max_memory	The ceiling amount of memory H2O will utilize
ratios	The percentage of train samples from source data (remainder goes to validation set)
BL_Trees	The number of trees to build in baseline GBM or RandomForest
nthreads	Set the number of threads to run function
model_path	Directory path for where you want your models saved
MaxRuntimeSeconds	Number of seconds of run time for grid tuning
MaxModels	Number of models you'd like to have returned
TrainData	Set to NULL or supply a data.table for training data
TestData	Set to NULL or supply a data.table for validation data
SaveToFile	Set to TRUE to save models and output to model_path
ReturnObjects	Set to TRUE to return objects from function

## Details

1. Logic: Error checking in the modeling arguments from your Construction file
2. ML: Build grid-tuned models and baseline models for comparison and checks which one performs better on validation data
3. Evaluation: Collects the performance metrics for both
4. Evaluation: Generates calibration plots (and boxplots for regression) for the winning model
5. Evaluation: Generates partial dependence calibration plots (and boxplots for regression) for the winning model
6. Evaluation: Generates variable importance tables and a table of non-important features
7. Production: Creates a storage file containing: model name, model path, grid tune performance, baseline performance, and threshold (if classification) and stores that file in your model\_path location

The Construct file must be a data.table and the columns need to be in the correct order (see examples). Character columns must be converted to type "Factor". You must remove date columns or convert them to "Factor". For classification models, your target variable needs to be a (0,1) of type "Factor." See the examples below for help with setting up the Construct file for various modeling target variable types. There are examples for regression, classification, multinomial, and quantile regression. For help on which parameters to use, look up the r/h2o documentation. If you misspecify the construct file, it will produce an error and outputfile of what was wrong and suggestions for fixing the error.

Let's go over the construct file, column by column. The Targets column is where you specify the column number of your target variable (in quotes, e.g. "c(1)").

The Distribution column is where you specify the distribution type for the modeling task. For classification use bernoulli, for multilabel use multinomial, for quantile use quantile, and for regression, you can choose from the list available in the H2O docs, such as gaussian, poisson, gamma, etc. It's not set up to handle tweedie distributions currently but I can add support if there is demand.

The Loss column tells H2O which metric to use for the loss metrics. For regression, I typically use "mse", quantile regression, "mae", classification "auc", and multinomial "logloss". For deeplearning models, you need to use "quadratic", "absolute", and "crossentropy".

The Quantile column tells H2O which quantile to use for quantile regression (in decimal form).

The ModelName column is the name you wish to give your model as a prefix.

The Algorithm column is the model you wish to use: gbm, randomForest, deeplearning, AutoML, XGBoost, LightGBM.

The dataName column is the name of your data.

The TargetCol column is the column number of your target variable.

The FeatureCols column is the column numbers of your features.

The CreateDate column is for tracking your model build dates.

The GridTune column is a TRUE / FALSE column for whether you want to run a grid tune model for comparison.

The ExportValidData column is a TRUE / FALSE column indicating if you want to export the validation data.

The ParDep column is where you put the number of partial dependence calibration plots you wish to generate.

The PD\_Data column is where you specify if you want to generate the partial dependence plots on "All" data, "Validate" data, or "Train" data.

The ThreshType column is for classification models. You can specify "f1", "f2", "f0point5", or "CS" for cost sensitive.

The FSC column is the feature selection column. Specify the percentage importance cutoff to create a table of "unimportant" features.

The tpProfit column is for when you specify "CS" in the ThreshType column. This is your true positive profit.

The tnProfit column is for when you specify "CS" in the ThreshType column. This is your true negative profit.

The fpProfit column is for when you specify "CS" in the ThreshType column. This is your false positive profit.

The fnProfit column is for when you specify "CS" in the ThreshType column. This is your false negative profit.

The SaveModel column is a TRUE / FALSE indicator. If you are just testing out models, set this to FALSE.

The SaveModelType column is where you specify if you want a "standard" model object saved or a "mojo" model object saved.

The PredsAllData column is a TRUE / FALSE column. Set to TRUE if you want all the predicted values returns (for all data).

The TargetEncoding column let's you specify the column number of features you wish to run target encoding on. Set to NA to not run this feature.

The SupplyData column lets you supply the data names for training and validation data. Set to NULL if you want the data partitioning to be done internally.

## Value

Returns saved models, corrected Construct file, variable importance tables, evaluation and partial dependence calibration plots, model performance measure, and a file called grid\_tuned\_paths.Rdata which contains paths to your saved models for operationalization.



```

ThreshType      = rep("f1",3),
FSC              = rep(0.001,3),
tpProfit        = rep(NA,3),
tnProfit        = rep(NA,3),
fpProfit        = rep(NA,3),
fnProfit        = rep(NA,3),
SaveModel       = rep(FALSE,3),
SaveModelType   = c("Mojo","standard","mojo"),
PredsAllData    = rep(TRUE,3),
TargetEncoding  = rep(NA,3),
SupplyData      = rep(FALSE,3))

AutoH2OModeler(Construct,
  max_memory = "28G",
  ratios = 0.75,
  BL_Trees = 500,
  nthreads = 5,
  model_path = NULL,
  MaxRuntimeSeconds = 3600,
  MaxModels = 30,
  TrainData = NULL,
  TestData = NULL,
  SaveToFile = FALSE,
  ReturnObjects = TRUE)

# Multinomial Example
Correl <- 0.85
aa <- data.table::data.table(target = runif(1000))
aa[, x1 := qnorm(target)]
aa[, x2 := runif(1000)]
aa[, Independent_Variable1 := log(pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable2 := (pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable3 := exp(pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable4 := exp(exp(pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2))))]
aa[, Independent_Variable5 := sqrt(pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable6 := (pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2)))^0.10]
aa[, Independent_Variable7 := (pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2)))^0.25]
aa[, Independent_Variable8 := (pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2)))^0.75]
aa[, Independent_Variable9 := (pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2)))^2]
aa[, Independent_Variable10 := (pnorm(Correl * x1 +
  sqrt(1-Correl^2) * qnorm(x2)))^4]
aa[, ':= ' (x1 = NULL, x2 = NULL)]
aa[, target := as.factor(ifelse(target < 0.33,"A",ifelse(target < 0.66, "B","C")))]
Construct <- data.table::data.table(Targets = rep("target",3),
  Distribution = c("multinomial",
    "multinomial",
    "multinomial"),
  Loss = c("auc","logloss","accuracy"),
  Quantile = rep(NA,3),

```



```

        ModelName      = c("GBM", "DRF", "DL"),
        Algorithm      = c("gbm",
                           "randomForest",
                           "deeplearning"),
        dataName       = rep("aa", 3),
        TargetCol      = rep(c("1"), 3),
        FeatureCols    = rep(c("2:11"), 3),
        CreateDate     = rep(Sys.time(), 3),
        GridTune       = rep(FALSE, 3),
        ExportValidData = rep(TRUE, 3),
        ParDep         = rep(NA, 3),
        PD_Data        = rep("All", 3),
        ThreshType     = rep("f1", 3),
        FSC            = rep(0.001, 3),
        tpProfit       = rep(NA, 3),
        tnProfit       = rep(NA, 3),
        fpProfit       = rep(NA, 3),
        fnProfit       = rep(NA, 3),
        SaveModel      = rep(FALSE, 3),
        SaveModelType  = c("Mojo", "standard", "mojo"),
        PredsAllData   = rep(TRUE, 3),
        TargetEncoding = rep(NA, 3),
        SupplyData     = rep(FALSE, 3))

AutoH2OModeler(Construct,
               max_memory = "28G",
               ratios = 0.75,
               BL_Trees = 500,
               nthreads = 5,
               model_path = NULL,
               MaxRuntimeSeconds = 3600,
               MaxModels = 30,
               TrainData = NULL,
               TestData = NULL,
               SaveToFile = FALSE,
               ReturnObjects = TRUE)

# Regression Example
Correl <- 0.85
aa <- data.table::data.table(target = runif(1000))
aa[, x1 := qnorm(target)]
aa[, x2 := runif(1000)]
aa[, Independent_Variable1 := log(pnorm(Correl * x1 +
                                       sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable2 := (pnorm(Correl * x1 +
                                       sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable3 := exp(pnorm(Correl * x1 +
                                       sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable4 := exp(exp(pnorm(Correl * x1 +
                                       sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable5 := sqrt(pnorm(Correl * x1 +
                                       sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable6 := (pnorm(Correl * x1 +
                                       sqrt(1-Correl^2) * qnorm(x2)))^0.10]
aa[, Independent_Variable7 := (pnorm(Correl * x1 +
                                       sqrt(1-Correl^2) * qnorm(x2)))^0.25]
aa[, Independent_Variable8 := (pnorm(Correl * x1 +

```



```

aa[, Independent_Variable3 := exp(pnorm(Correl * x1 +
                                         sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable4 := exp(exp(pnorm(Correl * x1 +
                                         sqrt(1-Correl^2) * qnorm(x2)))))
aa[, Independent_Variable5 := sqrt(pnorm(Correl * x1 +
                                         sqrt(1-Correl^2) * qnorm(x2)))]
aa[, Independent_Variable6 := (pnorm(Correl * x1 +
                                     sqrt(1-Correl^2) * qnorm(x2)))^0.10]
aa[, Independent_Variable7 := (pnorm(Correl * x1 +
                                     sqrt(1-Correl^2) * qnorm(x2)))^0.25]
aa[, Independent_Variable8 := (pnorm(Correl * x1 +
                                     sqrt(1-Correl^2) * qnorm(x2)))^0.75]
aa[, Independent_Variable9 := (pnorm(Correl * x1 +
                                     sqrt(1-Correl^2) * qnorm(x2)))^2]
aa[, Independent_Variable10 := (pnorm(Correl * x1 +
                                     sqrt(1-Correl^2) * qnorm(x2)))^4]
aa[, ':= ' (x1 = NULL, x2 = NULL)]
Construct <- data.table::data.table(Targets = rep("target",3),
                                   Distribution = c("quantile",
                                                    "quantile"),
                                   Loss = c("MAE", "Absolute"),
                                   Quantile = rep(0.75,2),
                                   ModelName = c("GBM", "DL"),
                                   Algorithm = c("gbm",
                                                "deeplearning"),
                                   dataName = rep("aa",2),
                                   TargetCol = rep(c("1"),2),
                                   FeatureCols = rep(c("2:11"),2),
                                   CreateDate = rep(Sys.time(),2),
                                   GridTune = rep(FALSE,2),
                                   ExportValidData = rep(TRUE,2),
                                   ParDep = rep(4,2),
                                   PD_Data = rep("All",2),
                                   ThreshType = rep("f1",2),
                                   FSC = rep(0.001,2),
                                   tpProfit = rep(NA,2),
                                   tnProfit = rep(NA,2),
                                   fpProfit = rep(NA,2),
                                   fnProfit = rep(NA,2),
                                   SaveModel = rep(FALSE,2),
                                   SaveModelType = c("Mojo", "mojo"),
                                   PredsAllData = rep(TRUE,2),
                                   TargetEncoding = rep(NA,2),
                                   SupplyData = rep(FALSE,2))

AutoH2OModeler(Construct,
               max_memory = "28G",
               ratios = 0.75,
               BL_Trees = 500,
               nthreads = 5,
               model_path = NULL,
               MaxRuntimeSeconds = 3600,
               MaxModels = 30,
               TrainData = NULL,
               TestData = NULL,
               SaveToFile = FALSE,
               ReturnObjects = TRUE)

```

```
## End(Not run)
```

---

AutoH2OScoring

*AutoH2OScoring is the complement of AutoH20Modeler.*


---

## Description

AutoH2OScoring is the complement of AutoH20Modeler. Use this for scoring models. You can score regression, quantile regression, classification, multinomial, clustering, and text models (built with the Word2VecModel function). You can also use this to score multioutcome models so long as there are two models: one for predicting the count of outcomes (a count outcome in character form) and a multinomial model on the label data. You will want to ensure you have a record for each label in your training data in (0,1) as factor form.

## Usage

```
AutoH2OScoring(
  Features = data,
  GridTuneRow = c(1:3),
  ScoreMethod = "Standard",
  TargetType = rep("multinomial", 3),
  ClassVals = rep("probs", 3),
  TextType = "individual",
  TextNames = NULL,
  NThreads = 6,
  MaxMem = "28G",
  JavaOptions = "-Xmx1g -XX:ReservedCodeCacheSize=256m",
  SaveToFile = FALSE,
  FilesPath = NULL,
  H2OShutDown = rep(FALSE, 3)
)
```

## Arguments

Features	This is a data.table of features for scoring.
GridTuneRow	Numeric. The row numbers of grid_tuned_paths, KMeansModelFile, or Store-File containing the model you wish to score
ScoreMethod	"Standard" or "Mojo": Mojo is available for supervised models; use standard for all others
TargetType	"Regression", "Classification", "Multinomial", "MultiOutcome", "Text", "Clustering". MultiOutcome must be two multinomial models, a count model (the count of outcomes, as a character value), and the multinomial model predicting the labels.
ClassVals	Choose from "p1", "Probs", "Label", or "All" for classification and multinomial models.
TextType	"Individual" or "Combined" depending on how you build your word2vec models
TextNames	Column names for the text columns to convert to word2vec
NThreads	Number of available threads for H2O
MaxMem	Amount of memory to dedicate to H2O



```

GridTune          = rep(FALSE,3),
ExportValidData   = rep(TRUE,3),
ParDep            = rep(NA,3),
PD_Data          = rep("All",3),
ThreshType        = rep("f1",3),
FSC               = rep(0.001,3),
tpProfit          = rep(NA,3),
tnProfit          = rep(NA,3),
fpProfit          = rep(NA,3),
fnProfit          = rep(NA,3),
SaveModel         = rep(FALSE,3),
SaveModelType     = c("Mojo","mojo","mojo"),
PredsAllData      = rep(TRUE,3),
TargetEncoding    = rep(NA,3),
SupplyData        = rep(FALSE,3))

AutoH2OModeler(Construct,
  max_memory = "28G",
  ratios = 0.75,
  BL_Trees = 500,
  nthreads = 5,
  model_path = NULL,
  MaxRuntimeSeconds = 3600,
  MaxModels = 30,
  TrainData = NULL,
  TestData = NULL,
  SaveToFile = FALSE,
  ReturnObjects = TRUE)

N <- 3
data <- AutoH2OScoring(Features = aa,
  GridTuneRow = c(1:N),
  ScoreMethod = "standard",
  TargetType = rep("multinomial",N),
  ClassVals = rep("Probs",N),
  NThreads = 6,
  MaxMem = "28G",
  JavaOptions = '-Xmx1g -XX:ReservedCodeCacheSize=256m',
  SaveToFile = FALSE,
  FilesPath = NULL,
  H2OShutDown = rep(FALSE,N))

## End(Not run)

```

---

AutoH2OTextPrepScoring

*AutoH2OTextPrepScoring is for NLP scoring*


---

## Description

This function returns prepared tokenized data for H2O Word2VecModeler scoring

**Usage**

```
AutoH20TextPrepScoring(
  data,
  string = NULL,
  MaxMem = NULL,
  NThreads = NULL,
  StartH2O = TRUE
)
```

**Arguments**

data	The text data
string	The name of the string column to prepare
MaxMem	Amount of memory you want to let H2O utilize
NThreads	The number of threads you want to let H2O utilize
StartH2O	Set to TRUE to have H2O start inside this function

**Author(s)**

Adrian Antico

**See Also**

Other Misc: [DeleteFile\(\)](#), [Logger\(\)](#), [PrintToPDF\(\)](#), [tokenizeH2O\(\)](#)

**Examples**

```
## Not run:
data <- AutoH20TextPrepScoring(data = x,
                               string = "text_column",
                               MaxMem = "28G",
                               NThreads = 8,
                               StartH2O = TRUE)

## End(Not run)
```

---

AutoHierarchicalFourier

*AutoHierarchicalFourier*

---

**Description**

AutoHierarchicalFourier reverses the difference

**Usage**

```
AutoHierarchicalFourier(
  datax = data,
  xRegs = names(XREGS),
  FourierTermS = FourierTerms,
  TimeUnit = TimeUnit,
  FC_PeriodS = FC_Periods,
  TargetColumnN = TargetColumn,
  DateColumnN = DateColumnName,
  HierarchGroups = NULL,
  IndependentGroups = NULL
)
```

**Arguments**

datax	data
xRegs	The XREGS
FourierTermS	Number of fourier pairs
TimeUnit	Time unit
FC_PeriodS	Number of forecast periods
TargetColumnN	Target column name
DateColumnN	Date column name
HierarchGroups	Character vector of categorical columns to fully interact
IndependentGroups	Character vector of categorical columns to run independently

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

---

AutoHurdleScoring	<i>AutoHurdleScoring()</i>
-------------------	----------------------------

---

**Description**

AutoHurdleScoring() can score AutoCatBoostHurdleModel() and AutoXGBoostHurdleModel()



**Usage**

```
AutoHurdleScoring(
  TestData = NULL,
  Path = NULL,
  ModelID = NULL,
  ModelClass = "catboost",
  ArgList = NULL,
  ModelList = NULL,
  Threshold = NULL
)
```

**Arguments**

TestData	scoring data.table
Path	Supply if ArgList is NULL or ModelList is null.
ModelID	Supply if ArgList is NULL or ModelList is null. Same as used in model training.
ModelClass	Name of model type. "catboost" is currently the only available option
ArgList	Output from the hurdle model
ModelList	Output from the hurdle model
Threshold	NULL to use raw probabilities to predict. Otherwise, supply a threshold

**Value**

A data.table with the final predicted value, the intermediate model predictions, and your source data

**Author(s)**

Adrian Antico

**See Also**

Other Automated Model Scoring: [AutoCatBoostScoring\(\)](#), [AutoH2OMLScoring\(\)](#), [AutoH2OModeler\(\)](#), [AutoXGBoostScoring\(\)](#), [IntermittentDemandScoringDataGenerator\(\)](#)

**Examples**

```
## Not run:

# XGBoost----

# Define file path
Path <- "C:/Users/aantico/Documents/Package/GUI_Package"

# Create hurdle data with correlated features
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.70,
  N = 25000,
  ID = 3,
  FactorCount = 2L,
  AddDate = TRUE,
  ZIP = 1,
  Classification = FALSE,
  MultiClass = FALSE)
```

```

# Define features
Features <- names(data)[!names(data) %chin%
  c("Adrian","IDcol_1","IDcol_2","IDcol_3","DateTime")]

# Build hurdle model
Output <- RemixAutoML::AutoXGBoostHurdleModel(

  # Operationalization args
  TreeMethod = "hist",
  TrainOnFull = FALSE,
  PassInGrid = NULL,

  # Metadata args
  NThreads = max(1L, parallel::detectCores()-2L),
  ModelID = "ModelTest",
  Paths = normalizePath(Path),
  MetaDataPaths = NULL,
  ReturnModelObjects = TRUE,

  # data args
  data,
  ValidationData = NULL,
  TestData = NULL,
  Buckets = c(0),
  TargetColumnName = "Adrian",
  FeatureColNames = Features,
  IDcols = c("IDcol_1","IDcol_2","IDcol_3"),

  # options
  TransformNumericColumns = NULL,
  SplitRatios = c(0.70, 0.20, 0.10),
  SaveModelObjects = TRUE,
  NumOfParDepPlots = 10L,

  # grid tuning args
  GridTune = FALSE,
  grid_eval_metric = "accuracy",
  MaxModelsInGrid = 1L,
  BaselineComparison = "default",
  MaxRunsWithoutNewWinner = 10L,
  MaxRunMinutes = 60L,

  # bandit hyperparameters
  Trees = 100L,
  eta = seq(0.05,0.40,0.05),
  max_depth = seq(4L, 16L, 2L),

  # random hyperparameters
  min_child_weight = seq(1.0, 10.0, 1.0),
  subsample = seq(0.55, 1.0, 0.05),
  colsample_bytree = seq(0.55, 1.0, 0.05))

# Score XGBoost Hurdle Model
HurdleScores <- RemixAutoML::AutoHurdleScoring(
  TestData = data,
  Path = Path,

```

```

ModelID = "ModelTest",
ModelClass = "xgboost",
ModelList = NULL,
ArgList = NULL,
Threshold = NULL)

## End(Not run)

```

---

AutoInteraction

*AutoInteraction*


---

## Description

AutoInteraction creates interaction variables from your numerical features in your data. Supply a set of column names to utilize and set the interaction level. Supply a character vector of columns to exclude and the function will ignore those features.

## Usage

```

AutoInteraction(
  data = NULL,
  NumericVars = NULL,
  InteractionDepth = 2,
  Center = TRUE,
  Scale = TRUE,
  SkipCols = NULL,
  Scoring = FALSE,
  File = NULL
)

```

## Arguments

data	Source data.table
InteractionDepth	The max K in N choose K. If NULL, K will loop through 1 to length(NumVars). Default is 2 for pairwise interactions
Center	TRUE to center the data
Scale	TRUE to scale the data
SkipCols	Use this to exclude features from being created. An example could be, you build a model with all variables and then use the variable importance list to determine which features aren't necessary and pass that set of features into this argument as a character vector.
Scoring	Defaults to FALSE. Set to TRUE for generating these columns in a model scoring setting
File	When Scoring is set to TRUE you have to supply either the .Rdata list with lookup values for recreating features or a pathfile to the .Rdata file with the lookup values. If you didn't center or scale the data then this argument can be ignored.
NumVars	Names of numeric columns (if NULL, all numeric and integer columns will be used)

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:

#####
# Feature Engineering for Model Training
#####

# Create fake data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.70,
  N = 50000,
  ID = 2L,
  FactorCount = 2L,
  AddDate = TRUE,
  ZIP = 0L,
  TimeSeries = FALSE,
  ChainLadderData = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Print number of columns
print(ncol(data))

# Store names of numeric and integer cols
Cols <- names(data)[c(which(unlist(lapply(data, is.numeric))),
                     which(unlist(lapply(data, is.integer))))]

# Model Training Feature Engineering
system.time(data <- RemixAutoML::AutoInteraction(
  data = data,
  NumericVars = Cols,
  InteractionDepth = 4,
  Center = TRUE,
  Scale = TRUE,
  SkipCols = NULL,
  Scoring = FALSE,
  File = getwd()))

# user  system elapsed
# 0.30   0.11   0.41

# Print number of columns
print(ncol(data))
```

```
#####
# Feature Engineering for Model Scoring
#####

# Create fake data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.70,
  N = 1000,
  ID = 2L,
  FactorCount = 2L,
  AddDate = TRUE,
  ZIP = 0L,
  TimeSeries = FALSE,
  ChainLadderData = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Print number of columns
print(ncol(data))

# Reduce to single row to mock a scoring scenario
data <- data[1L]

# Model Scoring Feature Engineering
system.time(data <- RemixAutoML::AutoInteraction(
  data = data,
  NumericVars = names(data)[
    c(which(unlist(lapply(data, is.numeric))),
      which(unlist(lapply(data, is.integer))))],
  InteractionDepth = 4,
  Center = TRUE,
  Scale = TRUE,
  SkipCols = NULL,
  Scoring = TRUE,
  File = file.path(getwd(), "Standardize.Rdata"))

# user  system elapsed
# 0.19   0.00   0.19

# Print number of columns
print(ncol(data))

## End(Not run)
```

---

AutoKMeans

*AutoKMeans Automated row clustering for mixed column types*


---

## Description

AutoKMeans adds a column to your original data with a cluster number identifier. Uses glrm (grid tune-able) and then k-means to find optimal k.

## Usage

```
AutoKMeans(
```

```

data,
nthreads = 8,
MaxMem = "28G",
SaveModels = NULL,
PathFile = NULL,
GridTuneGLRM = TRUE,
GridTuneKMeans = TRUE,
glrmCols = c(1:5),
IgnoreConstCols = TRUE,
glrmFactors = 5,
Loss = "Absolute",
glrmMaxIters = 1000,
SVDMethod = "Randomized",
MaxRunTimeSecs = 3600,
KMeansK = 50,
KMeansMetric = "totss"
)

```

### Arguments

<code>data</code>	is the source time series data.table
<code>nthreads</code>	set based on number of threads your machine has available
<code>MaxMem</code>	set based on the amount of memory your machine has available
<code>SaveModels</code>	Set to "standard", "mojo", or NULL (default)
<code>PathFile</code>	Set to folder where you will keep the models
<code>GridTuneGLRM</code>	If you want to grid tune the glrm model, set to TRUE, FALSE otherwise
<code>GridTuneKMeans</code>	If you want to grid tune the KMeans model, set to TRUE, FALSE otherwise
<code>glrmCols</code>	the column numbers for the glrm
<code>IgnoreConstCols</code>	tell H2O to ignore any columns that have zero variance
<code>glrmFactors</code>	similar to the number of factors to return from PCA
<code>Loss</code>	set to one of "Quadratic", "Absolute", "Huber", "Poisson", "Hinge", "Logistic", "Periodic"
<code>glrmMaxIters</code>	max number of iterations
<code>SVDMethod</code>	choose from "Randomized", "GramSVD", "Power"
<code>MaxRunTimeSecs</code>	set the timeout for max run time
<code>KMeansK</code>	number of factors to test out in k-means to find the optimal number
<code>KMeansMetric</code>	pick the metric to identify top model in grid tune c("totss", "betweeness", "withinss")

### Value

Original data.table with added column with cluster number identifier

### Author(s)

Adrian Antico

### See Also

Other Unsupervised Learning: [GenTSAnomVars\(\)](#), [H2oIsolationForest\(\)](#), [ResidualOutliers\(\)](#)

**Examples**

```
## Not run:
data <- data.table::as.data.table(iris)
data <- AutoKMeans(
  data,
  nthreads = 8,
  MaxMem = "28G",
  SaveModels = NULL,
  PathFile = normalizePath("./"),
  GridTuneGLRM = TRUE,
  GridTuneKMeans = TRUE,
  glrmCols = 1:(ncol(data)-1),
  IgnoreConstCols = TRUE,
  glrmFactors = 2,
  Loss = "Absolute",
  glrmMaxIters = 1000,
  SVDMethod = "Randomized",
  MaxRunTimeSecs = 3600,
  KMeansK = 5,
  KMeansMetric = "totss")
unique(data[["Species"]])
unique(data[["ClusterID"]])
temp <- data[, mean(ClusterID), by = "Species"]
Setosa <- round(temp[Species == "setosa", V1][[1]],0)
Versicolor <- round(temp[Species == "versicolor", V1][[1]],0)
Virginica <- round(temp[Species == "virginica", V1][[1]],0)
data[, Check := "a"]
data[ClusterID == eval(Setosa), Check := "setosa"]
data[ClusterID == eval(Virginica), Check := "virginica"]
data[ClusterID == eval(Versicolor), Check := "versicolor"]
data[, Acc := as.numeric(ifelse(Check == Species, 1, 0))]
data[, mean(Acc)][[1]]

## End(Not run)
```

---

AutoLagRollStats

*AutoLagRollStats*


---

**Description**

AutoLagRollStats Builds lags and a large variety of rolling statistics with options to generate them for hierarchical categorical interactions.

**Usage**

```
AutoLagRollStats(
  data,
  Targets = NULL,
  HierarchyGroups = NULL,
  IndependentGroups = NULL,
  DateColumn = NULL,
  TimeUnit = "day",
  TimeUnitAgg = "day",
```

```

TimeGroups = "day",
TimeBetween = NULL,
RollOnLag1 = TRUE,
Type = "Lag",
SimpleImpute = TRUE,
Lags = c(1:5),
MA_RollWindows = c(2, 5, 10),
SD_RollWindows = c(5, 10),
Skew_RollWindows = c(5, 10),
Kurt_RollWindows = c(5, 10),
Quantile_RollWindows = c(10),
Quantiles_Selected = c("q25", "q75"),
Debug = FALSE
)

```

### Arguments

data	A data.table you want to run the function on
Targets	A character vector of the column names for the reference column in which you will build your lags and rolling stats
HierarchyGroups	A vector of categorical column names that you want to have generate all lags and rolling stats done for the individual columns and their full set of interactions.
IndependentGroups	A vector of categorical column names that you want to have run independently of each other. This will mean that no interaction will be done.
DateColumn	The column name of your date column used to sort events over time
TimeUnit	List the time aggregation level for the time between events features, such as "hour", "day", "weeks", "months", "quarter", or "year"
TimeUnitAgg	List the time aggregation of your data that you want to use as a base time unit for your features. E.g. "raw" or "day"
TimeGroups	A vector of TimeUnits indicators to specify any time-aggregated GDL features you want to have returned. E.g. c("raw" (no aggregation is done), "hour", "day", "week", "month", "quarter", "year")
TimeBetween	Specify a desired name for features created for time between events. Set to NULL if you don't want time between events features created.
RollOnLag1	Set to FALSE to build rolling stats off of target columns directly or set to TRUE to build the rolling stats off of the lag-1 target
Type	List either "Lag" if you want features built on historical values or "Lead" if you want features built on future values
SimpleImpute	Set to TRUE for factor level imputation of "0" and numeric imputation of -1
Lags	A numeric vector of the specific lags you want to have generated. You must include 1 if WindowingLag = 1.
MA_RollWindows	A numeric vector of the specific rolling statistics window sizes you want to utilize in the calculations.
SD_RollWindows	A numeric vector of Standard Deviation rolling statistics window sizes you want to utilize in the calculations.



Skew_RollWindows	A numeric vector of Skewness rolling statistics window sizes you want to utilize in the calculations.
Kurt_RollWindows	A numeric vector of Kurtosis rolling statistics window sizes you want to utilize in the calculations.
Quantile_RollWindows	A numeric vector of Quantile rolling statistics window sizes you want to utilize in the calculations.
Quantiles_Selected	Select from the following c("q5", "q10", "q15", "q20", "q25", "q30", "q35", "q40", "q45", "q50", "q55", "q60", "q65", "q70", "q75", "q80", "q85", "q90", "q95")
Debug	Set to TRUE to get a print of which steps are running

**Value**

data.table of original data plus created lags, rolling stats, and time between event lags and rolling stats

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
# Create fake Panel Data----
Count <- 1L
for(Level in LETTERS) {
  datatemp <- RemixAutoML::FakeDataGenerator(
    Correlation = 0.75,
    N = 25000L,
    ID = 0L,
    ZIP = 0L,
    FactorCount = 0L,
    AddDate = TRUE,
    Classification = FALSE,
    MultiClass = FALSE)
  datatemp[, Factor1 := eval(Level)]
  if(Count == 1L) {
    data <- data.table::copy(datatemp)
  } else {
    data <- data.table::rbindlist(
      list(data, data.table::copy(datatemp)))
  }
  Count <- Count + 1L
}
```

```

}

# Add scoring records
data <- RemixAutoML::AutoLagRollStats(

  # Data
  data          = data,
  DateColumn    = "DateTime",
  Targets       = "Adrian",
  HierarchyGroups = NULL,
  IndependentGroups = c("Factor1"),
  TimeUnitAgg   = "days",
  TimeGroups    = c("days", "weeks",
                    "months", "quarters"),
  TimeBetween   = NULL,
  TimeUnit      = "days",

  # Services
  RollOnLag1    = TRUE,
  Type          = "Lag",
  SimpleImpute  = TRUE,

  # Calculated Columns
  Lags          = list("days" = c(seq(1,5,1)),
                       "weeks" = c(seq(1,3,1)),
                       "months" = c(seq(1,2,1)),
                       "quarters" = c(seq(1,2,1))),
  MA_RollWindows = list("days" = c(seq(1,5,1)),
                       "weeks" = c(seq(1,3,1)),
                       "months" = c(seq(1,2,1)),
                       "quarters" = c(seq(1,2,1))),
  SD_RollWindows = NULL,
  Skew_RollWindows = NULL,
  Kurt_RollWindows = NULL,
  Quantile_RollWindows = NULL,
  Quantiles_Selected = NULL,
  Debug           = FALSE)

## End(Not run)

```

---

AutoLagRollStatsScoring

*AutoLagRollStatsScoring*


---

## Description

AutoLagRollStatsScoring Builds lags and a large variety of rolling statistics with options to generate them for hierarchical categorical interactions.

## Usage

```

AutoLagRollStatsScoring(
  data,
  RowNumsID = "temp",

```

```

RowNumsKeep = 1,
Targets = NULL,
HierarchyGroups = NULL,
IndependentGroups = NULL,
DateColumn = NULL,
TimeUnit = "day",
TimeUnitAgg = "day",
TimeGroups = "day",
TimeBetween = NULL,
RollOnLag1 = 1,
Type = "Lag",
SimpleImpute = TRUE,
Lags = NULL,
MA_RollWindows = NULL,
SD_RollWindows = NULL,
Skew_RollWindows = NULL,
Kurt_RollWindows = NULL,
Quantile_RollWindows = NULL,
Quantiles_Selected = NULL,
Debug = FALSE
)

```

### Arguments

data	A data.table you want to run the function on
RowNumsID	The name of your column used to id the records so you can specify which rows to keep
RowNumsKeep	The RowNumsID numbers that you want to keep
Targets	A character vector of the column names for the reference column in which you will build your lags and rolling stats
HierarchyGroups	A vector of categorical column names that you want to have generate all lags and rolling stats done for the individual columns and their full set of interactions.
IndependentGroups	Only supply if you do not want HierarchyGroups. A vector of categorical column names that you want to have run independently of each other. This will mean that no interaction will be done.
DateColumn	The column name of your date column used to sort events over time
TimeUnit	List the time aggregation level for the time between events features, such as "hour", "day", "weeks", "months", "quarter", or "year"
TimeUnitAgg	List the time aggregation of your data that you want to use as a base time unit for your features. E.g. "day",
TimeGroups	A vector of TimeUnits indicators to specify any time-aggregated GDL features you want to have returned. E.g. c("hour", "day", "week", "month", "quarter", "year"). STILL NEED TO ADD these '1min', '5min', '10min', '15min', '30min', '45min'
TimeBetween	Specify a desired name for features created for time between events. Set to NULL if you don't want time between events features created.
RollOnLag1	Set to FALSE to build rolling stats off of target columns directly or set to TRUE to build the rolling stats off of the lag-1 target

Type	List either "Lag" if you want features built on historical values or "Lead" if you want features built on future values
SimpleImpute	Set to TRUE for factor level imputation of "0" and numeric imputation of -1
Lags	A numeric vector of the specific lags you want to have generated. You must include 1 if WindowingLag = 1.
MA_RollWindows	A numeric vector of the specific rolling statistics window sizes you want to utilize in the calculations.
SD_RollWindows	A numeric vector of Standard Deviation rolling statistics window sizes you want to utilize in the calculations.
Skew_RollWindows	A numeric vector of Skewness rolling statistics window sizes you want to utilize in the calculations.
Kurt_RollWindows	A numeric vector of Kurtosis rolling statistics window sizes you want to utilize in the calculations.
Quantile_RollWindows	A numeric vector of Quantile rolling statistics window sizes you want to utilize in the calculations.
Quantiles_Selected	Select from the following c("q5", "q10", "q15", "q20", "q25", "q30", "q35", "q40", "q45", "q50", "q55", "q60", "q65", "q70", "q75", "q80", "q85", "q90", "q95")
Debug	Set to TRUE to get a print out of which step you are on

**Value**

data.table of original data plus created lags, rolling stats, and time between event lags and rolling stats

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
# Create fake Panel Data----
Count <- 1L
for(Level in LETTERS) {
  datatemp <- RemixAutoML::FakeDataGenerator(
    Correlation = 0.75,
    N = 25000L,
    ID = 0L,
    ZIP = 0L,
    FactorCount = 0L,
```



```
Quantiles_Selected = c("q5", "q10", "q95"),
Debug              = FALSE)
```

---

AutoLimeAid

*AutoLimeAid automated lime*


---

## Description

AutoLimeAid automated lime explanations and lime model builds.

## Usage

```
AutoLimeAid(
  EvalPredsData = data,
  LimeTrainingData = data,
  LimeBins = 10,
  LimeIterations = 7500,
  LimeNumFeatures = 0,
  LimeModel = NULL,
  LimeModelPath = NULL,
  LimeModelID = NULL,
  MLModel = NULL,
  MLModelPath = NULL,
  MLMetaDataPath = NULL,
  MLModelID = NULL,
  ModelType = "xgboost",
  TargetType = "classification",
  NThreads = parallel::detectCores(),
  MaxMem = "32G",
  FeatureColumnNames = TestModel$ColNames,
  IDcols = NULL,
  FactorLevelsList = TestModel$FactorLevels,
  TargetLevels = NULL,
  OneHot = FALSE,
  ReturnFeatures = TRUE,
  TransformNumeric = FALSE,
  BackTransNumeric = FALSE,
  TargetColumnName = NULL,
  TransformationObject = NULL,
  TransID = NULL,
  TransPath = NULL,
  MDP_Impute = TRUE,
  MDP_CharToFactor = TRUE,
  MDP_RemoveDates = TRUE,
  MDP_MissFactor = "0",
  MDP_MissNum = -1
)
```

**Arguments**

EvalPredsData	Data used for interpretation. Should be the same kind of data used on ML_Scoring functions.
LimeTrainingData	Data used to train your ML model
LimeBins	Number of bins to use for bucketing numeric variables
LimeIterations	Number of lime permutations ran to generate interpretation of predicted value
LimeNumFeatures	How many features do you want to be considering for the Lime evaluation? Set to 0 to use all features
LimeModel	Supply a model if you have one available. Otherwise, provide a model path and either it will be pulling in or made and saved there.
LimeModelPath	Supply a path to where your model is located or to be stored.
LimeModelID	Provide a name for your model. If left NULL, a name will be created for you (and a new model).
MLModel	Supply the model object (except for H2O models). Can leave null.
MLModelPath	Supply a path to where your model is located. If this is supplied, the model will be pulled in from file (even if you supply a model)
MLMetaDataPath	Supply a path to where your model metadata is located (might be the same of the MLModelPath). If this is supplied, artifacts about the model will be pulled in from there.
MLModelID	The name of your model as read in the file directory
ModelType	Choose from "xgboost", "h2o", "catboost"
TargetType	For catboost models only. Select from "classification", "regression", "multi-class"
NThreads	Number of CPU threads.
MaxMem	Set the max memory you want to allocate. E.g. "32G"
FeatureColumnNames	The names of the features used in training your ML model (should be returned with the model or saved to file)
IDcols	The ID columns used in either CatBoost or XGBoost
FactorLevelsList	= TestModel\$FactorLevels,
TargetLevels	The target levels used in MultiClass models
OneHot	Replicate what you did with the model training
ReturnFeatures	TRUE or FALSE
TransformNumeric	Replicate what you did with the model training
BackTransNumeric	TRUE or FALSE. Replicate what you did with the model training.
TargetColumnName	For the transformations
TransformationObject	TRUE or FALSE. Replicate what you did with the model training.
TransID	Set to the ID used in model training.

TransPath	Same path used in model training.
MDP_Impute	Replicate what you did with the model training.
MDP_CharToFactor	Replicate what you did with the model training.
MDP_RemoveDates	Replicate what you did with the model training.
MDP_MissFactor	Replicate what you did with the model training.
MDP_MissNum	Replicate what you did with the model training.

## Value

LimeModelObject and Lime Explanations

## Author(s)

Adrian Antico

## See Also

Other Model Evaluation and Interpretation: [EvalPlot\(\)](#), [LimeModel\(\)](#), [ParDepCalPlots\(\)](#), [RedYellowGreen\(\)](#), [threshOptim\(\)](#)

## Examples

```
## Not run:
# CatBoost data generator
dataGenH20 <- function() {
  Correl <- 0.85
  N <- 10000
  data <- data.table::data.table(Classification = runif(N))
  data[, x1 := qnorm(Classification)]
  data[, x2 := runif(N)]
  data[, Independent_Variable1 := log(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable2 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable3 := exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable4 := exp(exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2))))]
  data[, Independent_Variable5 := sqrt(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable6 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.10]
  data[, Independent_Variable7 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.25]
  data[, Independent_Variable8 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.75]
  data[, Independent_Variable9 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^2]
  data[, Independent_Variable10 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^4]
  data[, Independent_Variable11 := as.factor(
    ifelse(Independent_Variable2 < 0.20,
      "A", ifelse(Independent_Variable2 < 0.40,
        "B", ifelse(Independent_Variable2 < 0.6,
          "C", ifelse(Independent_Variable2 < 0.8, "D", "E")))))]
  data[, ':= ' (x1 = NULL, x2 = NULL)]
  data[, Classification := ifelse(Classification > 0.5, 1, 0)]
  rm(N, Correl)
  return(data)
}
data <- dataGenH20()
TestModel <- RemixAutoML::AutoCatBoostRegression(
  data,
```



```

TrainOnFull = FALSE,
ValidationData = NULL,
TestData = NULL,
TargetColumnName = "Classification",
FeatureColNames = c(2:12),
PrimaryDateColumn = NULL,
IDcols = NULL,
MaxModelsInGrid = 3,
task_type = "GPU",
eval_metric = "RMSE",
Trees = 50,
GridTune = FALSE,
model_path = "C:/Users/aantico/Documents/Package/GUI_Package",
metadata_path = NULL,
ModelID = "Adrian",
NumOfParDepPlots = 15,
ReturnModelObjects = TRUE,
SaveModelObjects = TRUE,
PassInGrid = NULL)

# CatBoost Build Lime Model and Explanations
LimeOutput <- RemixAutoML::AutoLimeAid(
  EvalPredsData = data[c(1,15)],
  LimeTrainingData = data,
  LimeBins = 10,
  LimeIterations = 7500,
  LimeNumFeatures = 0,
  TargetType = "regression",
  LimeModel = NULL,
  LimeModelPath = "C:/Users/aantico/Documents/Package/GUI_Package",
  LimeModelID = "AdrianLime",
  MLModel = NULL,
  MLModelPath = "C:/Users/aantico/Documents/Package/GUI_Package",
  MLMetaDataPath = NULL,
  MLModelID = "Adrian",
  ModelType = "catboost",
  NThreads = parallel::detectCores(),
  MaxMem = "14G",
  FeatureColumnNames = NULL,
  IDcols = NULL,
  FactorLevelsList = NULL,
  TargetLevels = NULL,
  OneHot = FALSE,
  ReturnFeatures = TRUE,
  TransformNumeric = FALSE,
  BackTransformNumeric = FALSE,
  TargetColumnName = NULL,
  TransformationObject = NULL,
  TransID = NULL,
  TransPath = NULL,
  MDP_Impute = TRUE,
  MDP_CharToFactor = TRUE,
  MDP_RemoveDates = TRUE,
  MDP_MissFactor = "0",
  MDP_MissNum = -1)

# Plot lime objects

```

```

lime::plot_features(LimeOutput$LimeExplanations)
suppressWarnings(lime::plot_explanations(LimeOutput$LimeExplanations))

# H2O data generator
dataGenH2O <- function() {
  Correl <- 0.85
  N <- 10000
  data <- data.table::data.table(Classification = runif(N))
  data[, x1 := qnorm(Classification)]
  data[, x2 := runif(N)]
  data[, Independent_Variable1 := log(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable2 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable3 := exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable4 := exp(exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2))))]
  data[, Independent_Variable5 := sqrt(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable6 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.10]
  data[, Independent_Variable7 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.25]
  data[, Independent_Variable8 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.75]
  data[, Independent_Variable9 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^2]
  data[, Independent_Variable10 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^4]
  data[, Independent_Variable11 := as.factor(ifelse(Independent_Variable2 < 0.20,
    "A",ifelse(Independent_Variable2 < 0.40,
    "B",ifelse(Independent_Variable2 < 0.6,
    "C",ifelse(Independent_Variable2 < 0.8, "D", "E"))))]
  data[, ':= ' (x1 = NULL, x2 = NULL)]
  data[, Classification := ifelse(Classification > 0.5, 1, 0)]
  rm(N,Correl)
  return(data)
}
data <- dataGenH2O()
TestModel <- RemixAutoML::AutoH2oDRFClassifier(
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Classification",
  FeatureColNames = setdiff(names(data),"Classification"),
  eval_metric = "auc",
  Trees = 50,
  GridTune = FALSE,
  MaxMem = "32G",
  NThreads = max(1, parallel::detectCores()-2),
  MaxModelsInGrid = 10,
  model_path = "C:/Users/aantico/Desktop/Retention Analytics",
  metadata_path = NULL,
  ModelID = "Adrian",
  NumOfParDepPlots = 10,
  ReturnModelObjects = TRUE,
  SaveModelObjects = TRUE,
  IfSaveModel = "standard",
  H2OShutdown = TRUE)

LimeOutput <- RemixAutoML::AutoLimeAid(
  EvalPredsData = data[c(1,15)],
  LimeTrainingData = data,
  LimeBins = 10,
  LimeIterations = 7500,

```

```

TargetType = "regression",
LimeNumFeatures = 0,
LimeModel = NULL,
LimeModelPath = "C:/Users/aantico/Desktop/Retention Analytics",
LimeModelID = "AdrianLime",
MLModel = NULL,
MLModelPath = "C:/Users/aantico/Desktop/Retention Analytics",
MLMetaDataPath = NULL,
MLModelID = "Adrian",
ModelType = "h2o",
NThreads = parallel::detectCores(),
MaxMem = "14G",
FeatureColumnNames = NULL,
IDcols = NULL,
FactorLevelsList = NULL,
TargetLevels = NULL,
OneHot = FALSE,
ReturnFeatures = TRUE,
TransformNumeric = FALSE,
BackTransNumeric = FALSE,
TargetColumnName = NULL,
TransformationObject = NULL,
TransID = NULL,
TransPath = NULL,
MDP_Impute = TRUE,
MDP_CharToFactor = TRUE,
MDP_RemoveDates = TRUE,
MDP_MissFactor = "0",
MDP_MissNum = -1)

# Plot lime objects
lime::plot_features(LimeOutput$LimeExplanations)
suppressWarnings(lime::plot_explanations(LimeOutput$LimeExplanations))

# XGBoost create data function
dataGenXGBoost <- function() {
  Correl <- 0.85
  N <- 10000
  data <- data.table::data.table(Classification = runif(N))
  data[, x1 := qnorm(Classification)]
  data[, x2 := runif(N)]
  data[, Independent_Variable1 := log(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable2 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable3 := exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable4 := exp(exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2))))]
  data[, Independent_Variable5 := sqrt(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
  data[, Independent_Variable6 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.10]
  data[, Independent_Variable7 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.25]
  data[, Independent_Variable8 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.75]
  data[, Independent_Variable9 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^2]
  data[, Independent_Variable10 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^4]
  data[, Independent_Variable11 := as.factor(ifelse(Independent_Variable2 < 0.20,
    "A", ifelse(Independent_Variable2 < 0.40,
      "B", ifelse(Independent_Variable2 < 0.6,
        "C", ifelse(Independent_Variable2 < 0.8, "D", "E")))))]
  data[, ':= ' (x1 = NULL, x2 = NULL)]
  data[, Classification := ifelse(Classification > 0.5, 1, 0)]
}

```

```

    rm(Correl,N)
    return(data)
}
data <- dataGenXGBoost()
TestModel <- RemixAutoML::AutoXGBoostClassifier(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Classification",
  FeatureColNames = 2:12,
  IDcols = NULL,
  eval_metric = "auc",
  Trees = 50,
  GridTune = FALSE,
  grid_eval_metric = "auc",
  MaxModelsInGrid = 10,
  NThreads = 8,
  TreeMethod = "hist",
  model_path = "C:/Users/aantico/Desktop/Retention Analytics",
  metadata_path = NULL,
  ModelID = "Adrian2",
  NumOfParDepPlots = 3,
  ReturnModelObjects = TRUE,
  ReturnFactorLevels = TRUE,
  SaveModelObjects = TRUE,
  PassInGrid = NULL)

# XGBoost Build Lime and Generate Output
LimeOutput <- RemixAutoML::AutoLimeAid(
  EvalPredsData = data[c(1,15)],
  LimeTrainingData = data,
  LimeBins = 10,
  TargetType = "classification",
  LimeIterations = 7500,
  LimeNumFeatures = 0,
  LimeModel = NULL,
  LimeModelPath = "C:/Users/aantico/Desktop/Retention Analytics",
  LimeModelID = "Adrian2Lime",
  MLModel = NULL,
  MLModelPath = "C:/Users/aantico/Desktop/Retention Analytics",
  MLMetaDataPath = NULL,
  MLModelID = "Adrian2",
  ModelType = "xgboost",
  NThreads = parallel::detectCores(),
  MaxMem = "14G",
  FeatureColumnNames = NULL,
  IDcols = NULL,
  FactorLevelsList = NULL,
  TargetLevels = NULL,
  OneHot = FALSE,
  ReturnFeatures = TRUE,
  TransformNumeric = FALSE,
  BackTransNumeric = FALSE,
  TargetColumnName = NULL,
  TransformationObject = NULL,
  TransID = NULL,

```

```

TransPath = NULL,
MDP_Impute = TRUE,
MDP_CharToFactor = TRUE,
MDP_RemoveDates = TRUE,
MDP_MissFactor = "0",
MDP_MissNum = -1)

# Plot lime objects
lime::plot_features(LimeOutput$LimeExplanations)
suppressWarnings(lime::plot_explanations(LimeOutput$LimeExplanations))

## End(Not run)

```

---

AutoMarketBasketModel *AutoMarketBasketModel function runs a market basket analysis automatically*

---

## Description

AutoMarketBasketModel function runs a market basket analysis automatically. It will convert your data, run the algorithm, and add on additional significance values not originally contained within.

## Usage

```

AutoMarketBasketModel(
  data,
  OrderIDColumnName,
  ItemIDColumnName,
  LHS_Delimiter = ",",
  Support = 0.001,
  Confidence = 0.1,
  MaxLength = 2,
  MinLength = 2,
  MaxTime = 5
)

```

## Arguments

data	This is your transactions data set
OrderIDColumnName	Supply your column name for the Order ID Values
ItemIDColumnName	Supply your column name for the Item ID Values
LHS_Delimiter	Default delimiter for separating multiple ItemID's is a comma.
Support	Threshold for inclusion using support
Confidence	Threshold for inclusion using confidence
MaxLength	Maximum combinations of Item ID (number of items in basket to consider)
MinLength	Minimum length of combinations of ItemID (number of items in basket to consider)
MaxTime	Max run time per iteration (default is 5 seconds)

**Author(s)**

Adrian Antico and Douglas Pestana

**See Also**

Chi-sq statistics and p-values based on this paper: <http://www.cs.bc.edu/~alvarez/ChiSquare/chi2tr.pdf>

**Examples**

```
## Not run:
rules_data <- AutoMarketBasketModel(
  data,
  OrderIDColumnName = "OrderNumber",
  ItemIDColumnName = "ItemNumber",
  LHS_Delimiter = ",",
  Support = 0.001,
  Confidence = 0.1,
  MaxLength = 2,
  MinLength = 2,
  MaxTime = 5)

## End(Not run)
```

---

AutoNLS

*AutoNLS is a function for automatically building nls models*


---

**Description**

This function will build models for 9 different nls models, along with a non-parametric monotonic regression and a polynomial regression. The models are evaluated, a winner is picked, and the predicted values are stored in your data table.

**Usage**

```
AutoNLS(data, y, x, monotonic = TRUE)
```

**Arguments**

data	Data is the data table you are building the modeling on
y	Y is the target variable name in quotes
x	X is the independent variable name in quotes
monotonic	This is a TRUE/FALSE indicator - choose TRUE if you want monotonic regression over polynomial regression

**Value**

A list containing "PredictionData" which is a data table with your original column replaced by the nls model predictions; "ModelName" the model name; "ModelObject" The winning model to later use; "EvaluationMetrics" Model metrics for models with ability to build.

**Author(s)**

Adrian Antico

**Examples**

```
## Not run:
# Create Growth Data
data <- data.table::data.table(Target = seq(1, 500, 1),
  Variable = rep(1, 500))
for (i in as.integer(1:500)) {
  if (i == 1) {
    var <- data[i, "Target"][[1]]
    data.table::set(data, i = i, j = 2L,
      value = var * (1 + runif(1) / 100))
  } else {
    var <- data[i - 1, "Variable"][[1]]
    data.table::set(data, i = i, j = 2L,
      value = var * (1 + runif(1) / 100))
  }
}

# Add jitter to Target
data[, Target := jitter(Target, factor = 0.25)]

# To keep original values
data1 <- data.table::copy(data)

# Merge and Model data
data11 <- AutoNLS(
  data = data,
  y = "Target",
  x = "Variable",
  monotonic = TRUE)

# Join predictions to source data
data2 <- merge(
  data1,
  data11$PredictionData,
  by = "Variable",
  all = FALSE)

# Plot output
ggplot2::ggplot(data2, ggplot2::aes(x = Variable)) +
  ggplot2::geom_line(ggplot2::aes(y = data2[["Target.x"]],
    color = "Target")) +
  ggplot2::geom_line(ggplot2::aes(y = data2[["Target.y"]],
    color = "Predicted")) +
  RemixAutoML::ChartTheme(Size = 12) +
  ggplot2::ggtitle(paste0("Growth Models AutoNLS: ",
    data11$ModelName)) +
  ggplot2::ylab("Target Variable") +
  ggplot2::xlab("Independent Variable") +
  ggplot2::scale_colour_manual("Values",
    breaks = c("Target", "Predicted"),
    values = c("red", "blue"))
```

```
summary(data11$ModelObject)
data11$EvaluationMetrics

## End(Not run)
```

---

AutoRecomDataCreate	<i>Convert transactional data.table to a binary ratings matrix</i>
---------------------	--

---

## Description

Convert transactional data.table to a binary ratings matrix

## Usage

```
AutoRecomDataCreate(
  data,
  EntityColName = "CustomerID",
  ProductColName = "StockCode",
  MetricColName = "TotalSales",
  ReturnMatrix = FALSE
)
```

## Arguments

data	This is your transactional data.table. Must include an Entity (typically customer), ProductCode (such as SKU), and a sales metric (such as total sales).
EntityColName	This is the column name in quotes that represents the column name for the Entity, such as customer
ProductColName	This is the column name in quotes that represents the column name for the product, such as SKU
MetricColName	This is the column name in quotes that represents the column name for the metric, such as total sales
ReturnMatrix	Set to FALSE to coerce the object (desired route) or TRUE to return a matrix

## Value

A BinaryRatingsMatrix

## Author(s)

Adrian Antico and Douglas Pestana

## See Also

Other Recommenders: [AutoRecommenderScoring\(\)](#), [AutoRecommender\(\)](#)



## Examples

```
## Not run:
RatingsMatrix <- AutoRecomDataCreate(
  data,
  EntityColName = "CustomerID",
  ProductColName = "StockCode",
  MetricColName = "TotalSales",
  ReturnMatrix = TRUE)

## End(Not run)
```

---

AutoRecommender	<i>Automatically build the best recommender model among models available.</i>
-----------------	---

---

## Description

This function returns the winning model that you pass onto AutoRecommenderScoring

## Usage

```
AutoRecommender(
  data,
  Partition = "Split",
  KFold = 1,
  Ratio = 0.75,
  Given = 1,
  RatingType = "TopN",
  RatingsKeep = 20,
  SkipModels = "AssociationRules",
  ModelMetric = "TPR"
)
```

## Arguments

data	This is your BinaryRatingsMatrix. See function RecomDataCreate
Partition	Choose from "split", "cross-validation", "bootstrap". See evaluationScheme in recommenderlab for details.
KFold	Choose 1 for traditional train and test. Choose greater than 1 for the number of cross validations
Ratio	The ratio for train and test. E.g. 0.75 for 75 percent data allocated to training
Given	The number of products you would like to evaluate. Negative values implement all-but schemes.
RatingType	Choose from "TopN", "ratings", "ratingMatrix"
RatingsKeep	The total ratings you wish to return. Default is 20.
SkipModels	AssociationRules runs the slowest and may crash your system. Choose from: "AssociationRules", "ItemBasedCF", "UserBasedCF", "PopularItems", "RandomItems"
ModelMetric	Choose from "Precision", "Recall", "TPR", or "FPR"

**Value**

The winning model used for scoring in the AutoRecommenderScoring function

**Author(s)**

Adrian Antico and Douglas Pestana

**See Also**

Other Recommenders: [AutoRecomDataCreate\(\)](#), [AutoRecommenderScoring\(\)](#)

**Examples**

```
## Not run:
WinningModel <- AutoRecommender(
  RatingsMatrix,
  Partition = "Split",
  KFold = 1,
  Ratio = 0.75,
  Given = 1,
  RatingType = "TopN",
  RatingsKeep = 20,
  SkipModels = "AssociationRules",
  ModelMetric = "TPR")

## End(Not run)
```

---

AutoRecommenderScoring

*The AutoRecomScoring function scores recommender models from AutoRecommender()*

---

**Description**

This function will take your ratings matrix and model and score your data in parallel.

This function will take your ratings matrix and model and score your data in parallel.

**Usage**

```
AutoRecommenderScoring(
  data,
  WinningModel,
  EntityColName = "CustomerID",
  ProductColName = "StockCode",
  NumItemsReturn = 1
)

AutoRecommenderScoring(
  data,
  WinningModel,
  EntityColName = "CustomerID",
  ProductColName = "StockCode",
```

```
    NumItemsReturn = 1
  )
```

### Arguments

data	The binary ratings matrix from <code>RecomDataCreate()</code>
WinningModel	The winning model returned from <code>AutoRecommender()</code>
EntityColName	Typically your customer ID
ProductColName	Something like "StockCode"
NumItemsReturn	Number of items to return on scoring

### Value

Returns the prediction data  
Returns the prediction data

### Author(s)

Adrian Antico and Douglas Pestana  
Adrian Antico and Douglas Pestana

### See Also

Other Recommenders: [AutoRecomDataCreate\(\)](#), [AutoRecommender\(\)](#)  
Other Recommenders: [AutoRecomDataCreate\(\)](#), [AutoRecommender\(\)](#)

### Examples

```
## Not run:
Results <- AutoRecommenderScoring(
  data = AutoRecomDataCreate(
    data,
    EntityColName = "CustomerID",
    ProductColName = "StockCode",
    MetricColName = "TotalSales"),
  WinningModel = AutoRecommender(
    AutoRecomDataCreate(
      data,
      EntityColName = "CustomerID",
      ProductColName = "StockCode",
      MetricColName = "TotalSales"),
    Partition = "Split",
    KFold = 2,
    Ratio = 0.75,
    RatingType = "TopN",
    RatingsKeep = 20,
    SkipModels = "AssociationRules",
    ModelMetric = "TPR"),
  EntityColName = "CustomerID",
  ProductColName = "StockCode")

## End(Not run)
## Not run:
```

```
Results <- AutoRecommenderScoring(
  data = AutoRecomDataCreate(
    data,
    EntityColName = "CustomerID",
    ProductColName = "StockCode",
    MetricColName = "TotalSales"),
  WinningModel = AutoRecommender(
    AutoRecomDataCreate(
      data,
      EntityColName = "CustomerID",
      ProductColName = "StockCode",
      MetricColName = "TotalSales"),
    Partition = "Split",
    KFold = 2,
    Ratio = 0.75,
    RatingType = "TopN",
    RatingsKeep = 20,
    SkipModels = "AssociationRules",
    ModelMetric = "TPR"),
  EntityColName = "CustomerID",
  ProductColName = "StockCode")

## End(Not run)
```

---

AutoTBATS

*AutoTBATS*


---

## Description

AutoTBATS is a multi-armed bandit model testing framework for AR and SAR NNets. Randomized probability matching is the underlying bandit algorithm. Model evaluation is done by blending the training error and the validation error from testing the model on out of sample data. The bandit algorithm compares the performance of the current build against the previous builds which starts with the classic nnetar model from the forecast package. Depending on how many lags, seasonal lags, and fourier pairs you test the number of combinations of features to test begins to approach 10,000 different combinations of settings. The function tests out transformations, differencing, and variations of the lags, seasonal lags, and fourier pairs. The parameter space is broken up into various buckets that are increasing in sophistication. The bandit algorithm samples from those buckets and based on many rounds of testing it determines which buckets to generate samples from more frequently based on the models performance coming from that bucket. All of the models have performance data collected on them and a final rebuild is initiated when a winner is found. The rebuild process begins by retraining the model with the settings that produced the best performance. If the model fails to build, for whatever reason, the next best buildable model is rebuilt.

## Usage

```
AutoTBATS(
  data,
  FilePath = NULL,
  TargetVariableName,
  DateColumnName,
  TimeAggLevel = "week",
  EvaluationMetric = "MAE",
```

```

    NumHoldOutPeriods = 5L,
    NumFCPeriods = 5L,
    MaxLags = 5L,
    MaxMovingAverages = 5L,
    MaxSeasonalPeriods = 1L,
    TrainWeighting = 0.5,
    MaxConsecutiveFails = 12L,
    MaxNumberModels = 100L,
    MaxRunTimeMinutes = 10L,
    NumberCores = max(1L, min(4L, parallel::detectCores() - 2L))
)

```

### Arguments

<code>data</code>	Source data.table
<code>FilePath</code>	NULL to return nothing. Provide a file path to save the model and xregs if available
<code>TargetVariableName</code>	Name of your time series target variable
<code>DateColumnName</code>	Name of your date column
<code>TimeAggLevel</code>	Choose from "year", "quarter", "month", "week", "day", "hour"
<code>EvaluationMetric</code>	Choose from MAE, MSE, and MAPE
<code>NumHoldOutPeriods</code>	Number of time periods to use in the out of sample testing
<code>NumFCPeriods</code>	Number of periods to forecast
<code>MaxLags</code>	A single value of the max number of lags to use in the internal auto.arima of tbats
<code>MaxMovingAverages</code>	A single value of the max number of moving averages to use in the internal auto.arima of tbats
<code>MaxSeasonalPeriods</code>	A single value for the max allowable seasonal periods to be tested in the tbats framework
<code>TrainWeighting</code>	Model ranking is based on a weighted average of training metrics and out of sample metrics. Supply the weight of the training metrics, such as 0.50 for 50 percent.
<code>MaxConsecutiveFails</code>	When a new best model is found MaxConsecutiveFails resets to zero. Indicated the number of model attempts without a new winner before terminating the procedure.
<code>MaxNumberModels</code>	Indicate the maximum number of models to test.
<code>MaxRunTimeMinutes</code>	Indicate the maximum number of minutes to wait for a result.
<code>NumberCores</code>	Default max(1L, min(4L, parallel::detectCores()-2L))

### Author(s)

Adrian Antico

**See Also**

Other Automated Time Series: [AutoArfima\(\)](#), [AutoBanditNNet\(\)](#), [AutoBanditSarima\(\)](#), [AutoCatBoostFreqSizeScoring\(\)](#), [AutoETS\(\)](#), [AutoH2oGBMFreqSizeScoring\(\)](#), [AutoTS\(\)](#)

**Examples**

```
## Not run:
# Create fake data
data <- RemixAutoML::FakeDataGenerator(TimeSeries = TRUE, TimeSeriesTimeAgg = "days")

# Build model
Output <- RemixAutoML::AutoTBATS(
  data,
  FilePath = NULL,
  TargetVariableName = "Weekly_Sales",
  DateColumnName = "Date",
  TimeAggLevel = "weeks",
  EvaluationMetric = "MAE",
  NumHoldOutPeriods = 5L,
  NumFCPeriods = 5L,
  MaxLags = 5L,
  MaxMovingAverages = 5L,
  MaxSeasonalPeriods = 1L,
  TrainWeighting = 0.50,
  MaxConsecutiveFails = 12L,
  MaxNumberModels = 100L,
  MaxRunTimeMinutes = 10L,
  NumberCores = max(1L, min(4L, parallel::detectCores()-2L)))

# Output
Output$ForecastPlot
Output$Forecast
Output$PerformanceGrid

## End(Not run)
```

---

**AutoTransformationCreate**

*AutoTransformationCreate is a function for automatically identifying the optimal transformations for numeric features and transforming them once identified.*

---

**Description**

AutoTransformationCreate is a function for automatically identifying the optimal transformations for numeric features and transforming them once identified. This function will loop through your selected transformation options (YeoJohnson, BoxCox, Asinh, Asin, and Logit) and find the one that produces data that is the closest to normally distributed data. It then makes the transformation and collects the metadata information for use in the AutoTransformationScore() function, either by returning the objects (always) or saving them to file (optional).

**Usage**

```
AutoTransformationCreate(
  data,
  ColumnNames = NULL,
  Methods = c("BoxCox", "YeoJohnson", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit", "Identity"),
  Path = NULL,
  TransID = "ModelID",
  SaveOutput = FALSE
)
```

**Arguments**

data	This is your source data
ColumnNames	List your columns names in a vector, for example, c("Target", "IV1")
Methods	Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Asin", "Logit", and "Identity".
Path	Set to the directly where you want to save all of your modeling files
TransID	Set to a character value that corresponds with your modeling project
SaveOutput	Set to TRUE to save necessary file to run AutoTransformationScore()

**Value**

data with transformed columns and the transformation object for back-transforming later

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
Correl <- 0.85
N <- 1000
data <- data.table::data.table(Adrian = runif(N))
data[, x1 := qnorm(Adrian)]
data[, x2 := runif(N)]
data[, Adrian1 := log(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data <- RemixAutoML::AutoTransformationCreate(
  data,
  ColumnNames = "Sample",
  Methods = c("BoxCox",
    "YeoJohnson",
    "Asinh",
    "Log",
```

```

        "LogPlus1",
        "Asin",
        "Logit",
        "Identity"),
    Path = NULL,
    TransID = "Trans",
    SaveOutput = FALSE)

## End(Not run)

```

---

## AutoTransformationScore

*AutoTransformationScore() is a the complimentary function to AutoTransformationCreate()*

---

### Description

AutoTransformationScore() is a the compliment function to AutoTransformationCreate(). Automatically apply or inverse the transformations you identified in AutoTransformationCreate() to other data sets. This is useful for applying transformations to your validation and test data sets for modeling. It's also useful for back-transforming your target and prediction columns after you have build and score your models so you can obtain statistics on the original features.

### Usage

```

AutoTransformationScore(
  ScoringData,
  FinalResults,
  Type = "Inverse",
  TransID = "TestModel",
  Path = NULL
)

```

### Arguments

ScoringData	This is your source data
FinalResults	This is the FinalResults output object from AutoTransformationCreate().
Type	Set to "Inverse" to back-transfrom or "Apply" for applying the transformation.
TransID	Set to a character value that corresponds with your modeling project
Path	Set to the directly where you want to save all of your modeling files

### Value

data with transformed columns

### Author(s)

Adrian Antico



**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
Correl <- 0.85
N <- 1000
data <- data.table::data.table(Adrian = runif(N))
data[, x1 := qnorm(Adrian)]
data[, x2 := runif(N)]
data[, Adrian1 := log(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data <- RemixAutoML::AutoTransformationScore(
  data,
  FinalResults,
  Path = NULL,
  TransID = "Trans")

## End(Not run)
```

AutoTS

*AutoTS is an automated time series modeling function***Description**

Step 1 is to build all the models and evaluate them on the number of HoldOutPeriods periods you specify. Step 2 is to pick the winner and rebuild the winning model on the full data set. Step 3 is to generate forecasts with the final model for FCPeriods that you specify. AutoTS builds the best time series models for each type, using optimized box-cox transformations and using a user-supplied frequency for the ts data conversion along with a model-based frequency for the ts data conversion, compares all types, selects the winner, and generates a forecast. Models include:

**Usage**

```
AutoTS(
  data,
  TargetName = "Target",
  DateName = "DateTime",
  FCPeriods = 30,
  HoldOutPeriods = 30,
  EvaluationMetric = "MAPE",
  InnerEval = "AICc",
  TimeUnit = "day",
  Lags = 25,
  SLags = 2,
  MaxFourierPairs = 0,
  NumCores = 4,
  SkipModels = NULL,
```

```

    StepWise = TRUE,
    TSClean = TRUE,
    ModelFreq = TRUE,
    PrintUpdates = FALSE,
    PlotPredictionIntervals = TRUE
  )

```

### Arguments

<code>data</code>	is the source time series data as a <code>data.table</code> - or a data structure that can be converted to a <code>data.table</code>
<code>TargetName</code>	is the name of the target variable in your <code>data.table</code>
<code>DateName</code>	is the name of the date column in your <code>data.table</code>
<code>FCPeriods</code>	is the number of periods into the future you wish to forecast
<code>HoldOutPeriods</code>	is the number of periods to use for validation testing
<code>EvaluationMetric</code>	Set this to either "MAPE", "MSE", or "MAE". Default is "MAPE"
<code>InnerEval</code>	Choose from AICC, AIC, and BIC. These are what the time series models use internally to optimize
<code>TimeUnit</code>	is the level of aggregation your dataset comes in. Choices include: hour, day, week, month, quarter, year, 1Min, 5Min, 10Min, 15Min, and 30Min
<code>Lags</code>	is the number of lags you wish to test in various models (same as moving averages)
<code>SLags</code>	is the number of seasonal lags you wish to test in various models (same as moving averages)
<code>MaxFourierPairs</code>	Set the max number of Fourier terms to test out. They will be utilized in the ARIMA and NN models.
<code>NumCores</code>	is the number of cores available on your computer
<code>SkipModels</code>	Don't run specified models - e.g. exclude all models "DSHW" "ARFIMA" "ARIMA" "ETS" "NNET" "TBATS" "TSLM"
<code>StepWise</code>	Set to TRUE to have ARIMA and ARFIMA run a stepwise selection process. Otherwise, all models will be generated in parallel execution, but still run much slower.
<code>TSClean</code>	Set to TRUE to have missing values interpolated and outliers replaced with interpolated values: creates separate models for a larger comparison set
<code>ModelFreq</code>	Set to TRUE to run a separate version of all models where the time series frequency is chosen algorithmically
<code>PrintUpdates</code>	Set to TRUE for a print to console of function progress
<code>PlotPredictionIntervals</code>	Set to FALSE to not print prediction intervals on your plot output

### Details

DSHW: Double Seasonal Holt Winters

ARFIMA: Auto Regressive Fractional Integrated Moving Average

ARIMIA: Stepwise Auto Regressive Integrated Moving Average with specified max lags, seasonal lags, moving averages, and seasonal moving averages

ETS: Additive and Multiplicative Exponential Smoothing and Holt Winters

NNetar: Auto Regressive Neural Network models automatically compares models with 1 lag or 1 seasonal lag compared to models with up to N lags and N seasonal lags

TBATS: Exponential smoothing state space model with Box-Cox transformation, ARMA errors, Trend and Seasonal components

TSLM: Time Series Linear Model - builds a linear model with trend and season components extracted from the data

### Value

Returns a list containing 1: A data.table object with a date column and the forecasted values; 2: The model evaluation results; 3: The champion model for later use if desired; 4: The name of the champion model; 5: A time series ggplot with historical values and forecasted values with 80

### Author(s)

Adrian Antico and Douglas Pestana

### See Also

Other Automated Time Series: [AutoArfima\(\)](#), [AutoBanditNNet\(\)](#), [AutoBanditSarima\(\)](#), [AutoCatBoostFreqSizeScoring\(\)](#), [AutoETS\(\)](#), [AutoH2oGBMFreqSizeScoring\(\)](#), [AutoTBATS\(\)](#)

### Examples

```
## Not run:
data <- data.table::data.table(DateTime = as.Date(Sys.time()),
  Target = stats::filter(rnorm(100,
    mean = 50,
    sd = 20),
    filter=rep(1,10),
    circular=TRUE))
data[, temp := seq(1:100)][, DateTime := DateTime - temp][
  , temp := NULL]
data <- data[order(DateTime)]
output <- AutoTS(
  data,
  TargetName      = "Target",
  DateName        = "DateTime",
  FCPeriods       = 1,
  HoldOutPeriods  = 1,
  EvaluationMetric = "MAPE",
  InnerEval       = "AICc",
  TimeUnit        = "day",
  Lags            = 1,
  SLags           = 1,
  MaxFourierPairs = 0,
  NumCores        = 4,
  SkipModels      = c("NNet", "TBATS", "ETS",
    "TSLM", "ARFIMA", "DSHW"),
  StepWise        = TRUE,
  TSClean         = FALSE,
  ModelFreq       = TRUE,
  PlotPredictionIntervals = TRUE,
  PrintUpdates    = FALSE)
```

```

ForecastData <- output$Forecast
ModelEval    <- output$EvaluationMetrics
WinningModel <- output$TimeSeriesModel

## End(Not run)

```

---

AutoWord2VecModeler     *Automated word2vec data generation via H2O*

---

## Description

This function allows you to automatically build a word2vec model and merge the data onto your supplied dataset

## Usage

```

AutoWord2VecModeler(
  data,
  BuildType = "Combined",
  stringCol = c("Text_Col1", "Text_Col2"),
  KeepStringCol = FALSE,
  model_path = NULL,
  vects = 100,
  SaveStopWords = FALSE,
  MinWords = 1,
  WindowSize = 12,
  Epochs = 25,
  StopWords = NULL,
  SaveModel = "standard",
  Threads = max(1, parallel::detectCores() - 2),
  MaxMemory = "28G",
  SaveOutput = FALSE
)

```

## Arguments

<code>data</code>	Source data table to merge vects onto
<code>BuildType</code>	Choose from "individual" or "combined". Individual will build a model for every text column. Combined will build a single model for all columns.
<code>stringCol</code>	A string name for the column to convert via word2vec
<code>KeepStringCol</code>	Set to TRUE if you want to keep the original string column that you convert via word2vec
<code>model_path</code>	A string path to the location where you want the model and metadata stored
<code>vects</code>	The number of vectors to retain from the word2vec model
<code>SaveStopWords</code>	Set to TRUE to save the stop words used
<code>MinWords</code>	For H2O word2vec model
<code>WindowSize</code>	For H2O word2vec model
<code>Epochs</code>	For H2O word2vec model

StopWords	For H2O word2vec model
SaveModel	Set to "standard" to save normally; set to "mojo" to save as mojo. NOTE: while you can save a mojo, I haven't figured out how to score it in the AutoH2OScoring function.
Threads	Number of available threads you want to dedicate to model building
MaxMemory	Amount of memory you want to dedicate to model building
SaveOutput	Set to TRUE to save your models to file

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
data <- AutoWord2VecModeler(
  data,
  BuildType = "individual",
  stringCol = c("Text_Col1", "Text_Col2"),
  KeepStringCol = FALSE,
  model_path = normalizePath("./"),
  vects = 100,
  SaveStopWords = FALSE,
  MinWords = 1,
  WindowSize = 1,
  Epochs = 25,
  StopWords = NULL,
  SaveModel = "standard",
  Threads = max(1, parallel::detectCores()-2),
  MaxMemory = "28G",
  SaveOutput = TRUE)

## End(Not run)
```

**Description**

This function builds a word frequency table and a word cloud. It prepares data, cleans text, and generates output.

**Usage**

```
AutoWordFreq(
  data,
  TextColName = "DESCR",
  GroupColName = "ClusterAllNoTarget",
  GroupLevel = 0,
  RemoveEnglishStopwords = TRUE,
  Stemming = TRUE,
  StopWords = c("bla", "bla2")
)
```

**Arguments**

<code>data</code>	Source data table
<code>TextColName</code>	A string name for the column
<code>GroupColName</code>	Set to NULL to ignore, otherwise set to Cluster column name (or factor column name)
<code>GroupLevel</code>	Must be set if <code>GroupColName</code> is defined. Set to cluster ID (or factor level)
<code>RemoveEnglishStopwords</code>	Set to TRUE to remove English stop words, FALSE to ignore
<code>Stemming</code>	Set to TRUE to run stemming on your text data
<code>StopWords</code>	Add your own stopwords, in vector format

**Author(s)**

Adrian Antico

**See Also**

Other EDA: [AutoCorrAnalysis\(\)](#), [BNLearnArcStrength\(\)](#), [ProblematicFeatures\(\)](#)

**Examples**

```
## Not run:
data <- data.table::data.table(
  DESCR = c(
    "Gru", "Gru", "Gru", "Gru", "Gru", "Gru", "Gru",
    "Gru", "Gru", "Gru", "Gru", "Gru", "Gru", "Urkle",
    "Urkle", "Urkle", "Urkle", "Urkle", "Urkle", "Urkle",
    "Gru", "Gru", "Gru", "bears", "bears", "bears",
    "bears", "bears", "bears", "smug", "smug", "smug", "smug",
    "smug", "smug", "smug", "smug", "smug", "smug",
    "smug", "smug", "smug", "smug", "smug", "eats", "eats",
    "eats", "eats", "eats", "eats", "beats", "beats", "beats", "beats",
    "beats", "beats", "beats", "beats", "beats", "beats",
    "beats", "science", "science", "Dwigt", "Dwigt", "Dwigt", "Dwigt",
    "Dwigt", "Dwigt", "Dwigt", "Dwigt", "Dwigt", "Dwigt",
    "Schrute", "Schrute", "Schrute", "Schrute", "Schrute",
    "Schrute", "Schrute", "James", "James", "James", "James",
    "James", "James", "James", "James", "James", "James",
    "Halpert", "Halpert", "Halpert", "Halpert",
    "Halpert", "Halpert", "Halpert", "Halpert"))
data <- AutoWordFreq(
```

```

data,
TextColName = "DESCR",
GroupColName = NULL,
GroupLevel = NULL,
RemoveEnglishStopwords = FALSE,
Stemming = FALSE,
StopWords = c("Bla"))

## End(Not run)

```

AutoXGBoostCARMA

*Feature Rich ML Panel Forecasting*

## Description

AutoXGBoostCARMA Multivariate Forecasting with calendar variables, Holiday counts, holiday lags, holiday moving averages, differencing, transformations, interaction-based categorical encoding using target variable and features to generate various time-based aggregated lags, moving averages, moving standard deviations, moving skewness, moving kurtosis, moving quantiles, parallelized interaction-based fourier pairs by grouping variables, and Trend Variables.

## Usage

```

AutoXGBoostCARMA(
  data,
  NonNegativePred = FALSE,
  RoundPreds = FALSE,
  TrainOnFull = FALSE,
  TargetColumnName = NULL,
  DateColumnName = NULL,
  HierarchGroups = NULL,
  GroupVariables = NULL,
  FC_Periods = 5,
  SaveDataPath = NULL,
  PDFOutputPath = NULL,
  TimeUnit = "week",
  TimeGroups = c("weeks", "months"),
  TargetTransformation = FALSE,
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit"),
  AnomalyDetection = NULL,
  XREGS = NULL,
  Lags = c(1:5),
  MA_Periods = c(1:5),
  SD_Periods = NULL,
  Skew_Periods = NULL,
  Kurt_Periods = NULL,
  Quantile_Periods = NULL,
  Quantiles_Selected = NULL,
  Difference = TRUE,
  FourierTerms = 6,
  CalendarVariables = c("second", "minute", "hour", "wday", "mday", "yday", "week",

```

```

    "wom", "isoweek", "month", "quarter", "year"),
  HolidayVariable = c("USPublicHolidays", "EasterGroup", "ChristmasGroup",
    "OtherEcclesticalFeasts"),
  HolidayLags = 1L,
  HolidayMovingAverages = 3L,
  TimeTrendVariable = FALSE,
  DataTruncate = FALSE,
  ZeroPadSeries = NULL,
  SplitRatios = c(1 - 10/100, 10/100),
  TreeMethod = "hist",
  NThreads = max(1, parallel::detectCores() - 2L),
  PartitionType = "random",
  Timer = TRUE,
  DebugMode = FALSE,
  EvalMetric = "MAE",
  LossFunction = "reg:squarederror",
  GridTune = FALSE,
  GridEvalMetric = "mae",
  ModelCount = 30L,
  MaxRunsWithoutNewWinner = 20L,
  MaxRunMinutes = 24L * 60L,
  NTrees = 1000L,
  LearningRate = 0.3,
  MaxDepth = 9L,
  MinChildWeight = 1,
  SubSample = 1,
  ColSampleByTree = 1
)

```

### Arguments

data	Supply your full series data set here
NonNegativePred	TRUE or FALSE
RoundPreds	Rounding predictions to an integer value. TRUE or FALSE. Defaults to FALSE
TrainOnFull	Set to TRUE to train on full data
TargetColumnName	List the column name of your target variables column. E.g. "Target"
DateColumnName	List the column name of your date column. E.g. "DateTime"
HierarchGroups	= NULL Character vector or NULL with names of the columns that form the interaction hierarchy
GroupVariables	Defaults to NULL. Use NULL when you have a single series. Add in Group-Variables when you have a series for every level of a group or multiple groups.
FC_Periods	Set the number of periods you want to have forecasts for. E.g. 52 for weekly data to forecast a year ahead
SaveDataPath	Path to save modeling data
PDFOutputPath	Supply a path to save model insights to PDF
TimeUnit	List the time unit your data is aggregated by. E.g. "1min", "5min", "10min", "15min", "30min", "hour", "day", "week", "month", "quarter", "year"
TimeGroups	Select time aggregations for adding various time aggregated GDL features.



## TargetTransformation

Run AutoTransformationCreate() to find best transformation for the target variable. Tests YeoJohnson, BoxCox, and Asigh (also Asin and Logit for proportion target variables).

## Methods

Choose from "YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin", or "Logit". If more than one is selected, the one with the best normalization pearson statistic will be used. Identity is automatically selected and compared.

## AnomalyDetection

NULL for not using the service. Other, provide a list, e.g. AnomalyDetection = list("tstat\_high" = 4, tstat\_low = -4)

## XREGS

Additional data to use for model development and forecasting. Data needs to be a complete series which means both the historical and forward looking values over the specified forecast window needs to be supplied.

## Lags

Select the periods for all lag variables you want to create. E.g. c(1:5,52) or list("day" = c(1:10), "weeks" = c(1:4))

## MA\_Periods

Select the periods for all moving average variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))

## SD\_Periods

Select the periods for all moving standard deviation variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))

## Skew\_Periods

Select the periods for all moving skewness variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))

## Kurt\_Periods

Select the periods for all moving kurtosis variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))

## Quantile\_Periods

Select the periods for all moving quantiles variables you want to create. E.g. c(1:5,52) or list("day" = c(2:10), "weeks" = c(2:4))

## Quantiles\_Selected

Select from the following c("q5", "q10", "q15", "q20", "q25", "q30", "q35", "q40", "q45", "q50", "q55", "q60", "q65", "q70", "q75", "q80", "q85", "q90", "q95", "q99")

## Difference

Set to TRUE to put the I in ARIMA

## FourierTerms

Set to the max number of pairs

## CalendarVariables

NULL, or select from "second", "minute", "hour", "wday", "mday", "yday", "week", "wom", "isoweek", "month", "quarter", "year"

## HolidayVariable

NULL, or select from "USPublicHolidays", "EasterGroup", "ChristmasGroup", "OtherEcclesticalFeasts"

## HolidayLags

Number of lags for the holiday counts

## HolidayMovingAverages

Number of moving averages for holiday counts

## TimeTrendVariable

Set to TRUE to have a time trend variable added to the model. Time trend is numeric variable indicating the numeric value of each record in the time series (by group). Time trend starts at 1 for the earliest point in time and increments by one for each success time point.

## DataTruncate

Set to TRUE to remove records with missing values from the lags and moving average features created

ZeroPadSeries	NULL to do nothing. Otherwise, set to "maxmax", "minmax", "maxmin", "minmin". See <a href="#">TimeSeriesFill</a> for explanations of each type
SplitRatios	E.g c(0.7,0.2,0.1) for train, validation, and test sets
TreeMethod	Choose from "hist", "gpu_hist"
NThreads	Set the maximum number of threads you'd like to dedicate to the model run. E.g. 8
PartitionType	Select "random" for random data partitioning "time" for partitioning by time frames
Timer	Setting to TRUE prints out the forecast number while it is building
DebugMode	Setting to TRUE generates printout of all header code comments during run time of function
EvalMetric	Select from "r2", "RMSE", "MSE", "MAE"
LossFunction	Default is 'reg:squarederror'. Other options include 'reg:squaredlogerror', 'reg:pseudohubererror', 'count:poisson', 'survival:cox', 'survival:aft', 'aft_loss_distribution', 'reg:gamma', 'reg:tweedie'
GridTune	Set to TRUE to run a grid tune
GridEvalMetric	This is the metric used to find the threshold 'poisson', 'mae', 'mape', 'mse', 'msle', 'kl', 'cs', 'r2'
ModelCount	Set the number of models to try in the grid tune
MaxRunsWithoutNewWinner	Number of consecutive runs without a new winner in order to terminate procedure
MaxRunMinutes	Default 24L*60L
NTrees	Select the number of trees you want to have built to train the model
LearningRate	Learning Rate
MaxDepth	Depth
MinChildWeight	Records in leaf
SubSample	Random forecast setting
ColSampleByTree	Self explanatory

**Value**

See examples

**Author(s)**

Adrian Antico

**See Also**

Other Automated Panel Data Forecasting: [AutoCatBoostCARMA\(\)](#), [AutoCatBoostHurdleCARMA\(\)](#), [AutoCatBoostVectorCARMA\(\)](#), [AutoH2OCARMA\(\)](#)

**Examples**

```
## Not run:

# Load data
data <- data.table::fread("https://www.dropbox.com/s/2str3ek4f4cheqi/walmart_train.csv?dl=1")

# Ensure series have no missing dates (also remove series with more than 25% missing values)
data <- RemixAutoML::TimeSeriesFill(
  data,
  DateColumnName = "Date",
  GroupVariables = c("Store", "Dept"),
  TimeUnit = "weeks",
  FillType = "maxmax",
  MaxMissingPercent = 0.25,
  SimpleImpute = TRUE)

# Set negative numbers to 0
data <- data[, Weekly_Sales := data.table::fifelse(Weekly_Sales < 0, 0, Weekly_Sales)]

# Remove IsHoliday column
data[, IsHoliday := NULL]

# Create xregs (this is the include the categorical variables instead of utilizing only the interaction of them)
xregs <- data[, .SD, .SDcols = c("Date", "Store", "Dept")]

# Change data types
data[, "Date" := as.character(Date)]
xregs[, "Date" := as.character(Date)]

# Build forecast
XGBoostResults <- AutoXGBoostCARMA(

  # Data Artifacts
  data = data,
  NonNegativePred = FALSE,
  RoundPreds = FALSE,
  TargetColumnName = "Weekly_Sales",
  DateColumnName = "Date",
  HierarchGroups = NULL,
  GroupVariables = c("Store", "Dept"),
  TimeUnit = "weeks",
  TimeGroups = c("weeks", "months"),

  # Data Wrangling Features
  ZeroPadSeries = NULL,
  DataTruncate = FALSE,
  SplitRatios = c(1 - 10 / 138, 10 / 138),
  PartitionType = "timeseries",
  AnomalyDetection = NULL,

  # Productionize
  FC_Periods = 0,
  TrainOnFull = FALSE,
  NThreads = 8,
  Timer = TRUE,
  DebugMode = FALSE,
```

```

SaveDataPath = NULL,
PDFOutputPath = NULL,

# Target Transformations
TargetTransformation = TRUE,
Methods = c("BoxCox", "Asinh", "Asin", "Log",
            "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),
Difference = FALSE,

# Features
Lags = list("weeks" = seq(1L, 10L, 1L),
            "months" = seq(1L, 5L, 1L)),
MA_Periods = list("weeks" = seq(5L, 20L, 5L),
                  "months" = seq(2L, 10L, 2L)),
SD_Periods = NULL,
Skew_Periods = NULL,
Kurt_Periods = NULL,
Quantile_Periods = NULL,
HolidayLags = 1,
HolidayMovingAverages = 1:2,
Quantiles_Selected = c("q5", "q95"),
XREGS = xregs,
FourierTerms = 4,
CalendarVariables = c("week", "wom", "month", "quarter"),
HolidayVariable = c("USPublicHolidays", "EasterGroup",
                    "ChristmasGroup", "OtherEcclesticalFeasts"),
TimeTrendVariable = TRUE,

# ML eval args
TreeMethod = "hist",
EvalMetric = "RMSE",
LossFunction = 'reg:squarederror',

# ML grid tuning
GridTune = FALSE,
ModelCount = 5,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 24L*60L,

# ML args
NTrees = 300,
LearningRate = 0.3,
MaxDepth = 9L,
MinChildWeight = 1.0,
SubSample = 1.0,
ColSampleByTree = 1.0)

UpdateMetrics <- print(
  XGBoostResults$ModelInformation$EvaluationMetrics[
    Metric == "MSE", MetricValue := sqrt(MetricValue)])
print(UpdateMetrics)
XGBoostResults$ModelInformation$EvaluationMetricsByGroup[order(-R2_Metric)]
XGBoostResults$ModelInformation$EvaluationMetricsByGroup[order(MAE_Metric)]
XGBoostResults$ModelInformation$EvaluationMetricsByGroup[order(MSE_Metric)]
XGBoostResults$ModelInformation$EvaluationMetricsByGroup[order(MAPE_Metric)]

## End(Not run)

```

---

AutoXGBoostClassifier *AutoXGBoostClassifier is an automated XGBoost modeling framework with grid-tuning and model evaluation*

---

## Description

AutoXGBoostClassifier is an automated XGBoost modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation boxplot, evaluation metrics, variable importance, partial dependence calibration plots, partial dependence calibration box plots, and column names used in model fitting.

## Usage

```
AutoXGBoostClassifier(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  IDcols = NULL,
  model_path = NULL,
  metadata_path = NULL,
  SaveInfoToPDF = FALSE,
  ModelID = "FirstModel",
  ReturnFactorLevels = TRUE,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  Verbose = 0L,
  NumOfParDepPlots = 3L,
  NThreads = parallel::detectCores(),
  LossFunction = "reg:logistic",
  CostMatrixWeights = c(1, 0, 0, 1),
  eval_metric = "auc",
  TreeMethod = "hist",
  GridTune = FALSE,
  BaselineComparison = "default",
  MaxModelsInGrid = 10L,
  MaxRunsWithoutNewWinner = 20L,
  MaxRunMinutes = 24L * 60L,
  PassInGrid = NULL,
  Shuffles = 1L,
  Trees = 1000L,
  eta = seq(0.05, 0.4, 0.05),
  max_depth = seq(4L, 16L, 2L),
  min_child_weight = seq(1, 10, 1),
  subsample = seq(0.55, 1, 0.05),
  colsample_bytree = seq(0.55, 1, 0.05)
```

)

**Arguments**

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types). Note that the target column needs to be a 0   1 numeric variable.
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>IDcols</code>	A vector of column names or column numbers to keep in your data but not include in the modeling.
<code>model_path</code>	A character string of your path file to where you want your output saved
<code>metadata_path</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to <code>model_path</code> .
<code>SaveInfoToPDF</code>	Set to TRUE to save modeling information to PDF. If <code>model_path</code> or <code>metadata_path</code> aren't defined then output will be saved to the working directory
<code>ModelID</code>	A character string to name your model and output
<code>ReturnFactorLevels</code>	TRUE or FALSE. Set to FALSE to not return factor levels.
<code>ReturnModelObjects</code>	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
<code>SaveModelObjects</code>	Set to TRUE to return all modeling objects to your environment
<code>Verbose</code>	Set to 0 if you want to suppress model evaluation updates in training
<code>NumOfParDepPlots</code>	Tell the function the number of partial dependence calibration plots you want to create.
<code>NThreads</code>	Set the maximum number of threads you'd like to dedicate to the model run. E.g. 8
<code>LossFunction</code>	Select from 'reg:logistic', "binary:logistic"
<code>CostMatrixWeights</code>	A vector with 4 elements c(True Positive Cost, False Negative Cost, False Positive Cost, True Negative Cost). Default c(1,0,0,1),
<code>eval_metric</code>	This is the metric used to identify best grid tuned model. Choose from "logloss", "error", "aucpr", "auc"
<code>TreeMethod</code>	Choose from "hist", "gpu_hist"
<code>GridTune</code>	Set to TRUE to run a grid tuning procedure
<code>BaselineComparison</code>	Set to either "default" or "best". Default is to compare each successive model build to the baseline model using max trees (from function args). Best makes the comparison to the current best model.

MaxModelsInGrid	Number of models to test from grid options.
MaxRunsWithoutNewWinner	A number
MaxRunMinutes	In minutes
PassInGrid	Default is NULL. Provide a data.table of grid options from a previous run.
Shuffles	Numeric. List a number to let the program know how many times you want to shuffle the grids for grid tuning
Trees	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the trees numbers you want to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1000L, 10000L, 1000L)
eta	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the LearningRate values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.01,0.02,0.03,0.04)
max_depth	Bandit grid partitioned. Number, or vector for depth to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(4L, 16L, 2L)
min_child_weight	Number, or vector for min_child_weight to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1.0, 10.0, 1.0)
subsample	Number, or vector for subsample to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(0.55, 1.0, 0.05)
colsample_bytree	Number, or vector for colsample_bytree to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(0.55, 1.0, 0.05)

**Value**

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, GridCollect, and GridList

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Binary Classification: [AutoCatBoostClassifier\(\)](#), [AutoH2oDRFClassifier\(\)](#), [AutoH2oGAMClassifier\(\)](#), [AutoH2oGBMClassifier\(\)](#), [AutoH2oGLMClassifier\(\)](#), [AutoH2oMLClassifier\(\)](#)

**Examples**

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000L,
  ID = 2L,
  ZIP = 0L,
```

```

AddDate = FALSE,
Classification = TRUE,
MultiClass = FALSE)

# Run function
TestModel <- RemixAutoML::AutoXGBoostClassifier(

  # GPU or CPU
  TreeMethod = "hist",
  NThreads = parallel::detectCores(),

  # Metadata args
  model_path = normalizePath("./"),
  metadata_path = NULL,
  ModelID = "Test_Model_1",
  ReturnFactorLevels = TRUE,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,

  # Data args
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in%
    c("IDcol_1", "IDcol_2", "Adrian")],
  IDcols = c("IDcol_1", "IDcol_2"),

  # Model evaluation
  LossFunction = 'reg:logistic',
  CostMatrixWeights = c(1,0,0,1),
  eval_metric = "auc",
  NumOfParDepPlots = 3L,

  # Grid tuning args
  PassInGrid = NULL,
  GridTune = FALSE,
  BaselineComparison = "default",
  MaxModelsInGrid = 10L,
  MaxRunsWithoutNewWinner = 20L,
  MaxRunMinutes = 24L*60L,
  Verbose = 1L,

  # ML args
  Shuffles = 1L,
  Trees = 50L,
  eta = 0.05,
  max_depth = 4L,
  min_child_weight = 1.0,
  subsample = 0.55,
  colsample_bytree = 0.55)

## End(Not run)

```



---

AutoXGBoostHurdleModel

*AutoXGBoostHurdleModel is generalized hurdle modeling framework*


---

## Description

AutoXGBoostHurdleModel is generalized hurdle modeling framework

## Usage

```
AutoXGBoostHurdleModel(
  TreeMethod = "hist",
  TrainOnFull = FALSE,
  PassInGrid = NULL,
  NThreads = max(1L, parallel::detectCores() - 2L),
  ModelID = "ModelTest",
  Paths = NULL,
  MetaDataPaths = NULL,
  data,
  ValidationData = NULL,
  TestData = NULL,
  Buckets = 0L,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  IDcols = NULL,
  TransformNumericColumns = NULL,
  SplitRatios = c(0.7, 0.2, 0.1),
  SaveModelObjects = FALSE,
  ReturnModelObjects = TRUE,
  NumOfParDepPlots = 10L,
  GridTune = FALSE,
  grid_eval_metric = "accuracy",
  MaxModelsInGrid = 1L,
  BaselineComparison = "default",
  MaxRunsWithoutNewWinner = 10L,
  MaxRunMinutes = 60L,
  Trees = list(classifier = seq(1000, 2000, 100), regression = seq(1000, 2000, 100)),
  eta = list(classifier = seq(0.05, 0.4, 0.05), regression = seq(0.05, 0.4, 0.05)),
  max_depth = list(classifier = seq(4L, 16L, 2L), regression = seq(4L, 16L, 2L)),
  min_child_weight = list(classifier = seq(1, 10, 1), regression = seq(1, 10, 1)),
  subsample = list(classifier = seq(0.55, 1, 0.05), regression = seq(0.55, 1, 0.05)),
  colsample_bytree = list(classifier = seq(0.55, 1, 0.05), regression = seq(0.55, 1,
    0.05))
)
```

## Arguments

TreeMethod	Set to hist or gpu_hist depending on if you have an xgboost installation capable of gpu processing
TrainOnFull	Set to TRUE to train model on 100 percent of data

PassInGrid	Pass in a grid for changing up the parameter settings for catboost
NThreads	Set to the number of threads you would like to dedicate to training
ModelID	Define a character name for your models
Paths	The path to your folder where you want your model information saved
MetaDataPaths	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to Paths.
data	Source training data. Do not include a column that has the class labels for the buckets as they are created internally.
ValidationData	Source validation data. Do not include a column that has the class labels for the buckets as they are created internally.
TestData	Source test data. Do not include a column that has the class labels for the buckets as they are created internally.
Buckets	A numeric vector of the buckets used for subsetting the data. NOTE: the final Bucket value will first create a subset of data that is less than the value and a second one thereafter for data greater than the bucket value.
TargetColumnName	Supply the column name or number for the target variable
FeatureColNames	Supply the column names or number of the features (not included the Primary-DateColumn)
IDcols	Includes PrimaryDateColumn and any other columns you want returned in the validation data with predictions
TransformNumericColumns	Transform numeric column inside the AutoCatBoostRegression() function
SplitRatios	Supply vector of partition ratios. For example, c(0.70,0.20,0,10).
SaveModelObjects	Set to TRUE to save the model objects to file in the folders listed in Paths
ReturnModelObjects	Set to TRUE to return all model objects
NumOfParDepPlots	Set to pull back N number of partial dependence calibration plots.
GridTune	Set to TRUE if you want to grid tune the models
grid_eval_metric	Select the metric to optimize in grid tuning. "accuracy", "microauc", "logloss"
MaxModelsInGrid	Set to a numeric value for the number of models to try in grid tune
BaselineComparison	"default"
MaxRunsWithoutNewWinner	Number of runs without a new winner before stopping the grid tuning
MaxRunMinutes	Max number of minutes to allow the grid tuning to run for
Trees	Provide a named list to have different number of trees for each model. Trees = list("classifier" = seq(1000,2000,100), "regression" = seq(1000,2000,100))
eta	Provide a named list to have different number of eta for each model.
max_depth	Provide a named list to have different number of max_depth for each model.

`min_child_weight` Provide a named list to have different number of `min_child_weight` for each model.

`subsample` Provide a named list to have different number of `subsample` for each model.

`colsample_bytree` Provide a named list to have different number of `colsample_bytree` for each model.

**Value**

Returns `AutoXGBoostRegression()` model objects: `VariableImportance.csv`, `Model`, `ValidationData.csv`, `EvaluationPlot.png`, `EvaluationBoxPlot.png`, `EvaluationMetrics.csv`, `ParDepPlots.R` a named list of features with partial dependence calibration plots, `ParDepBoxPlots.R`, `GridCollect`, and the grid used

**Author(s)**

Adrian Antico

**See Also**

Other Supervised Learning - Compound: [AutoCatBoostHurdleModel\(\)](#), [AutoCatBoostSizeFreqDist\(\)](#), [AutoH2oDRFHurdleModel\(\)](#), [AutoH2oGBMHurdleModel\(\)](#), [AutoH2oGBMSizeFreqDist\(\)](#)

**Examples**

```
## Not run:
Output <- RemixAutoML::AutoXGBoostHurdleModel(

  # Operationalization args
  TreeMethod = "hist",
  TrainOnFull = FALSE,
  PassInGrid = NULL,

  # Metadata args
  NThreads = max(1L, parallel::detectCores()-2L),
  ModelID = "ModelTest",
  Paths = normalizePath("./"),
  MetaDataPaths = NULL,

  # data args
  data,
  ValidationData = NULL,
  TestData = NULL,
  Buckets = 0L,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  IDcols = NULL,

  # options
  TransformNumericColumns = NULL,
  SplitRatios = c(0.70, 0.20, 0.10),
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  NumOfParDepPlots = 10L,
```

```

# grid tuning args
GridTune = FALSE,
grid_eval_metric = "accuracy",
MaxModelsInGrid = 1L,
BaselineComparison = "default",
MaxRunsWithoutNewWinner = 10L,
MaxRunMinutes = 60L,

# bandit hyperparameters
Trees = list("classifier" = seq(1000,2000,100),
             "regression" = seq(1000,2000,100)),
eta = list("classifier" = seq(0.05,0.40,0.05),
           "regression" = seq(0.05,0.40,0.05)),
max_depth = list("classifier" = seq(4L,16L,2L),
                 "regression" = seq(4L,16L,2L)),

# random hyperparameters
min_child_weight = list("classifier" = seq(1.0,10.0,1.0),
                        "regression" = seq(1.0,10.0,1.0)),
subsample = list("classifier" = seq(0.55,1.0,0.05),
                 "regression" = seq(0.55,1.0,0.05)),
colsample_bytree = list("classifier" = seq(0.55,1.0,0.05),
                       "regression" = seq(0.55,1.0,0.05)))

## End(Not run)

```

---

AutoXGBoostMultiClass *AutoXGBoostMultiClass is an automated XGBoost modeling framework with grid-tuning and model evaluation*

---

## Description

AutoXGBoostMultiClass is an automated XGBoost modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, a stratified sampling (by the target variable) is done to create train and validation sets. Then, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation metrics, variable importance, and column names used in model fitting.

## Usage

```

AutoXGBoostMultiClass(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  IDcols = NULL,
  model_path = NULL,
  metadata_path = NULL,
  ModelID = "FirstModel",
  LossFunction = "multi:softmax",

```

```

ReturnFactorLevels = TRUE,
ReturnModelObjects = TRUE,
SaveModelObjects = FALSE,
Verbose = 0L,
NumOfParDepPlots = 3L,
NThreads = parallel::detectCores(),
eval_metric = "merror",
grid_eval_metric = "accuracy",
TreeMethod = "hist",
GridTune = FALSE,
BaselineComparison = "default",
MaxModelsInGrid = 10L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 24L * 60L,
PassInGrid = NULL,
Shuffles = 1L,
Trees = 50L,
eta = NULL,
max_depth = NULL,
min_child_weight = NULL,
subsample = NULL,
colsample_bytree = NULL
)

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types). Note that the target column needs to be a 0   1 numeric variable.
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>IDcols</code>	A vector of column names or column numbers to keep in your data but not include in the modeling.
<code>model_path</code>	A character string of your path file to where you want your output saved
<code>metadata_path</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to <code>model_path</code> .
<code>ModelID</code>	A character string to name your model and output
<code>LossFunction</code>	'multi:softmax'
<code>ReturnFactorLevels</code>	TRUE or FALSE. Set to FALSE to not return factor levels.
<code>ReturnModelObjects</code>	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)

SaveModelObjects	Set to TRUE to return all modeling objects to your environment
Verbose	Set to 0 if you want to suppress model evaluation updates in training
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create.
NThreads	Set the maximum number of threads you'd like to dedicate to the model run. E.g. 8
eval_metric	This is the metric used to identify best grid tuned model. Choose from "logloss", "error", "aucpr", "auc"
grid_eval_metric	"accuracy", "logloss", "microauc"
TreeMethod	Choose from "hist", "gpu_hist"
GridTune	Set to TRUE to run a grid tuning procedure
BaselineComparison	Set to either "default" or "best". Default is to compare each successive model build to the baseline model using max trees (from function args). Best makes the comparison to the current best model.
MaxModelsInGrid	Number of models to test from grid options.
MaxRunsWithoutNewWinner	A number
MaxRunMinutes	In minutes
PassInGrid	Default is NULL. Provide a data.table of grid options from a previous run.
Shuffles	Numeric. List a number to let the program know how many times you want to shuffle the grids for grid tuning
Trees	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the trees numbers you want to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1000L, 10000L, 1000L)
eta	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the LearningRate values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.01, 0.02, 0.03, 0.04)
max_depth	Bandit grid partitioned. Number, or vector for depth to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(4L, 16L, 2L)
min_child_weight	Number, or vector for min_child_weight to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1.0, 10.0, 1.0)
subsample	Number, or vector for subsample to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(0.55, 1.0, 0.05)
colsample_bytree	Number, or vector for colsample_bytree to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(0.55, 1.0, 0.05)

## Value

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Metrics.csv, GridCollect, GridList, and TargetLevels

**Author(s)**

Adrian Antico

**See Also**

Other Automated Supervised Learning - Multiclass Classification: [AutoCatBoostMultiClass\(\)](#), [AutoH2oDRFMultiClass\(\)](#), [AutoH2oGAMMultiClass\(\)](#), [AutoH2oGBMMultiClass\(\)](#), [AutoH2oGLMMultiClass\(\)](#), [AutoH2oMLMultiClass\(\)](#)

**Examples**

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000L,
  ID = 2L,
  ZIP = 0L,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = TRUE)

# Run function
TestModel <- RemixAutoML::AutoXGBoostMultiClass(

  # GPU or CPU
  TreeMethod = "hist",
  NThreads = parallel::detectCores(),

  # Metadata args
  model_path = normalizePath("./"),
  metadata_path = normalizePath("./"),
  ModelID = "Test_Model_1",
  ReturnFactorLevels = TRUE,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,

  # Data args
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = "Adrian",
  FeatureColNames = names(data)[!names(data) %in%
    c("IDcol_1", "IDcol_2", "Adrian")],
  IDcols = c("IDcol_1", "IDcol_2"),

  # Model evaluation args
  eval_metric = "merror",
  LossFunction = 'multi:softmax',
  grid_eval_metric = "accuracy",
  NumOfParDepPlots = 3L,

  # Grid tuning args
  PassInGrid = NULL,
  GridTune = FALSE,
```

```

BaselineComparison = "default",
MaxModelsInGrid = 10L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 24L*60L,
Verbose = 1L,

# ML args
Shuffles = 1L,
Trees = 50L,
eta = 0.05,
max_depth = 4L,
min_child_weight = 1.0,
subsample = 0.55,
colsample_bytree = 0.55)

## End(Not run)

```

---

AutoXGBoostRegression *AutoXGBoostRegression is an automated XGBoost modeling framework with grid-tuning and model evaluation*

---

## Description

AutoXGBoostRegression is an automated XGBoost modeling framework with grid-tuning and model evaluation that runs a variety of steps. First, the function will run a random grid tune over N number of models and find which model is the best (a default model is always included in that set). Once the model is identified and built, several other outputs are generated: validation data with predictions, evaluation plot, evaluation boxplot, evaluation metrics, variable importance, partial dependence calibration plots, partial dependence calibration box plots, and column names used in model fitting.

## Usage

```

AutoXGBoostRegression(
  data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
  TargetColumnName = NULL,
  FeatureColNames = NULL,
  IDcols = NULL,
  model_path = NULL,
  metadata_path = NULL,
  SaveInfoToPDF = FALSE,
  ModelID = "FirstModel",
  ReturnFactorLevels = TRUE,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  TransformNumericColumns = NULL,
  Methods = c("YeoJohnson", "BoxCox", "Asinh", "Log", "LogPlus1", "Sqrt", "Asin",
    "Logit"),
  Verbose = 0L,

```



```

    NumOfParDepPlots = 3L,
    NThreads = parallel::detectCores(),
    LossFunction = "reg:squarederror",
    eval_metric = "rmse",
    TreeMethod = "hist",
    GridTune = FALSE,
    grid_eval_metric = "rmse",
    BaselineComparison = "default",
    MaxModelsInGrid = 10L,
    MaxRunsWithoutNewWinner = 20L,
    MaxRunMinutes = 24L * 60L,
    PassInGrid = NULL,
    Shuffles = 1L,
    Trees = 50L,
    eta = NULL,
    max_depth = NULL,
    min_child_weight = NULL,
    subsample = NULL,
    colsample_bytrees = NULL
)

```

### Arguments

<code>data</code>	This is your data set for training and testing your model
<code>TrainOnFull</code>	Set to TRUE to train on full data
<code>ValidationData</code>	This is your holdout data set used in modeling either refine your hyperparameters.
<code>TestData</code>	This is your holdout data set. Catboost using both training and validation data in the training process so you should evaluate out of sample performance with this data set.
<code>TargetColumnName</code>	Either supply the target column name OR the column number where the target is located (but not mixed types).
<code>FeatureColNames</code>	Either supply the feature column names OR the column number where the target is located (but not mixed types)
<code>IDcols</code>	A vector of column names or column numbers to keep in your data but not include in the modeling.
<code>model_path</code>	A character string of your path file to where you want your output saved
<code>metadata_path</code>	A character string of your path file to where you want your model evaluation output saved. If left NULL, all output will be saved to <code>model_path</code> .
<code>SaveInfoToPDF</code>	Set to TRUE to save model insights to pdf
<code>ModelID</code>	A character string to name your model and output
<code>ReturnFactorLevels</code>	Set to TRUE to have the factor levels returned with the other model objects
<code>ReturnModelObjects</code>	Set to TRUE to output all modeling objects (E.g. plots and evaluation metrics)
<code>SaveModelObjects</code>	Set to TRUE to return all modeling objects to your environment

TransformNumericColumns	Set to NULL to do nothing; otherwise supply the column names of numeric variables you want transformed
Methods	Choose from "BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Sqrt", "Logit", "YeoJohnson". Function will determine if one cannot be used because of the underlying data.
Verbose	Set to 0 if you want to suppress model evaluation updates in training
NumOfParDepPlots	Tell the function the number of partial dependence calibration plots you want to create.
NThreads	Set the maximum number of threads you'd like to dedicate to the model run. E.g. 8
LossFunction	Default is 'reg:squarederror'. Other options include 'reg:squaredlogerror', 'reg:pseudohubererror', 'count:poisson', 'survival:cox', 'survival:aft', 'aft_loss_distribution', 'reg:gamma', 'reg:tweedie'
eval_metric	This is the metric used to identify best grid tuned model. Choose from "r2", "RMSE", "MSE", "MAE"
TreeMethod	Choose from "hist", "gpu_hist"
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in MaxModelsInGrid to tell the procedure how many models you want to test.
grid_eval_metric	Choose from "poisson", "mae", "mape", "mse", "msle", "kl", "cs", "r2"
BaselineComparison	Set to either "default" or "best". Default is to compare each successive model build to the baseline model using max trees (from function args). Best makes the comparison to the current best model.
MaxModelsInGrid	Number of models to test from grid options (243 total possible options)
MaxRunsWithoutNewWinner	Runs without new winner to end procedure
MaxRunMinutes	In minutes
PassInGrid	Default is NULL. Provide a data.table of grid options from a previous run.
Shuffles	Numeric. List a number to let the program know how many times you want to shuffle the grids for grid tuning
Trees	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the trees numbers you want to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1000L, 10000L, 1000L)
eta	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the LearningRate values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.01,0.02,0.03,0.04)
max_depth	Bandit grid partitioned. Number, or vector for depth to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(4L, 16L, 2L)
min_child_weight	Number, or vector for min_child_weight to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1.0, 10.0, 1.0)

**subsample**            Number, or vector for subsample to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(0.55, 1.0, 0.05)

**colsample\_bytree**        Number, or vector for colsample\_bytree to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(0.55, 1.0, 0.05)

### Value

Saves to file and returned in list: VariableImportance.csv, Model, ValidationData.csv, Evaluation-Plot.png, EvaluationBoxPlot.png, EvaluationMetrics.csv, ParDepPlots.R a named list of features with partial dependence calibration plots, ParDepBoxPlots.R, GridCollect, and GridList

### Author(s)

Adrian Antico

### See Also

Other Automated Supervised Learning - Regression: [AutoCatBoostRegression\(\)](#), [AutoH2oDRFRegression\(\)](#), [AutoH2oGAMRegression\(\)](#), [AutoH2oGBMRegression\(\)](#), [AutoH2oGLMRegression\(\)](#), [AutoH2oMLRegression\(\)](#)

### Examples

```
## Not run:
# Create some dummy correlated data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 1000,
  ID = 2,
  ZIP = 0,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Run function
TestModel <- RemixAutoML::AutoXGBoostRegression(

  # GPU or CPU
  TreeMethod = "hist",
  NThreads = parallel::detectCores(),
  LossFunction = 'reg:squarederror',

  # Metadata args
  model_path = normalizePath("./"),
  metadata_path = NULL,
  ModelID = "Test_Model_1",
  ReturnFactorLevels = TRUE,
  ReturnModelObjects = TRUE,
  SaveModelObjects = FALSE,
  SaveInfoToPDF = FALSE,

  # Data args
  data = data,
  TrainOnFull = FALSE,
  ValidationData = NULL,
  TestData = NULL,
```

```

TargetColumnName = "Adrian",
FeatureColNames = names(data)[!names(data) %in%
  c("IDcol_1", "IDcol_2", "Adrian")],
IDcols = c("IDcol_1", "IDcol_2"),
TransformNumericColumns = NULL,
Methods = c("BoxCox", "Asinh", "Asin", "Log",
  "LogPlus1", "Sqrt", "Logit", "YeoJohnson"),

# Model evaluation args
eval_metric = "rmse",
NumOfParDepPlots = 3L,

# Grid tuning args
PassInGrid = NULL,
GridTune = FALSE,
grid_eval_metric = "mse",
BaselineComparison = "default",
MaxModelsInGrid = 10L,
MaxRunsWithoutNewWinner = 20L,
MaxRunMinutes = 24L*60L,
Verbose = 1L,

# ML args
Shuffles = 1L,
Trees = 50L,
eta = 0.05,
max_depth = 4L,
min_child_weight = 1.0,
subsample = 0.55,
colsample_bytree = 0.55)

## End(Not run)

```

---

AutoXGBoostScoring	<i>AutoXGBoostScoring is an automated scoring function that compliments the AutoCatBoost model training functions.</i>
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---

## Description

AutoXGBoostScoring is an automated scoring function that compliments the AutoCatBoost model training functions. This function requires you to supply features for scoring. It will run `ModelDataPrep()` and the `DummifyDT()` function to prepare your features for xgboost data conversion and scoring.

## Usage

```

AutoXGBoostScoring(
  TargetType = NULL,
  ScoringData = NULL,
  FeatureColumnNames = NULL,
  IDcols = NULL,
  FactorLevelsList = NULL,
  TargetLevels = NULL,
  Objective = "multi:softmax",

```

```

OneHot = FALSE,
ModelObject = NULL,
ModelPath = NULL,
ModelID = NULL,
ReturnFeatures = TRUE,
TransformNumeric = FALSE,
BackTransNumeric = FALSE,
TargetColumnName = NULL,
TransformationObject = NULL,
TransID = NULL,
TransPath = NULL,
MDP_Impute = TRUE,
MDP_CharToFactor = TRUE,
MDP_RemoveDates = TRUE,
MDP_MissFactor = "0",
MDP_MissNum = -1
)

```

### Arguments

TargetType	Set this value to "regression", "classification", or "multiclass" to score models built using AutoCatBoostRegression(), AutoCatBoostClassify() or AutoCatBoostMultiClass().
ScoringData	This is your data.table of features for scoring. Can be a single row or batch.
FeatureColumnNames	Supply either column names or column numbers used in the AutoXGBoost__() function
IDcols	Supply ID column numbers for any metadata you want returned with your predicted values
FactorLevelsList	Supply the factor variables' list from DummifyDT()
TargetLevels	Supply the target levels output from AutoXGBoostMultiClass() or the scoring function will go looking for it in the file path you supply.
Objective	Set to 'multi:softprobs' if you did so in training. Default is softmax
OneHot	Set to TRUE to have one-hot-encoding run. Otherwise, N columns will be made for N levels of a factor variable
ModelObject	Supply a model for scoring, otherwise it will have to search for it in the file path you specify
ModelPath	Supply your path file used in the AutoXGBoost__() function
ModelID	Supply the model ID used in the AutoXGBoost__() function
ReturnFeatures	Set to TRUE to return your features with the predicted values.
TransformNumeric	Set to TRUE if you have features that were transformed automatically from an Auto__Regression() model AND you haven't already transformed them.
BackTransNumeric	Set to TRUE to generate back-transformed predicted values. Also, if you return features, those will also be back-transformed.
TargetColumnName	Input your target column name used in training if you are utilizing the transformation service

TransformationObject	Set to NULL if you didn't use transformations or if you want the function to pull from the file output from the <code>Auto__Regression()</code> function. You can also supply the transformation data.table object with the transformation details versus having it pulled from file.
TransID	Set to the ID used for saving the transformation data.table object or set it to the ModelID if you are pulling from file from a build with <code>Auto__Regression()</code> .
TransPath	Set the path file to the folder where your transformation data.table detail object is stored. If you used the <code>Auto__Regression()</code> to build, set it to the same path as ModelPath.
MDP_Impute	Set to TRUE if you did so for modeling and didn't do so before supplying ScoringData in this function
MDP_CharToFactor	Set to TRUE to turn your character columns to factors if you didn't do so to your ScoringData that you are supplying to this function
MDP_RemoveDates	Set to TRUE if you have date of timestamp columns in your ScoringData
MDP_MissFactor	If you set MDP_Impute to TRUE, supply the character values to replace missing values with
MDP_MissNum	If you set MDP_Impute to TRUE, supply a numeric value to replace missing values with

**Value**

A data.table of predicted values with the option to return model features as well.

**Author(s)**

Adrian Antico

**See Also**

Other Automated Model Scoring: [AutoCatBoostScoring\(\)](#), [AutoH2OMLScoring\(\)](#), [AutoH2OModeler\(\)](#), [AutoHurdleScoring\(\)](#), [IntermittentDemandScoringDataGenerator\(\)](#)

**Examples**

```
## Not run:
Preds <- AutoXGBoostScoring(
  TargetType = "regression",
  ScoringData = data,
  FeatureColumnNames = 2:12,
  IDcols = NULL,
  FactorLevelsList = NULL,
  TargetLevels = NULL,
  Objective = "multi:softmax",
  OneHot = FALSE,
  ModelObject = NULL,
  ModelPath = "home",
  ModelID = "ModelTest",
  ReturnFeatures = TRUE,
  TransformNumeric = FALSE,
  BackTransNumeric = FALSE,
```

```

    TargetColumnName = NULL,
    TransformationObject = NULL,
    TransID = NULL,
    TransPath = NULL,
    MDP_Impute = TRUE,
    MDP_CharToFactor = TRUE,
    MDP_RemoveDates = TRUE,
    MDP_MissFactor = "0",
    MDP_MissNum = -1)

## End(Not run)

```

---

BNLearnArcStrength	<i>BNLearnArcStrength</i>
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---

## Description

Utilize bnlearn to create a bayesian network and return the arc strengths for features and their edges

## Usage

```

BNLearnArcStrength(
  data = NULL,
  NetworkVars = NULL,
  DataSampleRate = 0.5,
  ByGroupVars = NULL,
  MinRows = 30
)

```

## Arguments

data	data.table
NetworkVars	Names of the columns to utilize in the analysis
DataSampleRate	Sample your data to reduce runtime
ByGroupVars	Group variables that you want to have the analysis done by
MinRows	Minimum number of rows to utilize in the ByGroupVars analysis

## Author(s)

Adrian Antico

## See Also

Other EDA: [AutoCorrAnalysis\(\)](#), [AutoWordFreq\(\)](#), [ProblematicFeatures\(\)](#)

---

CarmaCatBoostKeepVarsGDL

*CarmaCatBoostKeepVarsGDL*


---

## Description

CarmaCatBoostKeepVarsGDL is to help manage carma code

## Usage

```
CarmaCatBoostKeepVarsGDL(
  data,
  IndepVarPassTRUE = "GroupVar",
  UpdateData,
  CalendarFeatures,
  XREGS,
  Difference,
  HierarchGroups,
  GroupVariables,
  GroupVarVector,
  CalendarVariables,
  HolidayVariable,
  TargetColumnName,
  DateColumnName,
  Preds
)
```

## Arguments

data	Supply data
IndepVarPassTRUE	Name of the column used as a single grouping variable.
UpdateData	Supply UpdateData
CalendarFeatures	Supply CalendarFeatures
XREGS	Supply XREGS
Difference	Supply Difference
HierarchGroups	Supply HierarchGroups
GroupVariables	Supply GroupVariables
GroupVarVector	Supply GroupVarVector
CalendarVariables	Supply CalendarVariables
HolidayVariable	Supply HolidayVariable
TargetColumnName	Supply TargetColumnName
DateColumnName	Supply DateColumnName
Preds	Supply Preds



**Author(s)**

Adrian Antico

**See Also**

Other Carma Helper: [CARMA\\_Define\\_Args\(\)](#), [CARMA\\_Get\\_IndepentVariablesPass\(\)](#), [CARMA\\_GroupHierarchyCheck](#)  
[CarmaH2OKeepVarsGDL\(\)](#), [CarmaXGBoostKeepVarsGDL\(\)](#)

---

CarmaH2OKeepVarsGDL	<i>CarmaH2OKeepVarsGDL</i>
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---

**Description**

CarmaH2OKeepVarsGDL is to help manage carma code

**Usage**

```
CarmaH2OKeepVarsGDL(  
  data,  
  IndepVarPassTRUE = "GroupVar",  
  UpdateData,  
  CalendarFeatures,  
  XREGS,  
  Difference,  
  HierarchGroups,  
  GroupVariables,  
  GroupVarVector,  
  CalendarVariables = NULL,  
  HolidayVariable = NULL,  
  TargetColumnName,  
  DateColumnName  
)
```

**Arguments**

data	Supply data
IndepVarPassTRUE	Name of the column used as a single grouping variable.
UpdateData	Supply UpdateData
CalendarFeatures	Supply CalendarFeatures
XREGS	Supply XREGS
Difference	Supply Difference
HierarchGroups	Supply HierarchGroups
GroupVariables	Supply GroupVariables
GroupVarVector	Supply GroupVarVector
CalendarVariables	Supply CalendarVariables

HolidayVariable  
Supply HolidayVariable  
TargetColumnName  
Supply TargetColumnName  
DateColumnName Supply DateColumnName

Author(s)

Adrian Antico

See Also

Other Carma Helper: [CARMA\\_Define\\_Args\(\)](#), [CARMA\\_Get\\_IndepentVariablesPass\(\)](#), [CARMA\\_GroupHierarchyCheck](#)  
[CarmaCatBoostKeepVarsGDL\(\)](#), [CarmaXGBoostKeepVarsGDL\(\)](#)

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CarmaHoldoutMetrics	<i>CarmaHoldoutMetrics</i>
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---

Description

CarmaHoldoutMetrics

Usage

```
CarmaHoldoutMetrics(  
  DATA = TestDataEval,  
  TARGETCOLUMNNAME = TargetColumnName,  
  GROUPVARIABLES = GroupingVariables  
)
```

Arguments

DATA                    TestDataEval  
TARGETCOLUMNNAME  
                        TargetColumnName  
GROUPVARIABLES   GroupVariables

Author(s)

Adrian Antico

---

CarmaXGBoostKeepVarsGDL

*CarmaXGBoostKeepVarsGDL*


---

## Description

CarmaXGBoostKeepVarsGDL is to help manage carma code

## Usage

```
CarmaXGBoostKeepVarsGDL (
  data,
  IndepVarPassTRUE = "GroupVar",
  UpdateData,
  CalendarFeatures,
  XREGS,
  Difference,
  HierarchGroups,
  GroupVariables,
  GroupVarVector,
  CalendarVariables = NULL,
  HolidayVariable = NULL,
  TargetColumnName,
  DateColumnName
)
```

## Arguments

data	Supply data
IndepVarPassTRUE	Name of the column used as a single grouping variable.
UpdateData	Supply UpdateData
CalendarFeatures	Supply CalendarFeatures
XREGS	Supply XREGS
Difference	Supply Difference
HierarchGroups	Supply HierarchGroups
GroupVariables	Supply GroupVariables
GroupVarVector	Supply GroupVarVector
CalendarVariables	Supply CalendarVariables
HolidayVariable	Supply HolidayVariable
TargetColumnName	Supply TargetColumnName
DateColumnName	Supply DateColumnName

**Author(s)**

Adrian Antico

**See Also**

Other Carma Helper: [CARMA\\_Define\\_Args\(\)](#), [CARMA\\_Get\\_IndepentVariablesPass\(\)](#), [CARMA\\_GroupHierarchyCheck](#)  
[CarmaCatBoostKeepVarsGDL\(\)](#), [CarmaH20KeepVarsGDL\(\)](#)

CARMA\_Define\_Args

*CARMA\_Define\_Args***Description**

CARMA\_Define\_Args is to help manage carma code

**Usage**

```
CARMA_Define_Args(
  TimeUnit = NULL,
  TimeGroups = NULL,
  HierarchGroups = NULL,
  GroupVariables = NULL,
  FC_Periods = NULL,
  PartitionType = NULL,
  TrainOnFull = NULL,
  SplitRatios = NULL,
  SD_Periods = 0L,
  Skew_Periods = 0L,
  Kurt_Periods = 0L,
  Quantile_Periods = 0L
)
```

**Arguments**

TimeUnit	= TimeUnit
TimeGroups	= TimeGroups
HierarchGroups	= HierarchGroups
GroupVariables	= GroupVariables
FC_Periods	= FC_Periods
PartitionType	= PartitionType
TrainOnFull	= TrainOnFull
SplitRatios	= SplitRatios
SD_Periods	= 0L turns it off, otherwise values must be greater than 1 such as c(2L,5L,6L,25L)
Skew_Periods	= 0L turns it off, otherwise values must be greater than 2 such as c(3L,5L,6L,25L)
Kurt_Periods	= 0L turns it off, otherwise values must be greater than 3 such as c(4L,5L,6L,25L)
Quantile_Periods	= 0L turns it off, otherwise values must be greater than 3 such as c(5L,6L,25L)

**Author(s)**

Adrian Antico

**See Also**

Other Carma Helper: [CARMA\\_Get\\_IndepentVariablesPass\(\)](#), [CARMA\\_GroupHierarchyCheck\(\)](#), [CarmaCatBoostKeepVarsGDL\(\)](#), [CarmaH20KeepVarsGDL\(\)](#), [CarmaXGBoostKeepVarsGDL\(\)](#)

---

CARMA\_Get\_IndepentVariablesPass

*CARMA\_Get\_IndepentVariablesPass*

---

**Description**

CARMA\_Get\_IndepentVariablesPass is to help manage carma code

**Usage**

CARMA\_Get\_IndepentVariablesPass(HierarchGroups)

**Arguments**

HierarchGroups    Supply HierarchGroups

**Author(s)**

Adrian Antico

**See Also**

Other Carma Helper: [CARMA\\_Define\\_Args\(\)](#), [CARMA\\_GroupHierarchyCheck\(\)](#), [CarmaCatBoostKeepVarsGDL\(\)](#), [CarmaH20KeepVarsGDL\(\)](#), [CarmaXGBoostKeepVarsGDL\(\)](#)

---

CARMA\_GroupHierarchyCheck

*CARMA\_GroupHierarchyCheck*

---

**Description**

CARMA\_GroupHierarchyCheck

**Usage**

```
CARMA_GroupHierarchyCheck(
  data = data,
  Group_Variables = GroupVariables,
  HierarchyGroups = HierarchGroups
)
```

**Arguments**

data	data fed into function
Group_Variables	Takes GroupVariables from caram function
HierarchyGroups	Vector of group variables

**Author(s)**

Adrian Antico

**See Also**

Other Carma Helper: [CARMA\\_Define\\_Args\(\)](#), [CARMA\\_Get\\_IndepentVariablesPass\(\)](#), [CarmaCatBoostKeepVarsGDL\(\)](#), [CarmaH2OKeepVarsGDL\(\)](#), [CarmaXGBoostKeepVarsGDL\(\)](#)

---

CatBoostClassifierParams

*CatBoostClassifierParams*

---

**Description**

CatBoostClassifierParams

**Usage**

```
CatBoostClassifierParams(
  counter = NULL,
  BanditArmsN = NULL,
  HasTime = NULL,
  MetricPeriods = NULL,
  ClassWeights = NULL,
  eval_metric = NULL,
  LossFunction = NULL,
  task_type = NULL,
  NumGPUs = NULL,
  model_path = NULL,
  NewGrid = NULL,
  Grid = NULL,
  ExperimentalGrid = NULL,
  GridClusters = NULL
)
```

**Arguments**

counter	Passthrough
BanditArmsN	Passthrough
HasTime	Passthrough
MetricPeriods	Passthrough

ClassWeights	Passthrough
eval_metric	Passthrough
LossFunction	Passthrough
task_type	Passthrough
NumGPUs	Passthrough
model_path	Passthrough
NewGrid	Passthrough
Grid	Passthrough
ExperimentalGrid	Passthrough
GridClusters	Passthrough

**Author(s)**

Adrian Antico

**See Also**

Other Supervised Learning: [AutoH2OScoring\(\)](#), [CatBoostMultiClassParams\(\)](#), [CatBoostParameterGrids\(\)](#), [CatBoostRegressionParams\(\)](#), [XGBoostClassifierParams\(\)](#), [XGBoostMultiClassParams\(\)](#), [XGBoostParameterGrids\(\)](#), [XGBoostRegressionMetrics\(\)](#), [XGBoostRegressionParams\(\)](#)

---

CatBoostMultiClassParams

*CatBoostMultiClassParams*

---

**Description**

CatBoostMultiClassParams

**Usage**

```
CatBoostMultiClassParams(
    counter = NULL,
    BanditArmsN = NULL,
    HasTime = NULL,
    MetricPeriods = NULL,
    ClassWeights = NULL,
    eval_metric = NULL,
    loss_function = NULL,
    task_type = NULL,
    model_path = NULL,
    NewGrid = NULL,
    Grid = NULL,
    ExperimentalGrid = NULL,
    GridClusters = NULL
)
```

**Arguments**

counter	Passthrough
BanditArmsN	Passthrough
HasTime	Passthrough
MetricPeriods	Passthrough
ClassWeights	Passthrough
eval_metric	Passthrough
loss_function	Passthrough
task_type	Passthrough
model_path	Passthrough
NewGrid	Passthrough
Grid	Passthrough
ExperimentalGrid	Passthrough
GridClusters	Passthrough

**Author(s)**

Adrian Antico

**See Also**

Other Supervised Learning: [AutoH2OScoring\(\)](#), [CatBoostClassifierParams\(\)](#), [CatBoostParameterGrids\(\)](#), [CatBoostRegressionParams\(\)](#), [XGBoostClassifierParams\(\)](#), [XGBoostMultiClassParams\(\)](#), [XGBoostParameterGrids\(\)](#), [XGBoostRegressionMetrics\(\)](#), [XGBoostRegressionParams\(\)](#)

---

CatBoostParameterGrids

*CatBoostParameterGrids*

---

**Description**

CatBoostParameterGrids <https://catboost.ai/docs/concepts/r-training-parameters.html>

**Usage**

```
CatBoostParameterGrids(
  TaskType = "CPU",
  Shuffles = 1L,
  NTrees = seq(1000L, 10000L, 1000L),
  Depth = seq(4L, 16L, 2L),
  LearningRate = c(0.01, 0.02, 0.03, 0.04),
  L2_Leaf_Reg = seq(1, 10, 1),
  RandomStrength = seq(1, 2, 0.1),
  BorderCount = seq(32, 256, 32),
  RSM = c(0.8, 0.85, 0.9, 0.95, 1),
  BootstrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
  GrowPolicy = c("SymmetricTree", "Depthwise", "Lossguide")
)
```



**Arguments**

TaskType	"GPU" or "CPU"
Shuffles	The number of shuffles you want to apply to each grid
NTrees	seq(1000L, 10000L, 1000L)
Depth	seq(4L, 16L, 2L)
LearningRate	seq(0.01,.10,0.01)
L2_Leaf_Reg	c(1.0:10.0)
RandomStrength	seq(1, 2, 0.1)
BorderCount	seq(32,256,32)
RSM	CPU ONLY, Random subspace method.c(0.80, 0.85, 0.90, 0.95, 1.0)
BootStrapType	c("Bayesian", "Bernoulli", "Poisson", "MVS", "No")
GrowPolicy	c("SymmetricTree", "Depthwise", "Lossguide")

**Value**

A list containing data.table's with the parameters shuffled and ready to test in the bandit framework

**Author(s)**

Adrian Antico

**See Also**

Other Supervised Learning: [AutoH2OScoring\(\)](#), [CatBoostClassifierParams\(\)](#), [CatBoostMultiClassParams\(\)](#), [CatBoostRegressionParams\(\)](#), [XGBoostClassifierParams\(\)](#), [XGBoostMultiClassParams\(\)](#), [XGBoostParameterGrids\(\)](#), [XGBoostRegressionMetrics\(\)](#), [XGBoostRegressionParams\(\)](#)

---

CatBoostRegressionParams

*CatBoostRegressionParams*

---

**Description**

CatBoostRegressionParams

**Usage**

```
CatBoostRegressionParams(
  counter = NULL,
  BanditArmsN = NULL,
  HasTime = NULL,
  MetricPeriods = NULL,
  eval_metric = NULL,
  LossFunction = NULL,
  task_type = NULL,
  NumGPUs = NULL,
  model_path = NULL,
  NewGrid = NULL,
```

```
    Grid = NULL,  
    ExperimentalGrid = NULL,  
    GridClusters = NULL  
  )
```

Arguments

counter	Passthrough
BanditArmsN	Passthrough
HasTime	Passthrough
MetricPeriods	Passthrough
eval_metric	Passthrough
LossFunction	Passthrough
task_type	Passthrough
NumGPUs	Passthrough
model_path	Passthrough
NewGrid	Passthrough
Grid	Passthrough
ExperimentalGrid	Passthrough
GridClusters	Passthrough

Author(s)

Adrian Antico

See Also

Other Supervised Learning: [AutoH2OScoring\(\)](#), [CatBoostClassifierParams\(\)](#), [CatBoostMultiClassParams\(\)](#), [CatBoostParameterGrids\(\)](#), [XGBoostClassifierParams\(\)](#), [XGBoostMultiClassParams\(\)](#), [XGBoostParameterGrids\(\)](#), [XGBoostRegressionMetrics\(\)](#), [XGBoostRegressionParams\(\)](#)

---

ChartTheme	<i>ChartTheme function is a ggplot theme generator for ggplots</i>
------------	--

---

Description

This function helps your ggplots look professional with the choice of the two main colors that will dominate the theme

**Usage**

```
ChartTheme(
  Size = 12,
  AngleX = 35,
  AngleY = 0,
  ChartColor = "lightsteelblue1",
  BorderColor = "darkblue",
  TextColor = "darkblue",
  GridColor = "white",
  BackGroundColor = "gray95",
  LegendPosition = "bottom"
)
```

**Arguments**

Size	The size of the axis labels and title
AngleX	The angle of the x axis labels
AngleY	The angle of the Y axis labels
ChartColor	"lightsteelblue1",
BorderColor	"darkblue",
TextColor	"darkblue",
GridColor	"white",
BackGroundColor	"gray95",
LegendPosition	Where to place legend

**Value**

An object to pass along to ggplot objects following the "+" sign

**Author(s)**

Adrian Antico

**See Also**

Other Graphics: [RemixTheme\(\)](#), [TimeSeriesPlotter\(\)](#), [multiplot\(\)](#)

**Examples**

```
## Not run:
data <- data.table::data.table(DateTime = as.Date(Sys.time()),
  Target = stats::filter(rnorm(1000,
    mean = 50,
    sd = 20),
    filter=rep(1,10),
    circular=TRUE))
data[, temp := seq(1:1000)][, DateTime := DateTime - temp][
  , temp := NULL]
data <- data[order(DateTime)]
p <- ggplot2::ggplot(data, ggplot2::aes(x = DateTime, y = Target)) +
  ggplot2::geom_line()
```

```
p <- p + ChartTheme(Size = 12)

## End(Not run)
```

---

ClassificationMetrics *ClassificationMetrics*

---

## Description

ClassificationMetrics

## Usage

```
ClassificationMetrics(
  TestData,
  Thresholds,
  Target,
  PredictColumnName,
  PositiveOutcome,
  NegativeOutcome,
  CostMatrix = c(1, 0, 0, 1)
)
```

## Arguments

TestData	Test data from your modeling
Thresholds	Value
Target	Name of your target variable
PredictColumnName	Name of your predicted value variable
PositiveOutcome	The value of the positive outcome level
NegativeOutcome	The value of the negative outcome level
CostMatrix	c(True Positive Cost, False Negative Cost, False Positive Cost, True Negative Cost)

## Author(s)

Adrian Antico

## See Also

Other Model Evaluation: [DT\\_BinaryConfusionMatrix\(\)](#), [RemixClassificationMetrics\(\)](#)

---

CLForecast	<i>CLForecast</i>
------------	-------------------

---

**Description**

CLForecast for generating forecasts

**Usage**

```
CLForecast(  
  data,  
  OutputFilePath = NULL,  
  FC_BaseFunnelMeasure = NULL,  
  SegmentName = NULL,  
  MaxDateForecasted = NULL,  
  MaxCalendarDate = NULL,  
  ArgsList = NULL,  
  MaxCohortPeriods = NULL  
)
```

**Arguments**

data	N
OutputFilePath	P
FC_BaseFunnelMeasure	d
SegmentName	a
MaxDateForecasted	S
MaxCalendarDate	S
ArgsList	A
MaxCohortPeriods	T

**Value**

S

**Author(s)**

Adrian Antico

**See Also**

Other Population Dynamics Forecasting: [CLTrainer\(\)](#)

CLTrainer

*CLTrainer***Description**

CLTrainer is a forecasting model for chain ladder style forecasting

**Usage**

```
CLTrainer(
  data,
  PartitionRatios = c(0.7, 0.2, 0.1),
  BaseFunnelMeasure = NULL,
  ConversionMeasure = NULL,
  ConversionRateMeasure = NULL,
  CohortPeriodsVariable = NULL,
  CalendarDate = NULL,
  CohortDate = NULL,
  TruncateDate = NULL,
  TimeUnit = c("day"),
  CalendarTimeGroups = c("day", "week", "month"),
  CohortTimeGroups = c("day", "week", "month"),
  TransformTargetVariable = TRUE,
  TransformMethods = c("Identity", "YeoJohnson"),
  AnomalyDetection = list(tstat_high = 3, tstat_low = -2),
  Jobs = c("Evaluate", "Train"),
  SaveModelObjects = TRUE,
  ModelID = "Segment_ID",
  ModelPath = NULL,
  MetaDataPath = NULL,
  TaskType = "CPU",
  NumGPUs = 1,
  DT_Threads = max(1L, parallel::detectCores()),
  EvaluationMetric = "RMSE",
  LossFunction = "RMSE",
  NumOfParDepPlots = 1L,
  MetricPeriods = 50L,
  CalendarVariables = c("wday", "mday", "yday", "week", "isoweek", "month", "quarter",
    "year"),
  HolidayGroups = c("USPublicHolidays", "EasterGroup", "ChristmasGroup",
    "OtherEcclesticalFeasts"),
  ImputeRollStats = -0.001,
  CohortHolidayLags = c(1L, 2L, 7L),
  CohortHolidayMovingAverages = c(3L, 7L),
  CalendarHolidayLags = c(1L, 2L, 7L),
  CalendarHolidayMovingAverages = c(3L, 7L),
  CalendarLags = list(day = c(1L, 7L, 21L), week = c(1L, 4L, 52L), month = c(1L, 6L,
    12L)),
  CalendarMovingAverages = list(day = c(1L, 7L, 21L), week = c(1L, 4L, 52L), month =
    c(1L, 6L, 12L)),
  CalendarStandardDeviations = NULL,
```

```

CalendarSkews = NULL,
CalendarKurts = NULL,
CalendarQuantiles = NULL,
CalendarQuantilesSelected = "q50",
CohortLags = list(day = c(1L, 7L, 21L), week = c(1L, 4L, 52L), month = c(1L, 6L,
  12L)),
CohortMovingAverages = list(day = c(1L, 7L, 21L), week = c(1L, 4L, 52L), month =
  c(1L, 6L, 12L)),
CohortStandardDeviations = NULL,
CohortSkews = NULL,
CohortKurts = NULL,
CohortQuantiles = NULL,
CohortQuantilesSelected = "q50",
PassInGrid = NULL,
GridTune = FALSE,
BaselineComparison = "default",
MaxModelsInGrid = 25L,
MaxRunMinutes = 180L,
MaxRunsWithoutNewWinner = 10L,
Trees = 3000L,
Depth = seq(4L, 8L, 1L),
LearningRate = seq(0.01, 0.1, 0.01),
L2_Leaf_Reg = seq(1, 10, 1),
RSM = c(0.8, 0.85, 0.9, 0.95, 1),
BootStrapType = c("Bayesian", "Bernoulli", "Poisson", "MVS", "No"),
GrowPolicy = c("SymmetricTree", "Depthwise", "Lossguide")
)

```

## Arguments

<code>data</code>	data object
<code>PartitionRatios</code>	Requires three values for train, validation, and test data sets
<code>BaseFunnelMeasure</code>	E.g. "Leads". This value should be a forward looking variable. Say you want to forecast <code>ConversionMeasure</code> 2 months into the future. You should have two months into the future of values of <code>BaseFunnelMeasure</code>
<code>ConversionMeasure</code>	E.g. "Conversions". Rate is derived as conversions over leads by cohort periods out
<code>ConversionRateMeasure</code>	Conversions over Leads for every cohort
<code>CohortPeriodsVariable</code>	Numeric. Numerical value of the the number of periods since cohort base date.
<code>CalendarDate</code>	The name of your date column that represents the calendar date
<code>CohortDate</code>	The name of your date column that represents the cohort date
<code>TruncateDate</code>	NULL. Supply a date to represent the earliest point in time you want in your data. Filtering takes place before partitioning data so feature engineering can include as many non null values as possible.
<code>TimeUnit</code>	Base time unit of data. "days", "weeks", "months", "quarters", "years"

CalendarTimeGroups	TimeUnit value must be included. If you want to generate lags and moving averages in several time based aggregations, choose from "days", "weeks", "months", "quarters", "years".
CohortTimeGroups	TimeUnit value must be included. If you want to generate lags and moving averages in several time based aggregations, choose from "days", "weeks", "months", "quarters", "years".
TransformTargetVariable	TRUE or FALSE
TransformMethods	Choose from "Identity", "BoxCox", "Asinh", "Asin", "Log", "LogPlus1", "Logit", "YeoJohnson"
AnomalyDetection	Provide a named list. See examples
Jobs	Default is "eval" and "train"
SaveModelObjects	Set to TRUE to return all modeling objects to your environment
ModelID	A character string to name your model and output
ModelPath	Path to where you want your models saved
MetaDataPath	Path to where you want your metadata saved. If NULL, function will try ModelPath if it is not NULL.
TaskType	"GPU" or "CPU" for catboost training
NumGPUs	Number of GPU's you would like to utilize
DT_Threads	Number of threads to use for data.table. Default is Total - 2
EvaluationMetric	This is the metric used inside catboost to measure performance on validation data during a grid-tune. "RMSE" is the default, but other options include: "MAE", "MAPE", "Poisson", "Quantile", "LogLinQuantile", "Lq", "NumErrors", "SMAPE", "R2", "MSLE", "MedianAbsoluteError".
LossFunction	Used in model training for model fitting. Select from 'RMSE', 'MAE', 'Quantile', 'LogLinQuantile', 'MAPE', 'Poisson', 'PairLogitPairwise', 'Tweedie', 'QueryRMSE'
NumOfParDepPlots	Number of partial dependence plots to return
MetricPeriods	Number of trees to build before the internal catboost eval step happens
CalendarVariables	"wday", "mday", "yday", "week", "isoweek", "month", "quarter", "year"
HolidayGroups	c("USPublicHolidays", "EasterGroup", "ChristmasGroup", "OtherEcclesticalFeasts")
ImputeRollStats	Constant value to fill NA after running AutoLagRollStats()
CohortHolidayLags	c(1L, 2L, 7L),
CohortHolidayMovingAverages	c(3L, 7L),
CalendarHolidayLags	c(1L, 2L, 7L),
CalendarHolidayMovingAverages	= c(3L, 7L),



CalendarLags	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CalendarMovingAverages	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CalendarStandardDeviations	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CalendarSkews	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CalendarKurts	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CalendarQuantiles	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CalendarQuantilesSelected	Supply a vector of "q5", "q10", "q15", "q20", "q25", "q30", "q35", "q40", "q45", "q50", "q55", "q60", "q65", "q70", "q75", "q80", "q85", "q90", "q95"
CohortLags	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CohortMovingAverages	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CohortStandardDeviations	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CohortSkews	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CohortKurts	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CohortQuantiles	List of the form <code>list("day" = c(1L, 7L, 21L), "week" = c(1L, 4L, 52L), "month" = c(1L, 6L, 12L))</code>
CohortQuantilesSelected	Supply a vector of "q5", "q10", "q15", "q20", "q25", "q30", "q35", "q40", "q45", "q50", "q55", "q60", "q65", "q70", "q75", "q80", "q85", "q90", "q95"
PassInGrid	Defaults to NULL. Pass in a single row of grid from a previous output as a <code>data.table</code> (they are collected as <code>data.tables</code> )
GridTune	Set to TRUE to run a grid tuning procedure. Set a number in <code>MaxModelsInGrid</code> to tell the procedure how many models you want to test.
BaselineComparison	Set to either "default" or "best". Default is to compare each successive model build to the baseline model using max trees (from function args). Best makes the comparison to the current best model.
MaxModelsInGrid	Number of models to test from grid options
MaxRunMinutes	Maximum number of minutes to let this run
MaxRunsWithoutNewWinner	Number of models built before calling it quits

Trees	Bandit grid partitioned. The maximum number of trees you want in your models
Depth	Bandit grid partitioned. Number, or vector for depth to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(4L, 16L, 2L)
LearningRate	Bandit grid partitioned. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the LearningRate values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.01,0.02,0.03,0.04)
L2_Leaf_Reg	Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the L2_Leaf_Reg values to test. For running grid tuning, a NULL value supplied will mean these values are tested seq(1.0, 10.0, 1.0)
RSM	CPU only. Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the RSM values to test. For running grid tuning, a NULL value supplied will mean these values are tested c(0.80, 0.85, 0.90, 0.95, 1.0)
BootStrapType	Random testing. Supply a single value for non-grid tuning cases. Otherwise, supply a vector for the BootStrapType values to test. For running grid tuning, a NULL value supplied will mean these values are tested c("Bayesian", "Bernoulli", "Poisson", "MVS", "No")
GrowPolicy	Random testing. NULL, character, or vector for GrowPolicy to test. For grid tuning, supply a vector of values. For running grid tuning, a NULL value supplied will mean these values are tested c("SymmetricTree", "Depthwise", "Loss-guide")

### Value

Saves metadata and models to files of your choice. Also returns metadata and models from the function. User specifies both options.

### Author(s)

Adrian Antico

### See Also

Other Population Dynamics Forecasting: [CLForecast\(\)](#)

### Examples

```
## Not run:
# Create simulated data
data <- RemixAutoML::FakeDataGenerator(
  ChainLadderData = TRUE)

# Build model
RemixAutoML::CLTrainer(

  # Data Arguments----
  data = data,
  PartitionRatios = c(0.70,0.20,0.10),
  BaseFunnelMeasure = "Leads",
  ConversionMeasure = "Appointments",
  ConversionRateMeasure = NULL,
  CohortPeriodsVariable = "CohortDays",
```

```

CalendarDate = "CalendarDateColumn",
CohortDate = "CohortDateColumn",
TruncateDate = NULL,
TimeUnit = "days",
TransformTargetVariable = TRUE,
TransformMethods = c("Identity", "BoxCox", "Asinh",
                     "Asin", "LogPlus1", "Logit",
                     "YeoJohnson"),
AnomalyDetection = list(tstat_high = 3,
                        tstat_low = -2),

# Metadata Arguments----
Jobs = c("eval", "train"),
SaveModelObjects = TRUE,
ModelID = "ModelTest",
ModelPath = getwd(),
MetaDataPath = NULL,
TaskType = "GPU",
NumGPUs = 1,
DT_Threads = max(1L, parallel::detectCores() - 2L),
EvaluationMetric = "RMSE",
LossFunction = "RMSE",
NumOfParDepPlots = 1L,
MetricPeriods = 50L,

# Feature Engineering Arguments----
ImputeRollStats = -0.001,
CalendarTimeGroups = c("days", "weeks", "months"),
CohortTimeGroups = c("days", "weeks"),
CalendarVariables = c("wday", "mday", "yday", "week",
                     "month", "quarter", "year"),
HolidayGroups = c("USPublicHolidays", "EasterGroup",
                  "ChristmasGroup", "OtherEcclesticalFeasts"),
CohortHolidayLags = c(1L, 2L, 7L),
CohortHolidayMovingAverages = c(3L, 7L),
CalendarHolidayLags = c(1L, 2L, 7L),
CalendarHolidayMovingAverages = c(3L, 7L),
CalendarLags = list("day" = c(1L, 2L, 7L, 35L, 42L),
                   "week" = c(5L, 6L, 10L, 12L, 25L, 26L)),
CalendarMovingAverages = list("day" = c(7L, 14L, 35L, 42L),
                              "week" = c(5L, 6L, 10L, 12L, 20L, 24L),
                              "month" = c(6L, 12L)),
CalendarStandardDeviations = NULL,
CalendarSkews = NULL,
CalendarKurts = NULL,
CalendarQuantiles = NULL,
CalendarQuantilesSelected = "q50",
CohortLags = list("day" = c(1L, 2L, 7L, 35L, 42L),
                 "week" = c(5L, 6L)),
CohortMovingAverages = list("day" = c(7L, 14L, 35L, 42L),
                            "week" = c(5L, 6L),
                            "month" = c(1L, 2L)),
CohortStandardDeviations = NULL,
CohortSkews = NULL,
CohortKurts = NULL,
CohortQuantiles = NULL,
CohortQuantilesSelected = "q50",

```

```

# Grid Tuning
PassInGrid = NULL,
GridTune = FALSE,
BaselineComparison = "default",
MaxModelsInGrid = 25L,
MaxRunMinutes = 180L,
MaxRunsWithoutNewWinner = 10L,
Trees = 1000L,
Depth = seq(4L,8L,1L),
LearningRate = seq(0.01,0.10,0.01),
L2_Leaf_Reg = seq(1.0,10.0,1.0),
RSM = c(0.80,0.85,0.90,0.95,1.0),
BootstrapType = c("Bayesian","Bernoulli","Poisson","MVS","No"),
GrowPolicy = c("SymmetricTree","Depthwise","Lossguide"))

## End(Not run)

```

---

ColumnSubsetDataTable *ColumnSubsetDataTable*

---

## Description

ColumnSubsetDataTable will subset data tables by column

## Usage

```

ColumnSubsetDataTable(
  data,
  TargetColumnName = NULL,
  DateColumnName = NULL,
  GroupVars = NULL
)

```

## Arguments

data	data.table
TargetColumnName	Target variable
DateColumnName	Date variable
GroupVars	Group variables

## Author(s)

Adrian Antico

## See Also

Other Data Wrangling: [DataDisplayMeta\(\)](#), [FakeDataGenerator\(\)](#), [FullFactorialCatFeatures\(\)](#), [TimeSeriesMelt\(\)](#)

---

ContinuousTimeDataGenerator

*ContinuousTimeDataGenerator for creating continuous time data sets for on demand modeling*

---

## Description

ContinuousTimeDataGenerator for creating continuous time data sets for on demand modeling of transactional panel data.

## Usage

```
ContinuousTimeDataGenerator(
  data,
  RestrictDateRange = TRUE,
  Case = 2L,
  FC_Periods = 52L,
  SaveData = FALSE,
  FilePath = NULL,
  TargetVariableName = "qty",
  DateVariableName = "date",
  GDL_Targets = NULL,
  TimeUnit = "raw",
  TimeGroups = c("raw", "day", "week"),
  GroupingVariables = "sku",
  HierarchyGroupVars = NULL,
  MinTimeWindow = 1L,
  MinTxnRecords = 2L,
  Lags = 1L:7L,
  MA_Periods = 10L,
  SD_Periods = 10L,
  Skew_Periods = 10L,
  Kurt_Periods = 10L,
  Quantile_Periods = 10L,
  Quantiles_Selected = c("q5"),
  HolidayLags = c(1L:7L),
  HolidayMovingAverages = c(2L:14L),
  TimeBetween = NULL,
  TimeTrendVariable = TRUE,
  CalendarVariables = c("wday", "mday", "yday", "week", "isoweek", "month", "quarter",
    "year"),
  HolidayGroups = "USPublicHolidays",
  PowerRate = 0.5,
  SampleRate = 5,
  TargetWindowSamples = 5,
  PrintSteps = TRUE
)
```

## Arguments

data	This is your transactional level data
------	---------------------------------------

RestrictDateRange	Set to TRUE to only pull samples by entity within the entity life (not beyond)
Case	Currently set as 1 for forecasting and 2 for other
FC_Periods	The number of future periods to collect data on
SaveData	Set to TRUE to save the MetaData and final modeling data sets to file
FilePath	Set to your file of choice for where you want the data sets saved
TargetVariableName	The name of your target variable that represents demand
DateVariableName	The date variable of the demand instances
GDL_Targets	The variable names to run through AutoLagRollStats()
TimeUnit	List the time unit your data is aggregated by. E.g. "day", "week", "month", "quarter", "year"
TimeGroups	= c("raw", "day", "week"),
GroupingVariables	These variables (or single variable) is the combination of categorical variables that uniquely defines the level of granularity of each individual level to forecast. E.g. "sku" or c("Store", "Department"). Sku is typically unique for all sku's. Store and Department in combination defines all unique departments as the department may be repeated across the stores.
HierarchyGroupVars	Group vars
MinTimeWindow	The number of time periods you would like to omit for training. Default is 1 so that at a minimum, there is at least one period of values to forecast. You can set it up to a larger value if you do not want more possible target windows for the lower target window values.
MinTxnRecords	I typically set this to 2 so that there is at least one other instance of demand so that the forecasted values are not complete nonsense.
Lags	Select the periods for all lag variables you want to create. E.g. c(1:5,52)
MA_Periods	Select the periods for all moving average variables you want to create. E.g. c(1:5,52)
SD_Periods	Select the periods for all sd variables you want to create. E.g. c(1:5,52)
Skew_Periods	Select the periods for all skew variables you want to create. E.g. c(1:5,52)
Kurt_Periods	Select the periods for all kurtosis variables you want to create. E.g. c(1:5,52)
Quantile_Periods	Select the periods for all quantiles variables you want to create. E.g. c(1:5,52)
Quantiles_Selected	Select the quantiles you want. q5, q10, ..., q95
HolidayLags	Select the lags you want generated
HolidayMovingAverages	Select the moving averages you want generated
TimeBetween	Supply a name or NULL
TimeTrendVariable	Set to TRUE to have a time trend variable added to the model. Time trend is numeric variable indicating the numeric value of each record in the time series (by group). Time trend starts at 1 for the earliest point in time and increments by one for each success time point.

**CalendarVariables**

Set to TRUE to have calendar variables created. The calendar variables are numeric representations of second, minute, hour, week day, month day, year day, week, isoweek, quarter, and year

**HolidayGroups** Input the holiday groups of your choice from the `CreateHolidayVariable()` function in this package

**PowerRate** Sampling parameter

**SampleRate** Set this to a value greater than 0. The calculation used is the number of records per group level raised to the power of `PowerRate`. Then that values is multiplied by `SampleRate`.

**TargetWindowSamples**  
= 5

**PrintSteps** Set to TRUE to have operation steps printed to the console

**Value**

Returns two `data.table` data sets: The first is a modeling data set for the count distribution while the second data set if for the size model data set.

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
DataSets <- ContinuousTimeDataGenerator(
  data,
  RestrictDateRange = TRUE,
  FC_Periods = 52,
  SaveData = FALSE,
  FilePath = normalizePath("./"),
  TargetVariableName = "qty",
  DateVariableName = "date",
  GDL_Targets = NULL,
  GroupingVariables = "sku",
  HierarchyGroupVars = NULL,
  TimeGroups = c("raw", "day", "week"),
  MinTimeWindow = 1,
  MinTxnRecords = 2,
  Lags = 1:7,
  MA_Periods = 10L,
  SD_Periods = 10L,
  Skew_Periods = 10L,
  Kurt_Periods = 10L,
  Quantile_Periods = 10L,
```

```

Quantiles_Selected = c("q5"),
HolidayLags = c(1L:7L),
HolidayMovingAverages = c(2L:14L),
TimeBetween = NULL,
TimeTrendVariable = TRUE,
TimeUnit = "day",
CalendarVariables = c("wday",
  "mday",
  "yday",
  "week",
  "isoweek",
  "month",
  "quarter",
  "year"),
HolidayGroups = "USPublicHolidays",
PowerRate = 0.5,
SampleRate = 5,
TargetWindowSamples = 5,
PrintSteps = TRUE)
CountModelData <- DataSets$CountModelData
SizeModelData <- DataSets$SizeModelData
rm(DataSets)

## End(Not run)

```

---

## CreateCalendarVariables

*CreateCalendarVariables Create Calendar Variables*

---

### Description

CreateCalendarVariables Rapidly creates calendar variables based on the date column you provide

### Usage

```

CreateCalendarVariables(
  data,
  DateCols = NULL,
  AsFactor = FALSE,
  TimeUnits = "wday"
)

```

### Arguments

data	This is your data
DateCols	Supply either column names or column numbers of your date columns you want to use for creating calendar variables
AsFactor	Set to TRUE if you want factor type columns returned; otherwise integer type columns will be returned
TimeUnits	Supply a character vector of time units for creating calendar variables. Options include: "second", "minute", "hour", "wday", "mday", "yday", "week", "isoweek", "wom" (week of month), "month", "quarter", "year"



**Value**

Returns your data.table with the added calendar variables at the end

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engi](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
# Create fake data with a Date column----
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.75,
  N = 25000L,
  ID = 2L,
  ZIP = 0L,
  FactorCount = 4L,
  AddDate = TRUE,
  Classification = FALSE,
  MultiClass = FALSE)
for(i in seq_len(20L)) {
  print(i)
  data <- data.table::rbindlist(
    list(data, RemixAutoML::FakeDataGenerator(
      Correlation = 0.75,
      N = 25000L,
      ID = 2L,
      ZIP = 0L,
      FactorCount = 4L,
      AddDate = TRUE,
      Classification = FALSE,
      MultiClass = FALSE)))
}

# Create calendar variables - automatically excludes
# the second, minute, and hour selections since
# it is not timestamp data
runtime <- system.time(
  data <- RemixAutoML::CreateCalendarVariables(
    data = data,
    DateCols = "DateTime",
    AsFactor = FALSE,
    TimeUnits = c("second",
                  "minute",
                  "hour",
                  "wday",
                  "mday",
                  "yday",
```

```

        "week",
        "isoweek",
        "wom",
        "month",
        "quarter",
        "year"))))
head(data)
print(runtime)

## End(Not run)

```

---

## CreateHolidayVariables

*CreateHolidayVariables Create Holiday Count Columns*

---

### Description

CreateHolidayVariables Rapidly creates holiday count variables based on the date columns you provide

### Usage

```

CreateHolidayVariables(
  data,
  DateCols = NULL,
  HolidayGroups = c("USPublicHolidays", "EasterGroup", "ChristmasGroup",
    "OtherEccelesticalFeasts"),
  Holidays = NULL,
  GroupingVars = NULL,
  Print = FALSE
)

```

### Arguments

data	This is your data
DateCols	Supply either column names or column numbers of your date columns you want to use for creating calendar variables
HolidayGroups	Pick groups
Holidays	Pick holidays
GroupingVars	Grouping variable names
Print	Set to TRUE to print iteration number to console

### Value

Returns your data.table with the added holiday indicator variable

### Author(s)

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [DT\\_GDL\\_Feature\\_Eng](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
# Create fake data with a Date----
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.75,
  N = 25000L,
  ID = 2L,
  ZIP = 0L,
  FactorCount = 4L,
  AddDate = TRUE,
  Classification = FALSE,
  MultiClass = FALSE)
for(i in seq_len(20L)) {
  print(i)
  data <- data.table::rbindlist(list(data,
  RemixAutoML::FakeDataGenerator(
    Correlation = 0.75,
    N = 25000L,
    ID = 2L,
    ZIP = 0L,
    FactorCount = 4L,
    AddDate = TRUE,
    Classification = FALSE,
    MultiClass = FALSE)))
}
# Run function and time it
runtime <- system.time(
  data <- CreateHolidayVariables(
    data,
    DateCols = "DateTime",
    HolidayGroups = c("USPublicHolidays", "EasterGroup",
      "ChristmasGroup", "OtherEcclesticalFeasts"),
    Holidays = NULL,
    GroupingVars = c("Factor_1", "Factor_2", "Factor_3", "Factor_4"),
    Print = FALSE))
head(data)
print(runtime)

## End(Not run)
```

---

CreateProjectFolders    *CreateProjectFolders Converts path files to proper path files*

---

**Description**

CreateProjectFolders Converts path files to proper path files

**Usage**

```
CreateProjectFolders(
  ProjectName = input$ID_NewProjectName,
  RootPath = input$ID_Root_Folder,
  ExistsButNoProjectList = FALSE,
  Local = FALSE
)
```

**Arguments**

ProjectName	This is the name of a project which will be the name of the file created in the root folder
RootPath	This is the path file to the root folder
ExistsButNoProjectList	Set to TRUE if the folder exists but not the ProjectList file
Local	Local or cloud

**Value**

Returns a proper path file string

**Author(s)**

Adrian Antico

---

DataDisplayMeta

*DataDisplayMeta*


---

**Description**

DataDisplayMeta

**Usage**

```
DataDisplayMeta(data)
```

**Arguments**

data	Source data
------	-------------

**Author(s)**

Adrian Antico

**See Also**

Other Data Wrangling: [ColumnSubsetDataTable\(\)](#), [FakeDataGenerator\(\)](#), [FullFactorialCatFeatures\(\)](#), [TimeSeriesMelt\(\)](#)

DeleteFile

*DeleteFile***Description**

DeleteFile will prompt you for a file to delete and then permanently delete a file. You won't have to go to the recycle bin to delete it a second time

**Usage**

```
DeleteFile(File = NULL)
```

**Arguments**

File	If NULL a prompt will allow you to click on the file to have it removed. Otherwise, supply a path to the file including its name and extension
------	--

**Author(s)**

Adrian Antico

**See Also**

Other Misc: [AutoH2OTextPrepScoring\(\)](#), [Logger\(\)](#), [PrintToPDF\(\)](#), [tokenizeH2O\(\)](#)

DifferenceData

*DifferenceData***Description**

DifferenceData differences your data set

**Usage**

```
DifferenceData(
  data,
  ColumnsToDiff = c(names(data)[2:ncol(data)]),
  CARMA = FALSE,
  TargetVariable = NULL,
  GroupingVariable = NULL
)
```

**Arguments**

data	Source data
ColumnsToDiff	The column numbers you want differenced
CARMA	Set to TRUE for CARMA functions
TargetVariable	The target variable name
GroupingVariable	Difference data by group

Author(s)

Adrian Antico

See Also

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

---

DifferenceDataReverse    *DifferenceDataReverse*

---

Description

DifferenceDataReverse reverses the difference

Usage

```
DifferenceDataReverse(  
  data,  
  ScoreData = Forecasts$Predictions,  
  LastRow = DiffTrainOutput$LastRow$Weekly_Sales,  
  CARMA = FALSE,  
  TargetCol = TargetColumnName,  
  FirstRow = DiffTrainOutput$FirstRow,  
  GroupingVariables = NULL  
)
```

Arguments

data	Pre differenced scoring data
ScoreData	Predicted values from ML model
LastRow	The last row from training data target variables
CARMA	Set to TRUE for CARMA utilization
TargetCol	Target column name
FirstRow	The first row of the target variable
GroupingVariables	Group columns

Author(s)

Adrian Antico

See Also

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

---

DownloadCSVFromStorageExplorer  
*DownloadCSVFromStorageExplorer*

---

Description

DownloadCSVFromStorageExplorer

Usage

```
DownloadCSVFromStorageExplorer(  
  UploadCSVObjectName = "data.csv",  
  SaveCSVFilePath = file.path(Root),  
  SaveCSVName = "RawData.csv",  
  UploadLocation = "Analytics Sandbox/Machine Learning",  
  DataStoreName = NULL  
)
```

Arguments

UploadCSVObjectName	Name of the file you uploaded to the Microsoft Azure Storage Explorer
SaveCSVFilePath	Path file to where you want to save your csv in Azure
SaveCSVName	The name you want to give the csv that will be saved
UploadLocation	The location to where the data is saved in the Azure Storage Explorer
DataStoreName	The name of the store in data factory where you uploaded your data

Author(s)

Adrian Antico

```
DT_BinaryConfusionMatrix  
DT_BinaryConfusionMatrix
```

---

## Description

DT\_BinaryConfusionMatrix is for computing all metrics related to binary modeling outcomes

## Usage

```
DT_BinaryConfusionMatrix(  
  data = MetricsData,  
  GroupVariables = "IntervalNum",  
  Target = "ActiveAtInterval",  
  Predicted = "p1"  
)
```

## Arguments

data	Supply your model validation data with predictions
GroupVariables	Supply grouping variables to generate statistics by groups
Target	The name of your target variable column
Predicted	The name of your predicted value column#'

## Author(s)

Adrian Antico

## See Also

Other Model Evaluation: [ClassificationMetrics\(\)](#), [RemixClassificationMetrics\(\)](#)

## Examples

```
## Not run:  
AggMetricsByGroup <- DT_BinaryConfusionMatrix(  
  data,  
  GroupVariables = c("Store", "Dept"),  
  Target = "HitTarget",  
  Predicted = "p1")  
  
## End(Not run)
```



---

DT\_GDL\_Feature\_Engineering

*An Automated Feature Engineering Function Using data.table frol-  
lmean*


---

## Description

Builds autoregressive and moving average from target columns and distributed lags and distributed moving average for independent features distributed across time. On top of that, you can also create time between instances along with their associated lags and moving averages. This function works for data with groups and without groups.

## Usage

```
DT_GDL_Feature_Engineering(
  data,
  lags = c(seq(1, 50, 1)),
  periods = c(seq(5, 95, 5)),
  SDperiods = c(seq(5, 95, 5)),
  Skewperiods = c(seq(5, 95, 5)),
  Kurtperiods = c(seq(5, 95, 5)),
  Quantileperiods = c(seq(5, 95, 5)),
  statsFUNs = c("mean"),
  targets = NULL,
  groupingVars = NULL,
  sortDateName = NULL,
  timeDiffTarget = NULL,
  timeAgg = c("days"),
  WindowingLag = 0,
  Type = c("Lag"),
  SimpleImpute = TRUE
)
```

## Arguments

data	A data.table you want to run the function on
lags	A numeric vector of the specific lags you want to have generated. You must include 1 if WindowingLag = 1.
periods	A numeric vector of the specific rolling statistics window sizes you want to utilize in the calculations.
SDperiods	A numeric vector of Standard Deviation rolling statistics window sizes you want to utilize in the calculations.
Skewperiods	A numeric vector of Skewness rolling statistics window sizes you want to utilize in the calculations.
Kurtperiods	A numeric vector of Kurtosis rolling statistics window sizes you want to utilize in the calculations.
Quantileperiods	A numeric vector of Quantile rolling statistics window sizes you want to utilize in the calculations.

statsFUNs	Select from the following c("mean","sd","skew","kurt","q5","q10","q15","q20","q25","q30","q35","q40","q45","q50")
targets	A character vector of the column names for the reference column in which you will build your lags and rolling stats
groupingVars	A character vector of categorical variable names you will build your lags and rolling stats by
sortDateName	The column name of your date column used to sort events over time
timeDiffTarget	Specify a desired name for features created for time between events. Set to NULL if you don't want time between events features created.
timeAgg	List the time aggregation level for the time between events features, such as "hour", "day", "week", "month", "quarter", or "year"
WindowingLag	Set to 0 to build rolling stats off of target columns directly or set to 1 to build the rolling stats off of the lag-1 target
Type	List either "Lag" if you want features built on historical values or "Lead" if you want features built on future values
SimpleImpute	Set to TRUE for factor level imputation of "0" and numeric imputation of -1

**Value**

data.table of original data plus created lags, rolling stats, and time between event lags and rolling stats

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
N = 25116
data <- data.table::data.table(
  DateTime = as.Date(Sys.time()),
  Target = stats::filter(rnorm(N, mean = 50, sd = 20),
    filter=rep(1,10),
    circular=TRUE))
data[, temp := seq(1:N)][, DateTime := DateTime - temp][
  , temp := NULL]
data <- data[order(DateTime)]
data <- DT_GDL_Feature_Engineering(
  data,
  lags          = c(seq(1,5,1)),
  periods       = c(3,5,10,15,20,25),
  SDperiods     = c(seq(5, 95, 5)),
  Skewperiods   = c(seq(5, 95, 5)),
  Kurtperiods   = c(seq(5, 95, 5)),
```

```

Quantileperiods = c(seq(5, 95, 5)),
statsFUNs       = c("mean",
  "sd", "skew", "kurt", "q05", "q95"),
targets         = c("Target"),
groupingVars     = NULL,
sortDateName     = "DateTime",
timeDiffTarget   = c("Time_Gap"),
timeAgg          = c("days"),
WindowingLag     = 1,
Type            = "Lag",
SimpleImpute     = TRUE)

## End(Not run)

```

DummifyDT

*DummifyDT creates dummy variables for the selected columns.*

## Description

DummifyDT creates dummy variables for the selected columns. Either one-hot encoding, N+1 columns for N levels, or N columns for N levels.

## Usage

```

DummifyDT(
  data,
  cols,
  KeepFactorCols = FALSE,
  OneHot = FALSE,
  SaveFactorLevels = FALSE,
  SavePath = NULL,
  ImportFactorLevels = FALSE,
  FactorLevelsList = NULL,
  ClustScore = FALSE,
  ReturnFactorLevels = FALSE,
  GroupVar = FALSE
)

```

## Arguments

<code>data</code>	The data set to run the micro auc on
<code>cols</code>	A vector with the names of the columns you wish to dichotomize
<code>KeepFactorCols</code>	Set to TRUE to keep the original columns used in the dichotomization process
<code>OneHot</code>	Set to TRUE to run one hot encoding, FALSE to generate N columns for N levels
<code>SaveFactorLevels</code>	Set to TRUE to save unique levels of each factor column to file as a csv
<code>SavePath</code>	Provide a file path to save your factor levels. Use this for models that you have to create dummy variables for.

ImportFactorLevels	Instead of using the data you provide, import the factor levels csv to ensure you build out all of the columns you trained with in modeling.
FactorLevelsList	Supply a list of factor variable levels
ClustScore	This is for scoring AutoKMeans. Set to FALSE for all other applications.
ReturnFactorLevels	If you want a named list of all the factor levels returned, set this to TRUE. Doing so will cause the function to return a list with the source data.table and the list of factor variables' levels
GroupVar	Ignore this

**Value**

Either a data table with new dummy variables columns and optionally removes base columns (if ReturnFactorLevels is FALSE), otherwise a list with the data.table and a list of the factor levels.

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
# Create fake data with 10 categorical columns
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.85,
  N = 25000,
  ID = 2L,
  ZIP = 0,
  FactorCount = 10L,
  AddDate = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

# Create dummy variables
data <- RemixAutoML::DummifyDT(
  data = data,
  cols = c("Factor_1",
            "Factor_2",
            "Factor_3",
            "Factor_4",
            "Factor_5",
            "Factor_6",
            "Factor_8",
            "Factor_9",
            "Factor_10"),
```

```

    KeepFactorCols = FALSE,
    OneHot = FALSE,
    SaveFactorLevels = FALSE,
    SavePath = normalizePath("./"),
    ImportFactorLevels = FALSE,
    FactorLevelsList = NULL,
    ClustScore = FALSE,
    ReturnFactorLevels = FALSE)

## End(Not run)

```

---

EvalPlot

*EvalPlot automatically builds calibration plots for model evaluation*


---

## Description

This function automatically builds calibration plots and calibration boxplots for model evaluation using regression, quantile regression, and binary and multinomial classification

## Usage

```

EvalPlot(
  data,
  PredictionColName = c("PredictedValues"),
  TargetColName = c("ActualValues"),
  GraphType = c("calibration"),
  PercentileBucket = 0.05,
  aggrfun = function(x) mean(x, na.rm = TRUE)
)

```

## Arguments

data	Data containing predicted values and actual values for comparison
PredictionColName	String representation of column name with predicted values from model
TargetColName	String representation of column name with target values from model
GraphType	Calibration or boxplot - calibration aggregated data based on summary statistic; boxplot shows variation
PercentileBucket	Number of buckets to partition the space on (0,1) for evaluation
aggrfun	The statistics function used in aggregation, listed as a function

## Value

Calibration plot or boxplot

## Author(s)

Adrian Antico

See Also

Other Model Evaluation and Interpretation: [AutoLimeAid\(\)](#), [LimeModel\(\)](#), [ParDepCalPlots\(\)](#), [RedYellowGreen\(\)](#), [threshOptim\(\)](#)

Examples

```
## Not run:
# Create fake data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.70, N = 10000000, Classification = TRUE)
data.table::setnames(data, "IDcol_1", "Predict")

# Run function
EvalPlot(data,
  PredictionColName = "Predict",
  TargetColName = "Adrian",
  GraphType = "calibration",
  PercentileBucket = 0.05,
  aggrfun = function(x) mean(x, na.rm = TRUE))

## End(Not run)
```

---

ExecuteSSIS	<i>ExecuteSSIS</i>
-------------	--------------------

---

Description

Run an SSIS package from R. Function will check to make sure you can run an SSIS package and it will remove the output file if it exists so as to not append data on top of it.

Usage

```
ExecuteSSIS(PkgPath = NULL, CSVPath = NULL)
```

Arguments

PkgPath	Path to SSIS package includin the package name and the package extension .dtsx
CSVPath	Path to the csv output data location including the name of the file and the .csv extension

Author(s)

Adrian Antico

---

FakeDataGenerator	<i>FakeDataGenerator</i>
-------------------	--------------------------

---

**Description**

FakeDataGenerator

**Usage**

```
FakeDataGenerator(
  Correlation = 0.7,
  N = 1000L,
  ID = 5L,
  FactorCount = 2L,
  AddDate = TRUE,
  ZIP = 5L,
  TimeSeries = FALSE,
  TimeSeriesTimeAgg = "day",
  ChainLadderData = FALSE,
  Classification = FALSE,
  MultiClass = FALSE
)
```

**Arguments**

Correlation	Set the correlation value for simulated data
N	Number of records
ID	Number of IDcols to include
FactorCount	Number of factor type columns to create
AddDate	Set to TRUE to include a date column
ZIP	Zero Inflation Model target variable creation. Select from 0 to 5 to create that number of distinctly distributed data, stratified from small to large
TimeSeries	For testing AutoBanditSarima
TimeSeriesTimeAgg	Choose from "1min", "5min", "10min", "15min", "30min", "hour", "day", "week", "month", "quarter", "year",
ChainLadderData	Set to TRUE to return Chain Ladder Data for using AutoMLChainLadderTrainer
Classification	Set to TRUE to build classification data
MultiClass	Set to TRUE to build MultiClass data

**Author(s)**

Adrian Antico

**See Also**

Other Data Wrangling: [ColumnSubsetDataTable\(\)](#), [DataDisplayMeta\(\)](#), [FullFactorialCatFeatures\(\)](#), [TimeSeriesMelt\(\)](#)

Examples

```
## Not run:
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.70,
  N = 1000L,
  ID = 2L,
  FactorCount = 2L,
  AddDate = TRUE,
  ZIP = 2L,
  TimeSeries = FALSE,
  ChainLadderData = FALSE,
  Classification = FALSE,
  MultiClass = FALSE)

## End(Not run)
```

---

FinalBuildArfima	<i>FinalBuildArfima</i>
------------------	-------------------------

---

Description

FinalBuildArfima to generate forecasts and ensemble data

Usage

```
FinalBuildArfima(
  ModelOutputGrid = NULL,
  SavePath = NULL,
  TimeSeriesPrepareOutput = NULL,
  FCPeriods = 1,
  MetricSelection = "MAE",
  NumberModelsScore = 1,
  ByDataType = FALSE,
  DebugMode = FALSE
)
```

Arguments

ModelOutputGrid	Pass along the grid output from ParallelOptimizeArima()
SavePath	NULL returns nothing. Set path to return model
TimeSeriesPrepareOutput	Output from TimeSeriesPrepare()
FCPeriods	The number of periods ahead to forecast
MetricSelection	The value returned from TimeSeriesPrepare()
NumberModelsScore	The value returned from TimeSeriesPrepare()
ByDataType	Set to TRUE if you want to have models represented from all data sets utilized in training
DebugMode	Set to TRUE to print steps



Value

Time series data sets to pass onto auto modeling functions

Author(s)

Adrian Antico

See Also

Other Time Series Helper: [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepareWideTimeSeriesEnsembleForecast\(\)](#)

Examples

```
## Not run:
FinalBuildArfima(
  Output = NULL,
  SavePath = NULL,
  TimeSeriesPrepareOutput = NULL,
  MaxFourierTerms = 0,
  TrainValidateShare = c(0.50,0.50),
  MaxNumberModels = 5,
  MaxRunMinutes = 5,
  ByDataType = FALSE,
  DebugMode = FALSE)

## End(Not run)
```

---

FinalBuildArima	<i>FinalBuildArima</i>
-----------------	------------------------

---

Description

FinalBuildArima to generate forecasts and ensemble data

Usage

```
FinalBuildArima(
  SavePath = NULL,
  ModelOutputGrid = NULL,
  TimeSeriesPrepareOutput = NULL,
  FCPeriods = 1,
  MetricSelection = "MAE",
  NumberModelsScore = 1,
  ByDataType = FALSE,
  DebugMode = FALSE
)
```

**Arguments**

SavePath	Supply a path to save the model object and xregs if those were utilized
ModelOutputGrid	Pass along the grid output from ParallelOptimizeArima()
TimeSeriesPrepareOutput	Output from TimeSeriesPrepare()
FCPeriods	The number of periods ahead to forecast
MetricSelection	The value returned from TimeSeriesPrepare()
NumberModelsScore	The value returned from TimeSeriesPrepare()
ByDataType	Set to TRUE if you want to have models represented from all data sets utilized in training
DebugMode	Debugging

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
FinalBuildArima(
  SavePath = NULL,
  Output = NULL,
  TimeSeriesPrepareOutput = NULL,
  MaxFourierTerms = 0,
  TrainValidateShare = c(0.50,0.50),
  MaxNumberModels = 5,
  MaxRunMinutes = 5,
  ByDataType = FALSE,
  DebugMode = TRUE)

## End(Not run)
```

FinalBuildETS

*FinalBuildETS***Description**

FinalBuildETS to generate forecasts and ensemble data

**Usage**

```
FinalBuildETS(
  ModelOutputGrid = NULL,
  SavePath = NULL,
  TimeSeriesPrepareOutput = NULL,
  FCPeriods = 1,
  MetricSelection = "MAE",
  NumberModelsScore = 12,
  ByDataType = FALSE,
  DebugMode = FALSE
)
```

**Arguments**

ModelOutputGrid	Pass along the grid output from ParallelOptimizeArima()
SavePath	NULL returns nothing. Supply a path to return model
TimeSeriesPrepareOutput	Output from TimeSeriesPrepare()
FCPeriods	The number of periods ahead to forecast
MetricSelection	The value returned from TimeSeriesPrepare()
NumberModelsScore	The value returned from TimeSeriesPrepare()
ByDataType	Set to TRUE if you want to have models represented from all data sets utilized in training
DebugMode	Set to TRUE to print steps

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare](#), [WideTimeSeriesEnsembleForecast\(\)](#)

Examples

```
## Not run:
FinalBuildETS(
  Output = NULL,
  TimeSeriesPrepareOutput = NULL,
  MaxFourierTerms = 0,
  TrainValidateShare = c(0.50,0.50),
  MaxNumberModels = 5,
  MaxRunMinutes = 5,
  ByDataType = FALSE,
  DebugMode = FALSE)

## End(Not run)
```

---

FinalBuildNNET	<i>FinalBuildNNET</i>
----------------	-----------------------

---

Description

FinalBuildNNET to generate forecasts and ensemble data

Usage

```
FinalBuildNNET(
  ModelOutputGrid = NULL,
  SavePath = NULL,
  TimeSeriesPrepareOutput = NULL,
  FCPeriods = 1,
  MetricSelection = "MAE",
  NumberModelsScore = 1,
  ByDataType = FALSE,
  DebugMode = FALSE
)
```

Arguments

ModelOutputGrid	Pass along the grid output from ParallelOptimizeArima()
SavePath	NULL returns nothing. Supply path to save model object and xregs if they exist
TimeSeriesPrepareOutput	Output from TimeSeriesPrepare()
FCPeriods	The number of periods ahead to forecast
MetricSelection	The value returned from TimeSeriesPrepare()
NumberModelsScore	The value returned from TimeSeriesPrepare()
ByDataType	Set to TRUE if you want to have models represented from all data sets utilized in training
DebugMode	Set to TRUE to print steps

Value

Time series data sets to pass onto auto modeling functions

Author(s)

Adrian Antico

See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare](#), [WideTimeSeriesEnsembleForecast\(\)](#)

Examples

```
## Not run:
FinalBuildNNET(
  Output = NULL,
  SavePath = NULL,
  TimeSeriesPrepareOutput = NULL,
  MaxFourierTerms = 0,
  TrainValidateShare = c(0.50,0.50),
  MaxNumberModels = 5,
  MaxRunMinutes = 5,
  ByDataType = FALSE,
  DebugMode = FALSE)

## End(Not run)
```

---

FinalBuildTBATS	<i>FinalBuildTBATS</i>
-----------------	------------------------

---

Description

FinalBuildTBATS to generate forecasts and ensemble data

Usage

```
FinalBuildTBATS(
  ModelOutputGrid = NULL,
  SavePath = NULL,
  TimeSeriesPrepareOutput = NULL,
  FCPeriods = 1,
  MetricSelection = "MAE",
  NumberModelsScore = 1,
  ByDataType = FALSE,
  DebugMode = FALSE
)
```

**Arguments**

ModelOutputGrid	Pass along the grid output from ParallelOptimizeArima()
SavePath	NULL returns nothing. Provide a path to save model object
TimeSeriesPrepareOutput	Output from TimeSeriesPrepare()
FCPeriods	The number of periods ahead to forecast
MetricSelection	The value returned from TimeSeriesPrepare()
NumberModelsScore	The value returned from TimeSeriesPrepare()
ByDataType	Set to TRUE if you want to have models represented from all data sets utilized in training
DebugMode	Set to TRUE to print steps

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
FinalBuildTBATS(
  Output = NULL,
  SavePath = NULL,
  TimeSeriesPrepareOutput = NULL,
  MaxFourierTerms = 0,
  TrainValidateShare = c(0.50,0.50),
  MaxNumberModels = 5,
  MaxRunMinutes = 5,
  ByDataType = FALSE,
  DebugMode = FALSE)

## End(Not run)
```

FinalBuildTSLM

*FinalBuildTSLM***Description**

FinalBuildTSLM to generate forecasts and ensemble data

**Usage**

```
FinalBuildTSLM(
  ModelOutputGrid = NULL,
  SavePath = NULL,
  TimeSeriesPrepareOutput = NULL,
  FCPeriods = 1,
  MetricSelection = "MAE",
  NumberModelsScore = 1,
  ByDataType = FALSE,
  DebugMode = FALSE
)
```

**Arguments**

ModelOutputGrid	Pass along the grid output from ParallelOptimizeArima()
SavePath	NULL returns nothing. Set path to save model
TimeSeriesPrepareOutput	Output from TimeSeriesPrepare()
FCPeriods	The number of periods ahead to forecast
MetricSelection	The value returned from TimeSeriesPrepare()
NumberModelsScore	The value returned from TimeSeriesPrepare()
ByDataType	Set to TRUE if you want to have models represented from all data sets utilized in training
DebugMode	TRUE to print out steps

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
FinalBuildTSLM(
  Output = NULL,
  SavePath = NULL,
  TimeSeriesPrepareOutput = NULL,
  MaxFourierTerms = 0,
  TrainValidateShare = c(0.50,0.50),
  MaxNumberModels = 5,
  MaxRunMinutes = 5,
  DebugMode = FALSE)

## End(Not run)
```

---

FullFactorialCatFeatures

*FullFactorialCatFeatures*


---

**Description**

FullFactorialCatFeatures reverses the difference

**Usage**

```
FullFactorialCatFeatures(
  GroupVars = GroupVariables,
  MaxCombin = NULL,
  BottomsUp = TRUE
)
```

**Arguments**

GroupVars	Character vector of categorical columns to fully interact
MaxCombin	The max K in N choose K. If NULL, K will loop through 1 to length(GroupVars)
BottomsUp	TRUE or FALSE. TRUE starts with the most complex interaction to the main effects

**Author(s)**

Adrian Antico

**See Also**

Other Data Wrangling: [ColumnSubsetDataTable\(\)](#), [DataDisplayMeta\(\)](#), [FakeDataGenerator\(\)](#), [TimeSeriesMelt\(\)](#)



---

GenerateParameterGrids

*GenerateParameterGrids creates and stores model results in Experiment Grid*


---

## Description

GenerateParameterGrids creates and stores model results in Experiment Grid

## Usage

```
GenerateParameterGrids(
  Model = NULL,
  test = NULL,
  MinVal = NULL,
  DataSetName = NULL,
  SeasonalDifferences = NULL,
  SeasonalMovingAverages = NULL,
  SeasonalLags = NULL,
  MaxFourierTerms = NULL,
  Differences = NULL,
  MovingAverages = NULL,
  Lags = NULL
)
```

## Arguments

Model	'arima', 'ets', 'tbats', 'nnet', 'arfima', 'tslm', 'dshw'
test	validation data
MinVal	Minimum value of time series
DataSetName	Passthrough
SeasonalDifferences	Passthrough
SeasonalMovingAverages	Passthrough
SeasonalLags	Passthrough
MaxFourierTerms	Passthrough
Differences	Passthrough
MovingAverages	Passthrough
Lags	Passthrough

## Author(s)

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare](#), [WideTimeSeriesEnsembleForecast\(\)](#)

---

GenTSAnomVars

*GenTSAnomVars is an automated z-score anomaly detection via GLM-like procedure*

---

**Description**

GenTSAnomVars is an automated z-score anomaly detection via GLM-like procedure. Data is z-scaled and grouped by factors and time periods to determine which points are above and below the control limits in a cumulative time fashion. Then a cumulative rate is created as the final variable. Set KeepAllCols to FALSE to utilize the intermediate features to create rolling stats from them. The anomalies are separated into those that are extreme on the positive end versus those that are on the negative end.

**Usage**

```
GenTSAnomVars(
  data,
  ValueCol = "Value",
  GroupVars = NULL,
  DateVar = "DATE",
  HighThreshold = 1.96,
  LowThreshold = -1.96,
  KeepAllCols = TRUE,
  IsDataScaled = FALSE
)
```

**Arguments**

data	the source residuals data.table
ValueCol	the numeric column to run anomaly detection over
GroupVars	this is a group by variable
DateVar	this is a time variable for grouping
HighThreshold	this is the threshold on the high end
LowThreshold	this is the threshold on the low end
KeepAllCols	set to TRUE to remove the intermediate features
IsDataScaled	set to TRUE if you already scaled your data

**Value**

The original data.table with the added columns merged in. When KeepAllCols is set to FALSE, you will get back two columns: AnomHighRate and AnomLowRate - these are the cumulative anomaly rates over time for when you get anomalies from above the thresholds (e.g. 1.96) and below the thresholds.

**Author(s)**

Adrian Antico

**See Also**Other Unsupervised Learning: [AutoKMeans\(\)](#), [H2oIsolationForest\(\)](#), [ResidualOutliers\(\)](#)**Examples**

```
## Not run:
data <- data.table::data.table(
  DateTime = as.Date(Sys.time()),
  Target = stats::filter(
    rnorm(10000, mean = 50, sd = 20),
    filter=rep(1,10),
    circular=TRUE))
data[, temp := seq(1:10000)][, DateTime := DateTime - temp][
  , temp := NULL]
data <- data[order(DateTime)]
x <- data.table::as.data.table(sde::GBM(N=10000)*1000)
data[, predicted := x[-1,]]
data[, Fact1 := sample(letters, size = 10000, replace = TRUE)]
data[, Fact2 := sample(letters, size = 10000, replace = TRUE)]
data[, Fact3 := sample(letters, size = 10000, replace = TRUE)]
stuff <- GenTSAnomVars(
  data,
  ValueCol = "Target",
  GroupVars = c("Fact1","Fact2","Fact3"),
  DateVar = "DateTime",
  HighThreshold = 1.96,
  LowThreshold = -1.96,
  KeepAllCols = TRUE,
  IsDataScaled = FALSE)

## End(Not run)
```

H2oAutoencoder

*H2oAutoencoder for anomaly detection and dimensionality reduction***Description**

H2oAutoencoder for anomaly detection and or dimensionality reduction

**Usage**

```
H2oAutoencoder(
  AnomalyDetection = TRUE,
  DimensionReduction = TRUE,
  data,
  ValidationData = NULL,
  Features = NULL,
  RemoveFeatures = FALSE,
  NThreads = max(1L, parallel::detectCores() - 2L),
```

```

MaxMem = "28G",
H2oShutdown = TRUE,
ModelID = "TestModel",
LayerStructure = NULL,
ReturnLayer = 4L,
per_feature = TRUE,
Activation = "Tanh",
Epochs = 5L,
L2 = 0.1,
ElasticAveraging = TRUE,
ElasticAveragingMovingRate = 0.9,
ElasticAveragingRegularization = 0.001
)

```

### Arguments

AnomalyDetection	Set to TRUE to run anomaly detection
DimensionReduction	Set to TRUE to run dimension reduction
data	The data.table with the columns you wish to have analyzed
ValidationData	The data.table with the columns you wish to have scored
Features	NULL Column numbers or column names
RemoveFeatures	Set to TRUE if you want the features you specify in the Features argument to be removed from the data returned
NThreads	max(1L, parallel::detectCores()-2L)
MaxMem	"28G"
H2oShutdown	Setting to TRUE will shutdown H2O when it done being used internally.
ModelID	"TestModel"
LayerStructure	a
ReturnLayer	Which layer of the NNet to return. Choose from 1-7 with 4 being the layer with the least amount of nodes
per_feature	Set to TRUE to have per feature anomaly detection generated. Otherwise and overall value will be generated
Activation	Choose from "Tanh", "TanhWithDropout", "Rectifier", "RectifierWithDropout", "Maxout", "MaxoutWithDropout"
Epochs	Quantile value to find the cutoff value for classifying outliers
L2	Specify the amount of memory to allocate to H2O. E.g. "28G"
ElasticAveraging	Specify the number of threads (E.g. cores * 2)
ElasticAveragingMovingRate	Specify the number of decision trees to build
ElasticAveragingRegularization	Specify the row sample rate per tree

### Value

A data.table

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:

# Create simulated data

# Define correlation strength of features to target
Correl <- 0.85

# Number of rows you want returned
N <- 10000

# Create data
data <- data.table::data.table(Adrian = runif(N))
data[, x1 := qnorm(Adrian)]
data[, x2 := runif(N)]
data[, Independent_Variable1 := log(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data[, Independent_Variable2 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data[, Independent_Variable3 := exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data[, Independent_Variable4 := exp(exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2))))]
data[, Independent_Variable5 := sqrt(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data[, Independent_Variable6 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.10]
data[, Independent_Variable7 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.25]
data[, Independent_Variable8 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.75]
data[, Independent_Variable9 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^2]
data[, Independent_Variable10 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^4]
data[, Independent_Variable11 := as.factor(
  data.table::fifelse(Independent_Variable2 < 0.15, "A",
    data.table::fifelse(Independent_Variable2 < 0.45, "B",
      data.table::fifelse(Independent_Variable2 < 0.65, "C",
        data.table::fifelse(Independent_Variable2 < 0.85, "D", "E")))))]
data.table::set(data, j = c("x1", "x2"), value = NULL)

# Get number of columns for LayerStructure
N <- length(names(data)[2L:ncol(data)])

# Run algo
Output <- RemixAutoML::H2oAutoencoder(

  # Select the service
  AnomalyDetection = TRUE,
  DimensionReduction = TRUE,

  # Data related args
  data = data,
```

```

ValidationData = NULL,
Features = names(data)[2L:ncol(data)],
RemoveFeatures = FALSE,

# H2O args
NThreads = max(1L, parallel::detectCores()-2L),
MaxMem = "28G",
H2oShutdown = TRUE,
ModelID = "TestModel",
LayerStructure = NULL,
ReturnLayer = 4L,
per_feature = TRUE,
Activation = "Tanh",
Epochs = 5L,
L2 = 0.10,
ElasticAveraging = TRUE,
ElasticAveragingMovingRate = 0.90,
ElasticAveragingRegularization = 0.001)

# Inspect output
Data <- Output$Data
Model <- Output$Model

# If ValidationData is not null
ValidationData <- Output$ValidationData

## End(Not run)

```

---

H2oIsolationForest	<i>H2oIsolationForest for anomaly detection</i>
--------------------	---

---

## Description

H2oIsolationForest for anomaly detection

## Usage

```

H2oIsolationForest(
  data,
  TestData = NULL,
  ColumnNumbers = NULL,
  Threshold = 0.975,
  MaxMem = "28G",
  NThreads = -1,
  NTrees = 100,
  SampleRate = (sqrt(5) - 1)/2
)

```

## Arguments

data	The data.table with the columns you wish to have analyzed
TestData	Data for scoring the trained isolation forest
ColumnNumbers	A vector with the column numbers you wish to analyze

Threshold	Quantile value to find the cutoff value for classifying outliers
MaxMem	Specify the amount of memory to allocate to H2O. E.g. "28G"
NThreads	Specify the number of threads (E.g. cores * 2)
NTrees	Specify the number of decision trees to build
SampleRate	Specify the row sample rate per tree

**Value**

A data.table

**Author(s)**

Adrian Antico

**See Also**

Other Unsupervised Learning: [AutoKMeans\(\)](#), [GenTSAnomVars\(\)](#), [ResidualOutliers\(\)](#)

**Examples**

```
## Not run:

# Create simulated data

# Define correlation strength of features to target
Correl <- 0.85

# Number of rows you want returned
N <- 10000L

# Create data
data <- data.table::data.table(Target = runif(N))
data[, x1 := qnorm(Target)]
data[, x2 := runif(N)]
data[, Independent_Variable1 := log(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data[, Independent_Variable2 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data[, Independent_Variable3 := exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data[, Independent_Variable4 := exp(exp(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2))))]
data[, Independent_Variable5 := sqrt(pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data[, Independent_Variable6 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.10]
data[, Independent_Variable7 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.25]
data[, Independent_Variable8 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^0.75]
data[, Independent_Variable9 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^2]
data[, Independent_Variable10 := (pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))^4]
data[, Target := as.factor(
  data.table::fifelse(Independent_Variable2 < 0.20, "A",
    data.table::fifelse(Independent_Variable2 < 0.40, "B",
      data.table::fifelse(Independent_Variable2 < 0.6, "C",
        data.table::fifelse(Independent_Variable2 < 0.8, "D", "E")))))]
data[, Independent_Variable11 := as.factor(
  data.table::fifelse(Independent_Variable2 < 0.15, "A",
    data.table::fifelse(Independent_Variable2 < 0.45, "B",
      data.table::fifelse(Independent_Variable2 < 0.65, "C",
        data.table::fifelse(Independent_Variable2 < 0.85, "D", "E")))))]
data.table::set(data, j = c("x1", "x2"), value = NULL)
```

```
# Run algo
Outliers <- H2oIsolationForest(data,
                                TestData = NULL,
                                ColumnNumbers = NULL,
                                Threshold = 0.95,
                                MaxMem = "28G",
                                NThreads = -1,
                                NTrees = 100,
                                SampleRate = (sqrt(5)-1)/2)

## End(Not run)
```

---

ID\_BuildTrainDataSets *ID\_BuildTrainDataSets for assembling data*

---

## Description

ID\_BuildTrainDataSets for assembling data for the IntermittentDemandBootStrapper() function.

## Usage

```
ID_BuildTrainDataSets(
  MetaData,
  data,
  Case = 2L,
  TargetVariableName = NULL,
  DateVariableName = NULL,
  GroupingVariables = NULL,
  FC_Periods,
  TimeUnit = "week",
  PowerRate = 0.5,
  SampleRate = 5L,
  TargetWindowSamples = 5L
)
```

## Arguments

MetaData	This is the metadata returned from the ID_MetadataGenerator() function
data	This is your transactional data
Case	Indicate which data constructor method to use
TargetVariableName	Your target variable names
DateVariableName	Your date variable names
GroupingVariables	Your grouping variables
FC_Periods	The number of periods to forecast
TimeUnit	The time period unit, such as "day", "week", or "month"



PowerRate	The calculated for determining the total samples is number of records to the power of PowerRate. Then that values is multiplied by the SampleRate. This ensures that a more representative sample is generated across the data set.
SampleRate	The value used to sample from each level of the grouping variables
TargetWindowSamples	The number of different targets to utilize for a single random start date

**Value**

Returns the count modeling data and the size modeling data

**See Also**

Other Feature Engineering Helper: [AutoFourierFeatures\(\)](#), [ID\\_MetadataGenerator\(\)](#), [ID\\_TrainingDataGenerator\(\)](#), [ID\\_TrainingDataGenerator\(\)](#)

---

ID\_MetadataGenerator    *ID\_MetadataGenerator for summary metadata for transactional data*

---

**Description**

ID\_MetadataGenerator for summary metadata for transactional data. The data returned from this function feeds into the IntermittentDemandBootStrapper() function.

**Usage**

```
ID_MetadataGenerator(
  data,
  RestrictDateRange = TRUE,
  DateVariableName = NULL,
  GroupingVariables = NULL,
  MinTimeWindow = 1L,
  MinTxnRecords = 2L,
  DateInterval = "day"
)
```

**Arguments**

data	This is your transactional level data
RestrictDateRange	
	= TRUE
DateVariableName	
	Bla
GroupingVariables	
	Bla
MinTimeWindow	The number of time periods you would like to omit for training. Default is 1 so that at a minimum, there is at least one period of values to forecast. You can set it up to a larger value if you do not want more possible target windows for the lower target window values.
MinTxnRecords	I typically set this to 2 so that there is at least one other instance of demand so that the forecasted values are not complete nonsense.
DateInterval	This is the time unit for determining date calculations

**Value**

Returns a data.table with summary information for the IntermittentDemandBootStrapper() function.

**See Also**

Other Feature Engineering Helper: [AutoFourierFeatures\(\)](#), [ID\\_BuildTrainDataSets\(\)](#), [ID\\_TrainingDataGenerator\(\)](#), [ID\\_TrainingDataGenerator\(\)](#)

**Examples**

```
## Not run:
# Generate Metadata----
MetaData <- ID_MetadataGenerator(
  data = data,
  RestrictDateRange = TRUE,
  DateVariableName = DateVariableName,
  GroupingVariables = GroupingVariables,
  MinTimeWindow = MinTimeWindow,
  MinTxnRecords = MinTxnRecords,
  DateInterval = TimeUnit,
  TimeUnit = TimeUnit
)

## End(Not run)
```

---

ID\_TrainingDataGenerator

*ID\_TrainingDataGenerator for subsetting data*

---

**Description**

ID\_TrainingDataGenerator for subsetting data for the IntermittentDemandBootStrapper() function.

**Usage**

```
ID_TrainingDataGenerator(
  data,
  Type = "timetoevent1",
  TargetVariableName = NULL,
  Level = NULL,
  DateVariableName = NULL,
  GroupingVariables = NULL,
  RandomStartDate = NULL,
  TimeUnit = NULL,
  TargetWindow = NULL
)
```

**Arguments**

data	Source data
Type	"timetoevent1", "eventinwindow1"

TargetVariableName	Name of the variables to run feature engineering on. List the actual target variable name first.
Level	The individual level of your group variable
DateVariableName	Name of your date variable
GroupingVariables	Your grouping variables
RandomStartDate	The date to partition the data
TimeUnit	This is the TimeUnit you selected for aggregation
TargetWindow	The length of the target window sampled

**Value**

Returns two data sets for the IntermittentDemandBootStrapper() function based on a single level from the grouping variables.

**See Also**

Other Feature Engineering Helper: [AutoFourierFeatures\(\)](#), [ID\\_BuildTrainDataSets\(\)](#), [ID\\_MetadataGenerator\(\)](#), [ID\\_TrainingDataGenerator2\(\)](#)

---

ID\_TrainingDataGenerator2

*ID\_TrainingDataGenerator2 for subsetting data*

---

**Description**

ID\_TrainingDataGenerator2 for subsetting data for the IntermittentDemandBootStrapper() function.

**Usage**

```
ID_TrainingDataGenerator2(
  data,
  TargetVariableName = NULL,
  Level = NULL,
  GroupingVariables = NULL,
  DateVariableName = NULL,
  RandomStartDate = NULL,
  TimeUnit = NULL,
  TargetWindow = NULL
)
```

**Arguments**

data	Source data
TargetVariableName	vector of variable names
Level	The individual level of your group variable
GroupingVariables	Your grouping variables
DateVariableName	Name of your date variable
RandomStartDate	The date to partition the data
TimeUnit	This is the TimeUnit you selected for aggregation
TargetWindow	The length of the target window sampled

**Value**

Returns two data sets for the `IntermittentDemandBootStrapper()` function based on a single level from the grouping variables.

**See Also**

Other Feature Engineering Helper: [AutoFourierFeatures\(\)](#), [ID\\_BuildTrainDataSets\(\)](#), [ID\\_MetadataGenerator\(\)](#), [ID\\_TrainingDataGenerator\(\)](#)

---

IntermittentDemandScoringDataGenerator  
*IntermittentDemandScoringDataGenerator*

---

**Description**

`IntermittentDemandScoringDataGenerator` creates the scoring data for forecasting. It will recreate the same features used for modeling, take the most recent record, and then duplicate those records for each forecast period specified.

**Usage**

```
IntermittentDemandScoringDataGenerator(  
  data = NULL,  
  FC_Periods = 52,  
  SaveData = FALSE,  
  FilePath = NULL,  
  TargetVariableName = "qty",  
  DateVariableName = "date",  
  GroupingVariables = "sku",  
  Lags = 1:7,  
  MovingAverages = seq(7, 28, 7),  
  TimeTrendVariable = TRUE,  
  TimeUnit = "day",  
  CurrentDate = NULL,
```

```

    CalendarVariables = c("wday", "mday", "yday", "week", "isoweek", "month", "quarter",
                          "year"),
    HolidayGroups = "USPublicHolidays"
)

```

### Arguments

<code>data</code>	This is your source data
<code>FC_Periods</code>	The number of periods you set up to forecast
<code>SaveData</code>	Set to TRUE to save the output data to file
<code>FilePath</code>	Set a path file have the data saved there
<code>TargetVariableName</code>	Name or column number of your target variable
<code>DateVariableName</code>	Name or column number of your date variable
<code>GroupingVariables</code>	Name or column number of your group variables
<code>Lags</code>	The number of lags used in building the modeling data sets
<code>MovingAverages</code>	The number of moving averages used in building the modeling data sets
<code>TimeTrendVariable</code>	Set to TRUE if you did so in model data creation
<code>TimeUnit</code>	Set to the same time unit used in modeling data creation
<code>CurrentDate</code>	Set this to the current date or a date that you want. It is user specified in case you want to score historical data.
<code>CalendarVariables</code>	Set this to the same setting you used in modeling data creation
<code>HolidayGroups</code>	Set this to the same setting you used in modeling data creation

### Value

Returns the most recent records for every level of your grouping variables with all the feature used in model building

### Author(s)

Adrian Antico

### See Also

Other Automated Model Scoring: [AutoCatBoostScoring\(\)](#), [AutoH2OMLScoring\(\)](#), [AutoH2OModeler\(\)](#), [AutoHurdleScoring\(\)](#), [AutoXGBoostScoring\(\)](#)

### Examples

```

## Not run:
ScoringData <- IntermittentDemandScoringDataGenerator(
  data = data,
  SaveData = FALSE,
  FilePath = NULL,
  TargetVariableName = "qty",
  DateVariableName = "date",

```

```

    GroupingVariables = "sku",
    Lags = 1:7,
    MovingAverages = seq(7,28,7),
    TimeTrendVariable = TRUE,
    TimeUnit = "day",
    CurrentDate = NULL,
    CalendarVariables = c("wday",
                          "mday",
                          "yday",
                          "week",
                          "isoweek",
                          "month",
                          "quarter",
                          "year"),
    HolidayGroups = "USPublicHolidays")

## End(Not run)

```

---

LimeModel

*LimeModel to build a lime model*


---

## Description

LimeModel to build a lime model for prediction explanations in this package#'

## Usage

```

LimeModel(
  data,
  Model = NULL,
  Bins = 10,
  ModelType = "xgboost",
  NThreads = parallel::detectCores(),
  MaxMem = "32G",
  ModelPath = NULL,
  ModelID = NULL
)

```

## Arguments

data	Supply a training data set. This data set should be the data right before it gets converted to an h2o, catboost, or xgboost data object.
Model	Supply the model returned from training with the Auto__() functions.
Bins	Number of bins for discretizing numeric features
ModelType	Select from xgboost, h2o, and catboost
NThreads	Number of CPU threads
MaxMem	For use with H2O models. E.g. set to "28G"
ModelPath	Set to the path where your ML model is saved
ModelID	ID used to identify your ML model

**Value**

Model for utilizing lime

**Author(s)**

Adrian Antico

**See Also**

Other Model Evaluation and Interpretation: [AutoLimeAid\(\)](#), [EvalPlot\(\)](#), [ParDepCalPlots\(\)](#), [RedYellowGreen\(\)](#), [threshOptim\(\)](#)

---

Logger	<i>Logger</i>
--------	---------------

---

**Description**

Logging errors and warnings from repeated calls to a function

**Usage**

```
Logger(x)
```

**Arguments**

x	Function to call repeatedly
---	-----------------------------

**Author(s)**

Adrian Antico

**See Also**

Other Misc: [AutoH20TextPrepScoring\(\)](#), [DeleteFile\(\)](#), [PrintToPDF\(\)](#), [tokenizeH20\(\)](#)

**Examples**

```
## Not run:  
Output <- lapply(1:10, FUN = Logger(PrintToPDF))  
  
## End(Not run)
```

---

ModelDataPrep*Final Data Preparation Function*

---

**Description**

This function replaces inf values with NA, converts characters to factors, and imputes with constants

**Usage**

```
ModelDataPrep(  
  data,  
  Impute = TRUE,  
  CharToFactor = TRUE,  
  FactorToChar = FALSE,  
  IntToNumeric = TRUE,  
  LogicalToBinary = FALSE,  
  DateToChar = FALSE,  
  RemoveDates = FALSE,  
  MissFactor = "0",  
  MissNum = -1,  
  IgnoreCols = NULL  
)
```

**Arguments**

data	This is your source data you'd like to modify
Impute	Defaults to TRUE which tells the function to impute the data
CharToFactor	Defaults to TRUE which tells the function to convert characters to factors
FactorToChar	Converts to character
IntToNumeric	Defaults to TRUE which tells the function to convert integers to numeric
LogicalToBinary	Converts logical values to binary numeric values
DateToChar	Converts date columns into character columns
RemoveDates	Defaults to FALSE. Set to TRUE to remove date columns from your data.table
MissFactor	Supply the value to impute missing factor levels
MissNum	Supply the value to impute missing numeric values
IgnoreCols	Supply column numbers for columns you want the function to ignore

**Value**

Returns the original data table with corrected values

**Author(s)**

Adrian Antico



**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
# Create fake data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.75,
  N = 250000L,
  ID = 2L,
  ZIP = 0L,
  FactorCount = 6L,
  AddDate = TRUE,
  Classification = FALSE,
  MultiClass = FALSE)

# Check column types
str(data)

# Convert some factors to character
data <- RemixAutoML::ModelDataPrep(
  data,
  Impute      = TRUE,
  CharToFactor = FALSE,
  FactorToChar = TRUE,
  IntToNumeric = TRUE,
  LogicalToBinary = FALSE,
  DateToChar   = FALSE,
  RemoveDates  = TRUE,
  MissFactor   = "0",
  MissNum      = -1,
  IgnoreCols   = c("Factor_1"))

# Check column types
str(data)

## End(Not run)
```

---

multiplot

---

*Multiplot is a function for combining multiple plots*


---

**Description**

Sick of copying this one into your code? Well, not anymore.

**Usage**

```
multiplot(..., plotlist = NULL, cols = 2, layout = NULL)
```

**Arguments**

...	Passthrough arguments
plotlist	This is the list of your charts
cols	This is the number of columns in your multiplot
layout	Leave NULL

**Value**

Multiple ggplots on a single image

**Author(s)**

Adrian Antico

**See Also**

Other Graphics: [ChartTheme\(\)](#), [RemixTheme\(\)](#), [TimeSeriesPlotter\(\)](#)

**Examples**

```
## Not run:
Correl <- 0.85
data <- data.table::data.table(Target = runif(100))
data[, x1 := qnorm(Target)]
data[, x2 := runif(100)]
data[, Independent_Variable1 := log(
  pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
data[, Predict := (
  pnorm(Correl * x1 + sqrt(1-Correl^2) * qnorm(x2)))]
p1 <- RemixAutoML::ParDepCalPlots(
  data,
  PredictionColName = "Predict",
  TargetColName = "Target",
  IndepVar = "Independent_Variable1",
  GraphType = "calibration",
  PercentileBucket = 0.20,
  FactLevels = 10,
  Function = function(x) mean(x, na.rm = TRUE))
p2 <- RemixAutoML::ParDepCalPlots(
  data,
  PredictionColName = "Predict",
  TargetColName = "Target",
  IndepVar = "Independent_Variable1",
  GraphType = "boxplot",
  PercentileBucket = 0.20,
  FactLevels = 10,
  Function = function(x) mean(x, na.rm = TRUE))
RemixAutoML::multiplot(plotlist = list(p1,p2), cols = 2)

## End(Not run)
```

---

OptimizeArfima	<i>OptimizeArfima is a function that takes raw data and returns time series data</i>
----------------	--

---

## Description

OptimizeArfima is a function that takes raw data and returns the necessary time series data and objects for model building. It also fills any time gaps with zeros. Use this before you run any time series model functions.

## Usage

```
OptimizeArfima(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  Lags = NULL,
  MovingAverages = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  TrainValidateShare = NULL,
  FinalGrid = NULL
)
```

## Arguments

Output	This is passed through as output from TimeSeriesDataPrepare() and passed through ParallelArima()
Path	Path to where you want the model and xregs saved. Leave NULL to not save.
MetricSelection	Select from "MSE", "MAE", or "MAPE"
DataSetName	This is the name of the data set passed through in parallel loop
train	Training data returned from TimeSeriesDataPrepare()
test	Test data returned from TimeSeriesDataPrepare()
Lags	Max lags
MovingAverages	Max moving averages
FullData	Full series data for scoring and ensemble
HoldOutPeriods	Holdout periods returned from TimeSeriesDataPrepare()
MinVal	Minimum value of target variable returned from TimeSeriesDataPrepare()
TargetName	Target variable name returned from TimeSeriesDataPrepare()
DateName	Date variable name returned from TimeSeriesDataPrepare()

TrainValidateShare	A two-element numeric vector. The first element is the weight applied to the training performance and the remainder is applied to the validation performance.
FinalGrid	Grid for forecasting models

Value

Time series data sets to pass onto auto modeling functions

Author(s)

Adrian Antico

See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare](#), [WideTimeSeriesEnsembleForecast\(\)](#)

Examples

```
## Not run:
Results <- OptimizeArfima(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  Lags = NULL,
  MovingAverages = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  TrainValidateShare = NULL,
  FinalGrid = NULL)

## End(Not run)
```

---

OptimizeArima	<i>OptimizeArima is a function that takes raw data and returns time series data</i>
---------------	---

---

Description

OptimizeArima is a function that takes raw data and returns the necessary time series data and objects for model building. It also fills any time gaps with zeros. Use this before you run any time series model functions.

**Usage**

```

OptimizeArima(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  Lags = NULL,
  SeasonalLags = NULL,
  MovingAverages = NULL,
  SeasonalMovingAverages = NULL,
  Differences = NULL,
  SeasonalDifferences = NULL,
  MaxFourierTerms = NULL,
  TrainValidateShare = NULL,
  MaxRunsWithoutNewWinner = 20,
  MaxNumberModels = NULL,
  MaxRunMinutes = NULL,
  FinalGrid = NULL,
  DebugMode = FALSE
)

```

**Arguments**

Output	This is passed through as output from TimeSeriesDataPrepare() and passed through ParallelArima()
Path	Path to where you want the model and xregs saved. Leave NULL to not save.
MetricSelection	Select from "MSE", "MAE", or "MAPE"
DataSetName	This is the name of the data set passed through in parallel loop
train	Training data returned from TimeSeriesDataPrepare()
test	Test data returned from TimeSeriesDataPrepare()
FullData	Full series data for scoring and ensemble
HoldOutPeriods	Holdout periods returned from TimeSeriesDataPrepare()
MinVal	Minimum value of target variable returned from TimeSeriesDataPrepare()
TargetName	Target variable name returned from TimeSeriesDataPrepare()
DateName	Date variable name returned from TimeSeriesDataPrepare()
Lags	Max value of lag returned from TimeSeriesDataPrepare()
SeasonalLags	Max value of seasonal lags returned from TimeSeriesDataPrepare()
MovingAverages	Max value of moving averages
SeasonalMovingAverages	Max value of seasonal moving average

Differences	Max value of difference returned from TimeSeriesDataPrepare()
SeasonalDifferences	Max value of seasonal difference returned from TimeSeriesDataPrepare()
MaxFourierTerms	Max value of fourier pairs
TrainValidateShare	A two-element numeric vector. The first element is the weight applied to the training performance and the remainder is applied to the validation performance.
MaxRunsWithoutNewWinner	The number of runs without a new winner which if passed tells the function to stop
MaxNumberModels	The number of models you want to test.
MaxRunMinutes	Time
FinalGrid	If NULL, regular train optimization occurs. If the grid is supplied, final builds are conducted.
DebugMode	Debugging

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
Results <- OptimizeArima(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  Lags = NULL,
  SeasonalLags = NULL,
  MovingAverages = NULL,
```

```

SeasonalMovingAverages = NULL,
Differences = NULL,
SeasonalDifferences = NULL,
MaxFourierTerms = NULL,
TrainValidateShare = NULL,
MaxRunsWithoutNewWinner = 20,
MaxNumberModels = 5,
MaxRunMinutes = NULL,
FinalGrid = NULL)

## End(Not run)

```

OptimizeETS

*OptimizeETS is a function that takes raw data and returns time series data*

## Description

OptimizeETS is a function that takes raw data and returns the necessary time series data and objects for model building. It also fills any time gaps with zeros. Use this before you run any time series model functions.

## Usage

```

OptimizeETS(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  TrainValidateShare = NULL,
  FinalGrid = NULL
)

```

## Arguments

Output	This is passed through as output from TimeSeriesDataPrepare() and passed through ParallelArima()
Path	Path to where you want the model and xregs saved. Leave NULL to not save.
MetricSelection	Select from "MSE", "MAE", or "MAPE"
DataSetName	This is the name of the data set passed through in parallel loop
train	Training data returned from TimeSeriesDataPrepare()
test	Test data returned from TimeSeriesDataPrepare()

FullData	Full series data for scoring and ensemble
HoldOutPeriods	Holdout periods returned from TimeSeriesDataPrepare()
MinVal	Minimum value of target variable returned from TimeSeriesDataPrepare()
TargetName	Target variable name returned from TimeSeriesDataPrepare()
DateName	Date variable name returned from TimeSeriesDataPrepare()
TrainValidateShare	A two-element numeric vector. The first element is the weight applied to the training performance and the remainder is applied to the validation performance.
FinalGrid	Grid for forecasting models

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
Results <- OptimizeETS(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  TrainValidateShare = NULL,
  FinalGrid = NULL)

## End(Not run)
```



---

OptimizeNNET	<i>OptimizeNNET is a function that takes raw data and returns time series data</i>
--------------	--

---

## Description

OptimizeNNET is a function that takes raw data and returns the necessary time series data and objects for model building. It also fills any time gaps with zeros. Use this before you run any time series model functions.

## Usage

```
OptimizeNNET(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  Lags = NULL,
  SeasonalLags = NULL,
  MaxFourierTerms = NULL,
  TrainValidateShare = NULL,
  MaxRunsWithoutNewWinner = 20,
  MaxNumberModels = NULL,
  MaxRunMinutes = NULL,
  FinalGrid = NULL
)
```

## Arguments

Output	This is passed through as output from TimeSeriesDataPrepare() and passed through ParallelArima()
Path	Path to where you want the model and xregs saved. Leave NULL to not save.
MetricSelection	Select from "MSE", "MAE", or "MAPE"
DataSetName	This is the name of the data set passed through in parallel loop
train	Training data returned from TimeSeriesDataPrepare()
test	Test data returned from TimeSeriesDataPrepare()
FullData	Full series data for scoring and ensemble
HoldOutPeriods	Holdout periods returned from TimeSeriesDataPrepare()
MinVal	Minimum value of target variable returned from TimeSeriesDataPrepare()
TargetName	Target variable name returned from TimeSeriesDataPrepare()

DateName	Date variable name returned from TimeSeriesDataPrepare()
Lags	Max value of lag returned from TimeSeriesDataPrepare()
SeasonalLags	Max value of seasonal lags returned from TimeSeriesDataPrepare()
MaxFourierTerms	Max value of fourier pairs
TrainValidateShare	A two-element numeric vector. The first element is the weight applied to the training performance and the remainder is applied to the validation performance.
MaxRunsWithoutNewWinner	The number of runs without a new winner which if passed tells the function to stop
MaxNumberModels	The number of models you want to test.
MaxRunMinutes	Time
FinalGrid	If NULL, regular train optimization occurs. If the grid is supplied, final builds are conducted.

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
Results <- OptimizeNNET(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  Lags = NULL,
  SeasonalLags = NULL,
  MaxFourierTerms = NULL,
  TrainValidateShare = NULL,
```

```

MaxRunsWithoutNewWinner = 20,
MaxNumberModels = 5,
MaxRunMinutes = NULL,
FinalGrid = NULL)

## End(Not run)

```

---

OptimizeTBATS

*OptimizeTBATS is a function that takes raw data and returns time series data*


---

### Description

OptimizeTBATS is a function that takes raw data and returns the necessary time series data and objects for model building. It also fills any time gaps with zeros. Use this before you run any time series model functions.

### Usage

```

OptimizeTBATS(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  Lags = NULL,
  MovingAverages = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  TrainValidateShare = NULL,
  FinalGrid = NULL
)

```

### Arguments

Output	This is passed through as output from TimeSeriesDataPrepare() and passed through ParallelArima()
Path	Path to where you want the model and xregs saved. Leave NULL to not save.
MetricSelection	Select from "MSE", "MAE", or "MAPE"
DataSetName	This is the name of the data set passed through in parallel loop
train	Training data returned from TimeSeriesDataPrepare()
test	Test data returned from TimeSeriesDataPrepare()
Lags	Max lags
MovingAverages	Max moving averages

FullData	Full series data for scoring and ensemble
HoldOutPeriods	Holdout periods returned from TimeSeriesDataPrepare()
MinVal	Minimum value of target variable returned from TimeSeriesDataPrepare()
TargetName	Target variable name returned from TimeSeriesDataPrepare()
DateName	Date variable name returned from TimeSeriesDataPrepare()
TrainValidateShare	A two-element numeric vector. The first element is the weight applied to the training performance and the remainder is applied to the validation performance.
FinalGrid	Grid for forecasting models

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
Results <- OptimizeTBATS(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  Lags = NULL,
  MovingAverages = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  TrainValidateShare = NULL,
  FinalGrid = NULL)

## End(Not run)
```

---

OptimizeTSLM	<i>OptimizeTSLM is a function that takes raw data and returns time series data</i>
--------------	--

---

## Description

OptimizeTSLM is a function that takes raw data and returns the necessary time series data and objects for model building. It also fills any time gaps with zeros. Use this before you run any time series model functions.

## Usage

```
OptimizeTSLM(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  TrainValidateShare = NULL,
  FinalGrid = NULL
)
```

## Arguments

Output	This is passed through as output from TimeSeriesDataPrepare() and passed through ParallelArima()
Path	Path to where you want the model and xregs saved. Leave NULL to not save.
MetricSelection	Select from "MSE", "MAE", or "MAPE"
DataSetName	This is the name of the data set passed through in parallel loop
train	Training data returned from TimeSeriesDataPrepare()
test	Test data returned from TimeSeriesDataPrepare()
FullData	Full series data for scoring and ensemble
HoldOutPeriods	Holdout periods returned from TimeSeriesDataPrepare()
MinVal	Minimum value of target variable returned from TimeSeriesDataPrepare()
TargetName	Target variable name returned from TimeSeriesDataPrepare()
DateName	Date variable name returned from TimeSeriesDataPrepare()
TrainValidateShare	A two-element numeric vector. The first element is the weight applied to the training performance and the remainder is applied to the validation performance.
FinalGrid	Grid for forecasting models

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
Results <- OptimizeTSLM(
  Output,
  Path = NULL,
  MetricSelection = "MAE",
  DataSetName = NULL,
  train = NULL,
  test = NULL,
  FullData = NULL,
  HoldOutPeriods = NULL,
  MinVal = NULL,
  TargetName = NULL,
  DateName = NULL,
  TrainValidateShare = NULL,
  FinalGrid = NULL)

## End(Not run)
```

---

ParallelAutoArfima	<i>ParallelAutoArfima</i>
--------------------	---------------------------

---

**Description**

ParallelAutoArfima to run the 4 data sets at once

**Usage**

```
ParallelAutoArfima(
  Output,
  MetricSelection = "MAE",
  TrainValidateShare = c(0.5, 0.5),
  NumCores = max(1L, min(4L, parallel::detectCores() - 2L))
)
```

**Arguments**

Output	The output returned from TimeSeriesDataPrepare()
MetricSelection	Choose from MAE, MSE, and MAPE
TrainValidateShare	The value returned from TimeSeriesPrepare()
NumCores	Default of max(1L, min(4L, parallel::detectCores())). Up to 4 cores can be utilized.

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
ParallelAutoArfima(
  MetricSelection = "MAE",
  Output = NULL,
  TrainValidateShare = c(0.50, 0.50),
  NumCores = max(1L, min(4L, parallel::detectCores()-2L)))

## End(Not run)
```

---

ParallelAutoARIMA

---

*ParallelAutoARIMA to run the 4 data sets at once*


---

**Description**

ParallelAutoARIMA to run the 4 data sets at once

**Usage**

```
ParallelAutoARIMA(
  Output,
  MetricSelection = "MAE",
  MaxFourierTerms = 1L,
  TrainValidateShare = c(0.5, 0.5),
```

```

    MaxNumberModels = 20,
    MaxRunMinutes = 5L,
    MaxRunsWithoutNewWinner = 12,
    NumCores = max(1L, min(4L, parallel::detectCores()))
)

```

### Arguments

Output	The output returned from TimeSeriesDataPrepare()
MetricSelection	Choose from MAE, MSE, and MAPE
MaxFourierTerms	Fourier pairs
TrainValidateShare	c(0.50,0.50)
MaxNumberModels	20
MaxRunMinutes	5
MaxRunsWithoutNewWinner	12
NumCores	Default of max(1L, min(4L, parallel::detectCores())). Up to 4 cores can be utilized.

### Value

Time series data sets to pass onto auto modeling functions

### Author(s)

Adrian Antico

### See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepareWideTimeSeriesEnsembleForecast\(\)](#)

### Examples

```

## Not run:
ParallelAutoARIMA(
  MetricSelection = "MAE",
  Output = NULL,
  MaxRunsWithoutNewWinner = 20,
  TrainValidateShare = c(0.50,0.50),
  MaxNumberModels = 5,
  MaxRunMinutes = 5,
  NumCores = max(1L, min(4L, parallel::detectCores()))

## End(Not run)

```



ParallelAutoETS

*ParallelAutoETS***Description**

ParallelAutoETS to run the 4 data sets at once

**Usage**

```
ParallelAutoETS(
  Output,
  MetricSelection = "MAE",
  TrainValidateShare = c(0.5, 0.5),
  NumCores = max(1L, min(4L, parallel::detectCores() - 2L))
)
```

**Arguments**

Output	The output returned from TimeSeriesDataPrepare()
MetricSelection	Choose from MAE, MSE, and MAPE
TrainValidateShare	The value returned from TimeSeriesPrepare()
NumCores	Default of max(1L, min(4L, parallel::detectCores())). Up to 4 cores can be utilized.

**Value**

Time series data sets to pass onto auto modeling functions

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
ParallelAutoETS(
  MetricSelection = "MAE",
  Output = NULL,
  TrainValidateShare = c(0.50,0.50),
  NumCores = max(1L, min(4L, parallel::detectCores()-2L)))

## End(Not run)
```

---

ParallelAutoNNET

*ParallelAutoNNET to run the 4 data sets at once*


---

## Description

ParallelAutoNNET to run the 4 data sets at once

## Usage

```
ParallelAutoNNET(
  Output,
  MetricSelection = "MAE",
  MaxFourierTerms = 1,
  TrainValidateShare = c(0.5, 0.5),
  MaxNumberModels = 20,
  MaxRunMinutes = 5,
  MaxRunsWithoutNewWinner = 12,
  NumCores = max(1L, min(4L, parallel::detectCores() - 2L))
)
```

## Arguments

Output	The output returned from TimeSeriesDataPrepare()
MetricSelection	Choose from MAE, MSE, and MAPE
MaxFourierTerms	Fourier pairs
TrainValidateShare	c(0.50,0.50)
MaxNumberModels	20
MaxRunMinutes	5
MaxRunsWithoutNewWinner	12
NumCores	Default of max(1L, min(4L, parallel::detectCores())). Up to 4 cores can be utilized.

## Value

Time series data sets to pass onto auto modeling functions

## Author(s)

Adrian Antico

See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare](#), [WideTimeSeriesEnsembleForecast\(\)](#)

Examples

```
## Not run:
ParallelAutoNNET(
  MetricSelection = "MAE",
  Output = NULL,
  MaxRunsWithoutNewWinner = 20,
  TrainValidateShare = c(0.50,0.50),
  MaxNumberModels = 5,
  MaxRunMinutes = 5,
  NumCores = max(1L, min(4L, parallel::detectCores()-2L)))

## End(Not run)
```

---

ParallelAutoTBATS	<i>ParallelAutoTBATS</i>
-------------------	--------------------------

---

Description

ParallelAutoTBATS to run the 4 data sets at once

Usage

```
ParallelAutoTBATS(
  Output,
  MetricSelection = "MAE",
  TrainValidateShare = c(0.5, 0.5),
  NumCores = max(1L, min(4L, parallel::detectCores() - 2L))
)
```

Arguments

- Output                   The output returned from TimeSeriesDataPrepare()
- MetricSelection           Choose from MAE, MSE, and MAPE
- TrainValidateShare       The value returned from TimeSeriesPrepare()
- NumCores                 Default of max(1L, min(4L, parallel::detectCores())). Up to 4 cores can be utilized.

Value

Time series data sets to pass onto auto modeling functions

Author(s)

Adrian Antico

See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

Examples

```
## Not run:
ParallelAutoTBATS(
  MetricSelection = "MAE",
  Output = NULL,
  TrainValidateShare = c(0.50,0.50),
  NumCores = max(1L, min(4L, parallel::detectCores()-2L)))

## End(Not run)
```

---

ParallelAutoTSLM	<i>ParallelAutoTSLM</i>
------------------	-------------------------

---

Description

ParallelAutoTSLM to run the 4 data sets at once

Usage

```
ParallelAutoTSLM(
  Output,
  MetricSelection = "MAE",
  TrainValidateShare = c(0.5, 0.5),
  NumCores = max(1L, min(4L, parallel::detectCores() - 2L))
)
```

Arguments

- Output                   The output returned from TimeSeriesDataPrepare()
- MetricSelection           Choose from MAE, MSE, and MAPE
- TrainValidateShare       The value returned from TimeSeriesPrepare()
- NumCores                 Default of max(1L, min(4L, parallel::detectCores())). Up to 4 cores can be utilized.

Value

Time series data sets to pass onto auto modeling functions

Author(s)

Adrian Antico

See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare](#), [WideTimeSeriesEnsembleForecast\(\)](#)

Examples

```
## Not run:
ParallelAutoTSLM(
  MetricSelection = "MAE",
  Output = NULL,
  TrainValidateShare = c(0.50,0.50),
  NumCores = max(1L, min(4L, parallel::detectCores()-2L)))

## End(Not run)
```

---

ParDepCalPlots	<i>ParDepCalPlots automatically builds partial dependence calibration plots for model evaluation</i>
----------------	--

---

Description

This function automatically builds partial dependence calibration plots and partial dependence calibration boxplots for model evaluation using regression, quantile regression, and binary and multinomial classification

Usage

```
ParDepCalPlots(
  data,
  PredictionColName = c("PredictedValues"),
  TargetColName = c("ActualValues"),
  IndepVar = c("Independent_Variable_Name"),
  GraphType = c("calibration"),
  PercentileBucket = 0.05,
  FactLevels = 10,
  Function = function(x) mean(x, na.rm = TRUE)
)
```

Arguments

data                      Data containing predicted values and actual values for comparison  
PredictionColName                      Predicted values column names

TargetColName	Target value column names
IndepVar	Independent variable column names
GraphType	calibration or boxplot - calibration aggregated data based on summary statistic; boxplot shows variation
PercentileBucket	Number of buckets to partition the space on (0,1) for evaluation
FactLevels	The number of levels to show on the chart (1. Levels are chosen based on frequency; 2. all other levels grouped and labeled as "Other")
Function	Supply the function you wish to use for aggregation.

**Value**

Partial dependence calibration plot or boxplot

**Author(s)**

Adrian Antico

**See Also**

Other Model Evaluation and Interpretation: [AutoLimeAid\(\)](#), [EvalPlot\(\)](#), [LimeModel\(\)](#), [RedYellowGreen\(\)](#), [threshOptim\(\)](#)

**Examples**

```
## Not run:
# Create fake data
data <- RemixAutoML::FakeDataGenerator(
  Correlation = 0.70, N = 10000000, Classification = FALSE)
data.table::setnames(data, "Independent_Variable2", "Predict")

# Build plot
Plot <- RemixAutoML::ParDepCalPlots(
  data,
  PredictionColName = "Predict",
  TargetColName = "Adrian",
  IndepVar = "Independent_Variable1",
  GraphType = "calibration",
  PercentileBucket = 0.20,
  FactLevels = 10,
  Function = function(x) mean(x, na.rm = TRUE))

## End(Not run)
```



targets	A character vector of the column names for the reference column in which you will build your lags and rolling stats
groupingVars	A character vector of categorical variable names you will build your lags and rolling stats by
sortDateName	The column name of your date column used to sort events over time
timeDiffTarget	Specify a desired name for features created for time between events. Set to NULL if you don't want time between events features created.
timeAgg	List the time aggregation level for the time between events features, such as "hour", "day", "week", "month", "quarter", or "year"
WindowingLag	Set to 0 to build rolling stats off of target columns directly or set to 1 to build the rolling stats off of the lag-1 target
Type	List either "Lag" if you want features built on historical values or "Lead" if you want features built on future values
Timer	Set to TRUE if you percentage complete tracker printout
SimpleImpute	Set to TRUE for factor level imputation of "0" and numeric imputation of -1
AscRowByGroup	Required to have a column with a Row Number by group (if grouping) with the smallest numbers being the records for scoring (typically the most current in time).
RecordsKeep	List the row number of AscRowByGroup and those data points will be returned
AscRowRemove	Set to TRUE to remove the AscRowByGroup column upon returning data.

**Value**

data.table of original data plus created lags, rolling stats, and time between event lags and rolling stats

**Author(s)**

Adrian Antico

**See Also**

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [TimeSeriesFill\(\)](#)

**Examples**

```
## Not run:
N = 25116
data <- data.table::data.table(
  DateTime = as.Date(Sys.time()),
  Target = stats::filter(
    rnorm(N, mean = 50, sd = 20),
    filter=rep(1,10),
    circular=TRUE))
data[, temp := seq(1:N)][, DateTime := DateTime - temp]
data <- data[order(DateTime)]
data <- Partial_DT_GDL_Feature_Engineering(
```



```

data,
lags          = c(1:5),
periods       = c(seq(10,50,10)),
SDperiods     = c(seq(5, 95, 5)),
Skewperiods   = c(seq(5, 95, 5)),
Kurtperiods   = c(seq(5, 95, 5)),
Quantileperiods = c(seq(5, 95, 5)),
statsFUNs     = c("mean","sd", "skew",
  "kurt","q5","q95"),
targets       = c("Target"),
groupingVars   = NULL,
sortDateName  = "DateTime",
timeDiffTarget = c("Time_Gap"),
timeAgg       = "days",
WindowingLag  = 1,
Type          = "Lag",
Timer         = TRUE,
SimpleImpute  = TRUE,
AscRowByGroup = "temp",
RecordsKeep   = c(1,5,100,2500),
AscRowRemove  = TRUE)

## End(Not run)

```

---

PredictArima

---

*PredictArima to forecast an Arima() model from the stats package*


---

## Description

PredictArima is a function to overwrite the s3 generic `getS3method('predict','Arima')`

## Usage

```

PredictArima(
  object = Results,
  n.ahead = FCPeriods,
  newxreg = NULL,
  se.fit = TRUE
)

```

## Arguments

<code>object</code>	Object that stores the output from Arima()
<code>n.ahead</code>	Number of forecast periods to forecast
<code>newxreg</code>	NULL by default. Forward looking independent variables as matrix type
<code>se.fit</code>	Set to FALSE to not return prediction intervals with the forecast

## Author(s)

Adrian Antico

See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare](#), [WideTimeSeriesEnsembleForecast\(\)](#)

---

PrintToPDF	<i>PrintToPDF</i>
------------	-------------------

---

Description

PrintToPDF

Usage

```
PrintToPDF(  
  Path,  
  OutputName,  
  ObjectList = NULL,  
  Tables = FALSE,  
  MaxPages = 500,  
  Title = "Model Output",  
  Width = 12,  
  Height = 7,  
  Paper = "USr",  
  BackgroundColor = "transparent",  
  ForegroundColor = "black"  
)
```

Arguments

Path	Path file to the location where you want your pdf saved
OutputName	Supply a name for the file you want saved
ObjectList	List of objects to print to pdf
Tables	TRUE for data tables, FALSE for plots
MaxPages	Default of 500
Title	The title of the pdf
Width	Default is 12
Height	Default is 7
Paper	'USr' for landscape. 'special' means that Width and Height are used to determine page size
BackgroundColor	Default is 'transparent'
ForegroundColor	Default is 'black'

**Author(s)**

Adrian Antico

**See Also**Other Misc: [AutoH20TextPrepScoring\(\)](#), [DeleteFile\(\)](#), [Logger\(\)](#), [tokenizeH20\(\)](#)


---

ProblematicFeatures	<i>ProblematicFeatures identifies problematic features for machine learning</i>
---------------------	---

---

**Description**

ProblematicFeatures identifies problematic features for machine learning and outputs a data.table of the feature names in the first column and the metrics they failed to pass in the columns.

**Usage**

```
ProblematicFeatures(
  data,
  ColumnNumbers = c(1:ncol(data)),
  NearZeroVarThresh = 0.05,
  CharUniqThresh = 0.5,
  NA_Rate = 0.2,
  Zero_Rate = 0.2,
  HighSkewThresh = 10
)
```

**Arguments**

data	The data.table with the columns you wish to have analyzed
ColumnNumbers	A vector with the column numbers you wish to analyze
NearZeroVarThresh	Set to NULL to not run NearZeroVar(). Checks to see if the percentage of values in your numeric columns that are not constant are greater than the value you set here. If not, the feature is collected and returned with the percentage unique value.
CharUniqThresh	Set to NULL to not run CharUniqthresh(). Checks to see if the percentage of unique levels / groups in your categorical feature is greater than the value you supply. If it is, the feature name is returned with the percentage unique value.
NA_Rate	Set to NULL to not run NA_Rate(). Checks to see if the percentage of NA's in your features is greater than the value you supply. If it is, the feature name is returned with the percentage of NA values.
Zero_Rate	Set to NULL to not run Zero_Rate(). Checks to see if the percentage of zero's in your features is greater than the value you supply. If it is, the feature name is returned with the percentage of zero values.
HighSkewThresh	Set to NULL to not run HighSkew(). Checks for numeric columns whose ratio of the sum of the top 5th percentile of values to the bottom 95th percentile of values is greater than the value you supply. If true, the column name and value is returned.

**Value**

data table with new dummy variables columns and optionally removes base columns

**Author(s)**

Adrian Antico

**See Also**

Other EDA: [AutoCorrAnalysis\(\)](#), [AutoWordFreq\(\)](#), [BNLearnArcStrength\(\)](#)

**Examples**

```
## Not run:
test <- data.table::data.table(RandomNum = runif(1000))
test[, NearZeroVarEx := ifelse(runif(1000) > 0.99, runif(1), 1)]
test[, CharUniqueEx := as.factor(ifelse(RandomNum < 0.95, sample(letters, size = 1), "FFF"))]
test[, NA_RateEx := ifelse(RandomNum < 0.95, NA, "A")]
test[, ZeroRateEx := ifelse(RandomNum < 0.95, 0, runif(1))]
test[, HighSkewThreshEx := ifelse(RandomNum > 0.96, 100000, 1)]
ProblematicFeatures(
  test,
  ColumnNumbers = 2:ncol(test),
  NearZeroVarThresh = 0.05,
  CharUniqThresh = 0.50,
  NA_Rate = 0.20,
  Zero_Rate = 0.20,
  HighSkewThresh = 10)

## End(Not run)
```

---

RedYellowGreen

*RedYellowGreen is for determining the optimal thresholds for binary classification when do-nothing is an option*

---

**Description**

This function will find the optimal thresholds for applying the main label and for finding the optimal range for doing nothing when you can quantify the cost of doing nothing

**Usage**

```
RedYellowGreen(
  data,
  PredictColNumber = 2,
  ActualColNumber = 1,
  TruePositiveCost = 0,
  TrueNegativeCost = 0,
  FalsePositiveCost = -10,
  FalseNegativeCost = -50,
  MidTierCost = -2,
  Cores = 8,
```

```
Precision = 0.01,
Boundaries = c(0.05, 0.75)
)
```

### Arguments

data	data is the data table with your predicted and actual values from a classification model
PredictColNumber	The column number where the prediction variable is located (in binary form)
ActualColNumber	The column number where the target variable is located
TruePositiveCost	This is the utility for generating a true positive prediction
TrueNegativeCost	This is the utility for generating a true negative prediction
FalsePositiveCost	This is the cost of generating a false positive prediction
FalseNegativeCost	This is the cost of generating a false negative prediction
MidTierCost	This is the cost of doing nothing (or whatever it means to not classify in your case)
Cores	Number of cores on your machine
Precision	Set the decimal number to increment by between 0 and 1
Boundaries	Supply a vector of two values c(lower bound, upper bound) where the first value is the smallest threshold you want to test and the second value is the largest value you want to test. Note, if your results are at the boundaries you supplied, you should extent the boundary that was reached until the values is within both revised boundaries.

### Value

A data table with all evaluated strategies, parameters, and utilities, along with a 3d scatterplot of the results

### Author(s)

Adrian Antico

### See Also

Other Model Evaluation and Interpretation: [AutoLimeAid\(\)](#), [EvalPlot\(\)](#), [LimeModel\(\)](#), [ParDepCalPlots\(\)](#), [threshOptim\(\)](#)

### Examples

```
## Not run:
data <- data.table::data.table(Target = runif(10))
data[, x1 := qnorm(Target)]
data[, x2 := runif(10)]
data[, Predict := log(pnorm(0.85 * x1 +
  sqrt(1-0.85^2) * qnorm(x2)))]
```

```

data[, ']:= ' (x1 = NULL, x2 = NULL)]
data <- RedYellowGreen(
  data,
  PredictColNumber = 2,
  ActualColNumber = 1,
  TruePositiveCost = 0,
  TrueNegativeCost = 0,
  FalsePositiveCost = -1,
  FalseNegativeCost = -2,
  MidTierCost = -0.5,
  Precision = 0.01,
  Cores = 1,
  Boundaries = c(0.05,0.75))

## End(Not run)

```

---

Regular_Performance	<i>Regular_Performance creates and stores model results in Experiment Grid</i>
---------------------	--

---

## Description

Regular\_Performance creates and stores model results in Experiment Grid

## Usage

```

Regular_Performance(
  Model = NULL,
  Results = Results,
  GridList = GridList,
  TrainValidateShare = c(0.5, 0.5),
  ExperimentGrid = ExperimentGrid,
  run = run,
  train = train,
  ValidationData = ValidationData,
  HoldOutPeriods = HoldOutPeriods
)

```

## Arguments

Model	Set to ets, tbats, arfima, tslm, nnetar
Results	This is a time series model
GridList	List
TrainValidateShare	The values used to blend training and validation performance
ExperimentGrid	The results collection table
run	Iterator
train	Data set
ValidationData	Data set
HoldOutPeriods	Passthrough

Author(s)

Adrian Antico

See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

---

RemixClassificationMetrics  
*RemixClassificationMetrics*

---

Description

RemixClassificationMetrics

Usage

```
RemixClassificationMetrics(  
  MLModels = NULL,  
  TargetVariable = NULL,  
  Thresholds = seq(0.01, 0.99, 0.01),  
  CostMatrix = c(1, 0, 0, 1),  
  ClassLabels = c(1, 0),  
  CatBoostTestData = NULL,  
  H2oAutoMLTestData = NULL,  
  H2oGBMTestData = NULL,  
  H2oGAMTestData = NULL,  
  H2oDRFTestData = NULL,  
  H2oGLMTestData = NULL,  
  XGBoostTestData = NULL  
)
```

Arguments

MLModels	A vector of model names from remixautoml. e.g. c("catboost","h2oautoml","h2ogbm","h2odrf","h2o
TargetVariable	Name of your target variable
Thresholds	seq(0.01,0.99,0.01),
CostMatrix	c(1,0,0,1),
ClassLabels	c(1,0),
CatBoostTestData	Test data returned from AutoCatBoostClassifier
H2oAutoMLTestData	Test data returned from AutoCatBoostClassifier
H2oGBMTestData	Test data returned from AutoH2oGBMClassifier

H2oGAMTestData Test data returned from AutoH2oDRFClassifier  
 H2oGLMTestData Test data returned from AutoH2oGLMClassifier  
 XGBoostTestData Test data returned from AutoXGBoostClassifier

**Author(s)**

Adrian Antico

**See Also**

Other Model Evaluation: [ClassificationMetrics\(\)](#), [DT\\_BinaryConfusionMatrix\(\)](#)

**Examples**

```
## Not run:
RemixClassificationMetrics <- function(
  MLModels = "catboost",
  TargetVariable = "Adrian",
  Thresholds = seq(0.01,0.99,0.01),
  CostMatrix = c(1,0,0,1),
  ClassLabels = c(1,0),
  CatBoostTestData = NULL,
  H2oAutoMLTestData = NULL,
  H2oGBMTestData = NULL,
  H2oGAMTestData = NULL,
  H2oDRFTestData = NULL,
  H2oGLMTestData = NULL,
  XGBoostTestData = NULL)

## End(Not run)
```

---

RemixTheme

*RemixTheme function is a ggplot theme generator for ggplots*


---

**Description**

This function adds the Remix Theme to ggplots

**Usage**

```
RemixTheme()
```

**Value**

An object to pass along to ggplot objects following the "+" sign

**Author(s)**

Douglas Pestana

**See Also**

Other Graphics: [ChartTheme\(\)](#), [TimeSeriesPlotter\(\)](#), [multiplot\(\)](#)



## Examples

```
## Not run:
data <- data.table::data.table(
  DateTime = as.Date(Sys.time()),
  Target = stats::filter(rnorm(1000,
                             mean = 50,
                             sd = 20),
    filter=rep(1,10),
    circular=TRUE))
data[, temp := seq(1:1000)][, DateTime := DateTime - temp][
  , temp := NULL]
data <- data[order(DateTime)]
p <- ggplot2::ggplot(data, ggplot2::aes(x = DateTime, y = Target)) +
  ggplot2::geom_line()
p <- p + RemixTheme()

## End(Not run)
```

---

ResidualOutliers

*ResidualOutliers is an automated time series outlier detection function*


---

## Description

ResidualOutliers is an automated time series outlier detection function that utilizes tsoutliers and auto.arima. It looks for five types of outliers: "AO" Additive outlier - a singular extreme outlier that surrounding values aren't affected by; "IO" Innovational outlier - Initial outlier with subsequent anomalous values; "LS" Level shift - An initial outlier with subsequent observations being shifted by some constant on average; "TC" Transient change - initial outlier with lingering effects that dissipate exponentially over time; "SLS" Seasonal level shift - similar to level shift but on a seasonal scale.

## Usage

```
ResidualOutliers(
  data,
  DateColName = "DateTime",
  TargetColName = "Target",
  PredictedColName = NULL,
  TimeUnit = "day",
  Lags = 5,
  MA = 5,
  SLags = 0,
  SMA = 0,
  tstat = 2
)
```

## Arguments

data	the source residuals data.table
DateColName	The name of your data column to use in reference to the target variable
TargetColName	The name of your target variable column

PredictedColName	The name of your predicted value column. If you supply this, you will run anomaly detection of the difference between the target variable and your predicted value. If you leave PredictedColName NULL then you will run anomaly detection over the target variable.
TimeUnit	The time unit of your date column: hour, day, week, month, quarter, year
Lags	the largest lag or moving average (seasonal too) values for the arima fit
MA	Max moving average
SLags	Max seasonal lags
SMA	Max seasonal moving averages
tstat	the t-stat value for tsoutliers

**Value**

A named list containing FullData = original data.table with outliers data and ARIMA\_MODEL = the arima model.

**Author(s)**

Adrian Antico

**See Also**

Other Unsupervised Learning: [AutoKMeans\(\)](#), [GenTSAnomVars\(\)](#), [H2oIsolationForest\(\)](#)

**Examples**

```
## Not run:
data <- data.table::data.table(
  DateTime = as.Date(Sys.time()),
  Target = as.numeric(stats::filter(
    rnorm(1000, mean = 50, sd = 20),
    filter=rep(1,10),
    circular=TRUE)))
data[, temp := seq(1:1000)][, DateTime := DateTime - temp][
, temp := NULL]
data <- data[order(DateTime)]
data[, Predicted := as.numeric(
  stats::filter(rnorm(1000, mean = 50, sd = 20),
  filter=rep(1,10),
  circular=TRUE))]
stuff <- ResidualOutliers(
  data = data,
  DateColName = "DateTime",
  TargetColName = "Target",
  PredictedColName = NULL,
  TimeUnit = "day",
  Lags = 5,
  MA = 5,
  SLags = 0,
  SMA = 0,
  tstat = 4)
data <- stuff[[1]]
model <- stuff[[2]]
```

```

outliers <- data[type != "<NA>"]

## End(Not run)

```

---

RL\_Initialize

*RL\_Initialize*


---

## Description

RL\_Initialize sets up the components necessary for RL

## Usage

```

RL_Initialize(
  ParameterGridSet = NULL,
  Alpha = 1L,
  Beta = 1L,
  SubDivisions = 1000L
)

```

## Arguments

ParameterGridSet	This is a list of tuning grids
Alpha	Prior successes
Beta	Prior trials
SubDivisions	Tolerance for integration

## Author(s)

Adrian Antico

## See Also

Other Reinforcement Learning: [RL\\_ML\\_Update\(\)](#), [RL\\_Update\(\)](#), [RPM\\_Binomial\\_Bandit\(\)](#)

## Examples

```

## Not run:
RL_Start <- RL_Initialize(
  ParameterGridSet = GridClusters,
  Alpha = Alpha,
  Beta = Beta,
  SubDivisions = 1000L)
BanditArmsN <- RL_Start[["BanditArmsN"]]
Successes <- RL_Start[["Successes"]]
Trials <- RL_Start[["Trials"]]
GridIDs <- RL_Start[["GridIDs"]]
BanditProbs <- RL_Start[["BanditProbs"]]

## End(Not run)

```

RL\_ML\_Update

*RL\_ML\_Update***Description**

RL\_ML\_Update updates the bandit probabilities for selecting different grids

**Usage**

```
RL_ML_Update(
  ExperimentGrid = ExperimentGrid,
  ModelType = "classification",
  ModelRun = counter,
  NEWGrid = NewGrid,
  NewPerformance = NewPerformance,
  BestPerformance = BestPerformance,
  TrialVector = Trials,
  SuccessVector = Successes,
  GridIDS = GridIDS,
  BanditArmsCount = BanditArmsN,
  RunsWithoutNewWinner = RunsWithoutNewWinner,
  MaxRunsWithoutNewWinner = MaxRunsWithoutNewWinner,
  MaxNumberModels = MaxNumberModels,
  MaxRunMinutes = MaxRunMinutes,
  TotalRunTime = TotalRunTime,
  BanditProbabilities = BanditProbs
)
```

**Arguments**

ExperimentGrid	This is a data.table of grid params and model results
ModelType	"classification", "regression", and "multiclass"
ModelRun	Model iteration number
NEWGrid	Previous grid passed in
NewPerformance	Internal
BestPerformance	Internal
TrialVector	Numeric vector with the total trials for each arm
SuccessVector	Numeric vector with the total successes for each arm
GridIDS	The numeric vector that identifies which grid is which
BanditArmsCount	The number of arms in the bandit
RunsWithoutNewWinner	Counter of the number of models previously built without being a new winner
MaxRunsWithoutNewWinner	Maximum number of models built without a new best model (constraint)
MaxNumberModels	Maximum number of models to build (constraint)

MaxRunMinutes    Run time constraint  
 TotalRunTime    Cumulative run time in minutes  
 BanditProbabilities  
                   Initial probabilities from RL\_Initialize()

**Author(s)**

Adrian Antico

**See Also**

Other Reinforcement Learning: [RL\\_Initialize\(\)](#), [RL\\_Update\(\)](#), [RPM\\_Binomial\\_Bandit\(\)](#)

**Examples**

```
## Not run:
RL_Update_Output <- RL_ML_Update(
  ExperimentGrid = ExperimentGrid,
  ModelRun = run,
  ModelType = "classification",
  NewGrid = NewGrid,
  NewPerformance = NewPerformance,
  BestPerformance = BestPerformance,
  TrialVector = Trials,
  SuccessVector = Successes,
  GridIDS = GridIDS,
  BanditArmsCount = BanditArmsN,
  RunsWithoutNewWinner = RunsWithoutNewWinner,
  MaxRunsWithoutNewWinner = MaxRunsWithoutNewWinner,
  MaxNumberModels = MaxNumberModels,
  MaxRunMinutes = MaxRunMinutes,
  TotalRunTime = TotalRunTime,
  BanditProbabilities = BanditProbs)
BanditProbs <- RL_Update_Output[["BanditProbs"]]
Trials <- RL_Update_Output[["Trials"]]
Successes <- RL_Update_Output[["Successes"]]
NewGrid <- RL_Update_Output[["NewGrid"]]

## End(Not run)
```

---

RL\_Performance

*ARIMA\_Performance creates and stores model results in Experiment Grid*

---

**Description**

ARIMA\_Performance creates and stores model results in Experiment Grid

**Usage**

```

RL_Performance(
  Results = Results,
  NextGrid = NextGrid,
  TrainValidateShare = c(0.5, 0.5),
  MaxFourierTerms = NULL,
  XREGFC = XREGFC,
  ExperimentGrid = ExperimentGrid,
  run = run,
  train = train,
  ValidationData = ValidationData,
  HoldOutPeriods = HoldOutPeriods,
  FinalScore = FALSE
)

```

**Arguments**

Results	This is a time series model
NextGrid	Bandit grid
TrainValidateShare	The values used to blend training and validation performance
MaxFourierTerms	Numeric value
XREGFC	Fourier terms for forecasting
ExperimentGrid	The results collection table
run	Iterator
train	Data set
ValidationData	Data set
HoldOutPeriods	Passthrough
FinalScore	FALSE

**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

---

RL\_Update

*RL\_Update*


---

## Description

RL\_Update updates the bandit probabilities for selecting different grids

## Usage

```
RL_Update(
  ExperimentGrid = ExperimentGrid,
  MetricSelection = MetricSelection,
  ModelRun = run,
  NEWGrid = NewGrid,
  TrialVector = Trials,
  SuccessVector = Successes,
  GridIDS = GridIDS,
  BanditArmsCount = BanditArmsN,
  RunsWithoutNewWinner = RunsWithoutNewWinner,
  MaxRunsWithoutNewWinner = MaxRunsWithoutNewWinner,
  MaxNumberModels = MaxNumberModels,
  MaxRunMinutes = MaxRunMinutes,
  TotalRunTime = TotalRunTime,
  BanditProbabilities = BanditProbs
)
```

## Arguments

ExperimentGrid	This is a data.table of grid params and model results
MetricSelection	The chosen metric to evaluate models
ModelRun	Model iteration number
NEWGrid	Previous grid passed in
TrialVector	Numeric vector with the total trials for each arm
SuccessVector	Numeric vector with the total successes for each arm
GridIDS	The numeric vector that identifies which grid is which
BanditArmsCount	The number of arms in the bandit
RunsWithoutNewWinner	Counter of the number of models previously built without being a new winner
MaxRunsWithoutNewWinner	Maximum number of models built without a new best model (constraint)
MaxNumberModels	Maximum number of models to build (constraint)
MaxRunMinutes	Run time constraint
TotalRunTime	Cumulative run time in minutes
BanditProbabilities	Initial probabilities from RL_Initialize()

**Author(s)**

Adrian Antico

**See Also**Other Reinforcement Learning: [RL\\_Initialize\(\)](#), [RL\\_ML\\_Update\(\)](#), [RPM\\_Binomial\\_Bandit\(\)](#)**Examples**

```
## Not run:
RL_Update_Output <- RL_Update(
  ExperimentGrid = ExperimentGrid,
  MetricSelection = MetricSelection,
  ModelRun = run,
  NEWGrid = NewGrid,
  TrialVector = Trials,
  SuccessVector = Successes,
  GridIDS = GridIDS,
  BanditArmsCount = BanditArmsN,
  RunsWithoutNewWinner = RunsWithoutNewWinner,
  MaxRunsWithoutNewWinner = MaxRunsWithoutNewWinner,
  MaxNumberModels = MaxNumberModels,
  MaxRunMinutes = MaxRunMinutes,
  TotalRunTime = TotalRunTime,
  BanditProbabilities = BanditProbs)
BanditProbs <- RL_Update_Output[["BanditProbs"]]
Trials <- RL_Update_Output[["Trials"]]
Successes <- RL_Update_Output[["Successes"]]
NewGrid <- RL_Update_Output[["NewGrid"]]

## End(Not run)
```

---

RPM\_Binomial\_Bandit     *RPM\_Binomial\_Bandit*


---

**Description**

RPM\_Binomial\_Bandit computes randomized probability matching probabilities for each arm being best in a multi-armed bandit. Close cousin to Thomson Sampling.

**Usage**

```
RPM_Binomial_Bandit(
  Success,
  Trials,
  Alpha = 1L,
  Beta = 1L,
  SubDivisions = 1000L
)
```



**Arguments**

Success	Vector of successes. One slot per arm.
Trials	Vector of trials. One slot per arm.
Alpha	Prior parameter for success
Beta	Prior parameter for trials
SubDivisions	Default is 100L in the stats package. Changed it to 1000 for this function.

**Value**

Probability of each arm being the best arm compared to all other arms.

**Author(s)**

Adrian Antico

**See Also**

Other Reinforcement Learning: [RL\\_Initialize\(\)](#), [RL\\_ML\\_Update\(\)](#), [RL\\_Update\(\)](#)

---

SQL\_ClearTable

*SQL\_ClearTable*


---

**Description**

SQL\_ClearTable remove all rows from a database table

**Usage**

```
SQL_ClearTable(
  DBConnection,
  SQLTableName = "",
  CloseChannel = TRUE,
  Errors = TRUE
)
```

**Arguments**

DBConnection	RemixAutoML::SQL_Server_DBConnection()
SQLTableName	The SQL statement you want to run
CloseChannel	TRUE to close when done, FALSE to leave the channel open
Errors	Set to TRUE to halt, FALSE to return -1 in cases of errors

**Author(s)**

Adrian Antico

**See Also**

Other Database: [AutoDataDictionaries\(\)](#), [SQL\\_DropTable\(\)](#), [SQL\\_Query\\_Push\(\)](#), [SQL\\_Query\(\)](#), [SQL\\_SaveTable\(\)](#), [SQL\\_Server\\_BulkPull\(\)](#), [SQL\\_Server\\_BulkPush\(\)](#), [SQL\\_Server\\_DBConnection\(\)](#), [SQL\\_UpdateTable\(\)](#)

---

SQL_DropTable	<i>SQL_DropTable</i>
---------------	----------------------

---

**Description**

SQL\_DropTable drop a database table

**Usage**

```
SQL_DropTable(
  DBConnection,
  SQLTableName = "",
  CloseChannel = TRUE,
  Errors = TRUE
)
```

**Arguments**

DBConnection	RemixAutoML::SQL_Server_DBConnection()
SQLTableName	The SQL statement you want to run
CloseChannel	TRUE to close when done, FALSE to leave the channel open
Errors	Set to TRUE to halt, FALSE to return -1 in cases of errors

**Author(s)**

Adrian Antico

**See Also**

Other Database: [AutoDataDictionaries\(\)](#), [SQL\\_ClearTable\(\)](#), [SQL\\_Query\\_Push\(\)](#), [SQL\\_Query\(\)](#), [SQL\\_SaveTable\(\)](#), [SQL\\_Server\\_BulkPull\(\)](#), [SQL\\_Server\\_BulkPush\(\)](#), [SQL\\_Server\\_DBConnection\(\)](#), [SQL\\_UpdateTable\(\)](#)

---

SQL_Query	<i>SQL_Query</i>
-----------	------------------

---

**Description**

SQL\_Query get data from a database table

**Usage**

```
SQL_Query(
  DBConnection,
  Query,
  ASIS = FALSE,
  CloseChannel = TRUE,
  RowsPerBatch = 1024
)
```

**Arguments**

DBConnection	RemixAutoML::SQL_Server_DBConnection()
Query	The SQL statement you want to run
ASIS	Auto column typing
CloseChannel	TRUE to close when done, FALSE to leave the channel open
RowsPerBatch	Rows default is 1024

**Author(s)**

Adrian Antico

**See Also**

Other Database: [AutoDataDictionaries\(\)](#), [SQL\\_ClearTable\(\)](#), [SQL\\_DropTable\(\)](#), [SQL\\_Query\\_Push\(\)](#), [SQL\\_SaveTable\(\)](#), [SQL\\_Server\\_BulkPull\(\)](#), [SQL\\_Server\\_BulkPush\(\)](#), [SQL\\_Server\\_DBConnection\(\)](#), [SQL\\_UpdateTable\(\)](#)

---

SQL_Query_Push	<i>SQL_Query_Push</i>
----------------	-----------------------

---

**Description**

SQL\_Query\_Push push data to a database table

**Usage**

SQL\_Query\_Push(DBConnection, Query, CloseChannel = TRUE)

**Arguments**

DBConnection	RemixAutoML::SQL_Server_DBConnection()
Query	The SQL statement you want to run
CloseChannel	TRUE to close when done, FALSE to leave the channel open

**Author(s)**

Adrian Antico

**See Also**

Other Database: [AutoDataDictionaries\(\)](#), [SQL\\_ClearTable\(\)](#), [SQL\\_DropTable\(\)](#), [SQL\\_Query\(\)](#), [SQL\\_SaveTable\(\)](#), [SQL\\_Server\\_BulkPull\(\)](#), [SQL\\_Server\\_BulkPush\(\)](#), [SQL\\_Server\\_DBConnection\(\)](#), [SQL\\_UpdateTable\(\)](#)

SQL\_SaveTable

*SQL\_SaveTable***Description**

SQL\_SaveTable create a database table

**Usage**

```
SQL_SaveTable(
  DataToPush,
  DBConnection,
  SQLTableName = "",
  RowNames = NULL,
  ColNames = TRUE,
  CloseChannel = TRUE,
  AppendData = FALSE,
  AddPK = TRUE,
  Safer = TRUE
)
```

**Arguments**

DataToPush	data to be sent to warehouse
DBConnection	RemixAutoML::SQL_Server_DBConnection()
SQLTableName	The SQL statement you want to run
RowNames	c("Segment", "Date")
ColNames	Column names in first row
CloseChannel	TRUE to close when done, FALSE to leave the channel open
AppendData	TRUE or FALSE
AddPK	Add a PK column to table
Safer	TRUE

**Author(s)**

Adrian Antico

**See Also**

Other Database: [AutoDataDictionaries\(\)](#), [SQL\\_ClearTable\(\)](#), [SQL\\_DropTable\(\)](#), [SQL\\_Query\\_Push\(\)](#), [SQL\\_Query\(\)](#), [SQL\\_Server\\_BulkPull\(\)](#), [SQL\\_Server\\_BulkPush\(\)](#), [SQL\\_Server\\_DBConnection\(\)](#), [SQL\\_UpdateTable\(\)](#)

---

SQL_Server_BulkPull	<i>SQL_Server_BulkPull</i>
---------------------	----------------------------

---

**Description**

Pull data from a sql server warehouse using bulk copy process

**Usage**

```
SQL_Server_BulkPull(  
  Server = NULL,  
  DBName = NULL,  
  TableName = NULL,  
  Query = NULL,  
  FinalColumnNames = NULL,  
  SavePath = NULL,  
  SaveFileName = NULL,  
  DeleteTextFile = TRUE  
)
```

**Arguments**

Server	Server name
DBName	Name of the database
TableName	Name of the table to pull
Query	Leave NULL to pull entire talbe or supply a query
FinalColumnNames	Supply this if you supply a query that isn't a select * query
SavePath	Path file to where you want the text file saved
SaveFileName	Name of the text file to create
DeleteTextFile	Remove text file when done loading into R

**Author(s)**

Adrian Antico

**See Also**

Other Database: [AutoDataDictionaries\(\)](#), [SQL\\_ClearTable\(\)](#), [SQL\\_DropTable\(\)](#), [SQL\\_Query\\_Push\(\)](#), [SQL\\_Query\(\)](#), [SQL\\_SaveTable\(\)](#), [SQL\\_Server\\_BulkPush\(\)](#), [SQL\\_Server\\_DBConnection\(\)](#), [SQL\\_UpdateTable\(\)](#)

---

SQL_Server_BulkPush	<i>SQL_Server_BulkPush</i>
---------------------	----------------------------

---

**Description**

Push data to a sql server warehouse via bulk copy process

**Usage**

```
SQL_Server_BulkPush(
  Server = NULL,
  DBName = NULL,
  TableName = NULL,
  SavePath = NULL,
  SaveFileName = NULL,
  DeleteTextFile = TRUE
)
```

**Arguments**

Server	Server name
DBName	Name of the database
TableName	Name of the table to pull
SavePath	Path file to where you want the text file saved
SaveFileName	Name of the text file to create
DeleteTextFile	Remove text file when done loading into R

**Author(s)**

Adrian Antico

**See Also**

Other Database: [AutoDataDictionaries\(\)](#), [SQL\\_ClearTable\(\)](#), [SQL\\_DropTable\(\)](#), [SQL\\_Query\\_Push\(\)](#), [SQL\\_Query\(\)](#), [SQL\\_SaveTable\(\)](#), [SQL\\_Server\\_BulkPull\(\)](#), [SQL\\_Server\\_DBConnection\(\)](#), [SQL\\_UpdateTable\(\)](#)

---

SQL_Server_DBConnection	<i>SQL_Server_DBConnection</i>
-------------------------	--------------------------------

---

**Description**

SQL\_Server\_DBConnection makes a connection to a sql server database

**Usage**

```
SQL_Server_DBConnection(DataBaseName = "", Server = "")
```

**Arguments**

DataBaseName	Name of the database
Server	Name of the server to use

**Author(s)**

Adrian Antico

**See Also**

Other Database: [AutoDataDictionaries\(\)](#), [SQL\\_ClearTable\(\)](#), [SQL\\_DropTable\(\)](#), [SQL\\_Query\\_Push\(\)](#), [SQL\\_Query\(\)](#), [SQL\\_SaveTable\(\)](#), [SQL\\_Server\\_BulkPull\(\)](#), [SQL\\_Server\\_BulkPush\(\)](#), [SQL\\_UpdateTable\(\)](#)

---

SQL_UpdateTable	<i>SQL_UpdateTable</i>
-----------------	------------------------

---

**Description**

SQL\_UpdateTable update a database table

**Usage**

```
SQL_UpdateTable(
  DataToPush,
  DBConnection,
  SQLTableName = "",
  Index = NULL,
  CloseChannel = TRUE,
  Verbose = TRUE,
  Test = FALSE,
  NAString = "NA",
  Fast = TRUE
)
```

**Arguments**

DataToPush	Update data table in warehouse with new values
DBConnection	RemixAutoML::SQL_Server_DBConnection()
SQLTableName	The SQL statement you want to run
Index	Column name of index
CloseChannel	TRUE to close when done, FALSE to leave the channel open
Verbose	TRUE or FALSE
Test	Set to TRUE to see if what you plan to do will work
NAString	Supply character string to supply missing values
Fast	Set to TRUE to update table in one shot versus row by row

**Author(s)**

Adrian Antico

See Also

Other Database: [AutoDataDictionaries\(\)](#), [SQL\\_ClearTable\(\)](#), [SQL\\_DropTable\(\)](#), [SQL\\_Query\\_Push\(\)](#), [SQL\\_Query\(\)](#), [SQL\\_SaveTable\(\)](#), [SQL\\_Server\\_BulkPull\(\)](#), [SQL\\_Server\\_BulkPush\(\)](#), [SQL\\_Server\\_DBConnection\(\)](#)

---

StackedTimeSeriesEnsembleForecast  
*TimeSeriesEnsembleForecast*

---

Description

TimeSeriesEnsembleForecast to generate forecasts and ensemble data

Usage

```
StackedTimeSeriesEnsembleForecast(  
  TS_Models = c("arima", "tbats", "nnet"),  
  ML_Methods = c("CatBoost", "XGBoost", "H2oGBM", "H2oDRF"),  
  CalendarFeatures = TRUE,  
  HolidayFeatures = TRUE,  
  FourierFeatures = NULL,  
  Path = "C:/Users/aantico/Documents/Package",  
  TargetName = "Weekly_Sales",  
  DateName = "Date",  
  NTrees = 750,  
  TaskType = "GPU",  
  GridTune = FALSE,  
  FCPeriods = 5,  
  MaxNumberModels = 5  
)
```

Arguments

TS_Models	Select which ts model forecasts to ensemble
ML_Methods	Select which models to build for the ensemble
CalendarFeatures	TRUE or FALSE
HolidayFeatures	TRUE or FALSE
FourierFeatures	Full set of fourier features for train and score
Path	The path to the folder where the ts forecasts are stored
TargetName	"Weekly_Sales"
DateName	"Date"
NTrees	Select the number of trees to utilize in ML models
TaskType	GPU or CPU
GridTune	Set to TRUE to grid tune the ML models
FCPeriods	Number of periods to forecast
MaxNumberModels	The number of models to try for each ML model



**Author(s)**

Adrian Antico

**See Also**

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [TimeSeriesDataPrepare\(\)](#), [WideTimeSeriesEnsemble\(\)](#)

---

threshOptim	<i>Utility maximizing thresholds for binary classification</i>
-------------	--

---

**Description**

This function will return the utility maximizing threshold for future predictions along with the data generated to estimate the threshold

**Usage**

```
threshOptim(
  data,
  actTar = "target",
  predTar = "p1",
  tpProfit = 0,
  tnProfit = 0,
  fpProfit = -1,
  fnProfit = -2,
  MinThresh = 0.001,
  MaxThresh = 0.999,
  ThresholdPrecision = 0.001
)
```

**Arguments**

data	data is the data table you are building the modeling on
actTar	The column name where the actual target variable is located (in binary form)
predTar	The column name where the predicted values are located
tpProfit	This is the utility for generating a true positive prediction
tnProfit	This is the utility for generating a true negative prediction
fpProfit	This is the cost of generating a false positive prediction
fnProfit	This is the cost of generating a false negative prediction
MinThresh	Minimum value to consider for model threshold
MaxThresh	Maximum value to consider for model threshold
ThresholdPrecision	Incrementing value in search

**Value**

Optimal threshold and corresponding utilities for the range of thresholds tested

**Author(s)**

Adrian Antico

**See Also**

Other Model Evaluation and Interpretation: [AutoLimeAid\(\)](#), [EvalPlot\(\)](#), [LimeModel\(\)](#), [ParDepCalPlots\(\)](#), [RedYellowGreen\(\)](#)

**Examples**

```
## Not run:
data <- data.table::data.table(Target = runif(10))
data[, x1 := qnorm(Target)]
data[, x2 := runif(10)]
data[, Predict := log(pnorm(0.85 * x1 + sqrt(1-0.85^2) * qnorm(x2)))]
data[, ':= ' (x1 = NULL, x2 = NULL)]
data <- threshOptim(data = data,
                    actTar = "Target",
                    predTar = "Predict",
                    tpProfit = 0,
                    tnProfit = 0,
                    fpProfit = -1,
                    fnProfit = -2,
                    MinThresh = 0.001,
                    MaxThresh = 0.999,
                    ThresholdPrecision = 0.001)
optimalThreshold <- data$Thresholds
allResults <- data$EvaluationTable

## End(Not run)
```

---

TimeSeriesDataPrepare *TimeSeriesDataPrepare is a function that takes raw data and returns time series data*

---

**Description**

TimeSeriesDataPrepare is a function that takes raw data and returns the necessary time series data and objects for model building. It also fills any time gaps with zeros. Use this before you run any time series model functions.

**Usage**

```
TimeSeriesDataPrepare(
  data,
  TargetName,
  DateName,
  Lags,
  SeasonalLags,
```

```

    MovingAverages,
    SeasonalMovingAverages,
    TimeUnit,
    FCPeriods,
    HoldOutPeriods,
    TSClean = TRUE,
    ModelFreq = TRUE,
    FinalBuild = FALSE
)

```

### Arguments

data	Source data.table for forecasting
TargetName	Name of your target variable
DateName	Name of your date variable
Lags	The max number of lags you want to test
SeasonalLags	The max number of seasonal lags you want to test
MovingAverages	The max number of moving average terms
SeasonalMovingAverages	The max number of seasonal moving average terms
TimeUnit	The level of aggregation your dataset comes in. Choices include: 1Min, 5Min, 10Min, 15Min, and 30Min, hour, day, week, month, quarter, year
FCPeriods	The number of forecast periods you want to have forecasted
HoldOutPeriods	The number of holdout samples to compare models against
TSClean	TRUE or FALSE. TRUE will kick off a time series cleaning operation. Outliers will be smoothed and imputation will be conducted.
ModelFreq	TRUE or FALSE. TRUE will enable a model-based time frequency calculation for an alternative frequency value to test models on.
FinalBuild	Set to TRUE to create data sets with full data

### Value

Time series data sets to pass onto auto modeling functions

### Author(s)

Adrian Antico

### See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [WideTimeSeriesEnsembleForecast\(\)](#)

**Examples**

```
## Not run:
data <- data.table::fread(
  file.path(PathNormalizer(
    "C:\\Users\\aantico\\Documents\\Package\\data"),
    "tsdata.csv"))
TimeSeriesDataPrepare(
  data = data,
  TargetName = "Weekly_Sales",
  DateName = "Date",
  Lags = 5,
  MovingAverages,
  SeasonalMovingAverages,
  SeasonalLags = 1,
  TimeUnit = "week",
  FCPeriods = 10,
  HoldOutPeriods = 10,
  TSClean = TRUE,
  ModelFreq = TRUE,
  FinalBuild = FALSE)

## End(Not run)
```

TimeSeriesFill

*TimeSeriesFill For Completing Time Series Data***Description**

TimeSeriesFill For Completing Time Series Data For Single Series or Time Series by Group

**Usage**

```
TimeSeriesFill(
  data = data,
  DateColumnName = "Date",
  GroupVariables = c("Store", "Dept"),
  TimeUnit = "weeks",
  FillType = c("maxmax", "minmax", "maxmin", "minmin"),
  MaxMissingPercent = 0.05,
  SimpleImpute = FALSE
)
```

**Arguments**

data	Supply your full series data set here
DateColumnName	Supply the name of your date column
GroupVariables	Supply the column names of your group variables. E.g. "Group" or c("Group1","Group2")
TimeUnit	Choose from "second", "minute", "hour", "day", "week", "month", "quarter", "year"

FillType	Choose from maxmax - Fill from the absolute min date to the absolute max date, minmax - Fill from the max date of the min set to the absolute max date, maxmin - Fill from the absolute min date to the min of the max dates, or minmin - Fill from the max date of the min dates to the min date of the max dates
MaxMissingPercent	The maximum amount of missing values an individual series can have to remain and be imputed. Otherwise, they are discarded.
SimpleImpute	Set to TRUE or FALSE. With TRUE numeric cols will fill NAs with a -1 and non-numeric cols with a "0"

Value

Returns a data table with missing time series records filled (currently just zeros)

See Also

Other Feature Engineering: [AutoDataPartition\(\)](#), [AutoHierarchicalFourier\(\)](#), [AutoInteraction\(\)](#), [AutoLagRollStatsScoring\(\)](#), [AutoLagRollStats\(\)](#), [AutoTransformationCreate\(\)](#), [AutoTransformationScore\(\)](#), [AutoWord2VecModeler\(\)](#), [ContinuousTimeDataGenerator\(\)](#), [CreateCalendarVariables\(\)](#), [CreateHolidayVariables\(\)](#), [DT\\_GDL\\_Feature\\_Engineering\(\)](#), [DifferenceDataReverse\(\)](#), [DifferenceData\(\)](#), [DummifyDT\(\)](#), [H2oAutoencoder\(\)](#), [ModelDataPrep\(\)](#), [Partial\\_DT\\_GDL\\_Feature\\_Engineering\(\)](#)

Examples

```
## Not run:

# Pull in data
data <- data.table::fread("https://www.dropbox.com/s/2str3ek4f4cheqi/walmart_train.csv?dl=1")

# Run function
data <- TimeSeriesFill(
  data,
  DateColumnName = "Date",
  GroupVariables = c("Store", "Dept"),
  TimeUnit = "weeks",
  FillType = "maxmax",
  SimpleImpute = FALSE)

## End(Not run)
```

---

TimeSeriesMelt	<i>TimeSeriesMelt</i>
----------------	-----------------------

---

Description

TimeSeriesMelt

Usage

```
TimeSeriesMelt(
  data,
  TargetVariable = NULL,
  DateVariable = NULL,
```

```
    GroupVariables = NULL
  )
```

Arguments

- data source data
- TargetVariable vector of target variable names
- DateVariable Name of date variable
- GroupVariables Vector of group variable names

Author(s)

Adrian Antico

See Also

Other Data Wrangling: [ColumnSubsetDataTable\(\)](#), [DataDisplayMeta\(\)](#), [FakeDataGenerator\(\)](#), [FullFactorialCatFeatures\(\)](#)

---

TimeSeriesPlotter	<i>TimeSeriesPlotter</i>
-------------------	--------------------------

---

Description

TimeSeriesPlotter is a function to plot single or multiple lines on a single plot

Usage

```
TimeSeriesPlotter(
  data = data,
  TargetVariable = "TargetVariableName",
  DateVariable = "DateVariableName",
  GroupVariables = "GroupVariableName",
  EvaluationMode = FALSE,
  VLineDate = NULL,
  Aggregate = NULL,
  NumberGroupsDisplay = 5,
  LevelsToDisplay = NULL,
  OtherGroupLabel = "Other",
  DisplayOtherGroup = FALSE,
  TextSize = 12,
  LineWidth = 1,
  Color = "blue",
  XTickMarks = "1 year",
  AngleX = 35,
  AngleY = 0,
  ChartColor = "lightsteelblue1",
  BorderColor = "darkblue",
  TextColor = "darkblue",
  GridColor = "white",
  BackGroundColor = "gray95",
```

```

    LegendPosition = "bottom",
    LegendTextColor = "darkblue",
    LegendTextSize = 10,
    ForecastLineColor = "black",
    PredictionIntervals = FALSE,
    TS_ModelID = NULL,
    SSForecast = FALSE,
    PredictionIntervalColorInner = "aquamarine1",
    PredictionIntervalColorOuter = "peachpuff1"
)

```

### Arguments

<code>data</code>	Source data
<code>TargetVariable</code>	Target variable
<code>DateVariable</code>	Date variable
<code>GroupVariables</code>	Group variables
<code>EvaluationMode</code>	TRUE means two lines are displayed for Actual and Forecast
<code>VLineDate</code>	Date of last actual target value
<code>Aggregate</code>	Choose from 'sum' or 'mean'
<code>NumberGroupsDisplay</code>	Number of lines to display
<code>LevelsToDisplay</code>	Value
<code>OtherGroupLabel</code>	Label to call all other group levels
<code>DisplayOtherGroup</code>	If TRUE, a line will be shown with all levels that fall into 'other' otherwise no line will be shown
<code>TextSize</code>	Default 12
<code>LineWidth</code>	Numeric value. Default is 1
<code>Color</code>	Set to "blue", "red", etc
<code>XTickMarks</code>	Number of tick marks on x-axis. "1 minute", "15 minutes", "30 minutes", "1 hour", "3 hour", "6 hour", "12 hour", "1 day", "3 day", "1 week", "2 week", "1 month", "3 month", "6 month", "1 year", "2 year", "5 year", "10 year"
<code>AngleX</code>	Angle of text on x axis
<code>AngleY</code>	Angle of text on y axis
<code>ChartColor</code>	Color of chart background
<code>BorderColor</code>	Color of border
<code>TextColor</code>	Text color
<code>GridColor</code>	Grid color
<code>BackgroundColor</code>	Background color
<code>LegendPosition</code>	Legend position
<code>LegendTextColor</code>	Text color

LegendTextSize    Text size  
 ForecastLineColor    Forecast line color  
 PredictionIntervals    Set to TRUE to plot prediction intervals  
 TS\_ModelID    Select a model from the list for forecasting viewer  
 SSForecast    Default FALSE. Set to TRUE for single series models  
 PredictionIntervalColorInner    Fills 20th to 80th percentiles  
 PredictionIntervalColorOuter    Fills 5th to 20th and 80th to 95th percentiles

**Author(s)**

Adrian Antico

**See Also**

Other Graphics: [ChartTheme\(\)](#), [RemixTheme\(\)](#), [multiplot\(\)](#)

---

tokenizeH2O

*For NLP work*

---

**Description**

This function tokenizes text data

**Usage**

```
tokenizeH2O(data)
```

**Arguments**

data                      The text data

**Author(s)**

Adrian Antico

**See Also**

Other Misc: [AutoH2OTextPrepScoring\(\)](#), [DeleteFile\(\)](#), [Logger\(\)](#), [PrintToPDF\(\)](#)

**Examples**

```
## Not run:
data <- tokenizeH2O(data = data[["StringColumn"]])

## End(Not run)
```



---

WideTimeSeriesEnsembleForecast

*WideTimeSeriesEnsembleForecast*


---

## Description

WideTimeSeriesEnsembleForecast to generate forecasts and ensemble data

## Usage

```
WideTimeSeriesEnsembleForecast(
  TS_Models = c("arima", "tbats", "nnet"),
  ML_Methods = c("CatBoost", "XGBoost", "H2oGBM", "H2oDRF"),
  Path = "C:/Users/aantico/Documents/Package",
  TargetName = "Weekly_Sales",
  DateName = "Date",
  NTrees = 750,
  TaskType = "GPU",
  GridTune = FALSE,
  MaxNumberModels = 5
)
```

## Arguments

TS_Models	Select which ts model forecasts to ensemble
ML_Methods	Select which models to build for the ensemble
Path	The path to the folder where the ts forecasts are stored
TargetName	"Weekly_Sales"
DateName	"Date"
NTrees	Select the number of trees to utilize in ML models
TaskType	GPU or CPU
GridTune	Set to TRUE to grid tune the ML models
MaxNumberModels	The number of models to try for each ML model

## Author(s)

Adrian Antico

## See Also

Other Time Series Helper: [FinalBuildArfima\(\)](#), [FinalBuildArima\(\)](#), [FinalBuildETS\(\)](#), [FinalBuildNNET\(\)](#), [FinalBuildTBATS\(\)](#), [FinalBuildTSLM\(\)](#), [GenerateParameterGrids\(\)](#), [OptimizeArfima\(\)](#), [OptimizeArima\(\)](#), [OptimizeETS\(\)](#), [OptimizeNNET\(\)](#), [OptimizeTBATS\(\)](#), [OptimizeTSLM\(\)](#), [ParallelAutoARIMA\(\)](#), [ParallelAutoArfima\(\)](#), [ParallelAutoETS\(\)](#), [ParallelAutoNNET\(\)](#), [ParallelAutoTBATS\(\)](#), [ParallelAutoTSLM\(\)](#), [PredictArima\(\)](#), [RL\\_Performance\(\)](#), [Regular\\_Performance\(\)](#), [StackedTimeSeriesEnsembleForecast\(\)](#), [TimeSeriesDataPrepare\(\)](#)

---

XGBoostClassifierParams

*XGBoostClassifierParams*

---

**Description**

XGBoostClassifierParams

**Usage**

```
XGBoostClassifierParams(  
  counter = NULL,  
  NThreads = -1L,  
  Objective = "reg:logistic",  
  BanditArmsN = NULL,  
  eval_metric = NULL,  
  task_type = NULL,  
  model_path = NULL,  
  NewGrid = NULL,  
  Grid = NULL,  
  ExperimentalGrid = NULL,  
  GridClusters = NULL  
)
```

**Arguments**

counter	Passthrough
NThreads	= -1L,
Objective	Passthrough
BanditArmsN	Passthrough
eval_metric	Passthrough
task_type	Passthrough
model_path	Passthrough
NewGrid	Passthrough
Grid	Passthrough
ExperimentalGrid	Passthrough
GridClusters	Passthrough

**Author(s)**

Adrian Antico

**See Also**

Other Supervised Learning: [AutoH2OScoring\(\)](#), [CatBoostClassifierParams\(\)](#), [CatBoostMultiClassParams\(\)](#), [CatBoostParameterGrids\(\)](#), [CatBoostRegressionParams\(\)](#), [XGBoostMultiClassParams\(\)](#), [XGBoostParameterGr](#)  
[XGBoostRegressionMetrics\(\)](#), [XGBoostRegressionParams\(\)](#)

---

XGBoostMultiClassParams

*XGBoostMultiClassParams*


---

## Description

XGBoostMultiClassParams

## Usage

```
XGBoostMultiClassParams(
    counter = NULL,
    num_class = NULL,
    Objective = "multi:softmax",
    NThreads = -1L,
    BanditArmsN = NULL,
    eval_metric = NULL,
    task_type = NULL,
    model_path = NULL,
    NewGrid = NULL,
    Grid = NULL,
    ExperimentalGrid = NULL,
    GridClusters = NULL
)
```

## Arguments

counter	Passthrough
num_class	NULL
Objective	Passthrough
NThreads	= -1L,
BanditArmsN	Passthrough
eval_metric	Passthrough
task_type	Passthrough
model_path	Passthrough
NewGrid	Passthrough
Grid	Passthrough
ExperimentalGrid	Passthrough
GridClusters	Passthrough

## Author(s)

Adrian Antico

## See Also

Other Supervised Learning: [AutoH2OScoring\(\)](#), [CatBoostClassifierParams\(\)](#), [CatBoostMultiClassParams\(\)](#), [CatBoostParameterGrids\(\)](#), [CatBoostRegressionParams\(\)](#), [XGBoostClassifierParams\(\)](#), [XGBoostParameterGrids\(\)](#), [XGBoostRegressionMetrics\(\)](#), [XGBoostRegressionParams\(\)](#)

---

XGBoostParameterGrids *XGBoostParameterGrids*


---

## Description

XGBoostParameterGrids

## Usage

```
XGBoostParameterGrids(
  TaskType = "CPU",
  Shuffles = 1L,
  NTrees = seq(500L, 5000L, 500L),
  Depth = seq(4L, 16L, 2L),
  LearningRate = seq(0.05, 0.4, 0.05),
  MinChildWeight = seq(1, 10, 1),
  SubSample = seq(0.55, 1, 0.05),
  ColSampleByTree = seq(0.55, 1, 0.05)
)
```

## Arguments

TaskType	"GPU" or "CPU"
Shuffles	The number of shuffles you want to apply to each grid
NTrees	seq(500L, 5000L, 500L)
Depth	seq(4L, 16L, 2L)
LearningRate	seq(0.05, 0.4, 0.05)
MinChildWeight	seq(1.0, 10.0, 1.0)
SubSample	seq(0.55, 1.0, 0.05)
ColSampleByTree	seq(0.55, 1.0, 0.05)

## Value

A list containing data.table's with the parameters shuffled and ready to test in the bandit framework

## Author(s)

Adrian Antico

## See Also

Other Supervised Learning: [AutoH2OScoring\(\)](#), [CatBoostClassifierParams\(\)](#), [CatBoostMultiClassParams\(\)](#), [CatBoostParameterGrids\(\)](#), [CatBoostRegressionParams\(\)](#), [XGBoostClassifierParams\(\)](#), [XGBoostMultiClassP](#)  
[XGBoostRegressionMetrics\(\)](#), [XGBoostRegressionParams\(\)](#)

---

XGBoostRegressionMetrics

*XGBoostRegressionMetrics*


---

**Description**

XGBoostRegressionMetrics

**Usage**

```
XGBoostRegressionMetrics(grid_eval_metric, MinVal, calibEval)
```

**Arguments**

grid_eval_metric	
	Passthrough
MinVal	= -1L,
calibEval	Passthrough

**Author(s)**

Adrian Antico

**See Also**

Other Supervised Learning: [AutoH2OScoring\(\)](#), [CatBoostClassifierParams\(\)](#), [CatBoostMultiClassParams\(\)](#), [CatBoostParameterGrids\(\)](#), [CatBoostRegressionParams\(\)](#), [XGBoostClassifierParams\(\)](#), [XGBoostMultiClassP](#), [XGBoostParameterGrids\(\)](#), [XGBoostRegressionParams\(\)](#)

---

XGBoostRegressionParams

*XGBoostRegressionParams*


---

**Description**

XGBoostRegressionParams

**Usage**

```
XGBoostRegressionParams(
  counter = NULL,
  NThreads = -1L,
  BanditArmsN = NULL,
  objective = NULL,
  eval_metric = NULL,
  task_type = NULL,
  model_path = NULL,
  NewGrid = NULL,
  Grid = NULL,
  ExperimentalGrid = NULL,
  GridClusters = NULL
)
```

**Arguments**

counter	Passthrough
NThreads	= -1L,
BanditArmsN	Passthrough
objective	Passthrough
eval_metric	Passthrough
task_type	Passthrough
model_path	Passthrough
NewGrid	Passthrough
Grid	Passthrough
ExperimentalGrid	Passthrough
GridClusters	Passthrough

**Author(s)**

Adrian Antico

**See Also**

Other Supervised Learning: [AutoH2OScoring\(\)](#), [CatBoostClassifierParams\(\)](#), [CatBoostMultiClassParams\(\)](#), [CatBoostParameterGrids\(\)](#), [CatBoostRegressionParams\(\)](#), [XGBoostClassifierParams\(\)](#), [XGBoostMultiClassP](#)  
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