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IBM Netezza In-Database Analytics Reference Guide

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Note: Before using this information and the product that it supports, read the information in "Notices and Trademarks" on page 734.

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Preface

This guide describes the functions available for use within the IBM Netezza In-Database Analytics Package.

Audience for This Guide

The IBM Netezza In-Database Analytics Package was designed for users interested in using the provided data mining algorithms. Because this package includes heavy use of mathematical and statistical processes, you should have a strong understanding of these concepts to use it. Further, you should be familiar with the basic operation and concepts of the IBM Netezza system and the NPS.

The Purpose of This Guide

This guide describes the use of each algorithm in the IBM Netezza In-Database Analytics Package.

Conventions

Note on Terminology: The terms User-Defined Analytic Process (UDAP) and Analytic Executable (AE) are synonymous.

The following conventions apply:

Italics for emphasis on terms and user-defined values, such as user input.
Upper case for SQL commands, for example, INSERT or DELETE.
Bold for command line input, for example, **nzsystem stop**.
Bold to denote parameter names, argument names, or other named references.
Angle brackets (< >) to indicate a placeholder (variable) that should be replaced with actual text, for example, **nzmat <- nz.matrix("<matrix_name>")**.
A single backslash ("\") at the end of a line of code to denote a line continuation. Omit the back-slash when using the code at the command line, in a SQL command, or in a file.
When referencing a sequence of menu and submenu selections, the ">" character denotes the different menu options, for example *Menu Name > Submenu Name > Selection*.

If You Need Help

If you are having trouble using the IBM Netezza appliance, IBM Netezza Analytics or any of its com-ponents:

Retry the action, carefully following the instructions in the documentation.
Go to the IBM Support Portal at http://www.ibm.com/support. Log in using your IBM ID and password. You can search the Support Portal for solutions. To submit a support re-quest, click the 'Service Requests & PMRs' tab.
If you have an active service contract maintenance agreement with IBM, you can contact customer support teams via telephone. For individual countries, please visit the Technical Support section of the IBM Directory of worldwide contacts

http://www14.software.ibm.com/webapp/set2/sas/f/handbook/contacts.html#phone.

Comments on the Documentation

We welcome any questions, comments, or suggestions that you have for the IBM Netezza document-ation. Please send us an e-mail message at netezza-doc@wwpdl.vnet.ibm.com and include the fol-lowing information:

The name and version of the manual that you are using
Any comments that you have about the manual
Your name, address, and phone number

We appreciate your comments.

CHAPTER 1

List of functions by category

Analytics - Association Rules

ARULE - Build an Association Rules model

PREDICT_ARULE - Predict an Association Rules model

PRINT_ARULE - Print an Association Rules model

VERIFY_ARULE - Verify if data is prepared to build an Association Rules model

Analytics - Classification

CROSS_VALIDATION - Build and cross validate a Classification model

DECTREE - Build then prune a Decision Tree model

GROW_DECTREE - Build a Decision Tree model

KNN - Build a K-Nearest Neighbors model

NAIVEBAYES - Build a Naive Bayes model

PERCENTAGE_SPLIT - Build and evaluate a Classification model on a randomly split

table PMML_DECTREE - Convert a Decision Tree model to PMML

PMML_NAIVEBAYES - Convert a Naive Bayes model to

PMML PREDICT_DECTREE - Apply a Decision Tree model

PREDICT_KNN - Apply a K-Nearest Neighbors model

PREDICT_NAIVEBAYES - Apply a Naive Bayes model

PRINT_DECTREE - Print a Decision Tree model

PRUNE_DECTREE - Prune a Decision Tree model

TRAIN_TEST - Build and evaluate a Classification model on given training and testing sets

Analytics - Clustering

DIVCLUSTER - Build a Hierarchical Clustering model

KMEANS - Build a K-means Clustering model

PREDICT_DIVCLUSTER - Apply a Hierarchical Clustering model

PREDICT_KMEANS - K-means Clustering

PREDICT_TWOSTEP - Apply a TwoStep Clustering model

PRINT_KMEANS - Print a K-means model

PRINT_TWOSTEP - Print a TwoStep clustering model

SET_CLUSTERNAME - set name and/or description of a K-means cluster

TWOSTEP - Build a TwoStep Clustering model

Analytics - Column Properties

COLUMN_PROPERTIES - Create a column properties table

COLUMN_PROPERTIES_CHECK - Check a column properties table for correctness

GET_COLUMN_LIST - Retrieve a list of columns with a given role and type from a column proper-ties table

SET_COLUMN_PROPERTIES - Set columns role, type or weight in a column properties table

Analytics - Data Transformation

IMPUTE_DATA - Impute missing data

PCA - Build a Principal Component Analysis model

PROJECT_PCA - Apply a Principal Component Analysis model

SPLIT_DATA - Split a table into training and testing sets

STD_NORM - Standardization and Normalization

Analytics - Diagnostic Measures

ACC - Classification accuracy

CERROR - Classification Error

CMATRIX_ACC - Classification accuracy from a Confusion Matrix

CMATRIX_STATS - Print Classification quality factors from a Confusion Matrix

CMATRIX_WACC - Weighted Classification accuracy from a Confusion Matrix

CONFUSION_MATRIX - Build a Confusion Matrix

FMEASURE - F-Measure from a Confusion Matrix

FPR - False Positive Rate from a Confusion Matrix

MAE - Mean Absolute Error

MSE - Mean Squared Error

PPV - Positive Predictive Value from a Confusion Matrix

RAE - Relative Absolute Error

RSE - Relative Squared Error

TPR - True Positive Rate from a Confusion Matrix

WACC - Weighted Classification accuracy

Analytics - Discretization

APPLY_DISC - Discretize data using given discretization bin limits

EFDISC - Discretization bins of equal frequency

EMDISC - Discretization bins of minimal entropy

EWDISC - Discretization bins of equal width

EWDISC_NICE - Discretization bins of equal width with human-friendly limits

Analytics - Model Management

ALTER_MODEL - Alter properties of an analytics model

CLEANUP - Remove the model management infrastructure from the current database

COPY_MODEL - Duplicate an analytics model

DROP_ALL_MODELS - Drop selected or all analytics

models DROP_MODEL - Drop an analytics model

EXPORT_MODEL - Export one or more analytic models to a file set

EXPORT_PMML - Export an analytics model as PMML document to a file

GRANT_MODEL - Grant privileges on an analytics model

IMPORT_MODEL - Import one or more analytics models from a file set

INITIALIZE - Initialize the model management infrastructure

IS_INITIALIZED - Check the model management infrastructure

LIST_COLPROPS - List column properties for selected or all analytics models

LIST_COMPONENTS - List components of selected or all analytics models

LIST_MODELS - List selected or all analytics models

LIST_PARAMS - List parameters for selected or all analytics

models LIST_PRIVILEGES - List privileges on all analytics models

METADATA_ANALYZE - Check and Repair Metadata Repository

MIGRATE_MODEL - Migrate an analytics model MODEL_EXISTS -

Check if an analytics model exists

PMML_MODEL - Generate a PMML representation of an analytics model

PRINT_MODEL - Print an analytics model

REGISTER_MODEL - Register a version 1.x analytics model to model

management REVOKE_MODEL - Revoke privileges on an analytics model

Analytics - Probability Distributions

CUMULATIVE - Cumulative Distributions

DBERN - Density of the Bernoulli Distribution DBETA -

Probability density function for Beta distribution

DBINOM - Density of the Binomial Distribution

DCAUCHY - Probability density function for Cauchy

Distribution DCHISQ - Probability density function for Chi-

square Distribution DENSITY - Density of Distributions

DEXP - Probability density function for Exponential Distribution

DF - Probability density function for Fisher Distribution

DFISK - Probability density function for Fisk (or log-logistic)

Distribution DGAMMA - Probability density function for Gamma

distribution DGEOM - Density of the Geometric Distribution

DHYPER - Density of the Hypergeometric Distribution

DLNORM - Density of Galton (or LogNormal) Distribution

DLOGIS - Probability density function for Logistic

Distribution DMWW - Density of the Mann-Whitney-

Wilcoxon Distribution DNBINOM - Density of the Negative

Binomial Distribution DNORM - Density of the Standard

Normal Distribution DNORM3P - Density of the Normal

Distribution DPOIS - Density of the Poisson Distribution

DT - Density of the T-student Distribution

DUNIF - Density of the Uniform Distribution

DWALD - Density of the Wald distribution DWEIBULL - Density of

the Weibull (or Rosin-Rammer) Distribution DWILCOX - Density

of the Wilcoxon Distribution PBERN - Cumulative Bernoulli

Distribution

PBERN_H - Cumulative Bernoulli Distribution, high tail

PBETA - Cumulative Beta Distribution

PBETA_H - Cumulative Beta Distribution, high tail

PBINOM - Cumulative Binomial Distribution

PBINOM_H - Cumulative Binomial Distribution, high tail

PCAUCHY - Cumulative Cauchy Distribution

PCAUCHY_H - Cumulative Cauchy Distribution, high tail

PCHISQ - Cumulative Chi-square Distribution

PCHISQ_H - Cumulative Chi-square Distribution, high tail

PCHISQ_S - Cumulative Chi-square Distribution with string argument

PEXP - Cumulative Exponential Distribution

PEXP_H - Cumulative Exponential Distribution, high tail

PF - Cumulative Fisher Distribution

PF_H - Cumulative Fisher Distribution, high tail

PFISK - Cumulative Fisk (or log-logistic) Distribution

PFISK_H - Cumulative Fisk (or log-logistic) Distribution, high tail

PGAMMA - Cumulative Gamma Distribution

PGAMMA_H - Cumulative Gamma Distribution, high tail

PGEOM - Cumulative Geometric Distribution

PGEOM_H - Cumulative Geometric Distribution, high tail

PHYPER - Cumulative Hypergeometric Distribution

PHYPER_H - Cumulative Hypergeometric Distribution, high tail

PLNORM - Cumulative Galton (or LogNormal) Distribution

PLNORM_H - Cumulative Galton (or LogNormal) Distribution, high tail

PLOGIS - Cumulative Logistic Distribution

PLOGIS_H - Cumulative Logistic Distribution, high tail

PMWW - Cumulative Mann-Whitney-Wilcoxon Distribution

PMWW_H - Cumulative Mann-Whitney-Wilcoxon Distribution, high tail

PNBINOM - Cumulative Negative Binomial Distribution

PNBINOM_H - Negative Binomial Distribution, high tail

PNORM - Cumulative Standard Normal Distribution

PNORM3P - Cumulative Normal Distribution

PNORM_H - Cumulative Standard Normal Distribution, high tail

PPOINT - Percentage Point Distributions

PPOIS - Cumulative Poisson Distribution

PPOIS_H - Cumulative Poisson Distribution, high tail

PT - Cumulative T-student Distribution

PT - Cumulative T-student Distribution with string argument

PT_H - Cumulative T-student Distribution, high tail

PUNIF - Cumulative Uniform Distribution

PUNIF_H - Cumulative Uniform Distribution, high tail

PWALD - Cumulative Wald Distribution

PWALD_H - Cumulative Wald Distribution, high tail

PWEIBULL - Cumulative Weibull (or Rosin-Rammer) Distribution

PWEIBULL_H - Cumulative Weibull (or Rosin-Rammer) Distribution, high

tail PWILCOX - Cumulative Wilcoxon Distribution

PWILCOX_H - Cumulative Wilcoxon Distribution, high

tail QBERN - Inverse Bernoulli Distribution

QBERN_H - Inverse Bernoulli Distribution, high tail

QBETA - Inverse Beta Distribution

QBETA_H - Inverse Beta Distribution, high tail

QBINOM - Inverse Binomial Distribution

QBINOM_H - Inverse Binomial Distribution, high tail

QCAUCHY - Inverse Cauchy Distribution

QCAUCHY_H - Inverse Cauchy Distribution, high tail

QCHISQ - Inverse Chi-square Distribution

QCHISQ_H - Inverse Chi-square Distribution, high tail

QEXP - Inverse Exponential Distribution

QEXP_H - Inverse Exponential Distribution, high tail

QF - Inverse Fisher Distribution

QF_H - Inverse Fisher Distribution, high tail

QFISK - Inverse Fisk (or log-logistic) Distribution

QFISK_H - Inverse Fisk (or log-logistic) Distribution, high

tail QGAMMA - Inverse Gamma Distribution

QGAMMA_H - Inverse Gamma Distribution, high tail

QGEOM - Inverse Geometric Distribution

QGEOM_H - Inverse Geometric Distribution, high tail

QHYPER - Inverse Hypergeometric Distribution

QHYPER_H - Inverse Hypergeometric Distribution, high tail

QLNORM - Inverse Galton (or LogNormal) Distribution

QLNORM_H - Inverse Galton (or LogNormal) Distribution, high tail

QLOGIS - Inverse Logistic Distribution

QLOGIS_H - Inverse Logistic Distribution, high tail

QMWW - Inverse Mann-Whitney-Wilcoxon Distribution

QMWW_H - Inverse Mann-Whitney-Wilcoxon Distribution, high tail

QNBINOM - Inverse Negative Binomial Distribution

QNBINOM_H - Inverse Negative Binomial Distribution, high tail

QNORM - Inverse Standard Normal Distribution

QNORM3P - Inverse Normal Distribution

QNORM_H - Inverse Standard Normal Distribution, high tail

QPOIS - Inverse Poisson Distribution

QPOIS_H - Inverse Poisson Distribution, high tail

QT - Inverse t-Student Distribution

QT_H - Inverse t-Student Distribution, high tail

QUNIF - Inverse Uniform Distribution

QUNIF_H - Inverse Uniform Distribution, high tail

QWALD - Inverse Wald Distribution

QWALD_H - Inverse Wald Distribution, high tail

QWEIBULL - Inverse Weilbull (or Rosin-Rammer) Distribution

QWEIBULL_H - Inverse Weilbull (or Rosin-Rammer) Distribution, high tail

QWILCOX - Inverse Wilcoxon Distribution

QWILCOX_H - Inverse Wilcoxon Distribution, high tail

Analytics - Quantiles & Outliers

IQR - InterQuartile Range

MEDIAN - Median value for a numeric attribute

MEDIAN_DISC - Median value for a discrete attribute

OUTLIERS - Detect outliers for a numeric attribute

QUANTILE - Quantile for a numeric attribute

QUANTILE_DISC - Quantile for a discrete attribute

QUARTILE - Quartile for a numeric attribute

QUARTILE_DISC - Quartile for a discrete attribute

Analytics - Regression

BTBNET_GROW - Build a tree-like Bayesian Network model

GLM - Build a Generalized Linear Model

GROW_REGTREE - Grow a Regression Tree model

LINEAR_REGRESSION - Build a Linear Regression model

MTBNET_DIFF - Show differences between multiple tree-shaped bayesian networks

MTBNET_GROW - Build a multi-tree bayesian network for correlations

PREDICT_GLM - Apply a Generalized Linear Model

PREDICT_LINEAR_REGRESSION - Apply a Linear Regression Model

PREDICT_REGTREE - Apply a Regression Tree model

PRINT_GLM - Print a Generalized Linear Model

PRINT_REGTREE - Print a Regression Tree model

PRUNE_REGTREE - Prune a Regression Tree model

REGTREE - Build then prune a Regression Tree model

TANET_APPLY - Apply a tree-augmented network model

TANET_CLASSAPPLY - Apply a tree-augmented network

TANET_GROW - Build a tree-augmented network model

TBNET1G - Build a tree-like Bayesian Network model

TBNET1G2P - Build a tree-like Bayesian Network model

TBNET2G - Build a tree-like Bayesian Network model in bi-partite mode

TBNET_APPLY - Apply a tree-like Bayesian Network model

TBNET_GROW - Build a tree-like Bayesian Network model

Analytics - Sampling

RANDOM_SAMPLE - Random Sample

Analytics - Statistics

ANOVA_CRD_TEST - Analyze variance using Completely Randomized Design and One Way

ANOVA ANOVA_RBD_TEST - Analyze variance using ANOVA Randomized Block Design BITABLE

- Bivariate Frequencies

CANONICAL_CORR - Canonical Correlation

CANONICAL_CORR_AGG - Canonical Correlation

CBFS_AGG - Correlation-based feature selection

CHISQ_TEST - Pearson's Chi-square test of independence

CHISQ_TEST_AGG - Pearson's Chi-square

CHISQ_TEST_S_AGG - Pearson's Chi-square with degree of freedom

COL2TRCV_MANOVA_ONE_WAY_TEST - data transformation from column representation to trcv for Multivariate Analyzsis of Variance in one way setting

COL2TRCV_MANOVA_TWO_WAY_TEST - data transformation from column representation to grcv for Mul-tivariate Analyzsis of Variance in two way setting

COND_ENTROPY - Conditional Entropy

CORR - Mutual Correlation

CORR_AGG - Pearson's Correlation

CORR_AGG - Pearson's Correlation with weight

CORR_MATRIX_AGG - Correlation Matrix

CORRELATION1000MATRIX - Correlation matrix

CORRELATION500PAIRS - Correlation of pairs of variables

COV - Covariance

COV_AGG - Pearson's Covariance

COV_MATRIX_AGG - Covariance Matrix

COVARIANCE1000MATRIX - Covariance matrix

COVARIANCE500PAIRS - Covariance of pairs of variables

COVARIANCEMATRIX - Covariance matrix as string

DROP_SUMMARY1000 - Drop tables created by SUMMARY1000

ENTROPY - Univariate Entropy

HIST - Histograms

JOINT_ENTROPY - Bivariate Entropy

KURTOSIS_AGG - excess Kurtosis

LDF_MANOVA_ONE_WAY_TEST - LDF of ABC Multivariate Analysis of Variance result in one way setting

LDF_MANOVA_TWO_WAY_TEST - LDF of Multivariate Analysis of Variance result in TWO way setting

MANOVA_ONE_WAY_TEST - Multivariate Analyzsis of Variance in one way setting

MANOVA_Two_WAY_TEST - Multivariate Analyzsis of Variance in Two way setting

MOMENTS - Moments of a column

MUTUALINFO - Mutual Information

MUTUALINFO_AGG - Mutual Information

MWW_TEST - Mann-Whitney-Wilcoxon test of independence

PRINT_MANOVA_ONE_WAY_TEST - Pretty print of Multivariate Analyzsis of Variance result in one way set-ting

PRINT_MANOVA_Two_WAY_TEST - Pretty print of Multivariate Analyzsis of Variance result in two way set-ting

SKEWNESS_AGG - Skewness

SPEARMAN_CORR - Spearman Rank Correlation

SPEARMAN_CORR_S - Spearman Rank Correlation as string

SUMMARY1000 - Summary of up to 1000 columns

SUMMARY1000CHAR - Summary of up to 1000 character columns

SUMMARY1000DATE - Summary of up to 1000 date columns

SUMMARY1000INTERVAL - Summary of up to 1000 interval columns

SUMMARY1000NUM - Summary of up to 1000 numeric columns

SUMMARY1000TIME - Summary of up to 1000 time columns

SUMMARY1000TIMESTAMP - Summary of up to 1000 timestamp columns

T_LS_TEST - T-Student test for the linear relationship of two columns

T_LS_TEST_S_AGG - T-Student test between linearly dependent samples as string

T_ME_TEST - T-Student test for the expected mean of a column

T_ME_TEST_S_AGG - T-Student test for the expected mean of a variable as string

T_PMD_TEST - T-Student test for the expected mean difference between two paired columns

T_PMD_TEST_S_AGG - T-Student test for the expected mean difference between two paired vari-ables as string

T_TEST_AGG - T-Student test of a variable split into two classes

T_TEST_S_AGG - T-Student test of a variable split into two classes as string

T_UMD_TEST - T-Student test for the expected mean difference between class values of a

column UNITABLE - Univariate Frequencies

WILCOXON_TEST - Wilcoxon paired sample difference test

Analytics - Time Series

PRINT_TIMESERIES - Print Time Series predictions

TIMESERIES - Predict future values for Time Series

Utilities - Actions

_sp_utl_dropAllAggregates - Drop all UDA aggregate functions with the given prefix

_sp_utl_dropAllFunctions - Drop all UDF functions with the given prefix

_sp_utl_dropAllLike - Drop all database objects with the given LIKE expression

_sp_utl_dropAllProcedures - Drop all stored procedures with the given prefix

_sp_utl_dropAllUDX - Drop all UDx functions with the given prefix

_sp_utl_justExecute - Execute a SQL statement

DROP_TABLE - Drop a table

Utilities - Checking

_sp_utl_aggregateExists - Check if a UDA aggregate function exists

_sp_utl_columnContainsNulls - Check if a column contains at least one NULL value _sp_utl_columnExists - Check if a column exists

_sp_utl_columnIsId - Check if a column contains unique values

_sp_utl_columnIsNumeric - Check if a column is of a numeric data type

_sp_utl_columnListExists - Check if a columns exists

_sp_utl_columnsEqualTypes - Check if two columns have the same data type

_sp_utl_functionExists - Check if a UDF function exists

_sp_utl_isTempTable - Check if a table is temporary

_sp_utl_procedureExists - Check if a stored procedure exists

_sp_utl_relationExists - Check if a table or a view exists

_sp_utl_sequenceExists - Check if a sequence exists

_sp_utl_tableExists - Check if a table exists

_sp_utl_viewExists - Check if a view exists

ISDATE_TINY - Check if a string has the compact date format YYYYMMDD

msghelp - Show information related to a message number in the correct language of the locale.

Utilities - Data Exploration

_sp_utl_getColumnType - Column data type

_sp_utl_getTableSize - Table row count

Utilities - Preprocessing

drand64 - 64 bits pseudo-random number generator

CHAPTER 2
Reference Documentation: Analytics

ACC - Classification accuracy

This stored procedure calculates the Classification accuracy, i.e. the ratio of correctly classified pre-dictions

Usage

The ACC stored procedure has the following syntax:

ACC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table containing real

values Type: NVARCHAR(256)

id
the input table column in <intable> identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column in <intable> containing real

values Type: NVARCHAR(128)

resulttable
the input table containing predicted

values Type: NVARCHAR(256)

resultid
the input table column in <resulttable> identifying a unique instance

id Type: NVARCHAR(128)

Default: id

resulttarget
the input table column in <resulttable> containing predicted

values Type: NVARCHAR(128)

Default: class

Returns
DOUBLE the Classification accuracy

Details

This stored procedure calculates the ratio of correctly classified predictions among the total num-ber of predictions. This is done by comparing the predictions made when applying a Classification model onto data, and the real values for this data.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,
traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..ACC('intable=nza..iris_test,
resulttable=iris_pred, id=id, target=class');
CALL nza..DROP_MODEL('model=iris_c45');

CALL nza..DROP_TABLE('iris_pred');
```

```
 TRAIN_TEST
------------
   0.918919
(1 row)
   ACC
----------
 0.918919
(1 row)
 DROP_MODEL
------------
 t
(1 row)
```

```
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CERROR
WACC

ALTER_MODEL - Alter properties of an analytics model

This stored procedure alters the properties of the given model

Usage

The ALTER_MODEL stored procedure has the following syntax:

ALTER_MODEL(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to be altered

Type: NVARCHAR(64)

name
the new name of the model. If not specified, the model is not renamed. Otherwise, the model name and the names of the managed tables are changed

Type: NVARCHAR(64)

Default: <none>

owner
the new owner of the model. If not specified, the owner of the model does not change. Other-wise, the new owner will get all model privileges.

Type: NVARCHAR(128)

Default: <none>

description
the description for the model. If not specified, the description of the model does not change. Otherwise, the given description will be associated to the model.

Type: NVARCHAR(8192)

Default: <none>

copyright
the copyright statement for the model, used when exporting the model to PMML. If not specified, the copyright statement of the model does not change. Otherwise, the given copyright statement will be associated to the model.

Type: NVARCHAR(128)

Default: <none>

appname
the application that created the model, used when exporting the model to PMML. If not specified, the application that created the model does not change. Otherwise, the given application name will be associated to the model.

Type: VARCHAR(64)

Default: <none>

appversion
the version of the application that created the model, used when exporting the model to PMML. If not specified, the application version of the model does not change. Oth-erwise, the given application version will be associated to the model.

Type: VARCHAR(16)

Default: <none>

category
the user-defined category for the model. If not specified, the category of the model does not change. Otherwise, the given category will be associated to the model. Type: NVARCHAR(64)

Default: <none>

Returns
BOOLEAN always true (otherwise an exception is raised)

Details

This stored procedure alters the properties of the given model. The following model properties can be altered:

the model name,

the owner,

the description,

the copyright statement,

the application name,

the application version,

the user category.

Examples

```
CALL nza..ARULE('intable=nza..retail, model=mbamodel,
supporttype=percent, support=5, lvl=0, maxsetsize=5,
confidence=0.5');
CALL nza..ALTER_MODEL('model=mbamodel, description=Market basket
analysis');
SELECT modelname, description FROM v_nza_models WHERE
upper(modelname)='MBAMODEL';
CALL nza..DROP_MODEL('model=mbamodel');
```

```
NOTICE:
          RUNNING FPGrowth algorithm:
          DATASET : "NZA".."RETAIL"
          Transaction column : "TID"
          Item column : "ITEM"
          Group by : <none>
          Minimum support : 5 %
          Minimum confidence: 0.5
          Max frequent itemset size : 5
          Level of conditional dbs : 0
          Result tables prefix : "NZA_META_MBAMODEL"
 ARULE
-------
    14
(1 row)
 ALTER_MODEL
-------------
 t
(1 row)
 MODELNAME |      DESCRIPTION
-----------+-----------------------
 MBAMODEL  | Market basket analysis
(1 row)
NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
```

```
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS

ANOVA_CRD_TEST - Analyze variance using Completely Randomized Design and One Way ANOVA

This stored procedure performs a completely randomized design ANOVA

Usage

The ANOVA_CRD_TEST stored procedure has the following syntax:

ANOVA_CRD_TEST(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

treatment
the input table column identifying a unique

treatment Type: NVARCHAR(128)

incolumn
the input table observation columns, separated by a semi-colon (;). If several observa-tions are specified, an output table must be specified too.

Type: NVARCHAR(ANY)

variable
the observation column. Deprecated, use parameter incolumn

instead. Type: NVARCHAR(128)

Default: <none>

by
the input table column which uniquely identifies a group on which to perform ANOVA.

If specified, an output table must be specified too.

Type: NVARCHAR(ANY)

Default: <none>

outtable
the output table. This parameter is required if parameter by is specified and/or multiple obser-vation columns are provided. Otherwise the parameter is ignored.

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(200) The test results or the number of rows in the outtable.

The test result can contain following results: SScbetween, DFbetween, SScwithin, DFwithin, F and P. See the output table column description for more information on them.

Details

This stored procedure analyzes the variance of one or several observations for different treatments. It as-sumes that the input table contains one or several columns with numerical (double) observation results of an experiment concerning treatments indicated by the treatment parameter.

The One-way ANOVA considers independent samples (the treatments) while the Completely Randomized Design considers equally sized "samples". The implementation covers both cases. For more information, see 'Completely Randomized Design'.

The stored procedure returns, among others, the p-value of the F test. If the p-value is larger than 0.95 then it can be said that the hypothesis is incorrect or in this case the treatment had no effect.

If several observation columns are given and/or the treatment are grouped by the column specified in para-meter by, an output table is written with following columns: totno, totsu, totmean, totss, ssctot, sscbetween, dfbetween, sscwithin, dfwithin, f, p. If parameter by is specified, a column <by> is added. If parameter incolumn is specified, a column incolumn is added containing the column name specified in para-meter incolumn.

The output table columns have following meaning:

totno - the total number of observations,

totsum - the sum of the observations,

totmean - the mean value of the observations,

totss - the sum of squares of the observations,

ssctot - the variance of the observations,

sscbetween - the sum of squares between the treatments (around the overall mean),

dfbetween - the number of degrees of freedom between the treatments,

sscwithin - the sum of squares within the treatments (around the mean of each treatment),

dfwithin - the sum of the number of degrees of freedom within each treatment,

f - the value of the F-statistics for the treatments,

p - the probability that the true F statistics is lower or equal to the F-statistics above (computed from the sample).

Note that the larger the value of sscbetween as compared to sscwithin, the greater the impact of the treatment on the measured variable. Sscbetween and sscwithin sum up to the overall centered sum of squares. F-statistics is the quotient of the variance due to treatment to the rest variance.

Examples

```
CREATE TABLE wheattest2(fieldId INTEGER, variety
CHAR(1), yield DOUBLE, barrels INTEGER);
INSERT INTO wheattest2 VALUES(1,'A',80, 4);
INSERT INTO wheattest2 VALUES(2,'A',65, 3);
INSERT INTO wheattest2 VALUES(3,'A',50, 2);
INSERT INTO wheattest2 VALUES(4,'B',100, 5);
INSERT INTO wheattest2 VALUES(5,'B',85, 4);
INSERT INTO wheattest2 VALUES(6,'B',70, 3);
INSERT INTO wheattest2 VALUES(7,'C',60, 2);
INSERT INTO wheattest2 VALUES(8,'C',75, 3);
INSERT INTO wheattest2 VALUES(9,'C',90, 5);
CALL nza..ANOVA_CRD_TEST('intable=wheattest2,
variable= yield, treatment=variety');
CALL nza..ANOVA_CRD_TEST('intable=wheattest2,
incolumn= yield; barrels, treatment=variety,
outtable=outtab'); SELECT * FROM outtab ORDER BY
incolumn; CALL nza..DROP_TABLE('outtab');
CALL nza..DROP_TABLE('wheattest2');
```

```
                                                 ANOVA_CRD_TEST
-----------------------------------------------------------
----------------------------------------
 SScbetween= 600 DFbetween= 2 SScwithin= 1350 DFwithin=
6 F= 1.3333333333333 p= 0.6681838871188
(1 row)


 ANOVA_CRD_TEST
----------------
   2
```

```
(1 row)


 INCOLUMN | TOTNO | TOTSU |       TOTMEAN      | TOTSS |
SSCTOT        |  SSCBETWEEN     | DFBETWEEN |    SSCWITHIN    |
DFWITHIN |         F          |          P

----------+------- +-------+ -----------------+ -------
+-----------------  +-----------------    +-----------
+-----------------  +---------- +-----------------
+-----------------

 BARRELS  |      9 |      31 | 3.4444444444444|    117 |
10.222222222222 | 1.5555555555555 |          2 | 8.6666666666667
         6 | 0.53846153846153 | 0.39057491575573

  YIELD    |        9|  675|              75 | 52575 |
 1950 |             600 |         2 |            1350 |        6
   1.3333333333333 | 0.6681838871188

(2 rows)


 DROP_TABLE
------------
 t
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

```
CREATE TABLE wheatbytest(fieldId INTEGER, variety CHAR(1), yield
DOUBLE, barrels INTEGER, experiment INT4);
INSERT INTO wheatbytest VALUES(1,'A',65,3,1);
INSERT INTO wheatbytest VALUES(2,'A',66,4,1);
INSERT INTO wheatbytest VALUES(3,'A',64,2,1);
INSERT INTO wheatbytest VALUES(4,'B',84,3,1);
INSERT INTO wheatbytest VALUES(5,'B',85,4,1);
INSERT INTO wheatbytest VALUES(6,'B',86,5,1);
INSERT INTO wheatbytest VALUES(7,'C',75,3,1);
INSERT INTO wheatbytest VALUES(8,'C',76,4,1);
INSERT INTO wheatbytest VALUES(9,'C',74,2,1);
INSERT INTO wheatbytest VALUES(1,'A',80,4,2);
INSERT INTO wheatbytest VALUES(2,'A',65,3,2);
INSERT INTO wheatbytest VALUES(3,'A',50,2,2);
INSERT INTO wheatbytest VALUES(4,'B',100,5,2);
INSERT INTO wheatbytest VALUES(5,'B',85,4,2);
INSERT INTO wheatbytest VALUES(6,'B',70,3,2);
INSERT INTO wheatbytest VALUES(7,'C',60,2,2);
INSERT INTO wheatbytest VALUES(8,'C',75,3,2);
INSERT INTO wheatbytest VALUES(9,'C',90,5,2);
CALL nza..ANOVA_CRD_TEST('intable=wheatbytest,
incolumn=yield, treatment=variety,
by=experiment, outtable=outbytab');
SELECT * FROM outbytab ORDER BY experiment;
CALL nza..DROP_TABLE('outbytab');
CALL nza..ANOVA_CRD_TEST('intable=wheatbytest,
incolumn=yield;barrels, treatment=variety,
by=experiment, outtable=outbytab');
SELECT * FROM outbytab ORDER BY incolumn,
experiment; CALL nza..DROP_TABLE('outbytab'); CALL
nza..DROP_TABLE('wheatbytest');
```

```
 ANOVA_CRD_TEST
----------------
   2
(1 row)

 EXPERIMENT | TOTNO   | TOTSU | TOTMEAN | TOTSS| SSCTOT |
  SSCBETWEEN | DFBETWEEN | SSCWITHIN | DFWITHIN|        F
|          P
------------    +-------- +--------+ ---------+--------+  --------
+-------------+------------ +-----------         +----------
+---------------- +-----------------
 1          |       9 |    675|        75 | 51231|     606 |
600 |           2 |          6|         6 |              300
```

```
| 0.99999902940985
  2          |      9 |   675  |       75 | 52575 |   1950 |
600 |          2 |      1350  |        6 | 1.3333333333333 |
0.6681838871188
(2 rows)


 DROP_TABLE
------------
 t
(1 row)


 ANOVA_CRD_TEST
----------------
   4
(1 row)


 INCOLUMN | EXPERIMENT | TOTNO | TOTSU |      TOTMEAN     |
TOTSS |      SSCTOT       |   SSCBETWEEN     | DFBETWEEN |
SSCWITHIN     | DFWITHIN |         F         |         P
---------- +-------------      +--------  +-------- +-----------------
+--------+ ------------------ +-----------------            +-----------
+ -----------------+----------+-------------------
+ -----------------
 BARRELS  | 1          |      9 |    30 | 3.3333333333333 |
108 |                8 |              2 |          2 |
6 |         6 | 0.99999999999999 |         0.578125
 BARRELS  | 2          |      9 |    31 | 3.4444444444444 |
117 | 10.222222222222 | 1.5555555555555 |          2 |
8.6666666666667 |         6 | 0.53846153846153 |
0.39057491575573
 YIELD    | 1          |      9 |   675 |              75 |
51231 |              606 |            600 |          2 |
6 |         6 |              300 | 0.99999902940985
 YIELD    | 2          |      9 |   675 |              75 |
52575 |             1950 |            600 |          2 |
1350 |         6 |   1.3333333333333 |   0.6681838871188
(4 rows)


 DROP_TABLE
```

```
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
ANOVA_RBD_TEST

ANOVA_RBD_TEST - Analyze variance using ANOVA Randomized Block Design

This stored procedure performs a randomized block design ANOVA

Usage

The ANOVA_RBD_TEST stored procedure has the following syntax:

ANOVA_RBD_TEST(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

treatment
the input table column identifying a unique

treatment Type: NVARCHAR(128)

block
the input table column identifying a unique block of

treatments Type: NVARCHAR(128)

incolumn
the input table observation columns, separated by a semi-colon (;). If several observations are specified, an output table must be specified too.

Type: NVARCHAR(ANY)

variable
the observation column. Deprecated, use parameter incolumn

instead. Type: NVARCHAR(128)

Default: <none>

by
the input table column which uniquely identifies a group on which to perform ANOVA. If spe-cified, an output table must be specified too.

Type: NVARCHAR(ANY)

Default: <none>

outtable
the output table. This parameter is required if parameter by is specified and/or multiple obser-vation columns are provided. Otherwise the parameter is ignored.

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(200) The test results or the number of rows in the outtable.

The test result can contain following results: blSScbetween, blDFbetween, SScwithin, DFwithin, Fbl, Pbl, grSScbetween, grDFbetween, Fgr and Pgr. See the output table column description for more in-formation on them.

Details

This stored procedure analyzes the variance of one or several observations for different blocks of treat-ments. It assumes that the input table contains one or several columns with numerical (double) observation results of an experiment concerning treatments indicated by the treatment parameter. The treatments are performed repeatedly in various blocks, e.g. from different laboratories where experiments are carried out. This means there are independent samples (treatments) repeatedly drawn for each block. In particular, the number of observations for the same treatment in different blocks should be the same.

Generally, we would expect differences between blocks (we split into blocks just to reduce the variance res-ulting) and are curious about the differences concerning treatments.

The stored procedure returns, among others, the p-value of the F test, related to the block split and the group split of the data. If the p-value is larger than 0.95 then it can be said that the hypothesis is incorrect or in this case the treatment or block split had no effect.

If several observation columns are given and/or the treatment are grouped by the column specified in para-meter by, an output table is written with following columns: blscbetween, bldfbetween, sscwithin, dfwithin, fbl, pbl, grsscbetween, grdfbetween, fgr, pgr. If parameter by is specified, a column <by> is added. If para-meter incolumn is specified, a column incolumn is added containing the column name specified in paramet-er incolumn.

The output table columns have following meaning:

blsscbetween - the sum of squares between the blocks of treatments (around the overal mean),

bldfbetween - the number of degrees of freedom between the blocks of treatments,

sscwithin - the sum of squares within the treatments (around the mean of each treatment),

dfwithin - the sum of the number of degrees of freedom within each treatment,

grsscbetween - the sum of squares between the groups (around the overal mean),

grdfbetween - the number of degrees of freedom between the groups,

fbl - the value of the F-statistics for the blocks of treatments,

pbl - the probability that the true F statistics is lower or equal to the F-statistics above (computed from the sample),

fgr - the value of the F-statistics for the groups,

pgr - the probability that the true F statistics is lower or equal to the F-statistics above (computed from the sample).

Examples

```
CREATE TABLE textiles(chemical NVARCHAR(4), bolt
INT4, concentration DOUBLE, ph DOUBLE);
INSERT INTO textiles VALUES('A',1,65,10.1);
INSERT INTO textiles VALUES('A',2,50,12.2);
INSERT INTO textiles VALUES('A',3,45,11.9);
INSERT INTO textiles VALUES('B',1,42,11.4);
INSERT INTO textiles VALUES('B',2,30,12.9);
INSERT INTO textiles VALUES('B',3,22,12.7);
INSERT INTO textiles VALUES('C',1,44,9.9);
INSERT INTO textiles VALUES('C',2,80,12.3);
INSERT INTO textiles VALUES('C',3,76,11.4);
INSERT INTO textiles VALUES('D',1,79,12.1);
INSERT INTO textiles VALUES('D',2,99,13.4);
INSERT INTO textiles VALUES('D',3,86,12.9);
CALL nza..ANOVA_RBD_TEST('intable=textiles,
incolumn=ph, treatment=chemical, block=bolt');
CALL nza..ANOVA_RBD_TEST('intable=textiles,
incolumn=ph;concentration, treatment=chemical,
block=bolt, outtable=outtab');
SELECT * FROM outtab ORDER BY incolumn;

CALL nza..DROP_TABLE('outtab');
CALL nza..DROP_TABLE('textiles');
```

```
ANOVA_RBD_TEST
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
--------------

 blSScbetween= 7.1716666666662 blDFbetween= 2 SScwithin=
0.53500000000031 DFwithin= 6 Fbl= 40.214953271002 pbl=
0.999665449548 grSScbetween= 5.2 grDFbetween= 3 Fgr=
19.439252336438 pgr= 0.99828746900889

(1 row)

 ANOVA_RBD_TEST

---------------

   2

(1 row)

   INCOLUMN    |  BLSSCBETWEEN   | BLDFBETWEEN |     SSCWITHIN
| DFWITHIN |        FBL        |        PBL          |
GRSSCBETWEEN   |  GRDFBETWEEN|        FGR         |         PGR

              +__                + -------------
+-------------------------------     +----------+------------------
+-----------------   +-----------------       +------------
+----------------   +------------------

 CONCENTRATION | 145.16666666666 |          2 |
1258.8333333334 |         6 | 0.34595524956968 |
0.27921891773379 | 5083.6666666667 |           3 |
8.0767906792002 | 0.98422520011584

 PH            | 7.1716666666671 |          2 |
0.5349999999994 |         6 |  40.214953271075 |
0.999665449548 |             5.2 |          3 |
19.439252336471 | 0.99828746900833

(2 rows)

 DROP_TABLE

------------

 t

(1 row)

 DROP_TABLE

------------

 t
```

```
(1 row)

CREATE TABLE bytextiles(chemical NVARCHAR(4), bolt
INT4, concentration DOUBLE, ph DOUBLE, experiment
INT4); INSERT INTO bytextiles VALUES('A',1,65,10.1,1);
INSERT INTO bytextiles VALUES('A',2,50,12.2,1);
INSERT INTO bytextiles VALUES('A',3,45,11.9,1);
INSERT INTO bytextiles VALUES('B',1,42,11.4,1);
INSERT INTO bytextiles VALUES('B',2,30,12.9,1);
INSERT INTO bytextiles VALUES('B',3,22,12.7,1);
INSERT INTO bytextiles VALUES('C',1,44,9.9,1);
INSERT INTO bytextiles VALUES('C',2,80,12.3,1);
INSERT INTO bytextiles VALUES('C',3,76,11.4,1);
INSERT INTO bytextiles VALUES('D',1,79,12.1,1);
INSERT INTO bytextiles VALUES('D',2,99,13.4,1);
INSERT INTO bytextiles VALUES('D',3,86,12.9,1);
INSERT INTO bytextiles VALUES('A',1,100-65,15-10.1,2);
INSERT INTO bytextiles VALUES('A',2,100-50,15-12.2,2);
INSERT INTO bytextiles VALUES('A',3,100-45,15-11.9,2);
INSERT INTO bytextiles VALUES('B',1,100-42,15-11.4,2);
INSERT INTO bytextiles VALUES('B',2,100-30,15-12.9,2);
INSERT INTO bytextiles VALUES('B',3,100-22,15-12.7,2);
INSERT INTO bytextiles VALUES('C',1,100-44,15-9.9,2);
INSERT INTO bytextiles VALUES('C',2,100-80,15-12.3,2);
INSERT INTO bytextiles VALUES('C',3,100-76,15-11.4,2);
INSERT INTO bytextiles VALUES('D',1,100-79,15-12.1,2);
INSERT INTO bytextiles VALUES('D',2,100-99,15-13.4,2);
INSERT INTO bytextiles VALUES('D',3,100-86,15-12.9,2);
CALL nza..ANOVA_RBD_TEST('intable=bytextiles,
incolumn=ph, treatment=chemical, block=bolt,
by=experiment, outtable=outbytab');

SELECT * FROM outbytab ORDER BY experiment;
```

```
CALL nza..DROP_TABLE('outbytab');

call nza..ANOVA_RBD_TEST('intable=bytextiles,
incolumn=ph;concentration, treatment=chemical, block=bolt,
by=experiment, outtable=outbytab');
SELECT * FROM outbytab ORDER BY incolumn, experiment;

CALL nza..DROP_TABLE('outbytab'); CALL

nza..DROP_TABLE('bytextiles');
```

```
 ANOVA_RBD_TEST
----------------

   2

(1 row)

 EXPERIMENT |  BLSSCBETWEEN   | BLDFBETWEEN |     SSCWITHIN
| DFWITHIN |        FBL        |       PBL        | GRSSCBETWEEN |
GRDFBETWEEN |        FGR        |        PGR

------------+-----------------+-------------+-----------------
+----------+-----------------+----------------+-------------
+------------+-----------------+-----------------

 1          | 7.1716666666671 |           2 | 0.53499999999963
|        6 | 40.214953271058 | 0.999665449548 |          5.2 |
3 | 19.439252336462 | 0.99828746900889

 2          | 7.1716666666667 |           2 | 0.53500000000004
|        6 | 40.214953271025 | 0.999665449548 |          5.2 |
3 | 19.439252336447 | 0.99828746900889

(2 rows)

 DROP_TABLE
------------

 t

(1 row)

 ANOVA_RBD_TEST
----------------

   4

(1 row)

   INCOLUMN    | EXPERIMENT |  BLSSCBETWEEN   | BLDFBETWEEN |
SSCWITHIN      | DFWITHIN |        FBL        |        PBL
|  GRSSCBETWEEN   | GRDFBETWEEN |        FGR        |        PGR

---------------+------------+-----------------+------------
+------------------+----------+-----------------
+-----------------+----------------+------------
```

```
+-----------------+------------------
 CONCENTRATION | 1          | 145.16666666666 |
2 |   1258.8333333333 |       6 | 0.34595524956968 |
0.27921891773379 | 5083.6666666667 |          3 |
8.0767906792003 | 0.98422520011997
 CONCENTRATION | 2          | 145.16666666667 |
2 |   1258.8333333333 |       6 | 0.34595524956972 |
0.27921891773382 | 5083.6666666667 |          3 |
8.0767906792004 | 0.98422520011997
 PH            | 1          | 7.1716666666671 |
2 | 0.53499999999963 |       6 |  40.214953271058 |
0.999665449548 |            5.2 |          3 |
19.439252336462 | 0.99828746900889
 PH            | 2          | 7.1716666666666 |
2 | 0.53500000000005 |       6 |  40.214953271024 |
0.999665449548 |            5.2 |          3 |
19.439252336447 | 0.99828746900889
(4 rows)
 DROP_TABLE
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
ANOVA_CRD_TEST
ANOVA_CRD_TEST

APPLY_DISC - Discretize data using given discretization bin limits

This stored procedure discretize numeric input data columns according to the given limits for dis-cretization bins

Usage

The APPLY_DISC stored procedure has the following syntax:

APPLY_DISC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

outtable
the output table or view to store the discretized data

into Type: NVARCHAR(256)

btable
the input table containing the discretization bin limits for numeric columns of the input table to be discretized. This table contains following columns: colname, break.

Type: NVARCHAR(256)

view
a flag indicating whether the output object should be stored as a view (true) or as a table (false). This parameter is deprecated, please use parameter outtabletype instead. If parameter outtabletype is set, the value of parameter view is ignored.

Type: BOOLEAN

Default: false

replace
a flag indicating whether the discretized columns should replace the original columns (true) or should be added with another name (false). The name of the columns is then prefixed with 'disc_'.

Type: BOOLEAN

Default: true

outtabletype
the type of the output table or view to store the discretized data into. This can be 'table', 'tem-porary' or 'view'.

Type: VARCHAR(16)

Default: 'table'

Returns
INTEGER the number of discretized columns

Details

This stored procedure discretized numeric input table columns using the given discretization bin limits for the column. The original column value is transformed to the index of the discretization bin to which this value belongs.

The discretization bin limits are available in <btable> in following columns: colname, break. The column colname references the name of the input table columns, and the column break contains a bin limit for this column.

Only input table columns that have bin limits defined in <btable> are discretized.

If the flag replace=true, the output table contains the input table columns that are not discretized and the discretized columns with the same name as in the input table.

If the flag replace=false, the output table contains all input table columns with their original name, and the discretized column with their name prefixed with 'disc_'.

Examples

```
CALL nza..EWDISC('outtable=disc_bounds,
intable=nza..disc_iris,
incolumn=petal_length:5;sepal_width:4');
SELECT * FROM disc_bounds order by colname, break; CALL
nza..APPLY_DISC('outtable=disc_extended,
intable=nza..disc_iris, btable=disc_bounds, replace=F');
SELECT * FROM disc_extended order by 1,2,3,4 limit 10;
CALL nza..APPLY_DISC('outtable=disc_replaced,
intable=nza..disc_iris, btable=disc_bounds, replace=T');
SELECT species, petal_width, petal_length, sepal_width,
sepal_length FROM disc_replaced order by 1,2,3,4,5 limit
10;
CALL nza..DROP_TABLE('disc_bounds');
CALL nza..DROP_TABLE('disc_extended');
CALL nza..DROP_TABLE('disc_replaced');
```

```
 EWDISC
--------
      2
(1 row)

   COLNAME    | BREAK
--------------+-------
 PETAL_LENGTH |  2.18
 PETAL_LENGTH |   3.36
 PETAL_LENGTH |   4.54
 PETAL_LENGTH |   5.72
 SEPAL_WIDTH  |    2.6
 SEPAL_WIDTH  |    3.2
 SEPAL_WIDTH  |    3.8
(7 rows)

 APPLY_DISC
------------
          2
(1 row)

 SEPAL_LENGTH  | SEPAL_WIDTH | PETAL_LENGTH | PETAL_WIDTH |
SPECIES | DISC_PETAL_LENGTH |  DISC_SEPAL_WIDTH
--------------+-------------+ --------------+------------
+--------- +-------------------                +------------------
          4.3 |            3 |           1.1 |         0.1 |
setosa   | 1                 | 2
           4.4|          2.9|           1.4 |         0.2 |
setosa   | 1                 | 2
          4.4 |            3 |           1.3 |         0.2 |
setosa   | 1                 | 2
           4.4|          3.2|           1.3 |         0.2 |
setosa   | 1                 | 2
           4.5|          2.3|           1.3 |         0.3 |
setosa   | 1                 | 1
           4.6|          3.1|           1.5 |         0.2 |
setosa   | 1                 | 2
           4.6|          3.2|           1.4 |         0.2 |
setosa   | 1                 | 2
           4.6|          3.4|           1.4 |         0.3 |
setosa   | 1                 | 3
          4.6 |          3.6 |             1 |         0.2 |
setosa   | 1                 | 3
           4.7|          3.2 |           1.3 |         0.2 |
setosa   | 1                 | 2
```

```
(10 rows)

 APPLY_DISC
------------
          2
(1 row)

 SPECIES | PETAL_WIDTH | PETAL_LENGTH | SEPAL_WIDTH
| SEPAL_LENGTH
+----------------------- +------------+-------------+------------

 setosa  |          0.1| 1            | 2            |
4.3
 setosa  |          0.1| 1            | 2            |
4.8
 setosa  |          0.1| 1            | 2            |
4.9
 setosa  |          0.1| 1            | 2            |
4.9
 setosa  |          0.1| 1            | 2            |
4.9
 setosa  |          0.1| 1            | 4            |
5.2
 setosa  |          0.2| 1            | 2            |
4.4
 setosa  |          0.2| 1            | 2            |
4.4
 setosa  |          0.2| 1            | 2            |
4.4
 setosa  |          0.2| 1            | 2            |
4.6
(10 rows)

 DROP_TABLE
------------
 t
```

```
(1 row)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Discretization
EFDISC
EMDISC
EWDISC
EWDISC_NICE

ARULE - Build an Association Rules model

This stored procedure builds an Association Rule model by using the FP-growth algorithm. The procedure extracts sets of items that are frequently used by transactions. It also implies rules by associating these items. The algorithm is concurrently executed on independent parts of the data, where the level of parallel-ism is controlled by the lvl parameter. Be careful when you specify the lvl parameter because it affects the consumption of temporary database space and the main memory in the nodes.

Usage

The ARULE stored procedure has the following syntax:

ARULE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Association Rules model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

tid
the input table column identifying

transactions Type: NVARCHAR(128)

Default: tid

item
the input table column identifying items in

transactions Type: NVARCHAR(128)

Default: item

by
the input table column identifying groups of transactions if any. Association Rules min-ing is done separately on each of these groups. Leave the parameter undefined if no groups are to be considered.

Type: NVARCHAR(128)

Default: <none>

lvl
the level of splitting data into independent parts - conditional data sets.

ARULE first temporarily redistributes the data into overlapping parts in such a way, that each part can be processed in parallel without communication between the SPUs. Note that for this to work, there can be redundancy between the parts, such that the accumulative size of the temporary parts can be much higher than the one of the original data set. The parameter lvl controls how many parts are created. The higher lvl:

The more computation and temporary database space is required for the splitting

The smaller the amount of main memory that is required for each data slice

Note: To fully use the benefits of parallel computing, do not specify the value of the lvl parameter too low. Additionally, the lower the value of the lvl parameter, the higher the memory consumption for each part. The higher memory consumption might cause an out-of-memory error on the SPUs. If an out-of-memory error on the SPUs oc-curs, increase the lvl parameter.

If you specify the value 0, the algorithm is executed in a serial way for each data set group. However, only if the data set fits in one node, and only if the splitting increases the total number of rows dramatically, the stored procedure might be executed faster when you specify the value 0.

Type: INTEGER

Default: 1

Min: 0

Max: 64

maxsetsize
the maximum number of items occurring in mined association rules (identical with maximum number of items in frequent itemset to be extracted by FPGrowth algorithm).

Type: INTEGER

Default: 6

Min: 1

Max: 64

support
minimum support value satisfied by all association rules. According to supporttype, it defines the absolute number (#supporting transactions) or the percentage of transactions (#supporting transactions/#total transactions*100). Too low minimum support increases the number of gen-erated rules and the computational expense.

Type: DOUBLE

Default: 5 if supporttype=percent, undefined if supporttype=absolute

Min: 0.0 (excluded)

Max: 100.0 if supporttype=percent, no limit otherwise

supporttype
the type how the minimum support should be interpreted. The following values are allowed: absolute, percent.

NOTE: The support and supporttype values are common to all groups in the dataset. E.g. if 3 is the absolute minimum support, then an itemset will be considered frequent if at least 3 trans-actions contain its items, no matter what is the number of transactions in this group. Use sup-porttype=percent to indicate a minimum support depending on the size of the groups. Specify-ing supporttype=absolute takes effect only if a support is explicitly supplied.

Type: VARCHAR(64)

Default: percent

confidence
the minimum confidence for an association rule to be

extracted. Type: DOUBLE

Default: 0.5

Min: 0.0

Max: 1.0

Returns
INT8 number of association rules discovered (for all groups).

Details

This stored procedure builds an Association Rules model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the stored procedure PRINT_ARULE to display the Association Rules of the model, or the Model Management functions to further manipulate the model or access the model tables.

Examples

```
CALL nza..ARULE('intable=nza..retail, model=assoc,
supporttype=percent, support=5, lvl=0,
maxsetsize=5, confidence=0.5');
CALL nza..PRINT_ARULE('model=assoc, minsize=2,
minsupp=0.05,minconf=0.6,minlift=1.3,minconv=1.3'); CALL
nza..PMML_MODEL('model=assoc,outtable=ARule_pmml'); CALL
nza..DROP_MODEL('model=assoc'); CALL
nza..DROP_TABLE('ARule_pmml');
```

```
 ARULE
-------
    14
(1 row)

                                 PRINT_ARULE
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
--
     GRP=| {41} -> {39} [supp=0.12946620993172,
conf=0.76373369019739, lift=1.328708230788,
conv=1.7996889669349]
     GRP=| {32,39} -> {48}
[supp=0.061273564574306, conf=0.63891188645772,
lift=1.3368399129912, conv=1.4458326995372]
     GRP=| {38,48} -> {39}
[supp=0.069213493341803, conf=0.76812688821752,
lift=1.3363513116731, conv=1.8337868834446]
     GRP=| {41,48} -> {39}
[supp=0.083550736144824, conf=0.81681082279885,
lift=1.4210493489806, conv=2.3211298697154]
```

```
     GRP=| {39,41} -> {48}
[supp=0.083550736144824, conf=0.645347818468855,
lift=1.3503062625329, conv=1.4720704655452]
(1 row)


 PMML_MODEL
------------
          2
(1 row)


 DROP_MODEL
------------
 t
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Association Rules
Error: Reference source not found
PRINT_ARULE
LIST_MODELS

BITABLE - Bivariate Frequencies

This stored procedure creates a bivariate frequency table for two columns of the input table

Usage

The BITABLE stored procedure has the following syntax:

BITABLE(NVARCHAR(ANY) paramString)

- ▲ Parameters
  - ► **paramString**

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

incolumn
the input table columns to consider, separated by a semi-colon (;). Only first two columns will be used to construct bivariate frequency table.

Type: NVARCHAR(ANY)

outtable
the output table where the bivariate frequencies are written

to Type: NVARCHAR(ANY)

freq
flag indicating whether frequencies should be attached to the output

table Type: BOOLEAN

Default: false

cum
flag indicating whether cumulative frequencies should be attached to the output table (setting this flag automatically sets freq flag as frequencies have to be calculated prior to cumulative frequencies)

Type: BOOLEAN

Default: false

Returns
INTEGER the number of bivariate frequencies calculated

Details

This stored procedure counts the frequency of all pairs of distinct values for two columns of the in-put table.

The bivariate frequencies are stored in the output table with following columns: <incolumn1>, <in-column2>, count.

Two additional columns freq (frequency) and cum (cumulative frequency) can be available in the output table if the corresponding parameters are set to true.

Examples

```
CALL
nza..BITABLE('intable=nza..censusincome,incolumn=class_of
_worker;major_occupation_code,outtable=gdm_jf1,freq=t,cum
=t');
SELECT sum(count) = (SELECT count(*) FROM
nza..censusincome) eq FROM gdm_jf1;
SELECT count(*) = (SELECT count(distinct
class_of_worker)*count(distinct major_occupation_code) FROM
nza..censusincome) eq FROM gdm_jf1;
CALL nza..DROP_TABLE('gdm_jf1');
```

```
 BITABLE
---------
    135
(1 row)

 EQ
----
 t
(1 row)

 EQ
----
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
UNITABLE
HIST

BTBNET_GROW - Build a tree-like Bayesian Network model

This stored procedure builds a tree-like Bayesian Network for continuous and discrete variables. A spanning tree is constructed joining all the variables or the value pairs on grounds of most strong correlations. This gives the user an overview of most significant interrelations governing the whole set of variables.

Usage

The BTBNET_GROW stored procedure has the following syntax:

BTBNET_GROW(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Bayesian Network model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the input table columns to consider, separated by a semi-colon (;). Each column name may be followed by a colon (:) and either:

a value for a discrete column,

a boolean expression for a numeric column.

The columns followed by a colon (:) are transformed into numeric input columns tak-ing a value 0 or 1. The value 1 indicates that the column has the given discrete value or that the boolean expression is true.

Type: NVARCHAR(ANY)

baseidx
the numeric id to be assigned to the first

variable Type: int4

Default: 777

samplesize
the sample size to take if the number of records is too

large Type: int4

Default: 330000

talk
if talk=yes then additional information on progress will be

displayed Type: NVARCHAR(ANY)

Default: <none>

edgelabsort
if edgelabsort=yes then the left end of the edge will have a name lower in alphabetic

order than the right one

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(3000) a termination message

Details

This stored procedure builds a Bayesian Network over the given input table columns. The numeric columns are taken as is, the discrete columns specified with a colon (<column>:<value or boolexpr>) are transformed into numeric columns. Only the numeric columns, either from the input table or transformed, are con-sidered for the model. The model is stored as a set of edges, storing the correlation between two columns and the mean and standard deviation of both columns.

A sampling approach is taken to overcome the computational complexity. If parameter talk=yes, the stored procedure displays notices during the computation. This can be useful for a larger number of columns.

The model can be applied using stored procedure TBNET_APPLY. To apply the model on similar data and to recreate the same transformation as during the creation of the model, get the expression <expr> stored in table nza_meta_<model>_callcodes (1 row, 1 column) and create a view on the apply input table as follows: select <expr> from <intable>. The stored procedure TBNET_APPLY should then be called on this view.

Examples

```
CALL nza..BTBNET_GROW('model=struc_iris, intable=nza..iris,
incolumn=SEPALLENGTH;SEPALWIDTH:">3";PETALLENGTH;PETALWIDTH;clas
s:"virginica";class:"setosa",coldefrole=ignore');
SELECT varxname, varyname, corr::numeric(6,4) AS corr FROM
nza_meta_struc_iris_model order by 1,2;
SELECT * FROM nza_meta_struc_iris_varscodes order by 1,2;
SELECT * FROM nza_meta_struc_iris_callcodes;
CALL nza..DROP_MODEL('model=struc_iris');
```

```
             BTBNET_GROW
-------------------------------------
 Over node no6in BTBNet_Grow process
(1 row)

   VARXNAME   |    VARYNAME   |  CORR
-------------+-------------+---------
 CLASS_4      | SEPALWIDTH_3 |   0.5594
 PETALLENGTH | CLASS_4      | -0.9227
 PETALLENGTH | PETALWIDTH   |   0.9628
 PETALLENGTH | SEPALLENGTH  |   0.8718
 PETALWIDTH | CLASS_5      |  0.7691
(5 rows)

   VARNAME    | ORIGVARNAME | THRESHOLD
------------- +------------ +-----------
 CLASS_4      | CLASS       | setosa
 CLASS_5      | CLASS       | virginica
 SEPALWIDTH_3 | SEPALWIDTH  | >3
(3 rows)


THECALL
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
----------------------------------
 PETALLENGTH,PETALWIDTH,SEPALLENGTH,case when
SEPALWIDTH>3 then 1 else 0 end as SEPALWIDTH_3,case when
CLASS='setosa' then 1 else 0 end as CLASS_4,case when
CLASS='virginica' then 1 else 0 end as CLASS_5
(1 row)

 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
TBNET1G
TBNET2G
TBNET_APPLY

CANONICAL_CORR - Canonical Correlation

This stored procedure calculates the canonical correlation between two sets of numeric input columns

Usage

The CANONICAL_CORR stored procedure has the following syntax:

CANONICAL_CORR(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the correlations

into Type: NVARCHAR(256)

incolumn
the numeric input table columns to be correlated, separated by a semicolon (;). Each column is followed by :X or :Y to indicate it belongs to set X or set Y.

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be per-formed

Type: NVARCHAR(ANY)

Default: <none>

Returns
INT8 the number of correlations written into the output table

Details

This stored procedure calculates the canonical correlation of two sets of input columns, either in the whole input table or within the groups defined in the column specified by parameter <by>. Canonical correlation is a measure saying how easily it is to predict one column set from the other. It takes a value between -1 (inversely correlated) and 1 (correlated), 0 means that the two sets of columns are independent.

The output table is created with following column: canonical_correlation. If the parameter by is specified, an additional column <by> is added to indicate for which group the correlations have been calculated. The output column canonical_correlation is a string containing the correlation between the two sets of input columns is given as well as two vectors a and b containing the coefficients of the variables of sets X and Y re-spectively. Given two input column X1 and X2 in set X, and two input columns Y1 and Y2 in set Y, the given correlation between set X and Y is the maximum correlation found between a combination of X1 and X2 and a combination of Y1 and Y2. The maximum correlation is found between a[1] * X1 + a[2] * X2 and b[1] * Y1 + B[2] * Y2. You can check the correlation using following statement: SELECT nza..CORR_AGG((a[1] * X1 + a[2] * X2)::DOUBLE, (b[1] * Y1 + B[2] * Y2)::DOUBLE) FROM <intable>;

PLEASE note that if the variables (columns) are functionally dependent (that is one can be computed as a combination of the others, especially a linear combination of them) then the output of the procedure can be (in fact will be) non-deterministic. Therefore the user is advised not to use functionally dependent variables.

Examples

```
CALL nza..CANONICAL_CORR('intable=nza..CensusIncome,
incolumn=age:X;wage_per_hour:Y,
outtable=resultTable'); SELECT * FROM resultTable;
CALL nza..DROP_TABLE('resultTable');
 CANONICAL_CORR
----------------
              1
(1 row)

                                CANONICAL_CORRELATION
----------------------------------------------------------
---------------------------------
 correlation= 0.0369383,
   a=    "               1      ",
   b=    "       0.00299795      "
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..CANONICAL_CORR('intable=nza..iris,
incolumn=sepallength:X;sepalwidth:X;petallength:Y;petalwi
dth:Y, outtable=resultTable');
SELECT * FROM resultTable;
CALL nza..DROP_TABLE('resultTable');
```

```
 CANONICAL_CORR
----------------
              1
(1 row)

                                                            CANONICAL_
CORRELATION
------------------------------------------------------------
-----------------------------------------------------------
 correlation= 0.940897,
   a=    "         0.780366              -0.625323       ",
   b=    "          0.58457              -0.481924       "
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..CANONICAL_CORR('intable=nza..CensusIncome,
incolumn=age:X;wage_per_hour:Y, outtable=resultTable, by=sex');
SELECT * FROM resultTable ORDER BY sex; CALL
nza..DROP_TABLE('resultTable');
```

```
 CANONICAL_CORR
----------------
              2
(1 row)
                                  CANONICAL_CORRELATION
|  SEX
------------------------------------------------------------
---------------------------              +--------
 correlation= 0.0253748,
   a=    "                1       ",
   b=    "       0.00233639       "
```

```
  | Female
 correlation= 0.0507014,
   a=    "                1      ",
   b=    "       0.00365224      "
    Male
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
CORR
CORRELATION1000MATRIX
CORRELATION500PAIRS

CANONICAL_CORR_AGG - Canonical Correlation

This function calculate the canonical correlation between two sets of numeric input variables. It takes as arguments the number of variables in the set X, the number of variables in the set Y, and the variables themselves, and computes the highest correlation between linear combinations within both groups.

Usage

The CANONICAL_CORR_AGG aggregate has the following syntax:

CANONICAL_CORR_AGG(INT4 noX, INT4 noY, DOUBLE X1, DOUBLE X2, DOUBLE Y1, DOUBLE Y2, DOUBLE Y3)

Parameters

noX

the number of variables in set

X Type: INT4

Min: 1

Max: 61-noY

noY
the number of variables in set

Y Type: INT4

Min: 1

Max: 61-noX

X1,X2,etc.
the first, second, etc... variable in set

X Type: DOUBLE

Y1,Y2,etc.
the first, second, etc... variable in set

Y Type: DOUBLE

Returns
NVARCHAR(10000) the string with the canonical correlation and the correlation coefficients for the variables of sets X and Y

Details

This function calculates the canonical correlation of two sets of numeric input variables. Canonical correlation is a measure saying how easily it is to predict one variable set from the other. It takes a value between -1 (inversely correlated) and 1 (correlated), 0 means that the two sets of variables are independent.

The major limitation is that the number of input variables cannot exceed 61.

This function returns a string containing the correlation between the two sets of input variables as well as two vectors a and b containing the coefficients of the variables of sets X and Y respectively. Given two input variables X1 and X2 in set X, and two input variables Y1 and Y2 in set Y, the given correlation between set X and Y is the maximum correlation found between a combination of X1 and X2 and a combination of Y1 and Y2. The maximum correlation is found between a[1] * X1 + a[2] * X2 and b[1] * Y1 + B[2] * Y2. You can check the correlation using following statement: SELECT nza..CORR_AGG((a[1] * X1 + a[2] * X2)::DOUBLE, (b[1] * Y1 + B[2] * Y2)::DOUBLE) FROM <intable>;

PLEASE note that if the variables (columns) are functionally dependent (that is one can be computed as a combination of the others, especially a linear combination of them) then the output of the function can be (in fact will be) non-deterministic. Therefore the user is advised not to use functionally dependent variables.

Examples

```
CREATE TABLE my2table AS SELECT 0.4*petallength+2.5 as x1,
0.6*petallength+2.5 as x2,0.3*sepallength+2.5 as y1,
0.2*sepallength+2.5 as y2, 0.5*sepallength+2.5 as y3
FROM nza..iris;
SELECT nza..CANONICAL_CORR_AGG(2,3,X1,X2,Y1,Y2,Y3)
FROM my2table;
SELECT nza..CORR_AGG(0.832525*x1-0.553988*x2,
0.00131594*y1+0.00210631*y2+0.000660639*y3) FROM my2table;

CALL nza..DROP_TABLE('my2table');
```

```
CANONICAL_CORR_AGG
---------------------------------------------------------
---------------------------------------------------------
-----------------------------
 correlation= 0.871754,

   a=      "        0.832525           -0.553988    ",
   b=      "      0.00131594          0.00210631
0.000660639      "

(1 row)

      CORR_AGG
------------------
 0.87175415726467
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
CANONICAL_CORR
CORR_AGG

CBFS_AGG - Correlation-based feature selection

This function calculates the N best predictors for a numeric target variable out of several numeric input variables. It checks for each variable the contribution expressed by its partial correlation to the target variable and takes stepwise the most contributing variable. If the strongest contribution is too small, the process is stopped prematurally.

Usage

The CBFS_AGG aggregate has the following syntax:

CBFS_AGG(INT4 N, DOUBLE T, DOUBLE X1, DOUBLE X2, DOUBLE X3)

Parameters

N
the number of best predictors to find

out Type: INT4

Max: number of variables Xi

T
the target variable

Type: DOUBLE

X1,X2,etc.
the variables to choose

from Type: DOUBLE

Returns
NVARCHAR(10000) the string with the correlation matrix and the selected best predictors

Details

This function determines the N variables most strongly partially correlated with the target variable T, under the normality assumption.

The major limitation is that the number of input variables cannot exceed 62.

This function returns a string containing the correlation matrix between variables T,X1,X2,X3,etc. The N best predictors are then indicated with their correlation to the target variable T.

Examples

```
SELECT nza..CBFS_AGG(2, SEPALLENGTH, SEPALWIDTH, PETALLENGTH,
PETALWIDTH) from nza..iris;
```

```
                                      CBFS_AGG

---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
------------------------

  correlation matrix


               0              1       -0.109369       0.871754
 0.817954
```

```
               1      -0.109369              1
 -0.420516       -0.356544
               2       0.871754      -0.420516
         0.962757
               3       0.817954      -0.356544
0.962757                1
 Feature selection  2
1) 2         0.871754    2)  1        0.578643
(1 row)
```

Related Functions

category Analytics - Statistics
CORR_AGG

CERROR - Classification Error

This stored procedure calculates the classification error, i.e. the ratio of wrongly classified predic-tions

Usage

The CERROR stored procedure has the following syntax:

CERROR(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

pred_table
the input table or view containing predicted

values Type: NVARCHAR(256)

pred_column
the input table column in <pred_table> containing predicted

values Type: NVARCHAR(128)

pred_id
the input table column in <pred_table> identifying a unique instance

id Type: NVARCHAR(128)

true_table
the input table or view containing real

values Type: NVARCHAR(256)

true_column
the input table column in <true_table> containing real

values Type: NVARCHAR(128)

true_id
the input table column in <true_table> identifying a unique instance

id Type: NVARCHAR(128)

check
flag indicating to check parameters or not. This may consume some time but prevents usage er-rors. Allowed values are: 'all' (check all), 'none' (check nothing), 'nulls' (check for nulls only). Type: NVARCHAR(ANY)

Default: all

Returns
DOUBLE the Classification error

Details

This stored procedure calculates the ratio of wrongly classified predictions among the total number of pre-dictions. This is done by comparing the predictions made when applying a Classification model onto data, and the real values for this data.

Examples

```
CALL nza..GROW_DECTREE('model=adult_tree,
intable=nza..adult_train, id=id, target=income, minsplit=1000');
CALL nza..PREDICT_DECTREE('model=adult_tree,
intable=nza..adult_test, id=id, outtable=adult_pred');
CALL nza..CERROR('pred_table=adult_pred,
true_table=nza..adult_test, pred_column=class,
true_column=income, pred_id=id, true_id=id');
CALL nza..DROP_MODEL('model=adult_tree'); CALL
nza..DROP_TABLE('adult_pred');
```

```
 GROW_DECTREE
--------------
           25
(1 row)


 PREDICT_DECTREE
-----------------
```

```
           8140
(1 row)

      CERROR
-------------------
 0.15380835380835
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
MAE
MSE
RAE
RSE

CHISQ_TEST - Pearson's Chi-square test of independence

This stored procedure calculates the Chi-square value between two input columns and return the probability of their independence

Usage

The CHISQ_TEST stored procedure has the following syntax:

CHISQ_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the Chi-square values

into Type: NVARCHAR(256)

incolumn
the two input table columns, separated by a semicolon

(;) Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be per-formed

Type: NVARCHAR(128)

Default: <none>

Returns
DOUBLE the probability of the independence of the two input table columns, or the number of groups in the output table for which a Chi-square value has been calculated

Details

This stored procedure calculates the Chi-square value between two input columns, either in the whole input table or within the groups defined in the column specified by parameter <by>. Chi-square is a measure say-ing how easily it is to predict one column from the other. The stored procedure then returns a probability that the two columns are independent.

Rows with nulls in (any of) the columns of interest are omitted.

If parameter 'by' is specified, an output table must be specified. The output table is created with following columns: over_<by>, chi2statistic, df, percentage. The Chi-square value between the two input columns is given for each group of the <by> column. If the parameter by is not specified, the column is named over_no_group and contains a '-' value.

Additionally to the Chi-square statistics, this stored procedure returns the degree of freedom of the input variables and a percentage between 0 and 1.

If the percentage ranges from 0 to 0.05, the columns are definitely independent,

If the percentage ranges between 0.05 and 0.95, they are to be treated as independent, though one is not sure,

If the percentage ranges between 0.95 and 1, then a predictive mutual dependency is definitely there.

Examples

```
CALL nza..CHISQ_TEST('intable=nza..censusincome,
incolumn=citizenship;sex, outtable=Result7');
SELECT * FROM result7;
Drop TABLE result7;
```

```
 chisq_test
------------
   0.999999
(1 row)
    percentage    |  chi2statistic   | df | over_no_group
------------------+-----------------+----+---------------
 0.99999999847558 | 47.000679914049 | 4 | -
(1 row)
```

```
CALL nza..CHISQ_TEST('intable=nza..censusincome,
incolumn=race;sex, outtable=Result7,
by=class_of_worker');
SELECT Over_CLASS_OF_WORKER, percentage, chi2statistic,
df FROM result7 ORDER BY Over_CLASS_OF_WORKER;
CALL nza..DROP_TABLE('result7');
```

```
 CHISQ_TEST
------------
          9
(1 row)
     Over_CLASS_OF_WORKER       |     PERCENTAGE     |
CHI2STATISTIC  | DF
                                +------------------
+----------------------------------------------- +----
 Federal government             | 0.99999948679363 |
52.179603606458 |   4
 Local government               | 0.82417595627736 |
6.329968182374 |  4
 Never worked                   | 0.86042942906178 |
6.9311728303627 |   4
 Not in universe                | 0.94196124426241 |
9.1254701438947 |   4
 Private                        | 0.99999886640305 |
 128.53784913352 |  4
 Self-employed-incorporated     | 0.87829380668977  |
 7.2821925368807 |  4
 Self-employed-not incorporated | 0.47043176999387  |
 3.1713658426038 |  4
 State government               | 0.99996313406049  |
 25.683570562306 |  4
 Without pay                    | 0.37809556020125  |
 2.6278114467202 |  4
(9 rows)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
CHISQ_TEST_AGG
CHISQ_TEST_S_AGG
PCHISQ

CHISQ_TEST_AGG - Pearson's Chi-square

This function calculate the Chi-square value between two integer input variables

Usage

The CHISQ_TEST_AGG aggregate has the following syntax:

CHISQ_TEST_AGG(INT4 X, INT4 Y)

Parameters

X

the first input

variable Type: INT4

Min: 0

Y

the second input

variable Type: INT4

Min: 0

Returns

DOUBLE the Chi-square value, or NULL if there is too few data

Details

This function calculates the Chi-square value of two integer input variables. Chi-square is a meas-ure saying how easily it is to predict one column from the other. It takes positive values, the lower the Chi-square value the more independent are the input variables.

Input values smaller than 0 are ignored. Use only for small data sets. For larger ones, the stored procedure CHISQ_TEST is recommended.

Examples

```
SELECT nza..CHISQ_TEST_AGG(
case when sex='Female' then 0 when sex='Male' then 1
else -1 end,
case
when race='Amer Indian Aleut or Eskimo' then
1 when race='Black' then 2 when race='White'
then 3
when race='Asian or Pacific Islander' then

4 when race='Other' then 5 else -1 end

) FROM nza..censusincome;
```

```
 CHISQ_TEST_AGG
----------------
  101.155617992
(1 row)
```

Related Functions

category Analytics - Statistics
CHISQ_TEST
CHISQ_TEST_S_AGG
PCHISQ

CHISQ_TEST_S_AGG - Pearson's Chi-square with degree of freedom

This function calculate the Chi-square value and the degree of freedom between two integer input variables

Usage

The CHISQ_TEST_S_AGG aggregate has the following syntax:

CHISQ_TEST_S_AGG(INT4 X, INT4 Y)

Parameters

X

the first input

variable Type: INT4

Min: 0

Y

the second input

variable Type: INT4

Min: 0

Returns

VARCHAR(300) a string containing the Chi-square value and the degree of freedom, or NULL if there is too few data

Details

This function calculates the Chi-square value and the degree of freedom of two integer input variables. Chi-square is a measure saying how easily it is to predict one column from the other. It takes positive values, the lower the Chi-square value the more independent are the input variables.

Input values smaller than 0 are ignored. Use only for small data sets. For larger ones, the stored procedure CHISQ_TEST is recommended.

Examples

```
SELECT nza..CHISQ_TEST_S_AGG(
case when sex='Female' then 0 when sex='Male' then 1 else -1
end,
case
when race='Amer Indian Aleut or Eskimo' then 1
when race='Black' then 2 when race='White'
then 3
when race='Asian or Pacific Islander' then 4

when race='Other' then 5 else -1 end

  FROM nza..censusincome;
      CHISQ_TEST_S_AGG
```

```
-----------------------------
 chi2Stat= 101.156,      df= 4
(1 row)
```

Related Functions

category Analytics - Statistics
CHISQ_TEST
CHISQ_TEST_AGG
PCHISQ
PCHISQ_S

CLEANUP - Remove the model management infrastructure from the cur-rent database

This stored procedure removes the model management infrastructure from the current database, provided that there are no registered models.

Usage

The CLEANUP stored procedure has the following syntax:

CLEANUP()

Returns
NVARCHAR(ANY) a text explaining that the cleanup was successful.

Details

This stored procedure removes the model management infrastructure from the current database, provided that there are no registered models.

If the model management tables are empty, all objects (tables, views, sequences, procedures) are removed.

If at least one model management table is not empty, an exception is raised, and nothing is done.

Examples

```
CALL nza..CLEANUP();
CALL nza..INITIALIZE();
```

CLEANUP

```
-------------------------------------------------------
 The metadata objects have been removed successfully.
(1 row)

                      INITIALIZE
-----------------------------------------------------
 The metadata objects are successfully initialized.
(1 row)
```

Related Functions

category Analytics - Model Management
DROP_ALL_MODELS
INITIALIZE

CMATRIX_ACC - Classification accuracy from a Confusion Matrix

This stored procedure calculates the Classification accuracy, i.e. the ratio of correctly classified predictions, from a confusion matrix

Usage

The CMATRIX_ACC stored procedure has the following syntax:

CMATRIX_ACC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

matrixTable
the confusion matrix table

Type: NVARCHAR(256)

Returns
DOUBLE the Classification accuracy

Details

This stored procedure calculates the ratio of correctly classified predictions among the total number of predictions from a confusion matrix. The confusion matrix table has the following columns: real, prediction, cnt. The column cnt contains the frequency of making a given prediction for the given real value.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,
traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..CONFUSION_MATRIX('intable=nza..iris_test,
resulttable=iris_pred, id=id, resultid=id, target=class,
resulttarget=class, matrixTable=confMatrix');
CALL nza..CMATRIX_ACC('matrixTable=confMatrix');
CALL nza..DROP_MODEL('model=iris_c45'); CALL
nza..DROP_TABLE('iris_pred');
CALL nza..DROP_TABLE('confMatrix');
```

```
 TRAIN_TEST
------------
   0.918919
(1 row)


 CONFUSION_MATRIX
------------------
                5
(1 row)


 CMATRIX_ACC
-------------
    0.918919
(1 row)


 DROP_MODEL
------------
 t
(1 row)


 DROP_TABLE
------------
```

```
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CONFUSION_MATRIX
CMATRIX_WACC
ACC

CMATRIX_STATS - Print Classification quality factors from a Confusion Matrix

This stored procedure calculates and displays different Classification quality factors from a confusion matrix

Usage

The CMATRIX_STATS stored procedure has the following syntax:

CMATRIX_STATS(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

matrixTable
the confusion matrix table

Type: NVARCHAR(256)

Returns
TEXT pretty print of the quality factors of the confusion matrix

Details

This stored procedure calculates and displays different Classification quality factors from a confusion matrix. The confusion matrix table has the following columns: real, prediction, cnt. The column cnt contains the fre-quency of making a given prediction for the given real value.

Following quality factors are calculated:

- True Positive Rate for each predicted class, False Positive Rate for each predicted class,

Positive Predictive Value for each predicted class,

F-measure for each predicted class,

correctly and incorrectly classified predictions,

prediction accuracy and weighted prediction accuracy.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,
traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..CONFUSION_MATRIX('intable=nza..iris_test,
resulttable=iris_pred, id=id, resultid=id, target=class,
resulttarget=class, matrixTable=confMatrix');
CALL nza..CMATRIX_STATS('matrixTable=confMatrix');
CALL nza..DROP_MODEL('model=iris_c45'); CALL
nza..DROP_TABLE('iris_pred');
CALL nza..DROP_TABLE('confMatrix');
```

```
 TRAIN_TEST
------------
   0.918919
(1 row)

 CONFUSION_MATRIX
------------------
                5
(1 row)


CMATRIX_STATS
------------------------------------------------------------
------------------------------------------------------------
------------------------------------------------------------
------------------------------------------------------------
------------------------------------------------------------
------------------------------------------------------------
------------------------------------------------------------
------------------------------------------------------------
```

```
---------------------------------------------------------------
---------------------------------------------------------------
-----------------------------------------------------------
 class -> setosa
     True Positive Rate (sensitivity/recall): 0.846154
     False Positive Rate: 0
     Positive Predictive Value (precision): 1
     F-Measure: 0.91666675694444
class -> versicolor
     True Positive Rate (sensitivity/recall): 0.933333
     False Positive Rate: 0.090909
     Positive Predictive Value (precision): 0.875
     F-Measure: 0.90322565036418
class -> virginica
     True Positive Rate (sensitivity/recall): 1
     False Positive Rate: 0.035714
     Positive Predictive Value (precision): 0.9
     F-Measure: 0.94736842105263
---------------------------------------
Correctly Classified Instances: 34
Incorrectly Classified Instances: 3
Accuracy: 91.8919 %
Weighted Accuracy: 92.649566666667 %
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

```
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CONFUSION_MATRIX
TPR
FPR
PPV
FMEASURE
CMATRIX_ACC
CMATRIX_WACC

CMATRIX_WACC - Weighted Classification accuracy from a Confusion Matrix

This stored procedure calculates the weighted Classification accuracy, i.e. the weighted ratio of correctly classified predictions, from a confusion matrix

Usage

The CMATRIX_WACC stored procedure has the following syntax:

CMATRIX_WACC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

matrixTable
the confusion matrix table

Type: NVARCHAR(256)

Returns
DOUBLE the weighted Classification accuracy

Details

This stored procedure calculates the weighted ratio of correctly classified predictions among the total number of predictions from a confusion matrix. The confusion matrix table has the following columns: real, prediction, cnt. The column cnt contains the frequency of making a given prediction for the given real value.

Each class is assigned the same weight in calculating the ratio, independently of the real frequency of the class in the input data. This is useful when classes are not equally frequent.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,
traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..CONFUSION_MATRIX('intable=nza..iris_test,
resulttable=iris_pred, id=id, resultid=id, target=class,
resulttarget=class, matrixTable=confMatrix');
CALL nza..CMATRIX_WACC('matrixTable=confMatrix');
CALL nza..DROP_MODEL('model=iris_c45'); CALL
nza..DROP_TABLE('iris_pred');
CALL nza..DROP_TABLE('confMatrix');
```

```
 TRAIN_TEST
------------
   0.918919
(1 row)


 CONFUSION_MATRIX
------------------
                5
(1 row)


   CMATRIX_WACC
------------------
 0.92649566666667
(1 row)


 DROP_MODEL
------------
 t
```

```
(1 row)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CONFUSION_MATRIX
CMATRIX_ACC
WACC

COL2TRCV_MANOVA_ONE_WAY_TEST - data transformation from column representation to trcv for Multivariate Analyzsis of Variance in one way setting

This stored procedure transforms data between column format and trcv format

Usage

The COL2TRCV_MANOVA_ONE_WAY_TEST stored procedure has the following syntax:

COL2TRCV_MANOVA_ONE_WAY_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable

the input table name

Type: NVARCHAR(ANY)

outtable
the output table name for trcv

data Type: NVARCHAR(ANY)

taskname_outtable
the output table name for task names and ids, not

required Type: NVARCHAR(ANY)

varname_outtable
the output table name for variable names and ids, not

required Type: NVARCHAR(ANY)

factor1
the input table column identifying a first factor (so-called treatment in RBD/CRD

nomenclature) Type: NVARCHAR(ANY)

incolumn
the input table observation columns (dependent variables), separated by a semi-colon

(;). Type: NVARCHAR(ANY)

id
the input table column which uniquely identifies

records Type: NVARCHAR(ANY)

by
the input table column which splits the input table into subtables, on each of them a separate MANOVA is run If not specified, the whole input table is subject of a single MANOVA run. Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(2000) A string confirming execution of the process or indicating a failure. The real out-put is contained in the output table

Details

This stored procedure performs one-way analysis of variance/covariance aiming to tell whether or not the groups of data identified by factor1 have the same mean value in all dependent variables or not.

Examples

```
CREATE TABLE wheattest2(fieldId INTEGER, variety CHAR(1), yield
DOUBLE, barrels INTEGER);
INSERT INTO wheattest2 VALUES(1,'A',80, 4);
INSERT INTO wheattest2 VALUES(2,'A',65, 3);
INSERT INTO wheattest2 VALUES(3,'A',50, 2);
INSERT INTO wheattest2 VALUES(4,'B',100, 5);
INSERT INTO wheattest2 VALUES(5,'B',85, 4);
INSERT INTO wheattest2 VALUES(6,'B',70, 3);
INSERT INTO wheattest2 VALUES(7,'C',60, 2);
INSERT INTO wheattest2 VALUES(8,'C',75, 3);
INSERT INTO wheattest2 VALUES(9,'C',90, 5);
CALL
nza..COL2TRCV_MANOVA_ONE_WAY_TEST('intable=wheattest2,id=
fieldId, incolumn= yield; barrels, factor1=variety,
outtable=outtab_trcv');
select * from outtab_trcv order by id_task, row,col;
CALL nza..MANOVA_ONE_WAY_TEST('intable=outtab_trcv,
outtable=outtab');
drop table outtab;
drop table outtab_trcv;
drop table wheattest2;
```

```
  ID_TASK | ROW| COL | VAL
---------+-----+-----+-----
        1 |    1|    1|    1
        1 |    1|    2|   80
        1 |    1|    3|    4
        1 |    2|    1|    1
        1 |    2|    2|   65
        1 |    2|    3|    3
        1 |    3|    1|    1
        1 |    3|    2|   50
        1 |    3|    3|    2
        1 |    4|    1|    2
        1 |    4|    2| 100
        1 |    4|    3|    5
        1 |    5|    1|    2
        1 |    5|    2|   85
        1 |    5|    3|    4
        1 |    6|    1|    2
```

```
      1 |    6 |    2 | 70
      1 |    6 |    3 |  3
      1 |    7 |    1 |  3
      1 |    7 |    2 | 60
      1 |    7 |    3 |  2
      1 |    8 |    1 |  3
      1 |    8 |    2 | 75
      1 |    8 |    3 |  3
      1 |    9 |    1 |  3
      1 |    9 |    2 | 90
      1 |    9 |    3 |  5
(27 rows)
```

```
CREATE TABLE wheatbytest(fieldId INTEGER, variety CHAR(1), yield
DOUBLE, barrels INTEGER, experiment INT4);
INSERT INTO wheatbytest VALUES(1,'A',65,3,1);
   suspect: INSERT INTO wheatbytest VALUES(2,'A',66,4,1);
INSERT INTO wheatbytest VALUES(2,'A',65,3,1);
INSERT INTO wheatbytest VALUES(3,'A',64,2,1);
INSERT INTO wheatbytest VALUES(4,'B',84,3,1);
INSERT INTO wheatbytest VALUES(5,'B',85,4,1);
INSERT INTO wheatbytest VALUES(6,'B',86,5,1);
INSERT INTO wheatbytest VALUES(7,'C',75,3,1);
INSERT INTO wheatbytest VALUES(8,'C',76,4,1);
INSERT INTO wheatbytest VALUES(9,'C',74,2,1);
INSERT INTO wheatbytest VALUES(11,'A',80,4,2);
INSERT INTO wheatbytest VALUES(12,'A',65,3,2);
INSERT INTO wheatbytest VALUES(13,'A',50,2,2);
INSERT INTO wheatbytest VALUES(14,'B',100,5,2);
INSERT INTO wheatbytest VALUES(15,'B',85,4,2);
INSERT INTO wheatbytest VALUES(16,'B',70,3,2);
INSERT INTO wheatbytest VALUES(17,'C',60,2,2);
INSERT INTO wheatbytest VALUES(18,'C',75,3,2);
INSERT INTO wheatbytest VALUES(19,'C',90,5,2);
CALL
nza..COL2TRCV_MANOVA_ONE_WAY_TEST('intable=wheatbytest
, id=fieldid, incolumn=yield;barrels, factor1=variety,
by=experiment, outtable=outbytab_trcv');
SELECT * FROM outbytab_trcv order by id_task,row,col;
CALL nza..MANOVA_ONE_WAY_TEST('intable=outbytab_trcv,
outtable=outbytab');
CALL nza..DROP_TABLE('outbytab_trcv');
CALL nza..DROP_TABLE('outbytab'); CALL
nza..DROP_TABLE('wheatbytest');
```

```
  ID_TASK | ROW| COL | VAL
---------+-----+-----+-----
        1 |    1|    1|    1
        1 |    1|    2|   65
        1 |    1|    3|    3
        1 |    2|    1|    1
        1 |    2|    2|   65
        1 |    2|    3|    3
        1 |    3|    1|    1
        1 |    3|    2|   64
        1 |    3|    3|    2
        1 |    4|    1|    2
        1 |    4|    2|   84
        1 |    4|    3|    3
        1 |    5|    1|    2
        1 |    5|    2|   85
        1 |    5|    3|    4
        1 |    6|    1|    2
        1 |    6|    2|   86
        1 |    6|    3|    5
        1 |    7|    1|    3
        1 |    7|    2|   75
```

```
1 |    7 |    3 |   3
1 |    8 |    1 |   3
1 |    8 |    2 |  76
1 |    8 |    3 |   4
1 |    9 |    1 |   3
1 |    9 |    2 |  74
1 |    9 |    3 |   2
2 |    1 |    1 |   1
2 |    1 |    2 |  80
2 |    1 |    3 |   4
2 |    2 |    1 |   1
2 |    2 |    2 |  65
2 |    2 |    3 |   3
2 |    3 |    1 |   1
2 |    3 |    2 |  50
2 |    3 |    3 |   2
2 |    4 |    1 |   2
2 |    4 |    2| 100
2 |    4 |    3 |   5
2 |    5 |    1 |   2
2 |    5 |    2 |  85
2 |    5 |    3 |   4
2 |    6 |    1 |   2
2 |    6 |    2 |  70
2 |    6 |    3 |   3
2 |    7 |    1 |   3
2 |    7 |    2 |  60
2 |    7 |    3 |   2
2 |    8 |    1 |   3
2 |    8 |    2 |  75
2 |    8 |    3 |   3
2 |    9 |    1 |   3
2 |    9 |    2 |  90
```

```
       2|     9|     3|     5
(54 rows)
```

```
CREATE TABLE wheatbytest(fieldId INTEGER, variety
CHAR(1), yield DOUBLE, barrels INTEGER,
experiment varchar(100));
INSERT INTO wheatbytest VALUES(1,'A',65,3,'one');
   suspect: INSERT INTO wheatbytest
VALUES(2,'A',66,4,'one');
INSERT INTO wheatbytest VALUES(2,'A',65,3,'one');
INSERT INTO wheatbytest VALUES(3,'A',64,2,'one');
INSERT INTO wheatbytest VALUES(4,'B',84,3,'one');
INSERT INTO wheatbytest VALUES(5,'B',85,4,'one');
INSERT INTO wheatbytest VALUES(6,'B',86,5,'one');
INSERT INTO wheatbytest VALUES(7,'C',75,3,'one');
INSERT INTO wheatbytest VALUES(8,'C',76,4,'one');
INSERT INTO wheatbytest VALUES(9,'C',74,2,'one');
INSERT INTO wheatbytest VALUES(11,'A',80,4,'two');
INSERT INTO wheatbytest VALUES(12,'A',65,3,'two');
INSERT INTO wheatbytest VALUES(13,'A',50,2,'two');
INSERT INTO wheatbytest VALUES(14,'B',100,5,'two');
INSERT INTO wheatbytest VALUES(15,'B',85,4,'two');
INSERT INTO wheatbytest VALUES(16,'B',70,3,'two');
INSERT INTO wheatbytest VALUES(17,'C',60,2,'two');
INSERT INTO wheatbytest VALUES(18,'C',75,3,'two');
INSERT INTO wheatbytest VALUES(19,'C',90,5,'two');
CALL
nza..COL2TRCV_MANOVA_ONE_WAY_TEST('intable=wheatbytest
, id=fieldid, incolumn=yield;barrels, factor1=variety,
by=experiment, outtable=outbytab_trcv,
taskname_outtable=tasknames');
SELECT * FROM tasknames order by id_task;

CALL nza..DROP_TABLE('outbytab_trcv');

CALL nza..DROP_TABLE('tasknames');
CALL nza..DROP_TABLE('wheatbytest');

---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
------------------------------------

 call now:

        select x.id_task as
id_task,y.id_matrix,y.row,y.col,y.val

                from

                (select *,nzm..reorder_matrix(id_task) over
(partition by id_task order by row desc, col desc) as
id_task_ro

                 from "OUTBYTAB_TRCV") x

                ,TABLE(nza..ctf_mat_manova(x.id_task_ro,x.row,x
.col,x.val)) y;

(1 row)

 ID_TASK | TASK_NAME

---------+-----------

       1 | one

       2 | two

(2 rows)

 DROP_TABLE

------------

 t

(1 row)

 DROP_TABLE

------------

 t

(1 row)

 DROP_TABLE

------------

 t

(1 row)
```

Related Functions

category Analytics - Statistics
MANOVA_Two_WAY_TEST
ANOVA_CRD_TEST

COL2TRCV_MANOVA_TWO_WAY_TEST - data transformation from column representation to grcv for Multivariate Analyzsis of Variance in two way setting

This stored procedure transforms data between column format and trcv format

Usage

The COL2TRCV_MANOVA_TWO_WAY_TEST stored procedure has the following syntax:

COL2TRCV_MANOVA_TWO_WAY_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table name

Type: NVARCHAR(ANY)

outtable
the output table name for trcv

data Type: NVARCHAR(ANY)

taskname_outtable
the output table name for task names and ids, not

required Type: NVARCHAR(ANY)

varname_outtable
the output table name for variable names and ids, not

required Type: NVARCHAR(ANY)

factor1
the input table column identifying a first factor (so-called treatment in RBD/CRD no-menclature)

Type: NVARCHAR(ANY)

factor2
the input table column identifying a second factor (so-called block in RBD nomen-clature)

Type: NVARCHAR(ANY)

incolumn
the input table observation columns (dependent variables), separated by a semi-colon

(;). Type: NVARCHAR(ANY)

id
the input table column which uniquely identifies

records Type: NVARCHAR(ANY)

by
the input table column which splits the input table into subtables, on each of them a separate MANOVA is run If not specified, the whole input table is subject of a single MANOVA run. Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(2000) A string confirming execution of the process or indicating a failure. The real out-put is contained in the output table

Details

This stored procedure performs one-way analysis of variance/covariance aiming to tell whether or not the groups of data identified by factor1 have the same mean value in all dependent variables or not.

Examples

```
CREATE TABLE wheattest2(fieldId INTEGER, variety CHAR(1), yield
DOUBLE, barrels INTEGER);
INSERT INTO wheattest2 VALUES(1,'A',80, 4);
INSERT INTO wheattest2 VALUES(2,'A',65, 3);
INSERT INTO wheattest2 VALUES(3,'A',50, 2);
INSERT INTO wheattest2 VALUES(4,'B',100, 5);
INSERT INTO wheattest2 VALUES(5,'B',85, 4);
INSERT INTO wheattest2 VALUES(6,'B',70, 3);
INSERT INTO wheattest2 VALUES(7,'C',60, 2);
INSERT INTO wheattest2 VALUES(8,'C',75, 3);
INSERT INTO wheattest2 VALUES(9,'C',90, 5);
CALL
nza..COL2TRCV_MANOVA_TWO_WAY_TEST('intable=wheattest2,id=fieldId ,
incolumn= yield, factor1=variety,factor2= barrels,
outtable=outtab_trcv');
select * from outtab_trcv order by id_task, row,col;
CALL nza..MANOVA_TWO_WAY_TEST('intable=outtab_trcv,
outtable=outtab');
```

```
drop table outtab;
drop table outtab_trcv;
drop table wheattest2;
```

```
  ID_TASK | ROW| COL | VAL
---------+-----+-----+-----
        0 |    1|    1|    1
        0 |    1|    2|    3
        0 |    1|    3|   80
        0 |    2|    1|    1
        0 |    2|    2|    2
        0 |    2|    3|   65
        0 |    3|    1|    1
        0 |    3|    2|    1
        0 |    3|    3|   50
        0 |    4|    1|    2
        0 |    4|    2|    4
        0 |    4|    3| 100
        0 |    5|    1|    2
        0 |    5|    2|    3
        0 |    5|    3|   85
        0 |    6|    1|    2
        0 |    6|    2|    2
        0 |    6|    3|   70
        0 |    7|    1|    3
        0 |    7|    2|    1
        0 |    7|    3|   60
        0 |    8|    1|    3
        0 |    8|    2|    2
        0 |    8|    3|   75
        0 |    9|    1|    3
        0 |    9|    2|    4
        0|      9|      3|    90
(27 rows)

CREATE TABLE wheatbytest(fieldId INTEGER, variety CHAR(1), yield
DOUBLE, barrels INTEGER, experiment INT4);
INSERT INTO wheatbytest VALUES(1,'A',65,3,1);
   suspect: INSERT INTO wheatbytest VALUES(2,'A',66,4,1);
INSERT INTO wheatbytest VALUES(2,'A',65,3,1);
INSERT INTO wheatbytest VALUES(3,'A',64,2,1);
INSERT INTO wheatbytest VALUES(4,'B',84,3,1);
INSERT INTO wheatbytest VALUES(5,'B',85,4,1);
INSERT INTO wheatbytest VALUES(6,'B',86,5,1);
INSERT INTO wheatbytest VALUES(7,'C',75,3,1);
INSERT INTO wheatbytest VALUES(8,'C',76,4,1);
INSERT INTO wheatbytest VALUES(9,'C',74,2,1);
INSERT INTO wheatbytest VALUES(11,'A',80,4,2);
INSERT INTO wheatbytest VALUES(12,'A',65,3,2);
INSERT INTO wheatbytest VALUES(13,'A',50,2,2);
INSERT INTO wheatbytest VALUES(14,'B',100,5,2);
INSERT INTO wheatbytest VALUES(15,'B',85,4,2);
INSERT INTO wheatbytest VALUES(16,'B',70,3,2);
INSERT INTO wheatbytest VALUES(17,'C',60,2,2);
INSERT INTO wheatbytest VALUES(18,'C',75,3,2);
INSERT INTO wheatbytest VALUES(19,'C',90,5,2);
CALL  nza..COL2TRCV_MANOVA_TWO_WAY_TEST('intable=wheatbytest,
id=fieldid, incolumn=yield, factor2=barrels, factor1=variety,
by=experiment, outtable=outbytab_trcv');
SELECT * FROM outbytab_trcv order by id_task,row,col;
CALL  nza..MANOVA_TWO_WAY_TEST('intable=outbytab_trcv,
outtable=outbytab');
CALL nza..DROP_TABLE('outbytab_trcv');
CALL nza..DROP_TABLE('outbytab');
CALL nza..DROP_TABLE('wheatbytest');

 ID_TASK | ROW | COL | VAL
```

```
---------+-----+-----+-----
       1 |   1 |   1 |   1
       1 |   1 |   2 |   2
       1 |   1 |   3 |  65
       1 |   2 |   1 |   1
       1 |   2 |   2 |   2
       1 |   2 |   3 |  65
       1 |   3 |   1 |   1
       1 |   3 |   2 |   1
       1 |   3 |   3 |  64
       1 |   4 |   1 |   2
       1 |   4 |   2 |   2
       1 |   4 |   3 |  84
       1 |   5 |   1 |   2
       1 |   5 |   2 |   3
       1 |   5 |   3 |  85
       1 |   6 |   1 |   2
       1 |   6 |   2 |   4
       1 |   6 |   3 |  86
       1 |   7 |   1 |   3
       1 |   7 |   2 |   2
       1 |   7 |   3 |  75
       1 |   8 |   1 |   3
       1 |   8 |   2 |   3
       1 |   8 |   3 |  76
       1 |   9 |   1 |   3
       1 |   9 |   2 |   1
       1 |   9 |   3 |  74
       2 |   1 |   1 |   1
       2 |   1 |   2 |   3
       2 |   1 |   3 |  80
```

```
      2 |    2 |    1 |   1
      2 |    2 |    2 |   2
      2 |    2 |    3 |  65
      2 |    3 |    1 |   1
      2 |    3 |    2 |   1
      2 |    3 |    3 |  50
      2 |    4 |    1 |   2
      2 |    4 |    2 |   4
      2 |    4 |    3 | 100
      2 |    5 |    1 |   2
      2 |    5 |    2 |   3
      2 |    5 |    3 |  85
      2 |    6 |    1 |   2
      2 |    6 |    2 |   2
      2 |    6 |    3 |  70
      2 |    7 |    1 |   3
      2 |    7 |    2 |   1
      2 |    7 |    3 |  60
      2 |    8 |    1 |   3
      2 |    8 |    2 |   2
      2 |    8 |    3 |  75
      2 |    9 |    1 |   3
      2 |    9 |    2 |   4
      2 |    9 |    3 |  90
(54 rows)
```

```
CREATE TABLE wheatbytest(fieldId INTEGER, variety CHAR(1), yield
DOUBLE, barrels INTEGER, experiment varchar(100));
INSERT INTO wheatbytest VALUES(1,'A',65,3,'one');
   suspect: INSERT INTO wheatbytest VALUES(2,'A',66,4,'one');
INSERT INTO wheatbytest VALUES(2,'A',65,3,'one');
INSERT INTO wheatbytest VALUES(3,'A',64,2,'one');

INSERT INTO wheatbytest VALUES(4,'B',84,3,'one');
INSERT INTO wheatbytest VALUES(5,'B',85,4,'one');
INSERT INTO wheatbytest VALUES(6,'B',86,5,'one');
INSERT INTO wheatbytest VALUES(7,'C',75,3,'one');
INSERT INTO wheatbytest VALUES(8,'C',76,4,'one');
INSERT INTO wheatbytest VALUES(9,'C',74,2,'one');
INSERT INTO wheatbytest VALUES(11,'A',80,4,'two');
INSERT INTO wheatbytest VALUES(12,'A',65,3,'two');
INSERT INTO wheatbytest VALUES(13,'A',50,2,'two');
INSERT INTO wheatbytest VALUES(14,'B',100,5,'two');
INSERT INTO wheatbytest VALUES(15,'B',85,4,'two');
INSERT INTO wheatbytest VALUES(16,'B',70,3,'two');
INSERT INTO wheatbytest VALUES(17,'C',60,2,'two');
INSERT INTO wheatbytest VALUES(18,'C',75,3,'two');
INSERT INTO wheatbytest VALUES(19,'C',90,5,'two');
CALL
nza..COL2TRCV_MANOVA_TWO_WAY_TEST('intable=wheatbytest
, id=fieldid, incolumn=yield, factor2=barrels,
factor1=variety, by=experiment,
outtable=outbytab_trcv, taskname_outtable=tasknames');
SELECT * FROM tasknames order by id_task;
CALL nza..DROP_TABLE('outbytab_trcv');
CALL nza..DROP_TABLE('tasknames'); CALL
nza..DROP_TABLE('wheatbytest');
```

```
          COL2TRCV_MANOVA_TWO_WAY_TEST
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
-

 call now:

        select x.id_task as
id_task,y.id_matrix,y.row,y.col,y.val

                from

                (select *,nzm..reorder_matrix(id_task)
over (partition by id_task order by row desc, col desc) as
id_task_ro
                 from "OUTBYTAB_TRCV") x
                ,TABLE(nza..ctf_mat_manova(x.id_task_ro,x.row,x
.col,x.val)) y;
(1 row)
MIECIO(ADMIN)=> SELECT * FROM tasknames  order by id_task;
 ID_TASK | TASK_NAME
---------+-----------
       1 | one
       2 | two
(2 rows)
 DROP_TABLE
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

```
create view irisX05 as
select *, mod(id,3) as factor  from nza..iris;
CALL nza..COL2TRCV_MANOVA_TWO_WAY_TEST('intable=irisX05,id=Id,
incolumn= sepalwidth;sepallength;petallength;petalwidth,
factor1=factor, factor2=class, outtable=outtab05a');
CALL nza..DROP_TABLE('outtab05a');
CALL nza..DROP_TABLE('irisX05');
```

```
CREATE VIEW
```

```
      COL2TRCV_MANOVA_TWO_WAY_TEST
----------------------------------------------
(0 row)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
MANOVA_Two_WAY_TEST
Error: Reference source not found

COLUMN_PROPERTIES - Create a column properties table

This stored procedure creates a column properties table based on the given input table.

Usage

The COLUMN_PROPERTIES stored procedure has the following syntax:

COLUMN_PROPERTIES((NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable

the input table

Type: NVARCHAR(ANY)

outtable
the output table (column properties table) that receives the column

properties. Type: NVARCHAR(ANY)

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are con-tinuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore', ':objweight', ':trials'.

its weight: ':colweight(<wgt>)' where <wgt> is a numeric value of the weight.

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: input

outtabletype
the type of the output table. It can be 'table' or

'temporary'. Type: NVARCHAR(16)

Default: 'table'

Returns
INTEGER the number of records written into the column properties table

Details

This stored procedure creates a column properties table based on all columns of the input table. A column properties table can be used as input in different stored procedures to build an analytics model. The output table containing the column properties has following columns: idcol, colname, coldatatype, coltype, colrole, colweight. For each input column specified, one row is written into the output table. The output column col-weight contains 1 per default. This table can be modified manually or using SET_COLUMN_PROPERTIES be-fore using it to build an analytics model.

Examples

```
CALL nza..COLUMN_PROPERTIES('intable=nza..weather,
outtable=weatherDefSchema, coldeftype=nom,
incolumn=instance:cont:id;play:target;WINDY:ignore');
SELECT * FROM weatherDefSchema ORDER BY idcol; CALL
nza..DROP_TABLE('weatherDefSchema');
```

```
 COLUMN_PROPERTIES
-------------------
                 6
(1 row)

 IDCOL |   COLNAME   |           COLDATATYPE           |
COLTYPE | COLROLE | COLWEIGHT
-------+------------ +--------------------------------
+--------- +---------+-----------
     1 | INSTANCE    | INTEGER                         |
cont    | id       |         1
     2 | OUTLOOK     | NATIONAL CHARACTER VARYING(10) |
nom     | input    |         1
     3 | TEMPERATURE | NATIONAL CHARACTER VARYING(10) |
nom     | input    |         1
     4 | HUMIDITY    | NATIONAL CHARACTER VARYING(10) |
nom     | input    |         1
     5 | WINDY       | NATIONAL CHARACTER VARYING(10) |
nom     | ignore   |         1
     6 | PLAY        | NATIONAL CHARACTER VARYING(3)  |
nom     | target   |         1
(6 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Column Properties
COLUMN_PROPERTIES_CHECK
SET_COLUMN_PROPERTIES
GET_COLUMN_LIST

COLUMN_PROPERTIES_CHECK - Check a column properties table for correct-ness

This stored procedure checks if the given table is a correct column properties table for the given input table

Usage

The COLUMN_PROPERTIES_CHECK stored procedure has the following syntax:

COLUMN_PROPERTIES_CHECK((NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the data input table

Type: NVARCHAR(ANY)

colPropertiesTable
the column properties table to check for

correctness Type: NVARCHAR(ANY)

Returns
BOOLEAN true if the column properties table is correct regarding the given data input table

Details

This stored procedure checks that the given column properties table is correct regarding the given data in-put table. It raises an exception when:

the column name is incorrect,

the column role or type does not exist,

the column type can not be casted from the column data type,

more than one column with role=id or role=objweights or role=trials are present... This stored procedure do not check if target is defined.

Examples

```
CALL nza..COLUMN_PROPERTIES('intable=nza..weather,
outtable=weatherDefSchema, coldeftype=nom,
incolumn=temperature;WINDY:nom:ignore');
```

```
CALL nza..COLUMN_PROPERTIES_CHECK('intable=nza..weather,
colPropertiesTable=weatherDefSchema');
CALL nza..DROP_TABLE('weatherDefSchema');
```

```
 COLUMN_PROPERTIES
-------------------
                 6
(1 row)

 COLUMN_PROPERTIES_CHECK
-------------------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Column Properties
COLUMN_PROPERTIES

COND_ENTROPY - Conditional Entropy

This stored procedure calculates the conditional entropy of a column Y given a column X

Usage

The COND_ENTROPY stored procedure has the following syntax:

COND_ENTROPY(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the two input table columns separated by a semicolon (;). The conditional column is followed by :X, the column for which conditional entropy has to be calculated is followed by :Y.

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be per-formed. If specified, an output table must be indicated.

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the entropy into. This parameter must be specified if parameter by is specified.

Type: NVARCHAR(256)

Default: <none>

Returns
DOUBLE the conditional entropy of the input table column Y, or the number of groups in the output table for which conditional entropy has been calculated

Details

This stored procedure calculates the entropy of an input column Y given another input column X, either in the whole input table or within the groups defined in the column specified by parameter <by>. Conditional entropy gives an impression of the predictability of Y given X, when compared with the entropy of X. It takes a positive value, the lower the better predictability.

If parameter 'by' is specified, an output table must be specified. The output table is created with following columns: over_<by>, condentropy. The conditional entropy of the input column Y is given for each group of the <by> column.

Examples

```
CALL nza..COND_ENTROPY('intable=nza..CensusIncome,

incolumn=age:X;wage_per_hour:Y');
```

```
   COND_ENTROPY
------------------
 0.61428780276346
(1 row)
```

```
CALL nza..COND_ENTROPY('intable=nza..CensusIncome,
incolumn=age:X; wage_per_hour:Y,
outtable=resultTable, by=sex');
SELECT * FROM resultTable ORDER BY over_sex;
CALL nza..DROP_TABLE('resultTable');
```

```
 COND_ENTROPY
--------------
            2
(1 row)

   CONDENTROPY    | OVER_SEX
------------------+----------
 0.58848694657749 | Female
 0.58477089622504 | Male
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
ENTROPY
JOINT_ENTROPY
MUTUALINFO

CONFUSION_MATRIX - Build a Confusion Matrix

This stored procedure builds a confusion matrix for Classification predictions

Usage

The CONFUSION_MATRIX stored procedure has the following syntax:

CONFUSION_MATRIX(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table containing real

values Type: NVARCHAR(256)

id
the input table column in <intable> identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column in <intable> containing real

values Type: NVARCHAR(128)

resulttable
the input table containing predicted

values Type: NVARCHAR(256)

resultid
the input table column in <resulttable> identifying a unique instance

id Type: NVARCHAR(128)

Default: id

resulttarget
the input table column in <resulttable> containing predicted

values Type: NVARCHAR(128)

Default: class

matrixTable
the output table where the confusion matrix will be

stored Type: NVARCHAR(ANY)

Returns
INTEGER the number of rows written in the confusion matrix output table

Details

This stored procedure builds a confusion matrix for Classification predictions. This is done by comparing the predictions made when applying a Classification model onto data, and the real values for this data.

The output table that contains the confusion matrix has following columns: real, prediction, cnt. The column cnt contains the frequency of making a given prediction for the given real value.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,

traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..CONFUSION_MATRIX('intable=nza..iris_test,
resulttable=iris_pred, id=id, resultid=id, target=class,
resulttarget=class, matrixTable=confMatrix');
CALL nza..DROP_MODEL('model=iris_c45');
CALL nza..DROP_TABLE('iris_pred'); CALL
nza..DROP_TABLE('confMatrix');
```

```
 TRAIN_TEST
------------
   0.918919
(1 row)

 CONFUSION_MATRIX
------------------
                5
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures

COPY_MODEL - Duplicate an analytics model

This stored procedure duplicates the given analytics model to a new model with the given new name. The source model can be in another database.

Usage

The COPY_MODEL stored procedure has the following syntax:

COPY_MODEL(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to be duplicated. It can be qualified by a database name (<database>..<model>) if not in the current database.

Type: NVARCHAR(64)

copy
The name of the copy of the model to be created in the current

database Type: NVARCHAR(64)

Returns
BOOLEAN always true (otherwise an exception is raised)

Details

This stored procedure duplicates the given analytics model.

The model can be in any database, but the model copy is always created in the current database. Only mod-els in state "Complete" can be copied.

To duplicate an analytics model, the user needs the SELECT privilege for the model.

The stored procedure copies the model properties and the managed components of the model; refer-enced tables are not copied.

The current user is the owner of the new model. Creator and creation time are the same as in the source model.

Examples

```
CALL nza..ARULE('intable=nza..retail, model=mbamodel,
supporttype=percent, support=5, lvl=0, maxsetsize=5,
confidence=0.5');
```

```
CALL nza..COPY_MODEL('model=mbamodel, copy=mbaorig');
CALL nza..LIST_MODELS('where=upper(modelname) like
''MBA %''');
CALL nza..DROP_MODEL('model=mbamodel');
CALL nza..DROP_MODEL('model=mbaorig');
NOTICE:
          RUNNING FPGrowth algorithm:
          DATASET : "NZA".."RETAIL"
          Transaction column : "TID"
          Item column : "ITEM"
          Group by : <none>
          Minimum support : 5 %
          Minimum confidence: 0.5
          Max frequent itemset size : 5
          Level of conditional dbs : 0
          Result tables prefix : "NZA_META_MBAMODEL"

 ARULE
-------
    14
(1 row)

 COPY_MODEL
------------
 t
(1 row)

NOTICE:
 MODELNAME | OWNER |        CREATED        |  STATE   |
MININGFUNCTION  | ALGORITHM | USERCATEGORY
-----------+-------+---------------------+----------
+-----------------+----------+-------------
```

```
 MBAMODEL   | JOE    | 2012-01-01 00:00:00 | Complete  |
associationRules | FPGrowth   |
 MBAORIG    | JOE    | 2012-01-01 00:00:00 | Complete  |
associationRules | FPGrowth   |
 LIST_MODELS
-------------
           2
(1 row)
NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
 t
(1 row)

NOTICE:  Dropped: MBAORIG
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS

CORR - Mutual Correlation

This stored procedure calculates the correlation between two numeric input columns

Usage

The CORR stored procedure has the following syntax:

CORR(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the two numeric input table columns, separated by a semicolon (;). Optionally, a third numeric column can be specified for weights followed by :objweight.

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be performed. If specified, an output table must be indicated.

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the correlations into. This parameter must be specified if parameter by is specified.

Type: NVARCHAR(256)

Default: <none>

Returns
DOUBLE the correlation between the two input table columns, or the number of groups in the output table for which a correlation has been calculated

Details

This stored procedure calculates the correlation between two numeric input columns, either in the whole input table or within the groups defined in the column specified by parameter <by>. Correl-ation is a measure saying how easily it is to predict one column from the other. It takes a value between -1 (inversely correlated) and 1 (correlated), 0 means that the two columns are independ-ent.

If parameter 'by' is specified, an output table must be specified. The output table is created with following columns: <by>, correlation. The correlation between the two input columns is given for each group of the <by> column.

Examples

```
CALL nza..CORR('intable=nza..CensusIncome,
incolumn=age;wage_per_hour');
        CORR
--------------------
 0.036938290262767
(1 row)
```

```
CALL nza..CORR('intable=nza..CensusIncome,
incolumn=age;capital_gains;wage_per_hour:objweight');
       CORR
-------------------
 0.038507129604384
(1 row)
```

```
CALL nza..CORR('intable=nza..CensusIncome,
incolumn=age;wage_per_hour, outtable=resultTable, by=sex');
SELECT * FROM resultTable ORDER BY sex; CALL
nza..DROP_TABLE('resultTable');
 CORR
------
    2
(1 row)

  CORRELATION    |  SEX
-------------------+--------
 0.025374759165581 | Female
 0.050701396395573 | Male
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
CANONICAL_CORR
CORRELATION1000MATRIX

CORRELATION500PAIRS
COV

CORR_AGG - Pearson's Correlation

This function calculate the correlation between two numeric input variables

Usage

The CORR_AGG aggregate has the following syntax:

CORR_AGG(DOUBLE X, DOUBLE Y)

Parameters

X

the first variable to

correlate Type: DOUBLE

Y

the second variable to

correlate Type: DOUBLE

Returns

DOUBLE the Pearson's correlation, or NULL if there is too few data

Details

This function calculates the correlation of two numeric input variables. The Pearson's correlation coefficient measures the strength of relationship between linearly dependent variables that are normally distributed. It takes a value between -1 (inversely correlated) and 1 (correlated), 0 means that the two variables are independent.

Examples

```
SELECT nza..CORR_AGG(petallength,petalwidth)
FROM nza..iris;
     CORR_AGG
------------------
 0.96275709705097
(1 row)
```

Related Functions

category Analytics - Statistics

CORR
COV_AGG

CORR_AGG - Pearson's Correlation with weight

This function calculate the correlation between two numeric input variables, each pair of values being weighted

Usage

The CORR_AGG aggregate has the following syntax:

CORR_AGG(DOUBLE X, DOUBLE Y, DOUBLE W)

Parameters

X

the first variable to

correlate Type: DOUBLE

Y

the second variable to

correlate Type: DOUBLE

W

the weight of the (X,Y)

pair Type: DOUBLE

Returns

DOUBLE the Pearson's correlation, or NULL if there is too few data

Details

This function calculates the correlation of two numeric input variables, modulated by a weight for each pair of values. The Pearson's correlation coefficient measures the strength of relationship between linearly de-pendent variables that are normally distributed. It takes a value between -1 (inversely correlated) and 1 (correlated), 0 means that the two variables are independent.

Examples

```
SELECT nza..CORR_AGG(age, capital_gain, hours_per_week)
FROM nza..adult;
     CORR_AGG
------------------
 0.080162333217621
(1 row)
```

Related Functions

category Analytics - Statistics
CORR
COV_AGG

CORR_MATRIX_AGG - Correlation Matrix

This function calculates the matrix of correlations between pairs of numeric input variables divided into two sets X and Y. It takes as arguments the number of variables in the set X, the number of variables in the set Y, and the variables themselves, and computes the correlations between all pairs containing a variable of set X and a variable of set Y.

Usage

The CORR_MATRIX_AGG aggregate has the following syntax:

CORR_MATRIX_AGG(INT4 noX, INT4 noY, DOUBLE X1, DOUBLE X2, DOUBLE Y1, DOUBLE Y2, DOUBLE Y3)

Parameters

noX
the number of variables in set

X Type: INT4

Min: 1

Max: 61-noY

noY
the number of variables in set

Y Type: INT4

Min: 1

Max: 61-noX

X1,X2,etc.
the first, second, etc... variable in set

X Type: DOUBLE

Y1,Y2,etc.
the first, second, etc... variable in set

Y Type: DOUBLE

Returns
NVARCHAR(10000) the string with the matrix of correlations between the variables of sets X and Y

Details

This function calculates the matrix of correlations between pairs of numeric input variables taken from two sets X and Y. Correlation is a measure saying how easily it is to predict one variable from the other. It takes a value between -1 (inversely correlated) and 1 (correlated), 0 means that the two variables are independent.

The major limitation is that the number of input variables cannot exceed 61.

This function returns a string containing the correlation matrix between columns of sets X and Y. Columns of set X are the rows of the matrix, columns of set Y the columns of the matrix.

Examples

```
SELECT
nza..CORR_MATRIX_AGG(2,3,petallength,petalwidth,sepallength,sepa
lwidth,petalwidth) FROM nza..iris;


CORR_MATRIX_AGG
---------------------------------------------------------------
---------------------------------------------------------------
---------------
  our result
               0       0.871754       -0.420516       0.962757
               1       0.817954       -0.356544              1
 (1 row)
```

Related Functions

category Analytics - Statistics
CORRELATION1000MATRIX
CORR_AGG
COV_MATRIX_AGG

CORRELATION1000MATRIX - Correlation matrix

This stored procedure calculates the matrix of correlations between pairs of numeric columns divided in two sets

Usage

The CORRELATION1000MATRIX stored procedure has the following syntax:

CORRELATION1000MATRIX(NVARCHAR(ANY) paramStringtring)

▲ Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the correlations

into Type: NVARCHAR(256)

incolumn
the numeric input table columns to be correlated, separated by a semicolon (;). Each column is followed by :X or :Y to indicate it belongs to set X or set Y. If neither :X nor :Y is specified for any of the input columns, the matrix contains the correlations between all pairs of input columns.

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

Returns
INT8 the number of correlations written into the output table

Details

This stored procedure calculates the matrix of correlations between pairs of numeric input columns divided into two sets X and Y, either in the whole input table or within the groups defined in the column specified by parameter <by>. Correlation is a measure saying how easily it is to pre-dict one column from the other. It takes a value between -1 (inversely correlated) and 1 (correl-ated), 0 means that the two columns are independent.

The output table is created with following column: varxname, varyname, correlation. If the para-meter by is specified, an additional column grouped_on is added to indicate for which group the correlations have been calculated.

Examples

```
CALL nza..CORRELATION1000MATRIX('intable=nza..iris,
incolumn=sepallength;sepalwidth;petallength;petalwidth
, outtable=Result7');
SELECT * FROM result7 ORDER BY varxname,

varyname; CALL nza..DROP_TABLE('Result7');
```

```
  CORRELATION1000MATRIX
-----------------------
                     16
(1 row)

  VARXNAME   |  VARYNAME   |     CORRELATION
-------------+-------------+-------------------
 PETALLENGTH | PETALLENGTH |                  1
 PETALLENGTH | PETALWIDTH  |   0.96275709705097
 PETALLENGTH | SEPALLENGTH |   0.87175415730488
 PETALLENGTH | SEPALWIDTH  | -0.42051609640115
 PETALWIDTH  | PETALLENGTH |   0.96275709705097
 PETALWIDTH  | PETALWIDTH  |                  1
 PETALWIDTH  | SEPALLENGTH |   0.81795363336916
 PETALWIDTH  | SEPALWIDTH  |   -0.3565440896138
 SEPALLENGTH | PETALLENGTH |   0.87175415730488
 SEPALLENGTH | PETALWIDTH  |   0.81795363336916
 SEPALLENGTH | SEPALLENGTH |                  1
 SEPALLENGTH | SEPALWIDTH  | -0.10936924995065
 SEPALWIDTH  | PETALLENGTH | -0.42051609640115
 SEPALWIDTH  | PETALWIDTH  |   -0.3565440896138
 SEPALWIDTH  | SEPALLENGTH | -0.10936924995063
 SEPALWIDTH  | SEPALWIDTH  |                  1
(16 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..CORRELATION1000MATRIX('intable=nza..iris,
incolumn=sepallength:X;sepalwidth:X;petallength:Y;petalwidth:Y,
outtable=Result7');
```

```
SELECT * FROM result7 ORDER BY varxname, varyname;
CALL nza..DROP_TABLE('Result7');
 CORRELATION1000MATRIX
-----------------------
                     4
(1 row)

  VARXNAME    |  VARYNAME    |      CORRELATION
-------------+-------------+-------------------
 SEPALLENGTH | PETALLENGTH |    0.87175415730488
 SEPALLENGTH | PETALWIDTH  |    0.81795363336916
 SEPALWIDTH  | PETALLENGTH | -0.42051609640115
 SEPALWIDTH  | PETALWIDTH  |    -0.3565440896138
(4 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..CORRELATION1000MATRIX('intable=nza..iris,
by=class,
incolumn=sepallength:X;sepalwidth:X;petallength:Y;petalwi
dth:Y, outtable=Result7');
SELECT * FROM result7 ORDER BY grouped_on,
varxname, varyname;
CALL nza..DROP_TABLE('Result7');
  CORRELATION1000MATRIX
-----------------------
                    12
(1 row)
```

```
 GROUPED_ON |   VARXNAME    |   VARYNAME    |     CORRELATION
------------+-------------+-------------+------------------
 setosa     | SEPALLENGTH |  PETALLENGTH | 0.26387409291868
 setosa     | SEPALLENGTH |  PETALWIDTH  |   0.2790915749996
 setosa     | SEPALWIDTH  |  PETALLENGTH |   0.1766946286968
 setosa     | SEPALWIDTH  |  PETALWIDTH  |   0.2799728885169
 versicolor | SEPALLENGTH |  PETALLENGTH | 0.75404895859202
 versicolor | SEPALLENGTH |  PETALWIDTH  | 0.54646107159861
 versicolor | SEPALWIDTH  |  PETALLENGTH | 0.56052209169299
 versicolor | SEPALWIDTH  |  PETALWIDTH  | 0.66399872002411
 virginica  | SEPALLENGTH |  PETALLENGTH | 0.86422473293558
 virginica  | SEPALLENGTH |  PETALWIDTH  | 0.28110770915732
 virginica  | SEPALWIDTH  |  PETALLENGTH | 0.40104457734279
 virginica  | SEPALWIDTH  |  PETALWIDTH  | 0.53772802626619
(12 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
CANONICAL_CORR
CORR
CORRELATION500PAIRS
COVARIANCE1000MATRIX

CORRELATION500PAIRS - Correlation of pairs of variables

This stored procedure calculates correlations between pairs of numeric columns

Usage

The CORRELATION500PAIRS stored procedure has the following syntax:

CORRELATION500PAIRS(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the correlations

into Type: NVARCHAR(256)

incolumn
the pairs of numeric input table columns. The pairs are separated by a semicolon (;), the columns of a pair are separated by a colon (:).

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

Returns
INT8 the number of correlations written into the output table

Details

This stored procedure calculates the correlations between the given pairs of numeric input columns, either in the whole input table or within the groups defined in the column specified by parameter <by>. Correlation is a measure saying how easily it is to predict one column from the other. It takes a value between -1 (inversely correlated) and 1 (correlated), 0 means that the two columns are independent.

The output table is created with following column: grouped_on, varxname, varyname, correlation. If the parameter by is not specified, the column grouped_on contains -1. Otherwise, it contains the groups defined in the input column <by>.

Examples

```
CALL nza..CORRELATION500PAIRS('intable=nza..iris,
incolumn=sepallength:petallength;sepalwidth:petalwidth
, outtable=Result7');
SELECT * FROM result7 ORDER BY grouped_on,
varxname, varyname;
CALL nza..DROP_TABLE('Result7');
```

```
 CORRELATION500PAIRS
---------------------
                   2
(1 row)

 GROUPED_ON |  VARXNAME    |  VARYNAME    |     CORRELATION
------------+-------------+-------------+-------------------
 -1         | SEPALLENGTH | PETALLENGTH |  0.87175415730488
 -1         | SEPALWIDTH  | PETALWIDTH  | -0.35654408961381
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..CORRELATION500PAIRS('intable=nza..iris,
incolumn=sepallength:petallength;sepalwidth:petalwidth
, outtable=Result7, by=class');
SELECT * FROM result7 ORDER BY grouped_on, varxname,

varyname; CALL nza..DROP_TABLE('Result7');
```

```
 CORRELATION500PAIRS
---------------------
                   6
 (1 row)

 GROUPED_ON |   VARXNAME   |  VARYNAME    |     CORRELATION
------------+-------------+-------------+ ------------------
  setosa    | SEPALLENGTH | PETALLENGTH | 0.26387409291868
  setosa    |  SEPALWIDTH | PETALWIDTH  |   0.2799728885169
 versicolor | SEPALLENGTH | PETALLENGTH |    0.754048958592
 versicolor |  SEPALWIDTH | PETALWIDTH  | 0.66399872002411
 virginica | SEPALLENGTH | PETALLENGTH |
0.86422473293558
 virginica | SEPALWIDTH | PETALWIDTH |
0.53772802626619
(6 rows)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
CANONICAL_CORR
CORR
CORRELATION1000MATRIX
COVARIANCE500PAIRS

COV - Covariance

This stored procedure calculates the covariance between two numeric columns

Usage

The COV stored procedure has the following syntax:

COV(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the two numeric input table column, separated by a semicolon

(;) Type: NVARCHAR(ANY)

by

the input table column which splits the data into groups for which the operation is to be per-formed. If specified, an output table must be indicated.

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the covariances into. This parameter must be specified if parameter by is specified.

Type: NVARCHAR(256)

Default: <none>

Returns
DOUBLE the covariance between the two input table columns, or the number of groups in the out-put table for which a covariance has been calculated

Details

This stored procedure calculates the covariance of two numeric input columns, either in the whole input table or within the groups defined in the column specified by parameter <by>. Covariance is a measure say-ing how easily it is to predict one column from the other. It takes a negative value when both columns are inversely correlated, a positive value when they are correlated, 0 means that the two columns are inde-pendent.

If parameter 'by' is specified, an output table must be specified. The output table is created with following columns: <by>, covariance. The covariance between the two input columns is given for each group of the <by> column.

Examples

```
CALL nza..COV('intable=nza..CensusIncome,
incolumn=age;wage_per_hour');
       COV
-----------------
 226.54940380617
(1 row)
```

```
CALL nza..COV('intable=nza..CensusIncome,
incolumn=age;wage_per_hour, outtable=resultTable, by=sex');
SELECT * FROM resulttable ORDER BY sex; CALL
nza..DROP_TABLE('resulttable');
 COV
-----
   2
```

```
(1 row)

   COVARIANCE    |  SEX
-----------------+--------
 142.43203639029 | Female
 333.74358352398 | Male
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
COVARIANCEMATRIX
COVARIANCE1000MATRIX
COVARIANCE500PAIRS
CORR

COV_AGG - Pearson's Covariance

This function calculate the covariance between two numeric input variables

Usage

The COV_AGG aggregate has the following syntax:

COV_AGG(DOUBLE X, DOUBLE Y)

Parameters

X
the first variable

Type: DOUBLE

Y
the second variable

Type: DOUBLE

Returns
DOUBLE the Pearson's covariance, or NULL if there is too few data

Details

This function calculates the covariance of two numeric input variables. The Pearson's covariance coefficient measures the strength of relationship between linearly dependent variables that are normally distributed. It takes a negative value when both variables are inversely correlated, a positive value when they are correl-ated, 0 means that the two variables are independent.

Examples

```
SELECT nza..COV_AGG(petallength,petalwidth) FROM nza..iris;

     COV_AGG
----------------
 1.2963874720358
(1 row)
```

Related Functions

category Analytics - Statistics
CORR_AGG
COV

COV_MATRIX_AGG - Covariance Matrix

This function calculates the matrix of covariances between pairs of numeric input variables divided into two sets X and Y. It takes as arguments the number of variables in the set X, the number of variables in the set Y, and the variables themselves, and computes the covariances between all pairs containing a variable of set X and a variable of set Y.

Usage

The COV_MATRIX_AGG aggregate has the following syntax:

COV_MATRIX_AGG(INT4 noX, INT4 noY, DOUBLE X1, DOUBLE X2, DOUBLE Y1, DOUBLE Y2, DOUBLE Y3)

Parameters

noX

the number of variables in set

X Type: INT4

Min: 1

Max: 61-noY

noY
the number of variables in set

Y Type: INT4

Min: 1

Max: 61-noX

X1,X2,etc.
the first, second, etc... variable in set X

Type: DOUBLE

Y1,Y2,etc.
the first, second, etc... variable in set Y

Type: DOUBLE

Returns
NVARCHAR(10000) the string with the matrix of covariances between the variables of sets X and Y

Details

This function calculates the matrix of covariances between pairs of numeric input variables taken from two sets X and Y. Covariance is a measure saying how easily it is to predict one variable from the other. It takes a negative value when both variables are inversely correlated, a positive value when they are correlated, 0 means that the two variables are independent.

The major limitation is that the number of input variables cannot exceed 61.

This function returns a string containing the covariance matrix between columns of sets X and Y. Columns of set X are the rows of the matrix, columns of set Y the columns of the matrix.

Examples

```
SELECT
nza..COV_MATRIX_AGG(2,3,petallength,petalwidth,sepallengt

h,sepalwidth,petalwidth) FROM nza..iris;
```

```
COV_MATRIX_AGG
---------------------------------------------------------
---------------------------------------------------------
---------------------------

 our result
               0        1.27368      -0.321713
1.29639
               1       0.516904      -0.117981
0.582414
```

```
(1 row)
```

Related Functions

category Analytics - Statistics
CORR_MATRIX_AGG
COV_AGG
COVARIANCEMATRIX

COVARIANCE1000MATRIX - Covariance matrix

This stored procedure calculates the matrix of covariances between pairs of numeric columns divided in two sets

Usage

The COVARIANCE1000MATRIX stored procedure has the following syntax:

COVARIANCE1000MATRIX(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the covariances

into Type: NVARCHAR(256)

incolumn
the numeric input table columns to calculate covariances for, separated by a semicolon (;). Each column is followed by :X or :Y to indicate it belongs to set X or set Y. If neither :X nor :Y is spe-cified for any of the input columns, the matrix contains the covariances between all pairs of in-put columns.

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be per-formed

Type: NVARCHAR(128)

Default: <none> remark: If by is equal null, then the group is ignored.

Returns

INT8 the number of covariances written into the output table

Details

This stored procedure calculates the matrix of covariances between pairs of numeric input columns divided into two sets X and Y, either in the whole input table or within the groups defined in the column specified by parameter <by>. Covariance is a measure saying how easily it is to pre-dict one column from the other. It takes a negative value when both columns are inversely correl-ated, a positive value when they are correlated, 0 means that the two columns are independent.

The output table is created with following column: varxname, varyname, covariance, cntx. If the parameter by is specified, an additional column grouped_on is added to indicate for which group the covariances have been calculated.

Examples

```
CALL nza..COVARIANCE1000MATRIX('intable=nza..iris,
incolumn=sepallength;sepalwidth;petallength;petalwidth
, outtable=Result7');
SELECT * FROM result7 ORDER BY varxname,

varyname; CALL nza..DROP_TABLE('Result7');
```

```
 COVARIANCE1000MATRIX
----------------------
                   16
(1 row)

  VARXNAME    |  VARYNAME    |      COVARIANCE     | CNTX
-------------+-------------+--------------------+------
 PETALLENGTH | PETALLENGTH |     3.1131794183445|   150
 PETALLENGTH | PETALWIDTH  |     1.2963874720358|   150
 PETALLENGTH | SEPALLENGTH |     1.2736823266219|   150
 PETALLENGTH | SEPALWIDTH  |   -0.32171275167785|   150
 PETALWIDTH  | PETALLENGTH |     1.2963874720358|   150
 PETALWIDTH  | PETALWIDTH  |    0.58241431767338|   150
 PETALWIDTH  | SEPALLENGTH |    0.51690380313199|   150
 PETALWIDTH  | SEPALWIDTH  |   -0.11798120805369|   150
 SEPALLENGTH | PETALLENGTH |     1.2736823266219|   150
 SEPALLENGTH | PETALWIDTH  |    0.51690380313199|   150
 SEPALLENGTH | SEPALLENGTH |    0.68569351230425  |  150
 SEPALLENGTH | SEPALWIDTH   | -0.039268456375831 |  150
 SEPALWIDTH  | PETALLENGTH |   -0.32171275167785 |  150
 SEPALWIDTH  | PETALWIDTH  |   -0.11798120805369  |  150
 SEPALWIDTH  | SEPALLENGTH | -0.039268456375831  |  150
 SEPALWIDTH  | SEPALWIDTH  |    0.18800402684564  |  150
(16 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..COVARIANCE1000MATRIX('intable=nza..iris,
incolumn=sepallength:X;sepalwidth:X;petallength:Y;petalwidth:Y,
outtable=Result7');
SELECT * FROM result7 ORDER BY varxname,
varyname; CALL nza..DROP_TABLE('Result7');
```

```
 COVARIANCE1000MATRIX
----------------------
                    4
(1 row)

  VARXNAME   |  VARYNAME   |     COVARIANCE     | CNTX
-------------+-------------+ ------------------+ ------
 SEPALLENGTH | PETALLENGTH |     1.2736823266219|   150
 SEPALLENGTH | PETALWIDTH  |   0.51690380313199|   150
 SEPALWIDTH  | PETALLENGTH | -0.32171275167785 |   150
 SEPALWIDTH  | PETALWIDTH  | -0.11798120805369 |   150
(4 rows)

 DROP_TABLE
------------
```

```
 t
(1 row)
```

```
CALL nza..COVARIANCE1000MATRIX('by=class,
intable=nza..iris,
incolumn=sepallength:X;sepalwidth:X;petallength:Y;petalwi
dth:Y, outtable=Result7');
SELECT * FROM result7 ORDER BY grouped_on,
varxname, varyname;
CALL nza..DROP_TABLE('Result7');
```

```
 COVARIANCE1000MATRIX
----------------------
                   12
(1 row)
```

```
 GROUPED_ON |  VARXNAME   |  VARYNAME    |    COVARIANCE
| CNTX
            +-------------      +-------------
+-------------------------------        +------
 setosa     | SEPALLENGTH | PETALLENGTH  |
0.016138775510204  |   50
 setosa     | SEPALLENGTH | PETALWIDTH   |
0.01054693877551 |     50
 setosa     | SEPALWIDTH  | PETALLENGTH  |
0.011681632653061  |   50
 setosa     | SEPALWIDTH  | PETALWIDTH   |
0.011436734693878  |   50
 versicolor | SEPALLENGTH | PETALLENGTH  |
0.18289795918368 |     50
 versicolor | SEPALLENGTH | PETALWIDTH   |
0.055779591836735  |   50
 versicolor | SEPALWIDTH  | PETALLENGTH  |
0.082653061224491  |   50
 versicolor | SEPALWIDTH  | PETALWIDTH   |
0.041204081632653  |   50
```

```
 virginica  | SEPALLENGTH | PETALLENGTH |  0.30328979591837 |
50
 virginica  | SEPALLENGTH | PETALWIDTH  | 0.049093877551019 |
50
 virginica  | SEPALWIDTH  | PETALLENGTH | 0.071379591836735 |
50
 virginica  | SEPALWIDTH  | PETALWIDTH  | 0.047628571428571 |
50
(12 rows)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
CORRELATION1000MATRIX
COV
COVARIANCEMATRIX
COVARIANCE500PAIRS

COVARIANCE500PAIRS - Covariance of pairs of variables

This stored procedure calculates covariances between pairs of numeric columns

Usage

The COVARIANCE500PAIRS stored procedure has the following syntax:

COVARIANCE500PAIRS(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable

the output table to write the covariances into

Type: NVARCHAR(256)

incolumn
the pairs of numeric input table columns. The pairs are separated by a semicolon (;), the columns of a pair are separated by a colon (:).

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

Returns
INT8 the number of covariances written into the output table

Details

This stored procedure calculates the covariances between the given pairs of numeric input columns, either in the whole input table or within the groups defined in the column specified by parameter <by>. Covariance is a measure saying how easily it is to predict one column from the other. It takes a negative value when both columns are inversely correlated, a positive value when they are correlated, 0 means that the two columns are independent.

The output table is created with following column: grouped_on, varxname, varyname, covariance. If the parameter by is not specified, the column grouped_on contains -1. Otherwise, it contains the groups defined in the input column <by>.

Examples

```
CALL nza..COVARIANCE500PAIRS('intable=nza..iris,
incolumn=sepallength:petallength;sepalwidth:petalwidth
, outtable=Result7');
SELECT * FROM result7 ORDER BY grouped_on,
varxname, varyname;
CALL nza..DROP_TABLE('Result7');
```

```
 COVARIANCE500PAIRS
--------------------
                  2
(1 row)

 GROUPED_ON |   VARXNAME    |   VARYNAME    |     COVARIANCE
------------+-------------+-------------
```

```
+------------------
  -1          | SEPALLENGTH | PETALLENGTH |   1.2736823266219
  -1          | SEPALWIDTH  | PETALWIDTH  | -0.11798120805369
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..COVARIANCE500PAIRS('intable=nza..iris,
incolumn=sepallength:petallength;sepalwidth:petalwidth
, outtable=Result7, by=class');
SELECT * FROM result7 ORDER BY grouped_on, varxname,
varyname; CALL nza..DROP_TABLE('Result7');
```

```
 COVARIANCE500PAIRS
--------------------
                  6
(1 row)

 GROUPED_ON |   VARXNAME   |   VARYNAME   |     COVARIANCE
------------+-------------+-------------+-------------------
 setosa     | SEPALLENGTH | PETALLENGTH | 0.016138775510204
 setosa     | SEPALWIDTH  | PETALWIDTH  | 0.011436734693878
 versicolor | SEPALLENGTH | PETALLENGTH |   0.18289795918368
 versicolor | SEPALWIDTH  | PETALWIDTH  | 0.041204081632653
 virginica  | SEPALLENGTH | PETALLENGTH |   0.30328979591837
 virginica  | SEPALWIDTH  | PETALWIDTH  | 0.047628571428573
(6 rows)

 DROP_TABLE
------------
 t
```

```
(1 row)
```

Related Functions

category Analytics - Statistics
CORRELATION500PAIRS
COV
COVARIANCEMATRIX
COVARIANCE1000MATRIX

COVARIANCEMATRIX - Covariance matrix as string

This stored procedure calculates the matrix of covariances between pairs of numeric columns di-vided in two sets. It write the matrix as a string into the output table.

Usage

The COVARIANCEMATRIX stored procedure has the following syntax:

COVARIANCEMATRIX(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the covariances

into Type: NVARCHAR(256)

incolumn
the numeric input table columns to calculate covariances for, separated by a semi-colon (;). Each column is followed by :X or :Y to indicate it belongs to set X or set Y. If neither :X nor :Y is specified for any of the input columns, the matrix contains the cov-ariances between all pairs of input columns.

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

Returns
INT8 the number of groups for which a covariance matrix has been calculated

Details

This stored procedure calculates the matrix of covariances between pairs of numeric input columns divided into two sets X and Y, either in the whole input table or within the groups defined in the column specified by parameter <by>. Covariance is a measure saying how easily it is to predict one column from the other. It takes a negative value when both columns are inversely correlated, a positive value when they are correl-ated, 0 means that the two columns are independent.

The output table is created with following string column: covariance. The covariance columns contains a string with the covariance matrix: columns of set X are the rows of the matrix, columns of set Y the columns of the matrix. If the parameter by is specified, an additional column grouped_on is added to indicate for which group the covariances have been calculated.

Examples

```
CALL nza..COVARIANCEMATRIX('intable=nza..CensusIncome,
incolumn=age:X;wage_per_hour:Y,
outtable=resultTable'); SELECT * FROM resulttable;
CALL nza..DROP_TABLE('resulttable');
```

```
 COVARIANCEMATRIX
------------------
                1
(1 row)

 COVARIANCE
------------------------------------------------
 our result

                       226.549
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..COVARIANCEMATRIX('intable=nza..CensusIncome,
incolumn=wage_per_hour:X;capital_gains:X;age:Y,
outtable=resultTable, by=sex');
SELECT * FROM resulttable ORDER BY sex;
CALL nza..DROP_TABLE('resulttable');
```

```
 COVARIANCEMATRIX
------------------
                2
(1 row)


                                    COVARIANCE
   SEX
-------------------------------------------------------
------------------------+--------
 our result


                            142.432
              1         1921.78   | Female
 our result


                            333.744
              1         10270.4   | Male
(2 rows)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics

COV
COV_MATRIX_AGG
COVARIANCE1000MATRIX
COVARIANCE500PAIRS

CROSS_VALIDATION - Build and cross validate a Classification model

This stored procedure builds a Classification model and cross validates it. Cross validation is a technique for estimating the quality and performance of a predictive model

Usage

The CROSS_VALIDATION stored procedure has the following syntax:

CROSS_VALIDATION(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

modelType
the name of the procedure that builds a Classification model (e.g. naivebayes, dectree,

knn) Type: NVARCHAR(ANY)

model
the name of the Classification model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the

class Type: NVARCHAR(128)

outtable
the output table where the predictions will be

stored Type: NVARCHAR(256)

folds
the number of cross validation

subsets Type: INTEGER

Default: 10

seed
the seed of the random

function Type: FLOAT

Default: random()

Returns
FLOAT the prediction accuracy and -1 if accuracy cannot be calculated

Details

This stored procedure builds a Classification model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipulate the model or access the model tables.

All parameters specific to a the given Classification stored procedure can be defined too: they will be used when building and testing the model.

A table <outtable> is created with the following columns: id, class, fold. The id column matches the <id> column from intable, class is the predicted class label and fold is the fold number when the prediction was made. The size of this table is <folds> time the size of <intable>.

Examples

```
CALL nza..CROSS_VALIDATION('modelType=dectree,
intable=nza..iris, folds=3, model=iris_c45,
target=class, id=id, outtable=iris_pred, seed=12345');
CALL nza..DROP_MODEL('model=iris_c45');

CALL nza..DROP_TABLE('iris_pred');
```

```
 CROSS_VALIDATION
------------------
             0.94
(1 row)
 DROP_MODEL
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
PERCENTAGE_SPLIT
TRAIN_TEST
DECTREE
NAIVEBAYES
KNN
LIST_MODELS

CUMULATIVE - Cumulative Distributions

This stored procedure computes the probability that a variable following a given distribution takes a value smaller or equal to x

Usage

The CUMULATIVE stored procedure has the following syntax:

CUMULATIVE(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

type
the kind of distribution(s) to

use: n - normal (PNORM)

c - chi-square (PCHISQ)

t - t-student (PT)

u - uniform (PUNIF) e -

exponential (PEXP) w -

Weibull (PWEIBULL)

Note that several distributions can be calculated simultaneously by concatenating the distribu-tion abbreviations in the parameter value.

Type: NVARCHAR(ANY)

incolumn
the numeric input table column containing the x

value(s) Type: NVARCHAR(128)

id

the input table column identifying a unique instance id

Type: NVARCHAR(128)

outtable
the output table Type:

NVARCHAR(256)

df
the number of degrees of freedom for a student or chi-square

distribution Type: INT8

Default: <none>

min
the minimum for a uniform

distribution Type: DOUBLE

Default: <none>

max
the maximum for a uniform

distribution Type: DOUBLE

Default: <none>

scale
the scale for an exponential or weibull

distribution Type: DOUBLE

Default: <none>

Min: 0.00000000001

shape
the shape for a weibull

distribution Type: DOUBLE

Default: <none>

mean
the mean value for a normal

distribution Type: DOUBLE

Default: <none>

variance
the variance for a normal

distribution Type: NVARCHAR(ANY)

Default: <none>

Min: 0.00000000001

Returns
INT8 the number of input table values for which a probability is calculated

Details

You have a table in which you have computed some summary statistics (chi-square tests etc.) and you want to know what is the probability that the statistics gets smaller or equal to this value given that this statistics comes from a given distribution (you may compare alternative distributions if you are not sure). the CUMULATIVE stored procedure calculates a probability saying how likely the value is under the given distribution.

If the probability ranges between 0 and 0.05, the value is close to the left extreme of the distribution,

If it ranges between 0.05 and 0.95, the value is not to be considered extreme,

If it ranges between 0.95 and 1, the value is close to the right extreme of the distribution.

The parameters for the distributions can contain literal values or expressions.

The output table has following columns: id, <incolumn>. Additionally, the output table contains a column for each distribution, named like the cumulative distribution function, and containing the output of this func-tion. It also contains a column per specific parameter for this distribution, named as the parameter, and containing the value calculated for it in each row.

Examples

```
CALL nza..CUMULATIVE('intable=nza..iris, id=id,
type="n", incolumn=petallength, outtable=iripetall,
mean=3.75, variance=3.11');
SELECT * FROM iripetall ORDER BY id LIMIT

10; CALL nza..DROP_TABLE('iripetall');
```

```
 CUMULATIVE
------------
        150
(1 row)


 ID |        PNORM        | PETALLENGTH  | MEAN | VARIANCE
----+---------------------+--------------+------+----------
  1 | 0.091337668708794   |          1.4 | 3.75 |     3.11
  2 | 0.091337668708794   |          1.4 | 3.75 |     3.11
  3 | 0.082375704686719   |          1.3 | 3.75 |     3.11
  4 |   0.10100286923082  |          1.5 | 3.75 |     3.11
  5 | 0.091337668708794   |          1.4 | 3.75 |     3.11
  6 |   0.12252669600944  |          1.7 | 3.75 |     3.11
  7 | 0.091337668708794   |          1.4 | 3.75 |     3.11
  8 |   0.10100286923082  |          1.5 | 3.75 |     3.11
  9 | 0.091337668708794 |        1.4  | 3.75 |     3.11
 10 |   0.10100286923082 |        1.5  | 3.75 |     3.11
(10 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
CREATE TABLE pd_mytable(id INT4, thePoint DOUBLE, df
INT4);
INSERT INTO pd_mytable values(1,0,2);
INSERT INTO pd_mytable values(2,1,2);
INSERT INTO pd_mytable values(3,2,2);
INSERT INTO pd_mytable values(4,3,2);
INSERT INTO pd_mytable values(5,3.5,2);
INSERT INTO pd_mytable values(6,3.5,3);
INSERT INTO pd_mytable values(7,3.5,4);
CALL nza..CUMULATIVE('intable=pd_mytable, type="c",
incolumn=thePoint, id=id, outtable=CUMULATIVE_mp_5,
df=df');
SELECT * FROM CUMULATIVE_mp_5 ORDER BY ID;
CALL nza..DROP_TABLE('CUMULATIVE_mp_5');
CALL nza..DROP_TABLE('pd_mytable');
```

```
 CUMULATIVE
------------
          7
(1 row)

 ID |        PCHISQ      | THEPOINT | DF
----+------------------  +----------+----
```

```
  1 |                  0 |         0  | 2
  2  | 0.39346934028786 |         1  | 2
  3  | 0.63212055882856 |         2  | 2
  4  | 0.77686983985157 |         3  | 2
  5 | 0.82622605654955  |       3.5  | 2
  6 | 0.67923787919436  |       3.5  | 3
  7 | 0.52212165550395  |       3.5  | 4
 (7 rows)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

```
CREATE TABLE pd_mytable(id INT4, thePoint DOUBLE, df INT4);
INSERT INTO pd_mytable values(1,0,2); INSERT INTO
pd_mytable values(2,1,2);
INSERT INTO pd_mytable values(3,2,2);
INSERT INTO pd_mytable values(4,3,2);
INSERT INTO pd_mytable values(5,3.5,2);
INSERT INTO pd_mytable values(6,3.5,3);
INSERT INTO pd_mytable values(7,3.5,4);
CALL nza..CUMULATIVE('intable=pd_mytable, type=ce,
incolumn=thePoint, id=id, outtable=CUMULATIVE_mp_5, df=df,
scale=10');
SELECT * FROM CUMULATIVE_mp_5 ORDER BY ID;

CALL nza..DROP_TABLE('CUMULATIVE_mp_5');

CALL nza..DROP_TABLE('pd_mytable');
```

```
             CUMULATIVE
            ------------
                      7
            (1 row)

     ID |                                          PCHISQ   |     PEXP |
                                                          THEPOINT | DF
            | SCALE
            ----+------------------+-----------------+----------
            +----+-------
                1|                                     0| 0|    0|    2
               10
                2 | 0.39346934028786 | 0.09516258196404 |   1 |   2
               10
                3 | 0.63212055882856 | 0.18126924692202 |   2 |   2
               10
                4 | 0.77686983985157 | 0.25918177931828 |   3 |   2
               10
                5 | 0.82622605654955 | 0.29531191028129 |   3.5 | 2
               10
                6 | 0.67923787919436 | 0.29531191028129 |   3.5 | 3
               10
                7 | 0.52212165550395 | 0.29531191028129 |   3.5 | 4
               10
            (7 rows)

             DROP_TABLE
            ------------
             t
            (1 row)

             DROP_TABLE
            ------------
             t
            (1 row)
```

Related Functions

category Analytics - Probability Distributions
PCHISQ
PEXP
PNORM
PT
PUNIF
PWEIBULL

DBERN - Density of the Bernoulli Distribution

Given the success probability p, this function returns the probability that we get x successes in a single Bernoulli trial.

Usage

The DBERN function has the following syntax:

DBERN(int8 x, DOUBLE p)

Parameters

x
the value at which to

compute Type: INT8

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns
DOUBLE the probability density at the point x

Details

The probability density is assigned to each discrete event that can happen, here 0 (tails) or 1 (heads).

DBERN(0,p)=1-p,

DBERN(1,p)=p.

If p is not between 0 and 1, DBERN(x,p) is null for all x values.

Examples

```
SELECT nza..DBERN(0, 0.4);

 DBERN
```

```
-------
   0.6
(1 row)
```

```
SELECT nza..DBERN(1, 0.4);
 DBERN
-------
   0.4
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PBERN
PBERN_H
QBERN
QBERN_H

DBETA - Probability density function for Beta distribution

Given two shape parameters, this function returns the probability density that a variable following the Beta distribution takes a value equal to x

Usage

The DBETA function has the following syntax:

DBETA(DOUBLE x,DOUBLE shapeOne, DOUBLE shapeTwo)

Parameters

x
the value at which to

compute Type: DOUBLE

shapeOne
the first shape of the

distribution Type: DOUBLE

Min: 0.00000000001

shapeTwo
the second shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the probability density at the point x

Details

DBETA(x,shapeOne,shapeTwo)=x^{shapeOne-1}*(1-x)^{shapeTwo-1} / BETA(shapeOne,shapeTwo) for x between 0 and 1.

DBETA(x,shapeOne,shapeTwo)=0 for x outside of this range.

If shapeOne or shapeTwo is 0 or less, DBETA(x,shapeOne,shapeTwo) is null for all x values.

Examples

```
SELECT nza..DBETA(0.0, 3, 0.4),nza..DBETA(0.1, 3,
0.4),nza..DBETA(0.2, 3, 0.4),nza..DBETA(0.3, 3,
0.4),nza..DBETA(0.4, 3, 0.4);
```

```
  DBETA|         DBETA          |         DBETA          |         DBETA
|         DBETA

       +                        +-------------------

+-------------------    -------------------+-----------------
      0| 0.0071585286491726 | 0.030730899489516 |
0.074912270202529 | 0.14608260524138

(1 row)
```

Related Functions

category Analytics - Probability Distributions
PBETA
PBETA_H
QBETA
QBETA_H

DBINOM - Density of the Binomial Distribution

Given the success probability p and the number of trials, this function returns the probability that we get x successes in a serie of Bernoulli trials.

Usage

The DBINOM function has the following syntax:

DBINOM(INT8 x, INT8 N, DOUBLE p)

Parameters

x

the value at which to

compute Type: INT8

N

the number of

trials Type: INT8

Min: 1

p

the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns

DOUBLE the probability density at the point x

Details

The probability of having x successes in N trials with probability p of success in each is as follows:

DBINOM(x,N,p)=N!/(x!*(N-x)!) * p^x * (1-p)^(N-x) for all positive x and N values where x <= N and for p between 0 and 1.

If N is 0 or less, DBINOM(x,N,p) is null for all x and p values.

If p is not between 0 and 1, DBINOM(x,p) is null for all x values.

Examples

```
SELECT nza..DBINOM(0,3,0.4),
nza..DBINOM(1,3,0.4), nza..DBINOM(2,3,0.4),
nza..DBINOM(3,3,0.4), nza..DBINOM(4,3,0.4);
 DBINOM | DBINOM | DBINOM | DBINOM | DBINOM
--------+--------+--------+--------+--------
   0.216|   0.432|   0.288|   0.064|       0
(1 row)
```

```
SELECT nza..dbinom(3,5,0.6), nza..dbinom(30,50,0.6),
nza..dbinom(300,500,0.6), nza..dbinom(3000,5000,0.6),
nza..dbinom(30000,50000,0.6),
nza..dbinom(300000,500000,0.6),
nza..dbinom(3000000,5000000,0.6),
nza..dbinom(30000000,50000000,0.6);
```

```
 DBINOM |      DBINOM       |       DBINOM       |       DBINOM
|       DBINOM        |      DBINOM        |       DBINOM
        DBINOM
--------+------------------         +--------------------
+-------------------+-------------------- +-------------------
+--------------------    +---------------------
 0.3456 | 0.114558539127O2 | 0.036399043096838 |
0.011515940477347 | 0.0036419193276137 | 0.001151655236622 |
0.00036419700272489 | 0.00011498375120855
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PBINOM
PBINOM_H
QBINOM
QBINOM_H

DCAUCHY - Probability density function for Cauchy Distribution

Given the peak location and the interquartile range, this function returns the probability density that a vari-able following the Cauchy distribution takes a value equal to x

Usage

The DCAUCHY function has the following syntax:

DCAUCHY(DOUBLE x, DOUBLE location, DOUBLE scale)

Parameters

x
the value at which to

compute Type: DOUBLE

location
the location of the peak of the Cauchy

distribution Type: DOUBLE

scale
a value corresponding to half of the interquartile range. Smaller values result in a narrower peak.

Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the probability density at point x

Details

DCAUCHY(x,location,scale)=1/ (PI*scale*(1+((x-location)/scale)^2).

The maximum (mode) lies at location.

If scale=0 or less, DCAUCHY(x, location, scale) is null for all x and location values.

Examples

```
SELECT nza..DCAUCHY(0, 3, 0.4),nza..DCAUCHY(1, 3,
0.4),nza..DCAUCHY(2, 3, 0.4),nza..DCAUCHY(3, 3,
0.4),nza..DCAUCHY(4, 3, 0.4);
```

```
     DCAUCHY       |        DCAUCHY       |       DCAUCHY
|      DCAUCHY       |      DCAUCHY

------------------+-------------------+------------------
+------------------+------------------

 0.01389999502986 | 0.030606719825364 | 0.10976202971855
  0.79577471545948 |

0.10976202971855 (1 row)
```

Related Functions

category Analytics - Probability Distributions
PCAUCHY
PCAUCHY_H
QCAUCHY
QCAUCHY_H

DCHISQ - Probability density function for Chi-square Distribution

Given a degree of freedom, this function returns the probability density that a variable following the Chi-square distribution takes a value equal to x

Usage

The DCHISQ function has the following syntax:

DCHISQ(DOUBLE x, INT8 df)

▲ Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0.00000000001

df
the number of degrees of

freedom Type: INT8

Min: 1

Returns
DOUBLE the probability density at point x

Details

DCHISQ(x,df)= x^{df/2-1}*e^{-x/2} / (2^{df/2}*GAMMA(df/2)) for all positive x values.

For x<=0 we assume that DCHISQ(x,df)=0, though there is no practical meaning of this.

If df is 0 or less, DCHISQ(x,df) is null for all x values.

Examples

```
SELECT nza..DCHISQ(4.6188, 9);

      DCHISQ
-------------------
 0.079912209787221
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PCHISQ
PCHISQ_H
PCHISQ_S
QCHISQ
QCHISQ_H

DECTREE - Build then prune a Decision Tree model

This stored procedure builds a Decision Tree model by growing and pruning a tree.

Usage

The DECTREE stored procedure has the following syntax:

DECTREE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Decision Tree model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the

class Type: NVARCHAR(128)

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are continuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':col-weight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and 'ignore'.

If the parameter is undefined, all columns are considered 'input' columns.

Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPERTIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsupported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsupported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

weights
the input table containing optional instance or class weights for the input table

columns. If the parameter is undefined, we assume that the weights are uniformly

equal to 1. The <weights> table contains following columns:

weight: a numeric column containing the instance or class weight,

id: a column to be joined with the <id> column of <intable>, defining instance weights,

class: a column to be joined with the <target> column of <intable>, defining class weights.

The id or class column can be missing, at least one of them must be present. For instances or classes not occurring in this table, weights of 1 are assumed.

Type: NVARCHAR(256)

Default: <none>

eval
the class impurity measure used for split evaluation. Allowed values are 'entropy' and

'gini'. Type: NVARCHAR(ANY)

Default: entropy

minimprove
the minimum improvement of the split evaluation measure

required Type: DOUBLE

Default: 0.02

Min: 0.0

minsplit
the minimum number of instances per tree node that can be

split Type: INTEGER

Default: 50

Min: 2

maxdepth
the maximum number of tree levels (including

leaves) Type: INTEGER

Default: 10

Min: 1

Max: 62

valtable
the input table containing the validation dataset. If this parameter is undefined, no pruning will be performed.

Type: NVARCHAR(256)

Default: <none>

valweights
the input table containing optional instance or class weights for the validation dataset. It is similar to the <weights> table.

Type: NVARCHAR(256)

Default: <none>

qmeasure
the quality measure for pruning. Allowed values are Acc or

wAcc. Type: NVARCHAR(ANY)

Default: Acc

statistics
flags indicating which statistics to collect. Allowed values are: none, columns, values:n, all.

If statistics=none, no statistics are collected.

If statistics=columns, statistics on the input table columns like mean value are collec-ted.

If statistics=values:n with n a positive number, statistics about the columns and the column values are collected. Up to <n> column value statistics are collected:

If a nominal column contains more than <n> values, only the <n> most frequent column statistics are kept.

If a numeric column contains more than <n> values, the values will be discretized and the statistics will be collected on the discretized values.

Indicating statistics=all is equal to statistics=values:100.

Type: NVARCHAR(ANY)

Default: 'none'

Returns

INTEGER the number of Decision Tree nodes (including leaves)

Details

This stored procedure builds a Decision tree model by growing and (optionally) pruning the tree. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipulate the model or access the model tables.

A top-down tree growing algorithm is used with the following features:

binary splits (equality-based for nominal attributes, inequality-based for continuous attributes),

no missing value handling,

entropy or Gini index for split evaluation,

stop criteria satisfied at a node with a uniform class,

stop criteria satisfied when further splits do not improve the class impurity by at least <minimprove>,

stop criteria satisfied when the number of instances is less than <minsplit>,

stop criteria satisfied when the tree depth reaches <maxdepth>.

A bottom-up reduced error pruning algorithm is used. It bases on the prediction accuracy of the model against the validation dataset. The pruning is activated when parameter <valtable> is specified.

Examples

```
CALL nza..DECTREE('model=adult_tree, intable=nza..adult_train,
id=id, target=income, minsplit=1000, eval=entropy,
valtable=nza..adult_prune, qmeasure=wAcc');
CALL nza..DROP_MODEL('model=adult_tree');
```

```
 DECTREE
---------
      13
(1 row)

 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
GROW_DECTREE
PRUNE_DECTREE

PRINT_DECTREE
PREDICT_DECTREE
LIST_MODELS

DENSITY - Density of Distributions

This stored procedure computes the probability that a variable following a given distribution takes a value equal to x

Usage

The DENSITY stored procedure has the following syntax:

DENSITY(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

type
the kind of distribution(s) to

use: n - normal (DNORM)

c - chi-square (DCHISQ)

t - t-student (DT)

u - uniform (DUNIF) e -

exponential (DEXP) w -

Weibull (DWEIBULL)

Note that several distributions can be calculated simultaneously by concatenating the distribution abbreviations in the parameter value.

Type: NVARCHAR(ANY)

incolumn
the numeric input table column containing the x

value(s) Type: NVARCHAR(128)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

outtable

the output table

Type: NVARCHAR(256)

df
the number of degrees of freedom for a student or chi-square

distribution Type: INT8

Default: <none>

min
the minimum for a uniform

distribution Type: DOUBLE

Default: <none>

max
the maximum for a uniform

distribution Type: DOUBLE

Default: <none>

scale
the scale for an exponential or weibull

distribution Type: DOUBLE

Default: <none>

Min: 0.00000000001

shape
the shape for a weibull

distribution Type: DOUBLE

Default: <none>

mean
the mean value for a normal

distribution Type: DOUBLE

Default: <none>

variance
the variance for a normal

distribution Type: NVARCHAR(ANY)

Default: <none>

Min: 0.00000000001

Returns
INT8 the number of input table values for which a probability is calculated

Details

You have a table in which you have computed some summary statistics (chi-square tests etc.) and you want to know what is the probability that the statistics gets this value given that this statistics comes from a given distribution (you may compare alternative distributions if you are not sure). Density is a kind of probability at the point x and its close neighborhood (the density should be multiplied with the width of the neighborhood to get the probability). Formally the density is the derivative of a cumu-lative distribution function of a probability distribution. It has to be positive.

The parameters for the distributions can contain literal values or expressions.

The output table has following columns: id, <incolumn>. Additionally, the output table contains a column for each distribution, named like the distribution density function, and containing the out-put of this function. It also contains a column per specific parameter for this distribution, named as the parameter, and containing the value calculated for it in each row.

Examples

```
CALL nza..DENSITY('intable=nza..iris, id=id,
type="n", incolumn=petallength, outtable=iripetall,
mean=3.75, variance=3.11');
SELECT * FROM iripetall ORDER BY id LIMIT
10; CALL nza..DROP_TABLE('iripetall');
```

```
 DENSITY
---------
     150
(1 row)

  ID |       DNORM       | PETALLENGTH  | MEAN | VARIANCE
----+------------------ +-------------+------+----------
   1 | 0.16417862459158|          1.4| 3.75 |       3.11
   2 | 0.16417862459158|          1.4| 3.75 |       3.11
   3 |  0.1519854194291|          1.3| 3.75 |       3.11
   4 | 0.17678070212437|          1.5| 3.75 |       3.11
   5 | 0.16417862459158|          1.4| 3.75 |       3.11
   6 | 0.20299343912957|          1.7| 3.75 |       3.11
   7 | 0.16417862459158|          1.4| 3.75 |       3.11
   8 | 0.17678070212437|          1.5| 3.75 |       3.11
   9 | 0.16417862459158|          1.4| 3.75 |       3.11
  10 | 0.17678070212437|          1.5| 3.75 |       3.11
 (10 rows)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DCHISQ
DEXP
DNORM
DT
DUNIF
DWEIBULL

DEXP - Probability density function for Exponential Distribution

Given a degree of freedom, this function returns the probability density that a variable following the Expo-nential distribution takes a value equal to x

Usage

The DEXP function has the following syntax:

DEXP(DOUBLE x, DOUBLE scale)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0.00000000001

scale
the exponential

scale Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the probability density at point x

Details

DEXP(x,scale)= exp(-(x/scale))/scale for all positive x values.

If x is negative, DEXP(x,scale) is null for all scale values.

If scale is 0 or less, DEXP(x,scale) is null for all x values.

Examples

```
SELECT nza..DEXP(2,4);

        DEXP
------------------
 0.15163266492816
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PEXP
PEXP_H
QEXP
QEXP_H

DF - Probability density function for Fisher Distribution

Given the degrees of freedom of the nominator and the denominator, this function returns the probability density that a variable following the Fisher distribution takes a value equal to x

Usage

The DF function has the following syntax:

DF(DOUBLE x, INT8 dfNomin, INT8 dfDenom)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0.00000000001

dfNomin
the number of degrees of freedom of the

nominator Type: INT8

Min: 1

dfDenom
the number of degrees of freedom of the

denominator Type: INT8

Min: 1

Returns
DOUBLE the probability density at point x

Details

DF(x,dfNomin,dfDenom) is a derivative of PF(x,dfNomin,dfDenom) on x.

If x, dfNomin or dfDenom is 0 or less, PF(x,dfNomin,dfDenom) is null.

Examples

```
SELECT nza..df(9.55, 2, 3);

         DF
--------------------
 0.0067892601867821
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PF
PF_H
QF
QF_H

DFISK - Probability density function for Fisk (or log-logistic) Distribution

Given the median and the shape, this function returns the probability density that a variable following the Fisk distribution takes a value equal to x

Usage

The DFISK function has the following syntax:

DFISK(DOUBLE x, DOUBLE median, DOUBLE shape)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0.000000001

median
the median value of the distribution (also called scale)

Type: DOUBLE

Min: 0.000000001

shape
the shape of the

distribution Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the probability density at point x

Details

DFISK(x,median,shape) = (shape/median)*(x/median)^{shape-1} / (1+(x/median)^shape)^2 for all positive x, median and shape values.

If x, median or shape is 0 or less, PFISK(x,median,shape) is null.

Examples

```
SELECT nza..DFISK(2.43,5,8);

       DFISK
-------------------
 0.010182975576092
(1 row)
```

```
SELECT nza..DFISK(2.43,2,3);

      DFISK
------------------
 0.28373389001712
(1 row)
```

```
SELECT (nza..PFISK(0.000001+2.43,2,3)-
nza..PFISK(2.43,2,3))/0.000001-nza..DFISK(2.43,2,3) diff;

          DIFF
---------------------
 -1.0810318662458e-07
```

```
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PFISK
PFISK_H
QFISK
QFISK_H

DGAMMA - Probability density function for Gamma distribution

Given a shape and an inverted scale, this function returns the probability density that a variable following the Gamma distribution takes a value equal to x

Usage

The DGAMMA function has the following syntax:

DGAMMA(DOUBLE x,DOUBLE shape, DOUBLE scaleInv)

Parameters

x
the value at which to

compute Type: DOUBLE

shape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

scaleInv
the inverted scale of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the probability density at the point x

Details

If shape or scaleInv is 0 or less, DGAMMA(x,shape,scaleInv) is null for all x values.

Examples

```
SELECT nza..DGAMMA(0,3,0.4),
nza..DGAMMA(1,3,0.4), nza..DGAMMA(2,3,0.4),
nza..DGAMMA(3,3,0.4), nza..DGAMMA(4,3,0.4);
```

```
 DGAMMA |       DGAMMA        |        DGAMMA        |
DGAMMA         |       DGAMMA

--------+-------------------+-------------------
+-------------------+------------------

      0 | 0.021450241473568 | 0.057514107408152 |
0.086743933032445 | 0.10337101721533

(1 row)
```

Related Functions

category Analytics - Probability Distributions
PGAMMA
PGAMMA_H
QGAMMA
QGAMMA_H

DGEOM - Density of the Geometric Distribution

Given the success probability p, this function returns the probability that we get x failures before the first success in a serie of Bernoulli trials.

Usage

The DGEOM function has the following syntax:

DGEOM(INT8 x, DOUBLE p)

Parameters

x
the value at which to

compute Type: INT8

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

Returns
DOUBLE the probability density at the point x

Details

DGEOM(x,p) = p*(1-p)^x for all x values and for p between 0 and 1.

If p is not between 0 and 1, DGEOM(x,p) is null for all x values.

Examples

```
SELECT nza..DGEOM(0,0.4), nza..DGEOM(1,0.4), nza..DGEOM(2,0.4),
nza..DGEOM(3,0.4);
 DGEOM | DGEOM | DGEOM | DGEOM
-------+-------+-------+--------
   0.4 |  0.24 | 0.144 | 0.0864
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PGEOM
PGEOM_H
QGEOM
QGEOM_H

DHYPER - Density of the Hypergeometric Distribution

Given the number of white and black balls in the urn and the number of trials, this function returns the probability that we draw x white balls from N trials from an urn without replacement.

Usage

The DHYPER function has the following syntax:

DHYPER(BIGINT x, BIGINT wu, BIGINT bu, BIGINT N)

Parameters

x

the number of white balls drawn without replacement from an urn which contains both black and white balls

Type: BIGINT

wu

the number of white balls in the

urn Type: BIGINT

Min: 0

bu

the number of black balls in the urn

Type: BIGINT

Min: 0

N
the number of balls drawn from the urn without

replacement Type: BIGINT

Min: 1

Returns
DOUBLE the probability density at the point x

Details

In an urn containing wu white balls and bu black balls, we draw N balls without replacement. Drawing a white ball is a success (1), a black ball is a failure (0). The Hypergeometric distribution calculates the probability that we get exactly x successes in the N trials.

If wu or bu is negative, DHYPER(x,wu,bu,N) is null for all x and N values.

If N is 0 or less, DHYPER(x,wu,bu,N) is null for all x, wu and bu values.

Examples

```
SELECT nza..DHYPER(1,1,1,1);

 DHYPER

--------

     0.5

(1 row)
```

```
SELECT nza..DHYPER(1,2,3,4);

 DHYPER

--------

     0.4

(1 row)
```

```
SELECT nza..DHYPER(1,4,1,2);

 DHYPER

--------
```

```
    0.4
(1 row)
```

```
SELECT nza..DHYPER(10,20,30,40);
        DHYPER
---------------------
 1.7985883651357e-05
(1 row)
```

```
SELECT nza..DHYPER(10,40,20+30-40,20);
        DHYPER
---------------------
 1.7985883651357e-05
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PHYPER
PHYPER_H
QHYPER
QHYPER_H

DIVCLUSTER - Build a Hierarchical Clustering model

This stored procedure builds a Hierarchical Clustering model using a divisive method (top-down). The K-means algorithm is used recursively. The hierarchy of clusters is represented in a binary tree structure (each parent node has exactly 2 children node). The leafs of the cluster tree are identified by negative numbers. The divisive clustering algorithm may return different results for the same dataset and the same random generator seed when you use different input data distribution or a different number of dataslices. This is due to the behavior of the random number generator, which generates random sequences depending on the number of dataslices and data distribution. The algorithm returns the same model when the same ma-chine, the same input data distribution, and the same random seed is used.

Usage

The DIVCLUSTER stored procedure has the following syntax:

DIVCLUSTER(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Hierarchical Clustering model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where clusters are assigned to each input table

record Type: NVARCHAR(ANY)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing a class or a value to predict, this column is ig-nored by the Hierarchical Clustering algorithm.

Type: NVARCHAR(128)

Default: <none>

distance
the distance function. Allowed values are: euclidean, manhatthan, canberra, maxim-um.

Type: NVARCHAR(ANY)

Default: euclidean

maxiter
the maximum number of iterations to perform in the base K-means Clustering al-gorithm

Type: INTEGER

Default: 5

Min: 1

Max: 1000

minsplit
the minimum number of instances per cluster that can be split

Type: INTEGER

Default: 5

Min: 2

maxdepth
the maximum number of cluster levels (including

leaves) Type: INTEGER

Default: 3

Min: 1

Max: 60

randseed
the random generator

seed Type: INTEGER

Default: 12345

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are con-tinuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':colweight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable

the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPER-TIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsup-ported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsup-ported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

Returns
BIGINT the number of created clusters

Details

This stored procedure builds a Hierarchical Clustering model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management func-tions to further manipulate the model or access the model tables.

The hierarchy of clusters is build by recursively partitioning data into two separate clusters using the base K-means Clustering algorithm. The top-down Hierarchical Clustering algorithm is used with the following features:

base K-means algorithm with k=2 (binary splits),

no missing value handling,

stop criteria satisfied when the number of instances is less than <minsplit>,

stop criteria satisfied when the cluster tree depth reaches <maxdepth>.

The output table <outtable> is created with following columns: id, cluster_id, distance. The id column matches the <id> column of the input table. Each input table record is associated with a cluster, where the distance from the record to the cluster center is the smallest. The cluster ID and the distance to the cluster center are given in the columns cluster_id and distance.

Examples

```
CALL nza..DIVCLUSTER('model=iris_mdl, intable=nza..iris,
outtable=iris_out, id=id, distance=euclidean, maxiter=5,
minsplit=5, maxdepth=3, randseed=12345');
CALL nza..DROP_MODEL('model=iris_mdl');

CALL nza..DROP_TABLE('iris_out');

CALL nza..DIVCLUSTER('model=adult_mdl,
intable=nza..adult, outtable=adult_out, id=id,
distance=euclidean, maxiter=5, minsplit=5, maxdepth=3,
randseed=12345');

CALL nza..DROP_MODEL('model=adult_mdl');

CALL nza..DROP_TABLE('adult_out');

CALL nza..DIVCLUSTER('model=csi_mdl, intable=nza..censusincome,
outtable=csi_out, id=id, distance=euclidean, maxiter=5,
minsplit=5, maxdepth=3, randseed=12345');
CALL nza..DROP_MODEL('model=csi_mdl');

CALL nza..DROP_TABLE('csi_out');
```

```
  DIVCLUSTER
------------

          13

(1 row)


 DROP_MODEL
------------

 t

(1 row)


 DROP_TABLE
------------

 t

(1 row)


 DIVCLUSTER
------------

          15

(1 row)


 DROP_MODEL
------------

 t

(1 row)


 DROP_TABLE
```

```
------------
 t
(1 row)
 DIVCLUSTER
------------
          15
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Clustering
PREDICT_DIVCLUSTER
LIST_MODELS

DLNORM - Density of Galton (or LogNormal) Distribution

Given a logarithmic scale median and shape, this function returns the probability density that a variable following the LogNormal distribution takes a value equal to x

Usage

The DLNORM function has the following syntax:

DLNORM(DOUBLE x, DOUBLE medlog, DOUBLE sdlog)

▲ Parameters

  ► **x**

the value at which to compute

Type: DOUBLE

Min: 0.000000001

medlog
the median value on the logarithmic

scale Type: DOUBLE

sdlog
the shape on the logarithmic

scale Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the probability density at point x

Details

If x or sdlog is 0 or less, DLNORM(x,medlog,sdlog) is null for all medlog values.

Examples

```
SELECT nza..DLNORM(2.43,0,1);

      DLNORM
------------------
 0.11069183133537
(1 row)
```

```
SELECT nza..DLNORM(2.43,2,3);

      DLNORM
-------------------
 0.051090719919889
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PLNORM
PLNORM_H
QLNORM
QLNORM_H

DLOGIS - Probability density function for Logistic Distribution

Given the mean and the scale, this function returns the probability density that a variable follow-ing the Logistic distribution takes a value equal to x

Usage

The DLOGIS function has the following syntax:

DLOGIS(DOUBLE x, DOUBLE mean, DOUBLE scale)

Parameters

x

the value at which to

compute Type: DOUBLE

mean

the mean value of the

distribution Type: DOUBLE

scale

the scale of the

distribution Type: DOUBLE

Min: 0.000000001

Returns

DOUBLE the probability density at point x

Details

If scale is 0 or less, DLOGIS(x,mean,scale) is null for all x and mean values.

Examples

```
SELECT nza..DLOGIS(2.43,0,1);

       DLOGIS
-------------------
 0.074366478038637
(1 row)
```

```
SELECT nza..DLOGIS(2.43,2,3);

       DLOGIS
```

```
-------------------
 0.082906785355481
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PLOGIS
PLOGIS_H
QLOGIS
QLOGIS_H

DMWW - Density of the Mann-Whitney-Wilcoxon Distribution

Given the number of items separated in two sets, the minimum number of items in set 1, this function returns the probability that a variable following the MWW distribution takes a value equal to MWWmin

Usage

The DMWW function has the following syntax:

DMWW(INT8 MWWmin, INT8 COUNTmin, INT8 NoItems)

Parameters

MWWmin
the value at which to

compute Type: INT8

Min: 0

Max: COUNTmin*(NoItems+NoItems-COUNTmin+1)/2;

COUNTmin
the number of items in set

1 Type: INT8

Min: 1

Max: NoItems-1

NoItems
the total number of

items Type: INT8

Min: 1

Returns
DOUBLE the probability density at point MWWmin

Details

DMWW(MWWmin,COUNTmin,NoItems)=PMWW(MWWmin,COUNTmin,NoItems) - PMWW(MWWmin-1,COUNTmin,NoItems) for all MWWmin, COUNTmin and NoItems values in their respective validity interval.

If MWWmin, COUNTmin or NoItems are not in their validity interval, DMWW(MWWmin,COUNT-min,NoItems) returns null.

Examples

```
SELECT nza..DMWW(12,4,18);

        DMWW
---------------------
 0.00065359477124183
(1 row)
```

```
SELECT nza..DMWW(30,4,9);

        DMWW
--------------------
 0.0079365079365079
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PMWW
PMWW_H
QMWW
QMWW_H

DNBINOM - Density of the Negative Binomial Distribution

Given the success probability p and the number of successes needed, this function returns the probability that we get x failures before getting s successes in a serie of Bernoulli trials.

Usage

The DNBINOM function has the following syntax:

DNBINOM(INT8 x, INT8 s, DOUBLE p)

Parameters

x

the value at which to

compute Type: INT8

s

the number of successes needed to stop the serie of Bernoulli

trials Type: INT8

Min: 1

p

the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns

DOUBLE the probability density at the point x

Details

DNBINOM(x,s,p) returns the probability to get exactly x failures while getting s successes during a serie of Bernoulli trials with success probability p.

DNBINOM(x,s,p) = PNBINOM(x,s,p) - PNBINOM(x-1,s,p) for all positive x and s values, and for p between 0 and 1.

If s is 0 or less, DNBINOM(x,s,p) is null for all x and p values.

If p is not between 0 and 1, DNBINOM(x,s,p) is null for all x and s values.

Examples

```
SELECT nza..DNBINOM(0,3,0.4),
nza..DNBINOM(1,3,0.4), nza..DNBINOM(2,3,0.4),
nza..DNBINOM(3,3,0.4), nza..DNBINOM(4,3,0.4);
```

```
  DNBINOM| DNBINOM | DNBINOM | DNBINOM | DNBINOM
---------+---------+---------+---------+----------
    0.064|   0.1152|  0.13824|  0.13824|  0.124416
(1 row)
```

```
SELECT nza..DNBINOM(4,3,0.4), nza..DNBINOM(44,30,0.4),
nza..DNBINOM(444,300,0.4), nza..DNBINOM(4444,3000,0.4),
nza..DNBINOM(44444,30000,0.4);
```

```
 DNBINOM  |      DNBINOM       |       DNBINOM       |
DNBINOM         |      DNBINOM

                          +-------------------      +-------------------

+----------------------          +--------------------
 0.124416 | 0.037987034054405 | 0.011826025431987 |
0.0033016333604667 | 0.0003012950265096
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBINOM
PNBINOM
PNBINOM_H
QNBINOM
QNBINOM_H

DNORM - Density of the Standard Normal Distribution

This function returns the probability that a variable following the Standard Normal distribution takes a value equal to x

Usage

The DNORM function has the following syntax:

DNORM(DOUBLE x)

Parameters

x

the value at which to

compute Type: DOUBLE

Returns

DOUBLE the probability density at point x

Details

The density function is mathematically a derivative of the cumulative distribution function. It it positive in the whole domain.

DNORM(x)=exp(-x*x/2)/sqrt(2*PI) for all x values.

Examples

```
SELECT nza..DNORM(2.43);

       DNORM
-------------------
 0.020829426985092
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNORM3P
PNORM
PNORM_H
QNORM
QNORM_H

DNORM3P - Density of the Normal Distribution

Given a mean value and a standard deviation, this function returns the probability that a variable following the Normal distribution takes a value equal to x

Usage

The DNORM3P function has the following syntax:

DNORM3P(DOUBLE x, DOUBLE mean, DOUBLE stdev)

Parameters

x
the value at which to

compute Type: DOUBLE

mean
the mean value of the

distribution Type: DOUBLE

stdev
the standard deviation of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the probability density at point x

Details

The density function is mathematically a derivative of the cumulative distribution function. It it positive in the whole domain.

DNORM3P(x,mean,stdev)=exp(-((x-mean/stdev)^2/2)/sqrt(2*PI*stdev^2) for all x and mean values and for all strictly positive stdev values.

If stdev is 0 or less, DNORM3P(x,mean,stdev) is null for all x and mean values.

Examples

```
SELECT nza..DNORM3P(2.43,0,1);

      DNORM3P
-------------------
 0.020829426985092
(1 row)
```

```
SELECT nza..DNORM3p(2.43+5,5,1);

      DNORM3P
-------------------
 0.020829426985092
(1 row)
```

```
SELECT nza..DNORM3p(2.43*2,0,2);

      DNORM3P
-------------------
 0.010414713492546
(1 row)
```

```
SELECT nza..DNORM3p(2.43*2-7,-7,2);

      DNORM3P
-------------------
 0.010414713492546
```

```
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNORM
PNORM3P
QNORM3P

DPOIS - Density of the Poisson Distribution

Given the mean number of success within a fixed time interval, this function returns the probability that a variable following the Poisson distribution takes a value equal to x. The value x is the number of successes expected within this time interval.

Usage

The DPOIS function has the following syntax:

DPOIS(INT8 x, DOUBLE lambda)

Parameters

x

the value at which to

compute Type: INT8

lambda

the mean number of successes within a fixed time

interval Type: DOUBLE

Min: 0.00000000001

Returns

DOUBLE the probability density at the point x

Details

If lambda is 0 or less, PPOIS(x,lambda) is null for all x values.

Examples

```
SELECT nza..DPOIS(0,0.4), nza..DPOIS(1,0.4), nza..DPOIS(2,0.4),
nza..DPOIS(3,0.4);
      DPOIS         |        DPOIS        |         DPOIS         |
DPOIS

                    +-------------------+-------------------
+----------------------------------
 0.67032004603564 | 0.26812801841426 | 0.053625603682851 |
0.00715008804910468
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PPOIS
PPOIS_H
QPOIS
QPOIS_H

DROP_ALL_MODELS - Drop selected or all analytics models

This stored procedure drops all models for which the user has the DROP privilege. A WHERE clause can be used to drop only selected models.

Usage

The DROP_ALL_MODELS stored procedure has the following syntax:

DROP_ALL_MODELS(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

where
a WHERE clause to limit the set of models to be dropped. All columns from view V_NZA_MODELS can be used in the WHERE clause.

Type: NVARCHAR(ANY)

Returns
BOOLEAN true if all models for which the user has the DROP privilege could be dropped successfully. False, if there were errors.

Examples

```
CALL                nza..ARULE('intable=nza..retail,
model=mbamodel,    supporttype=percent,    support=5,
lvl=0, maxsetsize=5, confidence=0.5');
CALL nza..DROP_ALL_MODELS('where=upper(MODELNAME)
LIKE ''MBA%''');
NOTICE:
          RUNNING FPGrowth algorithm:
```

```
          DATASET : "NZA".."RETAIL"
          Transaction column : "TID"
          Item column : "ITEM"
          Group by : <none>
          Minimum support : 5 %
          Minimum confidence: 0.5
          Max frequent itemset size : 5
          Level of conditional dbs : 0
          Result tables prefix : "NZA_META_MBAMODEL"

 ARULE
-------
    14
(1 row)

NOTICE:  Dropped: MBAMODEL
 DROP_ALL_MODELS
-----------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS

DROP_MODEL - Drop an analytics model

This stored procedure drops the given model. All managed tables of this model are also dropped.

Usage

The DROP_MODEL stored procedure has the following syntax:

DROP_MODEL(NVARCHAR(ANY))

▲ Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to be dropped

Type: NVARCHAR(64)

Returns
BOOLEAN true if the model was dropped successfully. False, if there were errors.

Examples

```
CALL nza..ARULE('intable=nza..retail,
model=mbamodel, supporttype=percent, support=5,
lvl=0, maxsetsize=5, confidence=0.5');
CALL nza..DROP_MODEL('model=mbamodel');
```

```
NOTICE:
            RUNNING FPGrowth algorithm:
            DATASET : "NZA".."RETAIL"
            Transaction column : "TID"
            Item column : "ITEM"
            Group by : <none>
            Minimum support : 5 %
            Minimum confidence: 0.5
            Max frequent itemset size : 5
            Level of conditional dbs : 0
            Result tables prefix : "NZA_META_MBAMODEL"

 ARULE
-------
    14
(1 row)

NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
```

```
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS

DROP_SUMMARY1000 - Drop tables created by SUMMARY1000

This stored procedure drops all the tables created in the stored procedure SUMMARY1000.

Usage

The DROP_SUMMARY1000 stored procedure has the following syntax:

DROP_SUMMARY1000(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the table name specified in parameter outtable of

SUMMARY1000 Type: NVARCHAR(ANY)

Returns
NVARCHAR(ANY) an informative string

Details

This stored procedure drops all output tables created by the stored procedure SUMMARY1000. The stored procedure SUMMARY1000 is called with a parameter outtable, let us assume that outtable=<tbname>. It creates the table <tbname> and, depending on the type of its input table columns, one or several of the fol-lowing tables: <tbname>_char, <tbname>_num, <tbname>_date, <tbname>_interval, <tbname>_time and <tbname>_timestamp. Calling DROP_SUMMARY('intable=<tbname>') drops all the existing tables having these names.

Examples

```
CALL nza..SUMMARY1000('intable=nza..iris, outtable=result7');

CALL nza..DROP_SUMMARY1000('intable=result7');

 SUMMARY1000
-------------
 Done
```

```
(1 row)
 DROP_SUMMARY1000
------------------
 Done
(1 row)
```

Related Functions

category Analytics - Statistics
SUMMARY1000

DT - Density of the T-student Distribution

Given a degree of freedom, this function returns the probability density that a variable following the T-student distribution takes a value equal to x

Usage

The DT function has the following syntax:

DT(DOUBLE x, INT8 df)

Parameters

x
the value at which to

compute Type: DOUBLE

df
the number of degrees of

freedom Type: INT8

Min: 1

Returns
DOUBLE the probability density at point x

Details

DT(x,df) is a derivative of PT(x,df) on x. It is positive on the whole domain.

If df is 0 or less, DT(x,df) is null for all x values.

Examples

```
SELECT nza..DT(-2.821,9);

          DT
```

```
--------------------
  0.016338227550258
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PT
PT_H
QT
QT_H

DUNIF - Density of the Uniform Distribution

Given a minimum and a maximum for the uniform interval, this function returns the probability that a vari-able following the Uniform distribution takes a value equal to x

Usage

The DUNIF function has the following syntax:

DUNIF(DOUBLE x, DOUBLE minimum, DOUBLE maximum)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0.00000000001

minimum
left border of suppert, x must be above

this Type: DOUBLE

maximum
right border of suppert, x must be below

this Type: DOUBLE

Returns
DOUBLE the probability density at point x

Details

DUNIF(x,minimum,maximum)=1/(maximum-minimum) for all x, minimum and maximum values where x is between minimum and maximum.

If minimum is not smaller than maximum, or if x is not between minimum and maximum, DUNIF(x,minim-um,maximum) is null.

Examples

```
SELECT nza..DUNIF(2,-3.0,11.3);

      DUNIF
------------------
 0.06993006993007
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PUNIF
PUNIF_H
QUNIF
QUNIF_H

DWALD - Density of the Wald distribution

Given a location and a shape, this function returns the probability that a variable following the Wald distribution takes a value equal to x

Usage

The DWALD function has the following syntax:

DWALD(DOUBLE x, DOUBLE location, DOUBLE shape)

Parameters

x
the value at which to

compute Type: DOUBLE

location
the mean of the

distribution Type: DOUBLE

Min: 0.00000000001

shape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the probability density at point x

Details

If location or shape is 0 or less, DWALD(x,location,shape) is null for all x values.

Examples

```
SELECT nza..DWALD(1,1,1), nza..DWALD(2,1,1), nza..DWALD(2,2,1),
nza..DWALD(2,2,2);
      DWALD        |       DWALD       |       DWALD       |
DWALD

                   +-------------------+-------------------
+-------------------------------------
 0.39894228040143 | 0.10984782236693 | 0.14104739588694 |
0.19947114020072
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PWALD
PWALD_H
QWALD
QWALD_H

DWEIBULL - Density of the Weibull (or Rosin-Rammer) Distribution

Given a scale and a shape, this function returns the probability that a variable following the Weibull distribu-tion takes a value equal to x

Usage

The DWEIBULL function has the following syntax:

DWEIBULL(DOUBLE x, DOUBLE scale, DOUBLE kShape)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0

scale
the scale of the distribution

Type: DOUBLE

Min: 0.00000000001

kShape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the probability density at point x

Details

If x is less than 0, or if scale or shape are 0 or less, DWEIBULL(x,scale,kShape) is null.

Examples

```
SELECT nza..DWEIBULL(2,4,1);

     DWEIBULL
------------------
 0.15163266492816
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PWEIBULL
PWEIBULL_H
QWEIBULL
QWEIBULL_H

DWILCOX - Density of the Wilcoxon Distribution

Given the number of items, this function returns the probability that a variable following the Wil-coxon distribution takes a value equal to Wmin

Usage

The DWILCOX function has the following syntax:

DWILCOX(INT8 Wmin, INT8 NoItems)

- ▲ Parameters
  - ► **Wmin**

the value at which to compute

Type: INT8

Min: 0

Max: NoItems*(NoItems+1)/2

NoItems
the number of

items Type: INT8

Min: 1

Max: 15

Returns
DOUBLE the probability density at point Wmin

Details

DWILCOX(Wmin,NoItems)=PWILCOX(Wmin,NoItems) - PWILCOX(Wmin-1,NoItems) for all Wmin and NoItems values in their respective validity interval.

If Wmin or NoItems are not in their validity interval, DWILCOX(Wmin,NoItems) returns null.

Examples

```
SELECT nza..DWILCOX(42,15);

     DWILCOX
------------------
 0.01373291015625
(1 row)
```

Related Functions

category Analytics - Probability Distributions
PWILCOX
PWILCOX_H
QWILCOX
QWILCOX_H

EFDISC - Discretization bins of equal frequency

This stored procedure calculates the limits for discretization bins of equal frequency on numeric columns. Each bin contains approximatively an equal number of data records.

Usage

The EFDISC stored procedure has the following syntax:

EFDISC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(ANY)

outtable
the output table to store the discretization bin limits

into Type: NVARCHAR(ANY)

incolumn
the input table columns to consider, separated by a semi-colon (;).

Each column name may be followed by a colon (:) and the number of discretization bins to be calculated for this column.

Type: NVARCHAR(ANY)

bins
the default number of discretization bins to be

calculated Type: INTEGER

Default: 10

binprec
the precision allowed for considering an even distribution of data records in the calcu-lated discretization bins. The number of data records in each bin must be within [iw-<binprec>*iw,iw+<binprec>*iw] where iw is the size of the input table divided by the number of requested discretization bin limits.

Type: DOUBLE

Default: 0.1

Min: 0

Max: 1

outtabletype
the type of the output table. This can be 'table' or

'temporary'. Type: VARCHAR(16)

Default: 'table'

Returns
INTEGER the number of columns for which discretization bin limits are calculated

Details

This stored procedure calculates the limits for discretization bins of equal frequency on numeric columns. Each bin contains approximately an equal number of data records.

The discretization bin limits are written into the output table with following columns: colname, break. The column colname references the name of the input table columns, and the column break contains a bin limit for this column.

When it is impossible to discretize with the specified number of bins, the stored procedure tries to calculate a fewer number of bins. If the data is skewed, it is even possible that all data records fall into a single bin: in this case, a single row is written for this column into the output table with a NULL value in the column break.

Examples

```
CALL nza..EFDISC('outtable=disc_bounds1, intable=nza..iris,
incolumn=petallength;petalwidth:4, bins=3');
SELECT * FROM disc_bounds1 ORDER BY colname, break;
CALL nza..APPLY_DISC('outtable=disc_iris_discrete,
intable=nza..iris, btable=disc_bounds1, replace=T');
SELECT petallength, count(*) FROM disc_iris_discrete GROUP BY
petallength ORDER BY petallength;
SELECT petalwidth, count(*) FROM disc_iris_discrete GROUP
BY petalwidth ORDER BY petalwidth;
CALL nza..DROP_TABLE('disc_bounds1');
CALL nza..DROP_TABLE('disc_iris_discrete');
```

```
 EFDISC
--------
      2
(1 row)


   COLNAME   | BREAK
-------------+-------
 PETALLENGTH |   1.9
 PETALLENGTH |   4.9
 PETALWIDTH  |   0.3
 PETALWIDTH  |   1.3
 PETALWIDTH  |   1.8
(5 rows)
```

```
 APPLY_DISC
------------
          2
 (1row)

 PETALLENGTH | COUNT
------------ +-------
  1          |     50
  2          |     54
  3          |     46
 (3rows)

 PETALWIDTH | COUNT
----------- +-------
  1         |     41
  2         |     37
  3         |     38
  4         |     34
 (4rows)

 DROP_TABLE
------------
 t
 (1row)

 DROP_TABLE
------------
 t
 (1row)
```

```
CALL nza..EFDISC('outtable=disc_bounds2, intable=nza..iris,
incolumn= petallength:6, binprec=0.001');
SELECT * FROM disc_bounds2 ORDER BY colname, break;
CALL nza..APPLY_DISC('outtable=disc_iris_discrete2,
intable=nza..iris, btable=disc_bounds2, replace=T');
SELECT petallength, count(*) FROM disc_iris_discrete2 GROUP
BY petallength ORDER BY petallength;
CALL nza..DROP_TABLE('disc_bounds2');
CALL nza..DROP_TABLE('disc_iris_discrete2');
```

```
 EFDISC
--------
      1
(1 row)

   COLNAME   | BREAK
-------------+-------
 PETALLENGTH |    4.3
(1 row)

 APPLY_DISC
------------
          1
(1 row)

 PETALLENGTH | COUNT
-------------+-------
 1           |    75
 2           |    75
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Discretization
EMDISC
EWDISC
APPLY_DISC

EMDISC - Discretization bins of minimal entropy

This stored procedure calculates the limits for discretization bins of minimal entropy on numeric columns. Each bin contains approximatively an equal number of data records.

Usage

The EMDISC stored procedure has the following syntax:

EMDISC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(ANY)

outtable
the output table to store the discretization bin limits

into Type: NVARCHAR(ANY)

incolumn
the input table columns to consider, separated by a semi-colon

(;) Type: NVARCHAR(ANY)

target
the input table column containing a class label

Type: NVARCHAR(ANY)

outtabletype
the type of the output table. This can be 'table' or

'temporary'. Type: VARCHAR(16)

Default: 'table'

Returns
INTEGER the number of columns for which discretization bin limits are calculated

Details

This stored procedure calculates the limits for discretization bins on numeric columns that minimize the en-tropy of the input table column <target>.

The discretization bin limits are written into the output table with following columns: colname, break. The column colname references the name of the input table columns, and the column break contains a bin limit for this column.

Entropy Minimization Discretization was originally presented in [U. M. Fayyad, K. B. Irani Multi-interval dis-cretization of continuous-valued attributes for classification learning]. In this method a set of sorted values is recursively partitioned selecting splits that minimize class information entropy. Following original nota-tion, let T be the value of attribute A that partition set S of examples into two disjoint subsets S1 and S2. Let's also assume that there are k classes C1, ..., Ck and let P(Ci,S) be the proportion of examples in S that are labeled with class Ci.

- The class entropy of a subset S is defined as: E(S)=-P(C1,S)log(P(C1,S))-P(C2,S)log(P(C2,S))-...-P(Ck,S)log(P(Ck,S))

The class information entropy of the partition induced by split T on attribute A is given with the following equation: E(A,T;S)=(|S1|/|S|)E(S1)+(|S2|/|S|)*S2 Amongst all candidate split points TA is selected for which E(A,T;S) is minimal.

The stopping criterion problem is solved using so called Minimum Description Length Principle Criterion.

Examples

```
CALL nza..EMDISC('outtable=disc_bounds1, intable=nza..disc_iris,
incolumn=petal_length;petal_width, target=species');
SELECT * FROM disc_bounds1 ORDER BY colname, break; CALL
nza..APPLY_DISC('outtable=disc_iris_discrete,
intable=nza..disc_iris, btable=disc_bounds1, replace=T');
SELECT petal_length, count(*) FROM disc_iris_discrete GROUP
BY petal_length ORDER BY petal_length;
SELECT petal_width, count(*) FROM disc_iris_discrete GROUP BY
petal_width ORDER BY petal_width;
CALL nza..DROP_TABLE('disc_bounds1');
CALL nza..DROP_TABLE('disc_iris_discrete');
```

EMDISC

```
--------
      2
 (1row)

   COLNAME     | BREAK
-------------  +-------
 PETAL_LENGTH |     1.9
 PETAL_LENGTH |     4.7
 PETAL_WIDTH  |     0.6
 PETAL_WIDTH  |     1.7
 (4rows)

 APPLY_DISC
------------
          2
 (1row)

 PETAL_LENGTH | COUNT
-------------  +-------
  1           |      50
  2           |      45
  3           |      55
 (3rows)

 PETAL_WIDTH | COUNT
------------  +-------
  1          |      50
  2          |      54
  3          |      46
 (3rows)
 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Discretization
EFDISC
EWDISC
APPLY_DISC

ENTROPY - Univariate Entropy

This stored procedure calculates the entropy of a column

Usage

The ENTROPY stored procedure has the following syntax:

ENTROPY(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the input table column

Type: NVARCHAR(128)

by
the input table column which splits the data into groups for which the operation is to be per-formed. If specified, an output table must be indicated.

Type: NVARCHAR(128)

Default: <none>

outtable

the output table to write the entropy into. This parameter must be specified if para-meter by is specified.

Type: NVARCHAR(256)

Default: <none>

Returns
DOUBLE the entropy of the input table column, or the number of groups in the output table for which entropy has been calculated

Details

This stored procedure calculates the entropy of an input column, either in the whole input table or within the groups defined in the column specified by parameter <by>. Univariate Entropy is a measure saying how evenly the cases are distributed for the values of the input column. It takes a positive value, 0 means that the column contains only one value.

If parameter 'by' is specified, an output table must be specified. The output table is created with following columns: over_<by>, entropy. The entropy of the input column is given for each group of the <by> column.

Examples

```
CALL nza..ENTROPY('intable=nza..adult,
incolumn=WORKCLASS');
     ENTROPY
-----------------
 1.3588645281597
(1 row)
```

```
CALL nza..ENTROPY('intable=nza..adult,
incolumn=WORKCLASS, by=EDUCATION,
outtable=entropy_adult_4');
SELECT * FROM entropy_adult_4 order by over_education;
CALL nza..DROP_TABLE('entropy_adult_4');
 ENTROPY
---------
      16
```

```
(1 row)

      ENTROPY     | OVER_EDUCATION
------------------+----------------
  0.89894981922821| 10th
  0.74279033472579| 11th
  0.87727051185427| 12th
  0.69526495582091| 1st-4th
  0.70599054726772| 5th-6th
   1.1611784201972| 7th-8th
   0.8852814808038| 9th
   1.4635115503386| Assoc-acdm
   1.2741250142814| Assoc-voc
   1.5749857842579| Bachelors
    2.096963873495| Doctorate
   1.1911841663211| HS-grad
    1.927161656386| Masters
  0.53352632278282| Preschool
   2.0542073033733| Prof-school
   1.3084798585826| Some-college
(16 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
COND_ENTROPY
JOINT_ENTROPY
MUTUALINFO

EWDISC - Discretization bins of equal width

This stored procedure calculates the limits for discretization bins of equal width on numeric columns

Usage

The EWDISC stored procedure has the following syntax:

EWDISC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

outtable
the output table to store the discretization bin limits

into Type: NVARCHAR(256)

incolumn
the input table columns to consider, separated by a semi-colon (;).

Each column name may be followed by a colon (:) and the number of discretization bins to be calculated for this column.

Type: NVARCHAR(ANY)

bins
the default number of discretization bins to be

calculated Type: INTEGER

Default: 10

outtabletype
the type of the output table. This can be 'table' or

'temporary'. Type: VARCHAR(16)

Default: 'table'

Returns
INTEGER the number of columns for which discretization bin limits are calculated

Details

This stored procedure calculates the limits for discretization bins of equal width on numeric columns. The width of the bins for a given column is calculated as (vmax - vmin)/k where k is the number of discretization bins requested for the column and vmin and vmax are the minimum and maximum values of the column. The discretization bin limits are placed at vmin + i * w, for i = 1, ..., k-1.

The discretization bin limits are written into the output table with following columns: colname, break. The column colname references the name of the input table columns, and the column break contains a bin limit for this column.

Examples

```
CALL nza..EWDISC('outtable=disc_bounds1, intable=nza..iris,
incolumn=petallength:5;sepalwidth, bins=4');
SELECT * FROM disc_bounds1 ORDER BY colname, break;
CALL nza..APPLY_DISC('outtable=disc_iris_discrete,
intable=nza..iris, btable=disc_bounds1, replace=T');
SELECT petallength, count(*) FROM disc_iris_discrete GROUP BY
petallength ORDER BY petallength;
SELECT sepalwidth, count(*) FROM disc_iris_discrete GROUP
BY sepalwidth ORDER BY sepalwidth;
CALL nza..DROP_TABLE('disc_bounds1');
CALL nza..DROP_TABLE('disc_iris_discrete');
```

```
 EWDISC
--------
      2
(1 row)

   COLNAME   | BREAK
-------------+-------
 PETALLENGTH |  2.18
 PETALLENGTH |  3.36
 PETALLENGTH |  4.54
 PETALLENGTH |  5.72
 SEPALWIDTH  |   2.6
 SEPALWIDTH  |   3.2
 SEPALWIDTH  |   3.8
(7 rows)

 APPLY_DISC
------------
          2
 (1 row)

 PETALLENGTH | COUNT
-------------+-------
 1           |    50
 2           |     3
 3           |    34
 4           |    47
 5           |    16
 (5 rows)

 SEPALWIDTH | COUNT
------------+-------
 1          |    24
 2          |    84
 3          |    36
 4          |     6
 (4 rows)

 DROP_TABLE
------------
 t
 (1 row)

 DROP_TABLE
------------
 t
 (1 row)
```

Related Functions

category Analytics - Discretization
EFDISC
EMDISC
EWDISC_NICE
APPLY_DISC

EWDISC_NICE - Discretization bins of equal width with human-friendly limits

This stored procedure calculates the limits for discretization bins of equal width on numeric columns. The discretization bin limits are placed on human-friendly numeric values.

Usage

The EWDISC_NICE stored procedure has the following syntax:

EWDISC_NICE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(ANY)

outtable
the output table to store the discretization bin limits

into Type: NVARCHAR(ANY)

incolumn
the input table columns to consider, separated by a semi-colon (;).

Each column name may be followed by a colon (:) and the number of discretization bins to be calculated for this column.

Type: NVARCHAR(ANY)

bins
the default number of discretization bins to be

calculated Type: INTEGER

Default: 10

outtabletype
the type of the output table. This can be 'table' or

'temporary'. Type: VARCHAR(16)

Default: 'table'

Returns

INTEGER the number of columns for which discretization bin limits are calculated

Details

This stored procedure calculates the limits for discretization bins of equal width on numeric columns. The width of the bins for a given column is calculated as 6 * stddev / k where k is the number of discretization bins requested for the column and stddev is the standard deviation of the column values. The width is then made "nice" by choosing the nearest scale 1, 2, 2.5 or 5 of a power of ten. The bin limits are then set aroung the column mean value so that the bin limits are multiples of the nice width.

NOTE: the resulting number of bins may slightly differ from the requested number of bins.

The discretization bin limits are written into the output table with following columns: colname, break. The column colname references the name of the input table columns, and the column break contains a bin limit for this column.

Examples

```
CALL nza..EWDISC_NICE('outtable=disc_bounds1,
intable=nza..iris,
incolumn=petallength:5;sepalwidth, bins=4');
SELECT * FROM disc_bounds1 ORDER BY colname, break;
CALL nza..APPLY_DISC('outtable=disc_iris_discrete,
intable=nza..iris, btable=disc_bounds1, replace=T');
SELECT petallength, count(*) FROM disc_iris_discrete
GROUP BY petallength ORDER BY petallength;
SELECT sepalwidth, count(*) FROM disc_iris_discrete
GROUP BY sepalwidth ORDER BY sepalwidth;
CALL nza..DROP_TABLE('disc_bounds1');
CALL nza..DROP_TABLE('disc_iris_discrete');
```

```
 EWDISC_NICE
-------------
           2
(1 row)

   COLNAME    | BREAK
-------------+-------
 PETALLENGTH |     2
 PETALLENGTH |     3
 PETALLENGTH |     4
 PETALLENGTH |       5
 PETALLENGTH |       6
 SEPALWIDTH  |     2.5
 SEPALWIDTH  |       3
 SEPALWIDTH  |     3.5
 SEPALWIDTH  |       4
 (9 rows)

 APPLY_DISC
------------
          2
 (1 row)

 PETALLENGTH | COUNT
------------ +-------
  1          |     50
  2          |      1
  3          |     15
  4          |     42
  5          |     33
  6          |      9
 (6 rows)

 SEPALWIDTH | COUNT
------------ +-------
  1         |     19
  2         |     64
  3         |     49
  4         |     15
  5         |      3
 (5 rows)

 DROP_TABLE
```

```
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Discretization
EFDISC
EMDISC
EWDISC
APPLY_DISC

EXPORT_MODEL - Export one or more analytic models to a file set

This stored procedure exports the specified analytic models in a proprietary format to a set of files. All files are stored in the specified directory and have a common prefix. Model contents, model metadata, and model privileges can be exported.

Usage

The EXPORT_MODEL stored procedure has the following syntax:

EXPORT_MODEL(NVARCHAR(ANY))

Parameters

paramString
a comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
a semicolon-separated list of names of models to be exported. If all models must be exported, specify model=all. If parameter where is not specified, parameter model must be specified.

Type: NVARCHAR(ANY)

where

a WHERE clause to filter the set of models to be exported. All columns from view V_NZA_MOD-ELS can be used in the WHERE clause. If parameter model is not specified, parameter where must be specified.

Type: NVARCHAR(ANY)

directory
the name of the directory where all result files are written to. The directory must exist. An abso-lute path name must be specified.

Type: NVARCHAR(ANY)

name
the name of the result file set. This name is used as prefix for each file of the file set. If a file set with this name already exists, use the parameter overwrite to delete it first.

Type: NVARCHAR(ANY)

acl
a flag ("access control list") controlling export of privileges. Only the administrator can use this parameter. If set to true, model privileges are exported also.

Type: BOOLEAN

overwrite
a flag used to overwrite existing files. If a file set with the specified name already exists in the target directory, export is possible only if overwrite is set to true. In this case all existing files of the file set are deleted.

Type: BOOLEAN

verbose
a flag controlling if additional output about the progress of the export process is

printed. Type: BOOLEAN

Returns
INTEGER the number of sucessfully exported models

Details

The parameters model and where are used to specify the models to be exported. If both parameters are specified, the two model sets are merged. To export all models, pass model=all (the where parameter is ig-nored in this case). You can use any existing directory as target directory that can be written by the database process. A directory can contain export file sets of different export operations, but all of them must have dif-ferent names. The overwrite parameter can be used to automatically delete file sets with the same name before export. If a model cannot be exported (for example, the user does not have the SELECT privilege for this model), the export of this model is skipped and the system continuous the export with the next model. Only on severe errors the export process is aborted completely. Only the database administrator can export the model privileges (which user and which group has which access right on a model), using the acl para-meter.

Examples

```
CALL
nza..TIMESERIES('model=tsmodel,intable=nza..iris,time=ID,target=

PETALLENGTH,by=CLASS,algorithm=esmoothing');
```

```
CALL
nza..EXPORT_MODEL('model=tsmodel,directory=/tmp/export,na
me=tsexport,acl=true');
CALL nza..DROP_MODEL('model=tsmodel');
```

```
 TIMESERIES
------------
          3
(1 row)
 EXPORT_MODEL
--------------
            1
(1 row)
NOTICE:  Dropped: TSMODEL
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS
IMPORT_MODEL

EXPORT_PMML - Export an analytics model as PMML document to a file

This stored procedure exports the given analytics model as PMML document to a file, or it exports a model from a PMML table to a file. If no PMML table exists containing the PMML document for this model, one can be created automatically when requested. Optionally, instead of writing to a file, the result can be returned by the procedure.

Usage

The EXPORT_PMML stored procedure has the following syntax:

EXPORT_PMML(NVARCHAR(ANY))

- ▲ Parameters
  - ► **paramString**

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to be exported as PMML document to a

file Type: NVARCHAR(64)

type
the type of PMML document: "standard" (default), or "spss"

Type: VARCHAR(16)

intable
the table containing the PMML model to be

exported Type: NVARCHAR(256)

file
the file (absolute path name) to write the PMML document into. If file is not specified, the PMML document is returned by the procedure.

Type: NVARCHAR(256)

outtable
the output table to write the PMML document into. If it is not specified, the PMML document will be written to the file only. This parameter is ignored if a PMML table exists already for the given model. This parameter is not allowed if intable was specified.

Type: NVARCHAR(128)

Returns
TEXT if a file is specified, always 't' (otherwise an exception is raised). If no file is specified, the PMML document.

Details

This stored procedure can be called in two ways:

EXPORT_PMML('model=..., type=..., file=..., outtable=...'), where model is mandatory

EXPORT_PMML('intable=..., file=..., model=...'), where intable is mandatory

In case 1, the stored procedure exports the given analytics model as PMML document to a file (or returns the PMML document).

If there is a registered table for the model containing the PMML document of the given type, the stored procedure reads the table, concatenates the rows and writes them to the given file. In this case, the out-table parameter is ignored.

If there is no registered table for the model containing the PMML document of the given type, and the <outtable> parameter is specified, the procedure internally calls PMML_MODEL to create the table first. It then copies the PMML document from the table to the given file as above.

Otherwise, the PMML document is created directly (without an intermediate PMML table) and written to the file.

In case 2, the stored procedure exports an analytics model from a PMML table to a file. The PMML table is specified by the intable parameter. If the PMML table contains more than one model, the model parameter is needed to identify the model, else it is ignored.

NOTE: If possible, an existing file is overwritten without notice.

Examples

```
CALL                  nza..ARULE('intable=nza..retail,
model=mbamodel,    supporttype=percent,    support=5,
lvl=0, maxsetsize=5, confidence=0.5');
CALL nza..EXPORT_PMML('model=mbamodel,
file=/tmp/mbamodel.pmml');
CALL nza..DROP_MODEL('model=mbamodel');
```

```
NOTICE:
          RUNNING FPGrowth algorithm:
          DATASET : "NZA".."RETAIL"
          Transaction column : "TID"
          Item column : "ITEM"
          Group by : <none>
          Minimum support : 5 %
          Minimum confidence: 0.5
          Max frequent itemset size : 5
          Level of conditional dbs : 0
          Result tables prefix : "NZA_META_MBAMODEL"
 ARULE
-------
    14
(1 row)
 EXPORT_PMML
-------------
 t
(1 row)
NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
 t
```

```
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS
PMML_MODEL

FMEASURE - F-Measure from a Confusion Matrix

This stored procedure calculates the F-measure of a class from a confusion matrix

Usage

The FMEASURE stored procedure has the following syntax:

FMEASURE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

matrixTable
the confusion matrix table

Type: NVARCHAR(256)

class
the class in the confusion matrix table to calculate the F-measure

on Type: NVARCHAR(ANY)

Returns
DOUBLE the F-Measure

Details

This stored procedure calculates the F-measure of a class from a confusion matrix. The F-measure is calcu-lated as 2 * TPR * PPV / (TPR + PPV), where TPR and PPV are the result of the corresponding stored proced-ures called on the same confusion matrix.

The confusion matrix table has the following columns: real, prediction, cnt. The column cnt contains the fre-quency of making a given prediction for the given real value.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,
traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..CONFUSION_MATRIX('intable=nza..iris_test,
resulttable=iris_pred, id=id, resultid=id, target=class,
resulttarget=class, matrixTable=confMatrix');
CALL nza..FMEASURE('matrixTable=confMatrix,
class=virginica');
CALL nza..DROP_MODEL('model=iris_c45');
CALL nza..DROP_TABLE('iris_pred'); CALL
nza..DROP_TABLE('confMatrix');
 TRAIN_TEST
------------
   0.918919
(1 row)

 CONFUSION_MATRIX
------------------
                5
(1 row)

     FMEASURE
------------------
 0.94736842105263
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
```

```
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CONFUSION_MATRIX
TPR
PPV

FPR - False Positive Rate from a Confusion Matrix

This stored procedure calculates the False Positive Rate of a class from a confusion matrix

Usage

The FPR stored procedure has the following syntax:

FPR(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

matrixTable
the confusion matrix table

Type: NVARCHAR(256)

class
the class in the confusion matrix table to calculate the False Positive Rate

on Type: NVARCHAR(ANY)

Returns
DOUBLE the False Positive Rate

Details

This stored procedure calculates the False Positive Rate of a class from a confusion matrix. The False Positive Rate is the ratio of the number of wrongly classified records into the given class divided by the number of real values that are not the given class.

The confusion matrix table has the following columns: real, prediction, cnt. The column cnt contains the fre-quency of making a given prediction for the given real value.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,
traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..CONFUSION_MATRIX('intable=nza..iris_test,
resulttable=iris_pred, id=id, resultid=id, target=class,
resulttarget=class, matrixTable=confMatrix');
CALL nza..FPR('matrixTable=confMatrix, class=virginica');
CALL nza..DROP_MODEL('model=iris_c45');
CALL nza..DROP_TABLE('iris_pred');
CALL nza..DROP_TABLE('confMatrix');
```

```
 TRAIN_TEST
------------
   0.918919
(1 row)


 CONFUSION_MATRIX
------------------
                5
(1 row)


   FPR
----------
 0.035714
(1 row)


 DROP_MODEL
------------
 t
(1 row)


 DROP_TABLE
------------
```

```
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CONFUSION_MATRIX

GET_COLUMN_LIST - Retrieve a list of columns with a given role and type from a column properties table

This stored procedure looks into a column properties table and returns those columns that have the desired roles and types.

Usage

The GET_COLUMN_LIST stored procedure has the following syntax:

GET_COLUMN_LIST((NVARCHAR(ANY) paramString)

Parameters

paramString
Comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

colPropertiesTable
Full valid name of the column properties table in the form database.schema.objectname. Data-base and schema are optional (default: current database/default database, current schema). Type: NVARCHAR(ANY)

role
The expected column roles of the result columns, separated by a semicolon or comma. If it is NULL or empty, all columns are matched. Allowed values are: 'id', 'target', 'input', 'ignore', 'obj-weight', 'trials'.

Type: NVARCHAR(ANY)

Default: <none>

type

The expected column types of the result columns, separated by a semicolon or comma. If it is NULL or empty, all columns are matched. Allowed values are: 'nom', 'cont'.

Type: NVARCHAR(ANY)

Default: <none>

separator
A string used to separate the result columns (typically a single

character) Type: NVARCHAR(ANY)

Returns
NVARCHAR(ANY) The list of columns, filtered by their column role and column type.

Examples

```
CALL nza..COLUMN_PROPERTIES('intable=nza..weatherr,
outtable=weatherDefSchema, coldeftype=nom
,incolumn=temperature|GRADE:cont;WINDY:ignore');
CALL
nza..GET_COLUMN_LIST('colPropertiesTable=weatherDefSchema ,
role=input;id;target;objweight, type=nom;cont,
separator=";"');
CALL nza..DROP_TABLE('weatherDefSchema');
```

```
 COLUMN_PROPERTIES
-------------------
                 6
(1 row)


                  GET_COLUMN_LIST
------------------------------------------------------
 "INSTANCE";"OUTLOOK";"TEMPERATURE";"HUMIDITY";"GRADE"
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Column Properties
COLUMN_PROPERTIES

GLM - Build a Generalized Linear Model

This stored procedure builds a Generalized Linear Regression model

Usage

The GLM stored procedure has the following syntax:

GLM(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the GLM model

Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column to predict a value for. Only numeric type of target column is

accepted. Type: NVARCHAR(128)

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are con-tinuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore', ':objweight'.

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':colweight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPER-TIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsup-ported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

intercept
flag indicating whether the model is built with or without an intercept

value Type: BOOLEAN

Default: true

interaction
the definition of the allowed interactions between input columns. The interaction is a list of factors separated by a semicolon (;). A factor is a list of variables separated by a star (*). A variable is a column name of the input table. Continuous variables can be followed by a caret (^) and a numeric value, in this case the given power of values of this column is meant. Nominal variables can be followed by a sign equal (=) and a value, so that only the given value of the variable is allowed to interact with the other variables of this factor. If no value is indicated after a nominal variable, all distinct values interact independantly with the other variables of the factor. By default, all input columns are considered independent and do not interact with each other.

Type: NVARCHAR(ANY)

Default: ''

family
the type of the distribution. Allowed values are: bernoulli, gaussian, poisson, binomial, negat-ivebinomial, wald (inversegaussian), gamma.

Type: NVARCHAR(ANY)

Default: bernoulli

family_param
additional parameter used for some distributions. IF family_param='quasi' then quasi-likelihood in case of Poisson and Binomial distributions is optimized. IF family_param=-1 (or is omitted then mentioned distribution parameter is estimated from data. IF family_param is given explicit then should by > 0.

Type: DOUBLE

Default: -1

link
the type of the link function. Allowed values are: canbinom, cangeom, cannegbinom, cauchit, clog, cloglog, gaussit, identity, inverse, invnegative, invsquare, log, logit, loglog, oddspower, power, probit, sqrt.

Type: NVARCHAR(ANY)

Default: logit

link_param
an additional parameter used for some links like: cannegbinom, oddspower, power. The range of value depends on the used link function.

Type: DOUBLE

Default: 1

maxit
the maximum number of

iterations Type: INTEGER

Default: 20

eps
the maximum (relative) error used as stopping

criteria Type: DOUBLE

Default: 1e-3

tol
the tolerance for the linear equation solver when to consider a value to be equal to

zero Type: DOUBLE

Default: 1e-7

method
the method used to calculate a GLM model. Allowed values are: irls, psgd.

Type: NVARCHAR(ANY)

Default: irls

trials
- the input table column containing the number of trials for the binominal distribution. This parameter must be specified when family=binomial. This parametrs is ignored for other distributions.

Type: NVARCHAR(ANY)

Default: ''

debug
flag indicating to display debug

information Type: BOOLEAN

Default: false

Returns
BIGINT the number of variables (column or column=value) used in the GLM model

Details

This stored procedure builds a Generalized Linear model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management func-tions to further manipulate the model or access the model tables.

Examples

```
CALL nza..GLM('model=adult_glm,
intable=nza..adult_train, id=id, target=age');
CALL nza..DROP_MODEL('model=adult_glm');
```

```
 GLM
-----
  58
(1 row)

 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
PREDICT_GLM

PRINT_GLM
LIST_MODELS

GRANT_MODEL - Grant privileges on an analytics model

This stored procedure grants one or more privileges on an analytics model to users and/or groups

Usage

The GRANT_MODEL stored procedure has the following syntax:

GRANT_MODEL(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to be granted privileges

on Type: NVARCHAR(64)

privilege
a semicolon-separated list of privileges. Allowed privileges are: list, select, alter, update, drop.

Type: VARCHAR(256)

user
a semicolon-separated list of users to grant privileges to. If not specified, no user is granted the privileges, and the parameter group has to be specified.

Type: NVARCHAR(256)

Default: <none>

group
a semicolon-separated list of groups to grant privileges to. If not specified, no group is granted the privileges, and the parameter user has to be specified.

Type: NVARCHAR(256)

Default: <none>

grantoption
flag indicating if the users or groups can further grant the given privileges to other users or groups

Type: BOOLEAN

Default: false

Returns
BOOLEAN always true (otherwise an exception is raised)

Details

This stored procedure grants privileges to users and groups on the given model. The possible priv-ileges are:

LIST: Allows to list a model and its properties (using the views and the list procedures),

SELECT: Allows to read the model contents (to SELECT the model tables, print the model, convert the model to PMML),

ALTER: Allows to change the model properties (name, owner, ...),

UPDATE: Allows to change the model contents using specific procedures,

DROP: Allows to drop a model.

To grant a privilege to a user or group (including group "PUBLIC"), you must have the LIST privilege on this user or group. By default, the owner of a model, the ADMIN user, and the database owner have all privileges on a model. You cannot grant privileges to yourself.

Examples

```
CALL nza..ARULE('intable=nza..retail,
model=mbamodel, supporttype=percent, support=5,
lvl=0, maxsetsize=5, confidence=0.5');
CALL nza..GRANT_MODEL('model=mbamodel,
privilege=LIST;SELECT, user=inzauser');
CALL nza..DROP_MODEL('model=mbamodel');
NOTICE:
          RUNNING FPGrowth algorithm:
          DATASET : "NZA".."RETAIL"
          Transaction column : "TID"
          Item column : "ITEM"
          Group by : <none>
          Minimum support : 5 %
          Minimum confidence: 0.5
          Max frequent itemset size : 5
          Level of conditional dbs : 0
          Result tables prefix : "NZA_META_MBAMODEL"

 ARULE
-------
    14
```

```
(1 row)

 GRANT_MODEL
-------------
 t
(1 row)

NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS
REVOKE_MODEL

GROW_DECTREE - Build a Decision Tree model

This stored procedure builds a Decision Tree model

Usage

The GROW_DECTREE stored procedure has the following syntax:

GROW_DECTREE(NVARCHAR(ANY) paramString)

Parameters

paramString
The comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
The name of the Decision Tree model to

build. Type: NVARCHAR(ANY)

intable
The name of the input table.

Type: NVARCHAR(256)

id
The column of the input table that identifies a unique instance

ID. Type: NVARCHAR(128)

target
The input table column representing the

class. Type: NVARCHAR(128)

incolumn
The input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

type: ':nom' (for nominal), ':cont' (for continuous). By default, all numerical types are continuous, other types are nominal

role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':col-weight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
The default type of the input table columns. Valid values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
The default role of the input table columns. Allowed values are 'input' and 'ignore'.

If the parameter is undefined, all columns are considered 'input' columns.

Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
The input table where column properties for the input table columns are stored. The format of this table is the output format of the nza..COLUMN_PROPERTIES() stored procedure.

If the parameter is undefined, the input table column properties is detected automat-ically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsup-ported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsupported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

weights
The input table containing optional instance or class weights for the input table

columns. If the parameter is undefined, it is assumed that the weights are uniformly

equal to 1. The <weights> table contains following columns:

weight: a numeric column containing the instance or class weight

id: a column to be joined with the <id> column of <intable>, defining instance weights

class: a column to be joined with the <target> column of <intable>, defining class weights

Either the id or class column can be missing, at least one of them must be present. For in-stances or classes not occurring in this table, weights of 1 are assumed.

Type: NVARCHAR(256)

Default: <none>

eval
The class impurity measure used for split evaluation. Valid values are 'entropy' and

'gini'. Type: NVARCHAR(ANY)

Default: entropy

minimprove
The minimum improvement of the split evaluation measure that is

required. Type: DOUBLE

Default: 0.02

Min: 0.0

minsplit
The minimum number of instances per tree node that can be

split. Type: INTEGER

Default: 50

Min: 2

maxdepth
The maximum number of tree levels, including

leaves. Type: INTEGER

Default: 10

Min: 1

Max: 62

statistics
flags indicating which statistics to collect. Allowed values are: none, columns, values:n, all.

If statistics=none, no statistics are collected.

If statistics=columns, statistics on the input table columns like mean value are collec-ted.

If statistics=values:n with n a positive number, statistics about the columns and the column values are collected. Up to <n> column value statistics are collected:

If a nominal column contains more than <n> values, only the <n> most frequent column statistics are kept.

If a numeric column contains more than <n> values, the values will be discretized and the statistics will be collected on the discretized values.

Indicating statistics=all is equal to statistics=values:100.

Type: NVARCHAR(ANY)

Default: 'none'

Returns
INTEGER The number of Decision Tree nodes, including leaves.

Details

This stored procedure builds a Decision tree model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipulate the model or access the model tables.

A top-down tree growing algorithm is used with the following features:

binary splits (equality-based for nominal attributes, inequality-based for continuous attributes)

no missing value handling

entropy or Gini index for split evaluation

stop criteria satisfied at a node with a uniform class

stop criteria satisfied when further splits do not improve the class impurity by at least <minim-prove>

stop criteria satisfied when the number of instances is less than <minsplit>

stop criteria satisfied when the tree depth reaches <maxdepth>

Examples

```
CALL nza..GROW_DECTREE('model=adult_tree,
intable=nza..adult_train, id=id, target=income,
eval=gini, minsplit=1000, maxdepth=62');
CALL nza..DROP_MODEL('model=adult_tree');

 GROW_DECTREE
--------------
            11
```

```
(1 row)
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
DECTREE
PRUNE_DECTREE
PRINT_DECTREE
PREDICT_DECTREE
LIST_MODELS

GROW_REGTREE - Grow a Regression Tree model

This stored procedure builds a Regression Tree model

Usage

The GROW_REGTREE stored procedure has the following syntax:

GROW_REGTREE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Regression Tree model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the prediction

target Type: NVARCHAR(128)

incolumn

the input table columns with special properties, separated by a semi-colon (;).

Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are continuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':col-weight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPER-TIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsup-ported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsup-ported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

eval
the split evaluation measure. Allowed values are: variance.

Type: NVARCHAR(ANY)

Default: variance

minimprove
the minimum improvement of the split evaluation measure

required Type: DOUBLE

Default: 0.1

Min: 0.00001

minsplit
the minimum number of instances per tree node that can be

split Type: INTEGER

Default: 50

Min: 2

maxdepth
the maximum number of tree levels (including

leaves) Type: INTEGER

Default: 10

Min: 1

Max: 62

statistics
flags indicating which statistics to collect. Allowed values are: none, columns, values:n,

all. If statistics=none, no statistics are collected.

If statistics=columns, statistics on the input table columns like mean value are collected.

If statistics=values:n with n a positive number, statistics about the columns and the column val-ues are collected. Up to <n> column value statistics are collected:

If a nominal column contains more than <n> values, only the <n> most frequent column stat-istics are kept.

If a numeric column contains more than <n> values, the values will be discretized and the stat-istics will be collected on the discretized values.

Indicating statistics=all is equal to statistics=values:100.

Type: NVARCHAR(ANY)

Default: 'none'

Returns
INTEGER the number of Regression Tree nodes (including leaves)

Details

This stored procedure builds a Regression tree model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipu-late the model or access the model tables.

A top-down tree growing algorithm is used with the following features:

binary splits (equality-based for nominal attributes, inequality-based for continuous attributes),
no missing value handling,
variance for split evaluation,
stop criteria satisfied when further splits do not improve the variance by at least <minimprove>,
stop criteria satisfied when the number of instances is less than <minsplit>,
stop criteria satisfied when the tree depth reaches <maxdepth>.

Examples

```
CALL nza..GROW_REGTREE('model=wrt, intable=nza..weatherr,
id=instance, target=grade, minsplit=2, maxdepth=3'); CALL
nza..DROP_MODEL('model=wrt');
 GROW_REGTREE
--------------
            7
(1 row)
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
LIST_MODELS
PREDICT_REGTREE
PRINT_REGTREE
PRUNE_REGTREE
REGTREE

HIST - Histograms

This stored procedure creates histograms. The number of bins and the bins themselves can be spe-cified or are automatically calculated.

Usage

The HIST stored procedure has the following syntax:

HIST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(ANY)

incolumn
the input table column to build the histogram

onto Type: NVARCHAR(ANY)

outtable
the output table to store the histogram

into Type: NVARCHAR(ANY)

nbreaks
the number of bins for the histogram. If not specified, the number of bins is calculated auto-matically.

Type: INT4

Default: <none>

Min: 1

right
the flag indicating whether the histogram bins should be right-closed (true) or right-open

(false) Type: BOOLEAN

Default: true

btable
the input table with breaks for the histogram. If not specified, the bins are calculated automat-ically, using the parameter <nbreaks> if specified.

Type: NVARCHAR(ANY)

Default: <none>

bcolumn
the <btable> column containing the breaks for the histogram. This column must be specified if the parameter <btable> is specified.

Type: NVARCHAR(ANY)

Default: <none>

density
flag indicating whether densities should be attached to the output

table Type: BOOLEAN

Default: false

midpoints

flag indicating whether the midpoints of the bins should be attached to the output table

Type: BOOLEAN

Default: false

freq
flag indicating whether frequencies should be attached to the output

table Type: BOOLEAN

Default: false

cum
flag indicating whether cumulative frequencies should be attached to the output table (setting this flag automatically sets freq flag as frequencies have to be calculated prior to cumulative frequencies)

Type: BOOLEAN

Default: false

Returns
INTEGER the number of created bins

Details

This stored procedure calculates an histogram for the input table column. Three modes are avail-able:

- When neither parameter <nbreaks> nor parameter <btable> are specified, the histogram con-tains equally-sized bins that are automatically calculated.

When parameter <btable> is specified, the histogram contains the bins whose boundaries are defined in column <bcolumn> of <btable>.

When parameter <nbreaks> is specified, the histogram contains <nbreaks> equally-sized bins that are automatically calculated.

If parameters <nbreaks> and <btable> are specified simultaneously, parameter <nbreaks> is ig-nored.

The histogram is stored in an output table with following columns: idx, bleft, bright, count. The his-togram bins limits are defined in columns bleft and bright, and can be sorted in ascending order using the column idx. The frequency of the input column values per bin is indicated in column count.

Four additional columns density, midpoint, freq (frequency) and cum (cumulative frequency) can be available in the output table if the corresponding parameters are set to true.

Examples

```
CALL
nza..HIST('intable=nza..iris,incolumn=petallength,outtabl

e=hist1,right=F');
```

```
SELECT * FROM hist1 ORDER BY idx;
CALL nza..DROP_TABLE('hist1');
```

```
 HIST
 ------
   12
(1 row)

 IDX | BLEFT | BRIGHT | COUNT
-----+------- +--------+-------
   0 |     1 |     1.5|     23
   1 |   1.5 |       2|     27
   2 |     2 |     2.5|      0
   3 |   2.5 |       3|      0
   4 |     3 |     3.5|      3
   5 |   3.5 |       4|      8
   6 |     4 |     4.5|     18
   7 |   4.5 |       5|     25
   8 |     5 |     5.5|     18
   9 |   5.5 |       6|     17
  10 |     6 |     6.5|      7
  11 |   6.5 |       7|      4
(12 rows)

 DROP_TABLE
 ------------
 t
(1 row)
```

```
CALL
nza..HIST('intable=nza..iris,incolumn=petallength,outtable=hist2 ,nbreaks=10,right=T');

SELECT * FROM hist2 ORDER BY idx;
CALL nza..DROP_TABLE('hist2');
```

```
 HIST
 ------
   10
(1 row)
 IDX   | BLEFT | BRIGHT | COUNT
-----+------- +--------+-------
   0   |     1 |    1.59|     37
   1   |  1.59 |    2.18|     13
   2   |  2.18 |    2.77|      0
   3   |  2.77 |    3.36|      3
   4   |  3.36 |    3.95|      8
   5   |  3.95 |    4.54|     26
   6   |  4.54 |    5.13|     29
   7   |  5.13 |    5.72|     18
   8   |  5.72 |    6.31|     11
   9   |  6.31 |     6.9|      5
 (10 rows)

 DROP_TABLE
 ------------
 t
(1 row)
```

```
CREATE TABLE gdm_hbr (br DOUBLE);
INSERT INTO gdm_hbr VALUES(0);
INSERT INTO gdm_hbr VALUES(2);
INSERT INTO gdm_hbr VALUES(4);
INSERT INTO gdm_hbr VALUES(6);
INSERT INTO gdm_hbr VALUES(8);
CALL
nza..HIST('intable=nza..iris,incolumn=petallength,outtabl
e=hist3,btable=gdm_hbr,bcolumn=br');
SELECT * FROM hist3 ORDER BY idx;
CALL nza..DROP_TABLE('hist3');
CALL nza..DROP_TABLE('gdm_hbr');
```

```
 HIST
------
    4
(1 row)

 IDX | BLEFT | BRIGHT | COUNT
-----+------- +--------+-------
   0  |     0|       2|     50
   1  |     2|       4|     16
   2  |     4|       6|     75
   3  |     6|       8|      9
(4 rows)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL
nza..HIST('intable=nza..iris,incolumn=sepallength,outtable=hist4 ,right=F,density=T,midpoints=T,freq=T,cum=T');

SELECT * FROM hist4 ORDER BY idx;
CALL nza..DROP_TABLE('hist4');
```

```
 HIST
```

```
------
     8
(1 row)

 IDX | BLEFT | BRIGHT | COUNT |       DENSITY       |
 MIDPOINT |       FREQ         | CUM
-----+------- +-------- +------- +-------------------
+----------        +-------------------         +------
   0  |     4 |    4.5 |      4 | 0.053333333333333 |
4.25| 0.026666666666667 | 0.03
   1  |   4.5 |      5 |     18 |              0.24 |
4.75  |              0.12 | 0.15
   2  |     5 |    5.5 |     30 |               0.4 |
5.25  |               0.2 | 0.35
   3  |   5.5 |      6 |     31 |  0.41333333333333 |
5.75  | 0.20666666666667 | 0.55
   4  |     6 |    6.5 |     32 |  0.42666666666667 |
6.25  | 0.21333333333333 | 0.77
   5  |   6.5 |      7 |     22 |  0.29333333333333 |
6.75  | 0.14666666666667 | 0.91
   6  |     7 |    7.5 |      7 | 0.093333333333333 |
7.25| 0.046666666666667 | 0.96
   7  |   7.5 |      8 |      6 |              0.08 |
7.75  |              0.04 | 1.00
(8 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
UNITABLE
BITABLE

IMPORT_MODEL - Import one or more analytics models from a file set

This stored procedure imports the specified analytic models from a set of files into an INZA-enabled data-base. Model contents, model metadata, and model privileges can be imported. The file set must have been created with the EXPORT_MODEL procedure before.

Usage

The IMPORT_MODEL stored procedure has the following syntax:

IMPORT_MODEL(NVARCHAR(ANY))

Parameters

paramString
a comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
a semicolon-separated list of names of models to be imported from a file set. If all models must be imported, specify model=all. If parameter where is not specified, parameter model must be specified.

Type: NVARCHAR(ANY)

where
a WHERE clause to filter the set of models to be imported. All columns from view V_NZA_MOD-ELS can be used in the WHERE clause. If parameter model is not specified, parameter where must be specified.

Type: NVARCHAR(ANY)

directory
the name of the directory where all files of the file set are stored. An absolute path name must be specified.

Type: NVARCHAR(ANY)

name
the name of the file set. This name is used as prefix for each file of the file set. If the directory contains only one file set, this parameter does not need to be specified.

Type: NVARCHAR(ANY)

acl
a flag ("access control list") controlling import of privileges. Only the administrator can use this parameter. If set to true, model privileges are imported also (if they exist in the file set).

Type: BOOLEAN

owner
the name of the owner of all imported models. If no name is specified, the current user is the new owner of all models. This parameter can be specified by the database administrator only. Type: NVARCHAR(ANY)

overwrite
a flag used to overwrite existing models. If a model with the same name as an impor-ted model already exists in the database, import of this model is possible only if over-write is set to true. In this case, existing models are deleted first if name conflicts ap-pear.

Type: BOOLEAN

verbose
a flag controlling if additional output about the progress of the import process is prin-ted.

Type: BOOLEAN

Returns
INTEGER the number of successfully imported models

Details

The parameters model and where are used to specify the models to be imported. If both parameters are specified, the two model sets are merged. To import all models, pass model=all (the where parameter is ignored in this case). The specified directory must contain an export file set gener-ated by the procedure EXPORT_MODEL before. The database process must be able to read the files in this directory. If the directory contains more than one export file set, the parameter name must be used to select the desired file set for import. If a model to be imported has the same name as an existing model, the model is not imported. However, if the overwrite parameter is set to true and the user has the privilege to delete the existing model, the imported model overwrites the existing model. If a model cannot be imported (for example, an existing model cannot be over-written), the import of this model is skipped and the system continuous the import with the next model. Only on severe errors the import process is aborted completely. Only the database admin-istrator can import the model privileges (which user and which group has which access right on a model), using the acl parameter. Of course model privileges must have been exported before, else this parameter has no effect. By default, the current user is the new owner of all imported models and gets the corresponding privileges on the models. Only the administrator can specify another (existing) owner for all imported models.

Examples

```
\c EXDB

CALL
nza..TIMESERIES('model=tsmodel,intable=nza..iris,time=ID,
target=PETALLENGTH,by=CLASS,algorithm=esmoothing');
CALL
nza..EXPORT_MODEL('model=tsmodel,directory=/tmp/export,na
me=tsexport,acl=true');
CALL nza..DROP_MODEL('model=tsmodel');

\c IMDB
```

```
CALL
nza..IMPORT_MODEL('model=tsmodel,directory=/tmp/export,acl=true' );

You are now connected to database EXDB.
 TIMESERIES
------------
          3
(1 row)
 EXPORT_MODEL
--------------
            1
(1 row)
NOTICE:  Dropped: TSMODEL
 DROP_MODEL
------------
 t
(1 row)
You are now connected to database IMDB.
 IMPORT_MODEL
--------------
            1
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS
EXPORT_MODEL

IMPUTE_DATA - Impute missing data

This stored procedure replaces missing values in the input data

Usage

The IMPUTE_DATA stored procedure has the following syntax:

IMPUTE_DATA(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

method
the data imputation method. Allowed values are: mean, median, freq (most frequent value), replace. If not specified, the method is median for the numeric columns and freq for the nominal columns. The methods mean and median cannot be used with nominal columns.

Type: NVARCHAR(ANY)

Default: <none>

outtable
the output table with the replaced missing values. If not specified, the missing values are replaced in the input table directly.

Type: NVARCHAR(256)

Default: <none>

inColumn
the input table column where missing values have to be replaced. If not specified, all input data columns are considered.

Type: NVARCHAR(128)

Default: <none>

numericValue
the numeric replacement value when

method=replace Type: DOUBLE

Default: -1

nominalValue
the nominal replacement value when

method=replace Type: NVARCHAR(ANY)

Default: missing

outtabletype
the type of the output table. It can be 'table' or

'temporary'. Type: NVARCHAR(16)

Default: 'table'

Returns

INTEGER the number of attributes where data was updated

Details

This stored procedure replaces missing values in the specified column or, if no column is specified, in all columns of the input table. If no replacement method is specified, missing values in a numeric column are replaced by the median value of this column, while missing values in a nominal column are replaced by the most frequent value. If two values have the same frequency, the alphabetically first value is used.

The input data can be modified in place or copied then modified into the output table. Imputation of miss-ing data is helpful for most of the data mining procedures.

Examples

```
CREATE TABLE miss(id int, col float, attr float,data
datetime, class NVARCHAR(10));
INSERT INTO miss VALUES (1,1.4,null,'2008-01-01','white');
INSERT INTO miss VALUES (2,2.5,random(),null,null);
INSERT INTO miss VALUES (3,null,random(),'2008-01-01','white');
INSERT INTO miss VALUES (4,1.4,random(),null,'black'); CALL
nza..IMPUTE_DATA('intable=miss');
CALL nza..DROP_TABLE('miss');
```

```
 IMPUTE_DATA
-------------
           4
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Data Transformation
KNN
NAIVEBAYES

INITIALIZE - Initialize the model management infrastructure

This stored procedure creates tables, views, a sequence and a stored procedure needed for the analytics model management in the current database. If the tables, views and sequence already exist, nothing is done.

Usage

The INITIALIZE stored procedure has the following syntax:

INITIALIZE(NVARCHAR(ANY) paramString)

Parameters

paramString

The strings "help", "noschema", or "force". "Noschema" instructs the procedure to move back the metadata from the INZA schema to the default schema (as preparation for disablement of full schema mode). "Force" instructs the procedure to always recre-ate the metadata views (needed after database backup was restored to a different database).

Type: NVARCHAR(ANY)

Returns

NVARCHAR(ANY) a text explaining whether the infrastructure already exists, or has been created successfully

Details

This stored procedure creates the model management infrastructure into the current database if not already done. If full schema mode is enabled, the schema INZA is used, if it is disabled, we have no choice of a schema. The following database objects are created:

model management tables: NZA_META_MODELS, NZA_META_COMPONENTS, NZA_META_PARAMS, NZA_META_COLPROPS

model management views: V_NZA_MODELS, V_NZA_COMPONENTS, V_NZA_PARAMS, V_NZA_COLPROPS

model management sequence: NZA_META_IDSEQUENCE

model management procedure: METADATA_VERSION

The tables, the sequence, and the procedure are not public, the views are a public interface. The views return only records that belong to models where the user has the LIST privilege.

Examples

```
CALL nza..CLEANUP();

CALL nza..INITIALIZE();

CALL nza..INITIALIZE();

                       CLEANUP
------------------------------------------------------
 The metadata objects have been removed successfully.
(1 row)
                     INITIALIZE
```

```
----------------------------------------------------
 The metadata objects are successfully initialized.
(1 row)
                            INITIALIZE
---------------------------------------------------------------
----
 Nothing to be done. The metadata objects are already
initialized.
(1 row)
```

Related Functions

category Analytics - Model Management
IS_INITIALIZED

IQR - InterQuartile Range

This stored procedure calculates the interquartile range of a numeric column

Usage

The IQR stored procedure has the following syntax:

IQR(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

incolumn
the input table column

Type: NVARCHAR(128)

Returns
REAL the interquartile range value

Details

This stored procedure calculates the width of the interquartile range, i.e. Q3-Q1. Q1 is the first quartile con-taining 25% of the population, and Q3 is the third quartile containing 75% of the population.

Examples

```
CALL nza..IQR('intable=nza..quant_iris,
incolumn=sepal_length');
 IQR
-----
 1.3
(1 row)
```

Related Functions

category Analytics - Quantiles & Outliers
QUARTILE
QUARTILE_DISC

IS_INITIALIZED - Check the model management infrastructure

This stored procedure checks if the model management infrastructure is initialized, and if it needs to be migrated. If no database is given, the current database is assumed.

Usage

The IS_INITIALIZED stored procedure has the following syntax:

IS_INITIALIZED(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

database
the database where to check the model management infrastructure. If not specified, the current database is used.

Type: NVARCHAR(128)

Default: <none>

Returns
NVARCHAR(ANY) a text explaining that the metadata tables are initialized (otherwise an exception is raised)

Details

This stored procedure checks if the model management infrastructure is initialized with the expected ver-sion.

- if the model management tables, views and sequence does not exist, the model management infrastruc-ture has to be initialized.

- if they exist but their version is older than expected, the model management infrastructure has to be mi-grated to a newer version.

- Otherwise, nothing has to be done.

This stored procedure can check the model management infrastructure in a remote database using the parameter database. To check the current database, the stored procedure can be called with a NULL para-meter, an empty parameter or without parameter.

Examples

```
CALL nza..IS_INITIALIZED();

             IS_INITIALIZED
--------------------------------------
 The metadata tables are initialized.
(1 row)
```

Related Functions

category Analytics - Model Management
INITIALIZE
REGISTER_MODEL

JOINT_ENTROPY - Bivariate Entropy

This stored procedure calculates the joint entropy of two columns

Usage

The JOINT_ENTROPY stored procedure has the following syntax:

JOINT_ENTROPY(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the two input table columns separated by a semicolon

(;) Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be performed. If specified, an output table must be indicated.

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the entropy into. This parameter must be specified if para-meter by is specified.

Type: NVARCHAR(256)

Default: <none>

Returns
DOUBLE the joint entropy of both input table columns, or the number of groups in the output table for which entropy has been calculated

Details

This stored procedure calculates the entropy of two input columns, either in the whole input table or within the groups defined in the column specified by parameter <by>. Bivariate Entropy is a measure saying how evenly the cases are distributed for the values of both input columns. It takes a positive value, 0 means that the column contains only one value.

If parameter 'by' is specified, an output table must be specified. The output table is created with following columns: over_<by>, jointentropy. The joint entropy of both input columns is given for each group of the <by> column.

Examples

```
CALL nza..JOINT_ENTROPY('intable=nza..CensusIncome,
incolumn=age;wage_per_hour');
 JOINT_ENTROPY
------------------
 6.9548076555911
(1 row)
```

```
CALL nza..JOINT_ENTROPY('intable=nza..CensusIncome,
incolumn=age;wage_per_hour, outtable=resultTable,
by=sex');
```

```
SELECT * FROM resultTable order by over_sex;
CALL nza..DROP_TABLE('resultTable');
```

```
 JOINT_ENTROPY
---------------
              2
(1 row)

  JOINTENTROPY   | OVER_SEX
-----------------+----------
 6.9578241327179 | Female
 6.8873765557205 | Male
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
COND_ENTROPY
ENTROPY
MUTUALINFO

KMEANS - Build a K-means Clustering model

This stored procedure builds a Clustering model that clusters the input data into k centers. The centers are calculated as the mean value of the nearest input data records.

Usage

The KMEANS stored procedure has the following syntax:

KMEANS(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters below

Type: NVARCHAR(ANY)

model
the name of the Clustering model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where clusters are assigned to each input table

record Type: NVARCHAR(ANY)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing a class or a value to predict, this column is ig-nored by the Clustering algorithm.

Type: NVARCHAR(128)

Default: <none>

distance
the distance function. Allowed values are: euclidean, norm_euclidean, manhattan, canberra, maximum, mahalanobis.

Type: NVARCHAR(ANY)

Default: norm_euclidean

k
number of centers

Type: INTEGER

Default: 3

maxiter
the maximum number of iterations to

perform Type: INTEGER

Default: 5

Min: 1

Max: 1000

randseed
the random generator

seed Type: INTEGER

Default: 12345

idbased
the specification that random generator seed is based on id column

value Type: BOOL

Default: false

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are con-tinuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':colweight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPERTIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsupported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsupported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

statistics
flags indicating which statistics to collect. Allowed values are: none, columns, values:n, all.

If statistics=none, no statistics are collected.

If statistics=columns, statistics on the input table columns like mean value are collec-ted.

If statistics=values:n with n a positive number, statistics about the columns and the column values are collected. Up to <n> column value statistics are collected:

If a nominal column contains more than <n> values, only the <n> most frequent column statistics are kept.

If a numeric column contains more than <n> values, the values will be discretized and the statistics will be collected on the discretized values.

Indicating statistics=all is equal to statistics=values:100.

Type: NVARCHAR(ANY)

Default: 'none'

transform
flag indicating if the input table columns have to be transformed. Allowed values are: L (for leave as is), N (for normalization) or S (for standardization). If it is not specified, no transformation will be performed.

Type: NVARCHAR(ANY)

Default: L

Returns
BIGINT the number of generated clusters

Details

This stored procedure builds a K-means Clustering model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management func-tions to further manipulate the model or access the model tables.

The clusters are build iteratively by partitioning data into k (or less) separate clusters according to their distance to the cluster center, then re-calculating the cluster centers. The K-means Clustering algorithm stops after <maxiter> iterations.

The output table <outtable> is created with following columns: id, cluster_id, distance. The id column matches the <id> column of the input table. Each input table record is associated with a cluster, where the distance from the record to the cluster center is the smallest. The cluster ID and the distance to the cluster center are given in the columns cluster_id and distance.

Examples

```
CALL  nza..KMEANS('model=adult_mdl,  intable=nza..adult,
outtable=adult_out,  id=id,  target=income,  transform=S,
distance=euclidean, k=3, maxiter=5, randseed=12345,
idbased=false');
CALL nza..DROP_MODEL('model=adult_mdl');
CALL nza..DROP_TABLE('adult_out');
 KMEANS
--------
      3
(1 row)
 DROP_MODEL
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Clustering
PREDICT_KMEANS
LIST_MODELS

KNN - Build a K-Nearest Neighbors model

This stored procedure builds a K-Nearest Neighbors Classification or Regression model

Usage

The KNN stored procedure has the following syntax:

KNN(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model

the name of the KNN model to

build Type: NVARCHAR(ANY)

intable

the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the

class Type: NVARCHAR(128)

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are continuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':col-weight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPER-TIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsupported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsupported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

Returns
BIGINT the number of sample data records in the model

Details

This stored procedure builds a K-Nearest Neighbors Classification or Regression model. The model simply contains a sample among the input table records that will be used later for prediction.

Examples

```
CALL nza..KNN('model=iris_mdl, intable=nza..iris, id=id,
target=class');
CALL nza..DROP_MODEL('model=iris_mdl');
```

```
 KNN
-----
 150
(1 row)

DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
PREDICT_KNN
LIST_MODELS

KURTOSIS_AGG - excess Kurtosis

This function calculates the excess Kurtosis value of a single numeric variable, as the fourth central moment divided by the square of the variance of the probability distribution minus 3

Usage

The KURTOSIS_AGG aggregate has the following syntax:

KURTOSIS_AGG(DOUBLE X)

Parameters

X

the input variable

Type: DOUBLE

Returns

DOUBLE the excess Kurtosis value of the input variable

Details

This function calculate the excess Kurtosis value of a single numeric variable. The kurtosis is a measure of the thickness of the tails of the variable distribution. If the kurtosis is negative, the tails are thinner or lighter than in a normal distribution. If the kurtosis is positive, the tails are thicker or heavier than in a normal distribution.

The excess Kurtosis is calculated as the fourth moment of the variable around its mean divided by the square of the variance of the probability distribution minus 3. Note that the normal distribu-tion, due to the subtraction of 3, has a kurtosis of zero. A k-th order central moment is the sum of the k-th powers of differences between the mean and the actual value divided by the number of cases. Because of the fact that we want to know the moments for a population but we are com-puting them from the given sample values, diverse corrections are taken into account. This leads to many formulas for assessing the Kurtosis. In this implementation we followed a "midway" policy dividing the estimated central moments by the number of cases minus 1. This policy is a generally established practice for variance but not for Kurtosis. Therefore the implementations match each other for a large number of cases only. Our decision to use our approach was based on the fact that an unbiased estimate is not available anyway.

If a value is missing, the whole row is ignored.

Examples

```
SELECT nza..KURTOSIS_AGG(petallength) FROM nza..iris;

   KURTOSIS_AGG
------------------
 -1.4060569067921
(1 row)
```

Related Functions

category Analytics - Statistics
MOMENTS
SKEWNESS_AGG
SUMMARY1000

LDF_MANOVA_ONE_WAY_TEST - LDF of ABC Multivariate Analysis of Variance result in one way setting

This stored procedure prints the one way MANOVA linear discriminat function for the largest root,

Usage

The LDF_MANOVA_ONE_WAY_TEST stored procedure has the following syntax:

LDF_MANOVA_ONE_WAY_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table name

Type: NVARCHAR(ANY)

id_task
the id_task that will be presented, id_task must be positive integer >=

1. Type: integer

Returns
NVARCHAR(2000) A string contaning the SQL form of LDF

Details

This stored procedure outputs in a SQL form the ldf of one-way analysis of variance/covariance aiming to tell whether or not the groups of data identified by factor1 have the same mean value in all dependent vari-ables or not. Note that the one way analysis could have been performed for a multitude of tasks. Therefore id_task is needed

Examples

```
create view irisX05 as

select *, mod(id,3) as factor  from nza..iris;

CALL nza..MANOVA_ONE_WAY_TEST('intable=irisX05,id=Id, incolumn=
petallength;petalwidth;sepalwidth, factor1=class,
outtable=outtab05a, type=columns');
CALL
```

```
nza..LDF_MANOVA_ONE_WAY_TEST('intable=outtab05a,id_task=1
');
CALL nza..DROP_TABLE('outtab05a');
CALL nza..DROP_TABLE('irisX05');
```

```
LDF_MANOVA_ONE_WAY_TEST
-------------------------------------------------------
-------------------------------------------------------
-----------------------------------------
 select <row id>
  + 0.63828142599355 * "PETALLENGTH"
+ 14.376609151486 * "PETALWIDTH"
+ 10.766016415897 * "SEPALWIDTH"
 as factor1
 from <table
name> (1 row)
```

Related Functions

category Analytics - Statistics
MANOVA_ONE_WAY_TEST
PRINT_MANOVA_ONE_WAY_TEST

LDF_MANOVA_TWO_WAY_TEST - LDF of Multivariate Analysis of Vari-ance result in TWO way setting

This stored procedure prints the TWO way MANOVA linear discriminat function for the largest root,

Usage

The LDF_MANOVA_TWO_WAY_TEST stored procedure has the following syntax:

LDF_MANOVA_TWO_WAY_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable

the input table name

Type: NVARCHAR(ANY)

id_task
the id_task that will be presented, id_task must be positive integer >=

1. Type: integer

Returns
NVARCHAR(2000) A string contaning the SQL form of LDF

Details

This stored procedure outputs in a SQL form the ldf of TWO-way analysis of variance/covariance aiming to tell whether or not the groups of data identified by factor1 have the same mean value in all dependent vari-ables or not. Note that the TWO way analysis could have been performed for a multitude of tasks. Therefore id_task is needed

Examples

```
create view irisX05 as

select *, mod(id,3) as factor  from nza..iris;

CALL nza..MANOVA_TWO_WAY_TEST('intable=irisX05,id=Id, incolumn=
sepalwidth;petallength;sepallength,
factor1=factor,factor2=class, outtable=outtab05a,
type=columns');
CALL
nza..LDF_MANOVA_TWO_WAY_TEST('intable=outtab05a,id_task=1')

; CALL nza..DROP_TABLE('outtab05a'); CALL

nza..DROP_TABLE('irisX05');
```

```
LDF_MANOVA_TWO_WAY_TEST

LDF_MANOVA_TWO_WAY_TEST
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
-----------------------------

 select <row id>

  + 0.98933945482201 * "SEPALWIDTH"

+ 0.0074007470715444 * "PETALLENGTH"

+ 0.0088047416599598 * "SEPALLENGTH"

 as factor1
```

```
  + -0.071356687984851 * "SEPALWIDTH"
+ 9.0908512260774 * "PETALLENGTH"
+ 3.7847858074782 *
 "SEPALLENGTH" as factor2
  + -0.81232580404822 * "SEPALWIDTH"
+ 0.010025802114667 * "PETALLENGTH" +
0.070947392958058 * "SEPALLENGTH"
 as  factorInteract
 from <table name>
(1 row)
```

Related Functions

category Analytics - Statistics
MANOVA_Two_WAY_TEST
PRINT_MANOVA_Two_WAY_TEST

LINEAR_REGRESSION - Build a Linear Regression model

This stored procedure builds a Linear Regression model

Usage

The LINEAR_REGRESSION stored procedure has the following syntax:

LINEAR_REGRESSION(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Linear Regression model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance id

Type: NVARCHAR(128)

target
the input table column representing the prediction target, definition of multitargets can be pro-cessed by 'incolumn' parameter and column properties.

Type: NVARCHAR(128)

nominalCols
the input table nominal columns, if any, separated by a semi-colon (;). Parameter 'nominalCols' is deprecated please use 'incolumn' intead.

Type: NVARCHAR(ANY) {default} <none>

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are con-tinuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':colweight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPERTIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsupported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsup-ported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

useSVDSolver
a flag indicating whether Singular Value Decomposition and matrix multiplication should be used for solving the matrix equation

Type: BOOLEAN

Default: false

intercept
flag indicating whether the model is built with or without an intercept value. The de-fault has changed to true.

Type: BOOLEAN

Default: true

calculateDiagnostics
a flag indicating whether diagnostics information should be

displayed Type: BOOLEAN

Default: false

Returns
BOOLEAN always true

Details

This stored procedure builds the linear regression model using the QR solver of a non-singular model matrix, or the Moore-Penrose pseudoinversion in the case of a near-singular or exactly singular model matrix. Input data should be provided as a table with observations provided in rows, and predictors in columns. The list of predicted values may consist of more than 1 attribute, or a nominal attribute, in that case a model with multiple output variables will be created.

For each of the nominal attributes specified, the stored procedure will create the corresponding dictionary, encoding the mapping between the provided values and the model coefficients (each value of a given nominal attribute introduces a new coefficient into the model).

If requested, diagnostic information is displayed, as well as the set of matrices created for the model:

<model>_linearmodel_R2 - row vector containing R^2 (being a fraction of variance explained by the model) of models created for each output variable (when calculateDiagnostics is TRUE),

<model>_linearmodel_RSS - row vector containing Residual Sum of Squares of models created for each output variable (when calculateDiagnostics is TRUE),

<model>_linearmodel_SDEV - the matrix of standard deviations of model coefficients (when cal-culateDiagnostics is TRUE, diagnostics is possible and model is overdetermined),

<model>_linearmodel_TVAL - the matrix of the test statistics for the models' coefficients (when

calculateDiagnostics is TRUE, diagnostics is possible and model is overdetermined),

- <model>_linearmodel_PVAL - the matrix of the two--sided p-values for the models' coefficients (when cal-culateDiagnostics is TRUE, diagnostics is possible and model is overdetermined),

<model>_linearmodel_Y_VAR_EST - the row vector containing the estimators of a variance of error term for each predicted variable (when calculateDiagnostics is TRUE, diagnostics is possible and model is overde-termined),

<model>_linearmodel - the matrix (as table) containing model coefficients (when model can be construc-ted).

The model table contains following columns:

VAR_ID - contains the identifier of the predictive attribute,

VAR_NAME - contains the name of the predictive attribute,

LEVEL_ID - contains the code of given nominal attribute level,

LEVEL_NAME - contains the value of given nominal attribute level,

PREDICTED_ID - contains the identifier of predicted attribute (useful in case of models with multiple pre-dicted values),

PREDICTED_NAME - contains the name of predicted attribute (useful in case of models with multiple pre-dicted values),

PREDICTED_LEVEL_ID - contains the code of given nominal attribute level (for given predicted value),

PREDICTED_LEVEL_NAME - contains the value of given nominal attribute level (for given predicted value),

VALUE - contains the value of the model coefficient unically identified by the values of columns described above,

ST_DEV - contains the standard deviation of the model coefficient (when calculateDiagnostics is TRUE, dia-gnostics is possible and model is overdetermined, -1 otherwise),

TVAL - contains the value of the the statistics for given model coefficient (when calculateDiagnostics is TRUE, diagnostics is possible and model is overdetermined, -1 otherwise),

PVAL - contains the p-value of the two--sided test for given model coefficient (when calculateDiagnostics is TRUE, diagnostics is possible and model is overdetermined, -1 otherwise).

Additionally, for each output variable encoded using the convention described above, the additional rows will be present in the table, containing the following information:

Intercept of the model (when includeIntercept=TRUE) (row with VAR_NAME='(Intercept)', VAR_ID=-1),

R^2 of the model (row with VAR_NAME='[R^2]', VAR_ID=-2, ST_DEV = TVAL = PVAL = -1),

RSS of the model (Residual Sum of Squares) (row with VAR_NAME='[RSS]', VAR_ID=-3, ST_DEV = TVAL = PVAL = -1),

estimators of a variance of error term (row with VAR_NAME='[Y_VAR_EST]', VAR_ID=-4, ST_DEV = TVAL = PVAL = -1).

The constructed model can be applied to the data using the PREDICT_LINEAR_REGRESSION procedure. Note that using the Singular Value Decomposition and matrix multiplication (useSVDSolver=true) could be slower than the standard calculation, but is more stable in the case of an ill-posed, that is, near colinear, regression model.

Examples

```
CREATE TABLE adultT1 AS SELECT id, age AS v1, fnlwgt
AS fnlwgt, education_num AS v3 FROM nza..adult;
CALL nza..LINEAR_REGRESSION('model=modelA,
intable=adultT1, id=id, target=fnlwgt,
calculateDiagnostics=true');
CALL nza..DROP_MODEL('model=modelA');
CALL nza..DROP_TABLE('adultT1');
 LINEAR_REGRESSION
-------------------
 t
(1 row)
 DROP_MODEL
------------
 t
(1 row)
  DROP_TABLE
------------
 t
(1 row)

CREATE TABLE adultT2 AS SELECT id, age,
education_num, income, sex FROM nza..adult;
CALL nza..LINEAR_REGRESSION('model=modelC,
intable=adultT2, id=id, target=age,
nominalCols=income;sex, calculateDiagnostics=true');
CALL nza..DROP_MODEL('model=modelC'); CALL
nza..DROP_TABLE('adultT2');
 LINEAR_REGRESSION
-------------------
 t
(1 row)
 DROP_MODEL
```

```
------------
 t
(1 row)
  DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
PREDICT_LINEAR_REGRESSION

LIST_COLPROPS - List column properties for selected or all analytics models

This stored procedure lists the column properties for all models for which the user has the LIST privilege. A WHERE clause can be used to list only the column properties of specific models.

Usage

The LIST_COLPROPS stored procedure has the following syntax:

LIST_COLPROPS(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

where
a WHERE clause to limit the set of models whose column properties are listed. All columns from views V_NZA_MODELS and V_NZA_COLPROPS can be used in the WHERE clause.

Type: NVARCHAR(ANY)

Returns
INTEGER the number of column properties listed

Examples

```
CALL nza..ARULE('intable=nza..retail, model=mbamodel,
supporttype=percent, support=5, lvl=0, maxsetsize=5,
confidence=0.5');
CALL nza..LIST_COLPROPS('where=upper(MODELNAME) LIKE ''MBA%''');

CALL nza..DROP_MODEL('model=mbamodel');

NOTICE:
```

```
         RUNNING FPGrowth algorithm:
         DATASET : "NZA".."RETAIL"
         Transaction column : "TID"
         Item column : "ITEM"
         Group by : <none>
         Minimum support : 5 %
         Minimum confidence: 0.5
         Max frequent itemset size : 5
         Level of conditional dbs : 0
         Result tables prefix : "NZA_META_MBAMODEL"

 ARULE
-------
    14
(1 row)

NOTICE:
 MODELNAME | COLUMNNAME | PROPERTYNAME |
PROPERTYTYPE            | PROPERTYVALUE
-----------+----------- +--------------
+----------------------------------          +---------------
 MBAMODEL  | ITEM       | COLDATATYPE  | NATIONAL
CHARACTER VARYING(128) | INTEGER
 MBAMODEL  | ITEM       | COLROLE      | NATIONAL
CHARACTER VARYING(128) | input
 MBAMODEL  | ITEM       | COLTYPE      | NATIONAL
CHARACTER VARYING(128) | cont
 MBAMODEL  | ITEM       | COLWEIGHT    | DOUBLE PRECISION
| 1
 MBAMODEL  | ITEM       | IDCOL        | INTEGER
| 2
 MBAMODEL  | TID        | COLDATATYPE  | NATIONAL
CHARACTER VARYING(128) | INTEGER
 MBAMODEL  | TID        | COLROLE      | NATIONAL
CHARACTER VARYING(128) | input
```

```
 MBAMODEL  | TID         | COLTYPE      | NATIONAL CHARACTER
VARYING(128) | cont
 MBAMODEL  | TID         | COLWEIGHT    | DOUBLE PRECISION
| 1
 MBAMODEL  | TID         | IDCOL        | INTEGER
| 1


 LIST_COLPROPS
---------------
            10
(1 row)


NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS

LIST_COMPONENTS - List components of selected or all analytics models

This stored procedure lists the components belonging to all models for which the user has the LIST privilege. A WHERE clause can be used to list only the components of specific models.

Usage

The LIST_COMPONENTS stored procedure has the following syntax:

LIST_COMPONENTS(NVARCHAR(ANY))

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

where

a WHERE clause to limit the set of models whose components are listed. All columns from views V_NZA_MODELS and V_NZA_COMPONENTS can be used in the WHERE clause.

Type: NVARCHAR(ANY)

Returns
INTEGER the number of components listed

Details

This stored procedure lists the managed or referenced components that belong to an analytics model for which the user has the LIST privilege:

tables,

views,

synonyms,

matrices.

Examples

```
CALL                    nza..ARULE('intable=nza..retail,
model=mbamodel,    supporttype=percent,    support=5,
lvl=0, maxsetsize=5, confidence=0.5');
CALL nza..LIST_COMPONENTS('where=upper(MODELNAME)
LIKE ''MBA%''');
CALL nza..DROP_MODEL('model=mbamodel');
```

```
NOTICE:

          RUNNING FPGrowth algorithm:

          DATASET : "NZA".."RETAIL"

          Transaction column : "TID"

          Item column : "ITEM"

          Group by : <none>

          Minimum support : 5 %

          Minimum confidence: 0.5

          Max frequent itemset size : 5

          Level of conditional dbs : 0

          Result tables prefix : "NZA_META_MBAMODEL"


 ARULE
-------
    14
```

```
(1 row)

NOTICE:
 MODELNAME |                NAME                 | DATABASE   |
TYPE   | MANAGEMENT |      USAGETYPE      | SEQID
----------   +-------------------------------------          +------------
+------- +-----------   +------------------   +-------
 MBAMODEL  | NZA_META_MBAMODEL_COLUMN_PROPERTIES | TEST_NZDOC |
View   | Managed    | Column Properties |
 MBAMODEL  | NZA_META_MBAMODEL_GROUP             | TEST_NZDOC |
Table | Managed    | Group             |
 MBAMODEL  | NZA_META_MBAMODEL_ITEM              | TEST_NZDOC |
Table | Managed    | Item              |
 MBAMODEL  | NZA_META_MBAMODEL_ITEMSET           | TEST_NZDOC |
Table | Managed    | Itemset           |
 MBAMODEL  | NZA_META_MBAMODEL_RULE              | TEST_NZDOC |
Table | Managed    | Rule              |
 MBAMODEL  | RETAIL                              | NZA        |
Table | Referenced | Input             |

 LIST_COMPONENTS
-----------------
               6
(1 row)

NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS

LIST_MODELS - List selected or all analytics models

This stored procedure lists all models for which the user has the LIST privilege. This stored proced-ure can also list all models that have been exported via EXPORT_MODEL. A WHERE clause can be used to list only specific models.

Usage

The LIST_MODELS stored procedure has the following syntax:

LIST_MODELS(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

directory
the name of a directory that contains the result file set of the EXPORT_MODEL com-mand. If this parameter is specified, the exported models are listed. If this parameter is not specified, the models from the metadata repository are listed.

Type: NVARCHAR(ANY)

name
the name of the export result file set, as specified in EXPORT_MODEL. This parameter can only be specified if parameter directory is specified also. If the directory contains only one result file set, this parameter does not need to be specified.

Type: NVARCHAR(ANY)

where
a WHERE clause to limit the set of models that are listed. All columns from view V_NZA_MODELS can be used in the WHERE clause.

Type: NVARCHAR(ANY)

Returns
INTEGER the number of models listed

Examples

```
CALL nza..ARULE('intable=nza..retail,
model=mbamodel, supporttype=percent, support=5,
lvl=0, maxsetsize=5, confidence=0.5');
CALL nza..LIST_MODELS('where=upper(MODELNAME) LIKE
''MBA %''');
CALL nza..EXPORT_MODEL('model=mbamodel,

directory=/tmp/mbaexport, name=mba');

CALL nza..DROP_MODEL('model=mbamodel');
CALL nza..LIST_MODELS('directory=/tmp/mbaexport');
NOTICE:
           RUNNING FPGrowth algorithm:
           DATASET : "NZA".."RETAIL"
           Transaction column : "TID"
           Item column : "ITEM"
           Group by : <none>
           Minimum support : 5 %
           Minimum confidence: 0.5
           Max frequent itemset size : 5
           Level of conditional dbs : 0
           Result tables prefix : "NZA_META_MBAMODEL"
 ARULE
-------
    14
(1 row)
NOTICE:
 MODELNAME | OWNER |       CREATED       |  STATE   |
MININGFUNCTION  | ALGORITHM | USERCATEGORY
-----------+-------+---------------------+----------
+------------------+-----------+-------------
 MBAMODEL | JOE | 2012-01-01 00:00:00 | Complete |
associationRules | FPGrowth |
 LIST_MODELS
-------------
           1
(1 row)
 EXPORT_MODEL
--------------
            1
(1 row)
NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
```

```
 t
(1 row)
NOTICE:
 MODELNAME | OWNER |       CREATED       |
MININGFUNCTION  | ALGORITHM | USERCATEGORY
-----------+-------+---------------------
+-----------------+-----------+-------------
 MBAMODEL | JOE | 2012-01-01 00:00:00 |
associationRules | FPGrowth |
 LIST_MODELS
-------------
           1
(1 row)
```

Related Functions

category Analytics - Model Management

LIST_PARAMS - List parameters for selected or all analytics models

This stored procedure lists the parameters used to build the models for which the user has the LIST privilege. A WHERE clause can be used to list only the parameters of specific models.

Usage

The LIST_PARAMS stored procedure has the following syntax:

LIST_PARAMS(NVARCHAR(ANY))

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

where

a WHERE clause to limit the set of models whose parameters are listed. All columns from views V_NZA_MODELS and V_NZA_PARAMS can be used in the WHERE clause. Type: NVARCHAR(ANY)

Returns

INTEGER the number of parameters listed

Examples

```
CALL nza..ARULE('intable=nza..retail, model=mbamodel,
supporttype=percent, support=5, lvl=0, maxsetsize=5,
confidence=0.5');
CALL nza..LIST_PARAMS('where=upper(MODELNAME) LIKE
''MBA%'''); CALL nza..DROP_MODEL('model=mbamodel');
```

```
NOTICE:
          RUNNING FPGrowth algorithm:
          DATASET : "NZA".."RETAIL"
          Transaction column : "TID"
          Item column : "ITEM"
          Group by : <none>
          Minimum support : 5 %
          Minimum confidence: 0.5
          Max frequent itemset size : 5
          Level of conditional dbs : 0
          Result tables prefix : "NZA_META_MBAMODEL"

 ARULE
-------
    14
(1 row)

NOTICE:
 MODELNAME | TASKSEQ | PARAMETERNAME |          PARAMETERTYPE
| PARAMETERVALUE
          +---------+-------------+---------------
+-----------------------------
 MBAMODEL  | 1       | confidence    | DOUBLE PRECISION
| 0.5
 MBAMODEL  | 1       | intable       | NATIONAL CHARACTER
VARYING(256) | nza..retail
 MBAMODEL  | 1       | item          | NATIONAL CHARACTER
VARYING(128) | item
 MBAMODEL  | 1       | lvl           | INTEGER
| 0
```

```
 MBAMODEL   | 1       | maxSetSize    | INTEGER
| 5
 MBAMODEL   | 1       | procedure     | CHARACTER
VARYING(64)           | ARULE
 MBAMODEL   | 1       | support       | DOUBLE PRECISION
| 5
 MBAMODEL   | 1       | supportType   | CHARACTER
VARYING(64)           | percent
 MBAMODEL   | 1       | tid           | NATIONAL CHARACTER
VARYING(128) | tid


 LIST_PARAMS
-------------
           9
(1 row)


NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS

LIST_PRIVILEGES - List privileges on all analytics models

This stored procedure lists the effective privileges of a selected or all users on all models for which you have the LIST privilege.

Usage

The LIST_PRIVILEGES stored procedure has the following syntax:

LIST_PRIVILEGES(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

user
the user whose privileges are listed. If not specified, the privileges of all users are

listed. Type: NVARCHAR(ANY)

grant
if true, the grant permissions are displayed. If false (default), the regular object permissions are displayed.

Type: NVARCHAR(ANY)BOOLEAN

Returns
INTEGER the number of privileges listed

Details

This stored procedure lists the effective privileges of all users on all models.

You need SELECT privilege on the system view _V_SYS_PRIV to read the model privileges. Typically, only the administrator can grant this privilege to you.

You need the LIST privilege on the model to read the model privileges. The model owner, the database owner or the administrator can grant the LIST privilege to you using the GRANT_MODEL stored procedure.

To get privileges for all users, the stored procedure can be called with a NULL parameter, an empty paramet-er or without parameter.

Examples

```
CALL nza..LIST_PRIVILEGES();

NOTICE:

 User Name | Model Name | L S A U D

-----------+------------+----------

Model Privileges

    (L)ist (S)elect (A)lter (U)pdate (D)rop

 LIST_PRIVILEGES

-----------------

               0

(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS
GRANT_MODEL

MAE - Mean Absolute Error

This stored procedure calculates the mean absolute error of Regression predictions

Usage

The MAE stored procedure has the following syntax:

MAE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

pred_table
the input table or view containing predicted

values Type: NVARCHAR(256)

pred_column
the input table column in <pred_table> containing predicted

values Type: NVARCHAR(128)

pred_id
the input table column in <pred_table> identifying a unique instance

id Type: NVARCHAR(128)

true_table
the input table or view containing real

values Type: NVARCHAR(256)

true_column
the input table column in <true_table> containing real

values Type: NVARCHAR(128)

true_id
the input table column in <true_table> identifying a unique instance

id Type: NVARCHAR(128)

check
flag indicating to check parameters or not. This may consume some time but prevents usage errors. Allowed values are: 'all' (check all), 'none' (check nothing), 'nulls' (check

for nulls only).

Type: NVARCHAR(ANY)

Default: all

Returns
DOUBLE the Mean Absolute Error

Details

This stored procedure calculate the mean absolute error of Regression predictions. This is done by comparing the predictions made when applying a Regression model onto data, and the real values for this data.

The MAE value is calculated as sum(abs(true_i-pred_i))/count(true_i) where true_i is the real value and pred_i is the predicted value.

Examples

```
CALL nza..GROW_REGTREE('model=wrt, intable=nza..weatherr,
id=instance, target=grade, maxdepth=4, minsplit=2');
CALL nza..PREDICT_REGTREE('model=wrt, intable=nza..weatherr,
id=instance, outtable=wpr, var=TRUE');
CALL
nza..MAE('pred_table=wpr,true_table=nza..weatherr,pred_column=cl
ass,true_column=grade,pred_id=id,true_id=instance');
CALL nza..DROP_MODEL('model=wrt');
CALL nza..DROP_TABLE('wpr');
```

```
 GROW_REGTREE
--------------
           13
(1 row)

 PREDICT_REGTREE
-----------------
              22
(1 row)

       MAE
-------------------
 0.090909090909091
(1 row)
```

```
 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CERROR
MSE
RAE
RSE

MANOVA_ONE_WAY_TEST - Multivariate Analyzsis of Variance in one way setting

This stored procedure performs a completely randomized design MANOVA

Usage

The MANOVA_ONE_WAY_TEST stored procedure has the following syntax:

MANOVA_ONE_WAY_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table name

Type: NVARCHAR(ANY)

outtable
the output table name

Type: NVARCHAR(ANY)

factor1
the input table column identifying a first factor (so-called treatment in RBD/CRD nomenclature) used for type='column' only for type='trcv' these are the values for col-column equal 1

Type: NVARCHAR(ANY)

incolumn
the input table observation columns (dependent variables), separated by a semi-colon (;). used for type='column' only for type='trcv' these are the values for col-column greater equal 2 Type: NVARCHAR(ANY)

type
the input table form: either 'columns' or 'trcv' trcv stands for "id_task, row, column, value" id_task must be positive integer >= 1. columns means the traditional table representation Type: NVARCHAR(ANY)

Default: 'trcv'

id
the input table column which uniquely identifies records used for type='column' only for type='trcv' not needed due to the structure of the table

Type: NVARCHAR(ANY)

by
the input table column which splits the input table into subtables, on each of them a separate MANOVA is run If not specified, the whole input table is subject of a single MANOVA run. used for type='column' only for type='trcv' it is by default the column named id_task

Type: NVARCHAR(ANY)

Default: <none>

_timecheck
the output will be enriched with execution time of critical sections if set to yes If not specified, the whole input table is subject of a single MANOVA run. used for type='column' only for type='trcv' it is by default the column named id_task

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(2000) A string confirming execution of the process or indicating a failure. The real out-put is contained in the output table

Details

This stored procedure performs one-way analysis of variance/covariance aiming to tell whether or not the groups of data identified by factor1 have the same mean value in all dependent variables or not. As an out-put 4 matrices (for each task) are produced that are stored in the output table the first matrix describes the ground means of all dependent variables (row vector) the second matrix describes the covariance table stat-istics and their p-values (row vector) the third matrix lists the eigenvalues of the covariance table statistics (column vector) the forth matrix lists the eigenvectors of the covariance table statistics (row of column vec-tors)

Examples

```
CREATE TABLE wheattest2trcv(
id_task    INTEGER
, row      INTEGER
, col      INTEGER
, val      DOUBLE);
   INSERT INTO wheattest2 VALUES(1,'A',80, 4);
INSERT INTO wheattest2trcv VALUES(1,9,1, 0);
INSERT INTO wheattest2trcv VALUES(1,9,2, 80);
INSERT INTO wheattest2trcv VALUES(1,9,3, 4);
   INSERT INTO wheattest2 VALUES(2,'A',65, 3);
INSERT INTO wheattest2trcv VALUES(1,1,1, 0);
INSERT INTO wheattest2trcv VALUES(1,1,2, 65);
INSERT INTO wheattest2trcv VALUES(1,1,3, 3);
   INSERT INTO wheattest2 VALUES(3,'A',50, 2);
INSERT INTO wheattest2trcv VALUES(1,2,1, 0);
INSERT INTO wheattest2trcv VALUES(1,2,2, 50);
INSERT INTO wheattest2trcv VALUES(1,2,3, 2);
   INSERT INTO wheattest2 VALUES(4,'B',100, 5);
INSERT INTO wheattest2trcv VALUES(1,3,1, 1);
INSERT INTO wheattest2trcv VALUES(1,3,2, 100);
INSERT INTO wheattest2trcv VALUES(1,3,3, 5);
   INSERT INTO wheattest2 VALUES(5,'B',85, 4);
INSERT INTO wheattest2trcv VALUES(1,4,1, 1);
INSERT INTO wheattest2trcv VALUES(1,4,2, 85);
INSERT INTO wheattest2trcv VALUES(1,4,3, 4);
   INSERT INTO wheattest2 VALUES(6,'B',70, 3);
INSERT INTO wheattest2trcv VALUES(1,5,1, 1);
INSERT INTO wheattest2trcv VALUES(1,5,2, 70);
INSERT INTO wheattest2trcv VALUES(1,5,3, 3);
   INSERT INTO wheattest2 VALUES(7,'C',60, 2);
INSERT INTO wheattest2trcv VALUES(1,6,1, 2);
INSERT INTO wheattest2trcv VALUES(1,6,2, 60);
INSERT INTO wheattest2trcv VALUES(1,6,3, 2);
   INSERT INTO wheattest2 VALUES(8,'C',75, 3);
INSERT INTO wheattest2trcv VALUES(1,7,1, 2);
INSERT INTO wheattest2trcv VALUES(1,7,2, 75);
INSERT INTO wheattest2trcv VALUES(1,7,3, 3);
   INSERT INTO wheattest2 VALUES(9,'C',90, 5);
INSERT INTO wheattest2trcv VALUES(1,8,1, 2);
INSERT INTO wheattest2trcv VALUES(1,8,2, 90);
INSERT INTO wheattest2trcv VALUES(1,8,3, 5);
CALL nza..MANOVA_ONE_WAY_TEST('intable=wheattest2trcv,
outtable=outtab');
select * from outtab order by id_matrix , row , col ;
CALL nza..DROP_TABLE('outtab');
CALL nza..DROP_TABLE('wheattest2trcv');
```

```
  ID_TASK | TASK_NAME | ID_MATRIX | ROW    |COL|        VAL
|                            EXPLANATION
| BONFERRONI_CORR

+---------+----------- +----------- +-----+ -----
 -------------------

+----- ---------------------------------------------------+-----------------

        1 |         1 |          1 |    1 |    1 |
75 | vector of Grand Means
|
        1 |         1 |          1 |    1 |    2 |
3.4444444444444 | vector of Grand Means
|
        1 |         1 |          2 |    1 |    1 |
1  | Factor_1_present
|
        1 |         1 |          2 |    1 |    2 |
0 | Factor 2 not present
|
        1 |         1 |          2 |    1 |    3 |
0.39512195121951 | WilksLambda
|
        1 |         1 |          2 |    1 |    4 |
0.28038050472772 | WilksLambdaPval
| 0.28038050472772
       1  |         1 |         2 |   1 |   5 |
1.44736237142 | RoysLargestRoot
|
       1  |         1 |         2 |   1 |   6 |
0.26118761661441 | RoysLargestRootPval
| 0.26118761661441
       1  |         1 |         2 |   1 |   7 |
1.4814814814815 | HotellingsTrace
|
       1  |         1 |         2 |   1 |   8 |
0.26289561423837 | HotellingsTracePval
| 0.26289561423837
       1  |         1 |         2 |   1 |   9 |
0.62439024390244 | PillaisTrace
|
       1  |         1 |         2 |   1 |  10 |
0.30419561076293 | PillaisTracePval
| 0.30419561076293
       1  |         1 |         2 |   1 |  11 |
2 | df
|
       1  |         1 |         2 |   1 |  12 |
0.034119110061522 | Min Eigenvalue
|
       1  |         1 |         2 |   1 |  13 |
3 | number of groups
|
       1  |         1 |         3 |   1 |   1 |
0.034119110061522 | vector of characteristic roots for
factor1                         |
       1  |         1 |         3 |   2 |   1 |
1.44736237142 | vector of characteristic roots for
factor1                         |
       1  |         1 |         4 |   1 |   1 |
0.44444444444444 | matrix of characteristic vectors
(provided in columns) for factor1 |
       1  |         1 |         4 |   1 |   2 |
-0.64150029909958 | matrix of characteristic vectors
(provided in columns) for factor1 |
        1 |          1 |              4|  2|  1|
30 | matrix of characteristic vectors (provided in columns) for
factor1 |
       1|          1|          4|    2|    2|
1.037037037037 | matrix of characteristic vectors (provided in
columns) for factor1 |
```

```
CREATE TABLE wheattest2(fieldId INTEGER, variety CHAR(1), yield
DOUBLE, barrels INTEGER);
INSERT INTO wheattest2 VALUES(1,'A',80, 4);
INSERT INTO wheattest2 VALUES(2,'A',65, 3);
INSERT INTO wheattest2 VALUES(3,'A',50, 2);
INSERT INTO wheattest2 VALUES(4,'B',100, 5);
INSERT INTO wheattest2 VALUES(5,'B',85, 4);
INSERT INTO wheattest2 VALUES(6,'B',70, 3);
INSERT INTO wheattest2 VALUES(7,'C',60, 2);
INSERT INTO wheattest2 VALUES(8,'C',75, 3);
INSERT INTO wheattest2 VALUES(9,'C',90, 5);
CALL nza..MANOVA_ONE_WAY_TEST('intable=wheattest2,id=fieldId,
incolumn= yield; barrels, factor1=variety, outtable=outtab,
type=columns');
SELECT * FROM outtab  order by id_task, id_matrix, row , col;
CALL nza..DROP_TABLE('outtab');
CALL nza..DROP_TABLE('wheattest2');
```

```
  ID_TASK| ID_MATRIX | ROW | COL |        VAL        |
EXPLANATION                                 | BONFERRONI CORR  |
TASK_NAME | VARIABLE_NAME
          +----------  +-----+-----+------------------
------+----------------      +-----------  +---------------
       1|         1 |   1 |    1 |              75 | vector
of Grand Means                                              |
            | "YIELD"
       1 |         1 |   1 |    2 |   3.4444444444444 | vector
 of Grand Means                                             |
            | "BARRELS"
       1 |         2 |   1 |   1 |                1 |
Factor_1_present - "VARIETY"
|                   |          |
      1  |        2  |  1  |   2 |                0  |
Factor_2_not_present
|                  |           |
      1  |        2  |  1  |   3 |  0.39512195121951  |
WilksLambda
|                  |           |
      1  |        2  |  1  |   4 |  0.28038050472772  |
WilksLambdaPval
| 0.28038050472772 |           |
      1  |        2  |  1  |   5 |     1.44736237142  |
RoysLargestRoot
|                  |           |
      1  |        2  |  1  |   6 |  0.26118761661441  |
RoysLargestRootPval
| 0.26118761661441 |           |
      1  |        2  |  1  |   7 |   1.4814814814815  |
HotellingsTrace
|                  |           |
      1  |        2  |  1  |   8 |  0.26289561423837  |
HotellingsTracePval
| 0.26289561423837 |           |
      1  |        2  |  1  |   9 |  0.62439024390244  |
PillaisTrace
|                  |           |
      1  |        2  |  1  |  10 |  0.30419561076293  |
PillaisTracePval
| 0.30419561076293 |           |
       1 |        2 |      1| 11|                2  | df
|                  |           |
      1  |        2  |  1  |  12 | 0.034119110061522  |
Min Eigenvalue
|                  |           |
      1  |        2  |  1  |  13 |                3  |
number of groups
|                  |           |
      1  |        3  |  1  |   1 | 0.034119110061522  |
vector of characteristic roots  for  factor1
|                  |           |
      1  |        3  |  2  |   1 |     1.44736237142  |
vector of characteristic roots  for  factor1
|                  |           |
       1 |         4 |   1 |   1 |  0.44444444444444 | matrix
of characteristic vectors (provided in columns) for factor1 |
            | "YIELD"

       1 | 4 | 1 | 2 | -0.64150029909958 | matrix of
characteristic vectors (provided in columns) for factor1 |
            | "YIELD"

       1 | 4 | 2 | 1 | 30 | matrix of characteristic vectors
(provided in columns) for factor1 |
            | "BARRELS"

       1 | 4 | 2 | 2 | 1.037037037037 | matrix of
characteristic vectors (provided in columns) for factor1 |
            | "BARRELS"
```

```
CREATE TABLE wheatbytest(fieldId INTEGER, variety CHAR(1), yield
DOUBLE, barrels INTEGER, experiment INT4);
INSERT INTO wheatbytest VALUES(1,'A',65,3,1);
   suspect: INSERT INTO wheatbytest VALUES(2,'A',66,4,1);
INSERT INTO wheatbytest VALUES(2,'A',65,100,1);
INSERT INTO wheatbytest VALUES(3,'A',64,2,1);
INSERT INTO wheatbytest VALUES(4,'B',84,3,1);
INSERT INTO wheatbytest VALUES(5,'B',85,4,1);
INSERT INTO wheatbytest VALUES(6,'B',86,5,1);
INSERT INTO wheatbytest VALUES(7,'C',75,3,1);
INSERT INTO wheatbytest VALUES(8,'C',76,4,1);
INSERT INTO wheatbytest VALUES(9,'C',74,2,1);
INSERT INTO wheatbytest VALUES(11,'A',80,1000,2);
INSERT INTO wheatbytest VALUES(12,'A',65,3,2);
INSERT INTO wheatbytest VALUES(13,'A',50,2,2);
INSERT INTO wheatbytest VALUES(14,'B',100,5,2);
INSERT INTO wheatbytest VALUES(15,'B',85,4,2);
INSERT INTO wheatbytest VALUES(16,'B',70,3,2);
INSERT INTO wheatbytest VALUES(17,'C',60,2,2);
INSERT INTO wheatbytest VALUES(18,'C',75,3,2);
INSERT INTO wheatbytest VALUES(19,'C',90,5,2);
```

```
CALL nza..MANOVA_ONE_WAY_TEST('intable=wheatbytest,
id=fieldid, incolumn=yield;barrels,
factor1=variety, by=experiment,
outtable=outbytab,type=columns'); select * from
outbytab order by id_task, id_matrix , row , col ;
CALL nza..DROP_TABLE('outbytab');

CALL nza..DROP_TABLE('wheatbytest');
```

```
 ID_TASK | ID_MATRIX | ROW | COL |          VAL          |
EXPLANATION                                   |
BONFERRONI_CORR   | TASK_NAME | VARIABLE_NAME

          +-----------+----- +-----+--------------------

          +---------------------            +-----------
+
       1 |          1|    1 |    1|      74.888888888889|
vector of Grand Means
|                     |         1 | "YIELD"
       1 |          1|    1 |    2|                   14 |
vector of Grand Means
|                     |         1 | "BARRELS"
       1 |          2|    1 |    1|                    1 |
Factor_1_present - "VARIETY"
|                     |         1 |
       1 |          2|    1 |    2|                    0 |
Factor_2_not_present
|                     |         1 |
       1 |          2|    1 |    3|   0.0064612213792179|
WilksLambda
|                     |         1 |
       1 |          2|    1 |    4|  1.878566343938e-05 |
WilksLambdaPval
| 3.7570973977608e-05 |         1 |
       1 |          2|    1 |    5|       142.0904611388|
RoysLargestRoot
|                     |         1 |
       1 |          2|    1 |    6| 0.00058423016276909 |
RoysLargestRootPval
|  0.0011681190006551 |         1 |
       1 |          2|    1 |    7|      142.17208110438|
HotellingsTrace
|                     |         1 |
       1 |           2 |  1  |  8  | 1.4859080665119e-05 |
HotellingsTracePval
| 2.9717940537966e-05 |          1 |
       1 |           2 |  1  |  9  |      1.068472267282 |
PillaisTrace
|                      |          1 |
       1 |           2 |  1  | 10  |   0.042934242499617 |
PillaisTracePval
|   0.084025135820219 |          1 |
       1 |           2 |  1| 11|                       2 | df
|                      |          1 |
       1 |           2 |  1  | 12  |   0.081619965579003| Min
Eigenvalue
|                      |          1 |
       1 |           2 |  1  | 13  |                   3| number
of groups                                                      |
|          1 |
       1 |           3 |  1  |  1  |   0.081619965579003| vector
of characteristic roots for factor1                            |
|          1 |
       1 |           3 |  2  |  1  |      142.0904611388| vector
of characteristic roots for factor1                            |
|          1 |
       1 |           4 |  1  |  1  |     132.90476190476| matrix
of characteristic vectors (provided in columns) for factor1 |
          1 | "YIELD"
       1 | 4 | 1 | 2 | -34.929549570148 | matrix of
characteristic vectors (provided in columns) for factor1 |
          1 | "YIELD"
       1 | 4 | 2 | 1 | -951 | matrix of characteristic vectors
(provided in columns) for factor1 |
          1 | "BARRELS"
       1 | 4 | 2 | 2 | 9.2673191996181 | matrix of
characteristic vectors (provided in columns) for factor1 |
          1 | "BARRELS"
        2 |          1 |      1|  1|                 75 | vector
 of Grand Means                                                |
          2 | "YIELD"
        2 |          1 |      1|  2|    114.11111111111 | vector
 of Grand Means                                                |
          2 | "BARRELS"
        2 |         2 |    1 |   1 |                   1 |
Factor_1_present - "VARIETY"
|                      |          2 |
       2 |          2 |  1 |    2 |                 0|
Factor_2_not_present
|                      |        2  |
       2 |          2 |  1 |    3 |  0.39466805085924|
WilksLambda
|                      |        2  |
       2 |          2 |  1 |    4 |  0.27975267472799|
WilksLambdaPval
|     0.48124379043852 |        2  |
       2 |          2 |  1 |    5 |   1.4501142776685|
RoysLargestRoot
|                      |        2  |
       2 |          2 |  1 |    6 |  0.26074770123253|
RoysLargestRootPval
|     0.45350603876701 |        2  |
       2 |          2 |  1 |    7 |   1.4842598766347|
HotellingsTrace
|                      |        2  |
       2 |          2 |  1 |    8 |  0.26228606026505|
HotellingsTracePval
|     0.45577814312074 |        2  |
       2 |          2 |  1 |    9 |  0.62487394580152|
PillaisTrace
|                      |        2  |
       2 |          2 |  1 |   10 |  0.30370770512967|
PillaisTracePval
|     0.51517704010421 |        2  |
       2 |          2 |  1 |   11 |                 2|
df
|                      |        2  |
       2 |          2 |  1 |   12 | 0.034145598966242|
Min Eigenvalue
|                      |        2  |
       2 |          2 |  1 |   13 |                 3|
number of groups
|                      |        2  |
       2 |          3 |  1 |    1 | 0.034145598966242|
vector of characteristic roots for factor1
|                      |        2  |
       2 |          3 |  2 |    1 |   1.4501142776685|
vector of characteristic roots for factor1
|                      |        2  |
        2 |         4 |       1|  1|   0.444444444444444 | matrix
of characteristic vectors (provided in columns) for factor1 |
          2 | "YIELD"

       2 | 4 | 1 | 2 | -0.64235906742576 | matrix of
characteristic vectors (provided in columns) for factor1 |
          2 | "YIELD"

       2 | 4 | 2 | 1 | -9930 | matrix of characteristic vectors
(provided in columns) for factor1 |
          2 | "BARRELS"

       2 | 4 | 2 | 2 | 1.0398154321903 | matrix of
characteristic vectors (provided in columns) for factor1 |
          2 | "BARRELS"

(42 rows)
```

```
   CREATE TABLE wheatbytest(fieldId INTEGER, variety CHAR(1),
yield DOUBLE, barrels INTEGER, experiment INT4);
CREATE TABLE wheatbytesttrcv(
id_task    INTEGER
, row      INTEGER
, col      INTEGER
, val      DOUBLE);
   INSERT INTO wheatbytest VALUES(1,'A',65,3,1);
INSERT INTO wheatbytesttrcv VALUES(1,1,1, 0);
INSERT INTO wheatbytesttrcv VALUES(1,1,2, 1000);
INSERT INTO wheatbytesttrcv VALUES(1,1,3, 3);
   INSERT INTO wheatbytest VALUES(2,'A',66,4,1);
INSERT INTO wheatbytesttrcv VALUES(1,2,1, 0); --
suspectINSERT INTO wheatbytesttrcv VALUES(1,2,2, 66);
--suspectINSERT INTO wheatbytesttrcv VALUES(1,2,3, 4);
INSERT INTO wheatbytesttrcv VALUES(1,2,2, 65);
INSERT INTO wheatbytesttrcv VALUES(1,2,3, 3);
   INSERT INTO wheatbytest VALUES(3,'A',64,2,1);
INSERT INTO wheatbytesttrcv VALUES(1,3,1, 0);
INSERT INTO wheatbytesttrcv VALUES(1,3,2, 64);
INSERT INTO wheatbytesttrcv VALUES(1,3,3, 2);
   INSERT INTO  wheatbytest VALUES(4,'B',84,3,1);
INSERT INTO wheatbytesttrcv VALUES(1,4,1, 1);
INSERT INTO wheatbytesttrcv VALUES(1,4,2, 84);
INSERT INTO wheatbytesttrcv VALUES(1,4,3, 3);
   INSERT INTO wheatbytest VALUES(5,'B',85,4,1);
INSERT INTO wheatbytesttrcv VALUES(1,5,1, 1);
INSERT INTO wheatbytesttrcv VALUES(1,5,2, 85);
INSERT INTO wheatbytesttrcv VALUES(1,5,3, 4);
   INSERT INTO wheatbytest VALUES(6,'B',86,5,1);
INSERT INTO wheatbytesttrcv VALUES(1,6,1, 1);
INSERT INTO wheatbytesttrcv VALUES(1,6,2, 86);
INSERT INTO wheatbytesttrcv VALUES(1,6,3, 5);
   INSERT INTO wheatbytest VALUES(7,'C',75,3,1);
INSERT INTO wheatbytesttrcv VALUES(1,7,1, 2);
INSERT INTO wheatbytesttrcv VALUES(1,7,2, 75);
INSERT INTO wheatbytesttrcv VALUES(1,7,3, 3);
   INSERT INTO wheatbytest VALUES(8,'C',76,4,1);
INSERT INTO wheatbytesttrcv VALUES(1,8,1, 2);
INSERT INTO wheatbytesttrcv VALUES(1,8,2, 76);
INSERT INTO wheatbytesttrcv VALUES(1,8,3, 4);
   INSERT INTO wheatbytest VALUES(9,'C',74,2,1);
INSERT INTO wheatbytesttrcv VALUES(1,9,1, 2);
INSERT INTO wheatbytesttrcv VALUES(1,9,2, 74);
INSERT INTO wheatbytesttrcv VALUES(1,9,3, 2);
   INSERT INTO wheatbytest VALUES(11,'A',80, 4,2);
INSERT INTO wheatbytesttrcv VALUES(2,9,1, 0); INSERT
INTO wheatbytesttrcv VALUES(2,9,2, 80); INSERT INTO
wheatbytesttrcv VALUES(2,9,3, 4);
   INSERT INTO wheatbytest VALUES(12,'A',65, 3,2);
INSERT INTO wheatbytesttrcv VALUES(2,1,1, 0); INSERT
INTO wheatbytesttrcv VALUES(2,1,2, 65); INSERT INTO
wheatbytesttrcv VALUES(2,1,3, 3);
```

```
--INSERT INTO  wheatbytest VALUES(13,'A',50,2,2);
INSERT INTO wheatbytesttrcv VALUES(2,2,1, 0);
INSERT INTO wheatbytesttrcv VALUES(2,2,2, 1000);
INSERT INTO wheatbytesttrcv VALUES(2,2,3, 2);
--INSERT INTO  wheatbytest VALUES(14,'B',100,5,2);
INSERT INTO wheatbytesttrcv VALUES(2,3,1, 1);
INSERT INTO wheatbytesttrcv VALUES(2,3,2, 100);
INSERT INTO wheatbytesttrcv VALUES(2,3,3, 5);
--INSERT INTO  wheatbytest VALUES(15,'B',85,4,2);
INSERT INTO wheatbytesttrcv VALUES(2,4,1, 1);
INSERT INTO wheatbytesttrcv VALUES(2,4,2, 85);
INSERT INTO wheatbytesttrcv VALUES(2,4,3, 4);
--INSERT INTO  wheatbytest VALUES(16,'B',70,3,2);
INSERT INTO wheatbytesttrcv VALUES(2,5,1, 1);
INSERT INTO wheatbytesttrcv VALUES(2,5,2, 70);
INSERT INTO wheatbytesttrcv VALUES(2,5,3, 3);
--INSERT INTO  wheatbytest VALUES(17,'C',60,2,2);
INSERT INTO wheatbytesttrcv VALUES(2,6,1, 2);
INSERT INTO wheatbytesttrcv VALUES(2,6,2, 60);
INSERT INTO wheatbytesttrcv VALUES(2,6,3, 2);
--INSERT INTO  wheatbytest VALUES(18,'C',75,3,2);
INSERT INTO wheatbytesttrcv VALUES(2,7,1, 2);
INSERT INTO wheatbytesttrcv VALUES(2,7,2, 75);
INSERT INTO wheatbytesttrcv VALUES(2,7,3, 3);
   INSERT INTO wheatbytest VALUES(19,'C',90,5,2);
INSERT INTO wheatbytesttrcv VALUES(2,8,1, 2);
INSERT INTO wheatbytesttrcv VALUES(2,8,2, 90);
INSERT INTO wheatbytesttrcv VALUES(2,8,3, 5);
CALL nza..MANOVA_ONE_WAY_TEST('intable=wheatbytesttrcv,
outtable=outbytab_trcv,type=trcv');
select * from outbytab_trcv order by id_task , id_matrix , row ,
col ;
CALL nza..DROP_TABLE('outbytab_trcv');

CALL nza..DROP_TABLE('wheatbytesttrcv');
```

```
  ID_TASK | TASK_NAME | ID_MATRIX | ROW | COL |         VAL
|                           EXPLANATION
| BONFERRONI_CORR

+---------+----------- +-----------+-----+ -----
 --------------------

         +------------------

        1|          1|          1|    1|    1 |
178.77777777778 | vector of Grand Means
|
        1|          1|          1|    1|    2 |
3.2222222222222 | vector of Grand Means
|
        1|          1|          2|    1|    1 |
1  | Factor 1 present
|
        1|          1|          2|    1|    2 |
0 | Factor_2_not_present
|
        1|          1|          2|    1|    3 |
0.45931933970544 | WilksLambda
|
        1|          1|          2|    1|    4 |
0.3733800101217 | WilksLambdaPval
| 0.60734738828492
        1|          1|          2|    1|    5 |
0.96040503530125 | RoysLargestRoot
|
        1|          1|          2|    1|    6 |
0.36431855104074 | RoysLargestRootPval
| 0.59590909544905
        1|          1|          2|    1|    7 |
1.0709584679764 | HotellingsTrace
|
        1|          1|          2|    1|    8 |
0.3784638014586 | HotellingsTracePval
| 0.61369275390271
        1|          1|          2|    1|    9 |
0.58944938422624 | PillaisTrace
|
        1|          1|          2|    1|   10 |
0.34070050877455 | PillaisTracePval
```

```
| 0.56532418086986
       1  |          1  |          2  |   1  |  11  |
2  | df
|
       1  |          1  |          2  |   1  |  12  |
0.11055343267515 | Min Eigenvalue
|
       1  |          1  |          2  |   1  |  13  |
3  | number of groups
|
       1  |          1  |          3  |   1  |   1  |
0.11055343267515 | vector of characteristic roots for factor1
|
      1|          1|          3|    2|    1|
0.96040503530125 | vector of characteristic roots for factor1
|
      1|          1|          4|    1|    1|
0.30127430916995 | matrix of characteristic vectors (provided
in columns) for factor1 |
       1  |          1  |          4  |   1  |   2 |
 -0.35455604608075 | matrix of characteristic vectors (provided
 in columns) for factor1 |
       1  |          1  |          4  |   2  |   1 |
-478.88888888889 | matrix of characteristic vectors (provided
in columns) for factor1 |
      1|          1|          4|    2|    2|
0.76968415880645 | matrix of characteristic vectors (provided
in columns) for factor1 |
       2  |          2  |          1  |   1  |   1 |
180.55555555556 | vector of Grand Means
|
       2  |          2  |          1  |   1  |   2 |
3.4444444444444 | vector of Grand Means
|
       2  |          2  |          2  |   1  |   1 |
1  | Factor_1_present
|
       2  |          2  |          2  |   1  |   2 |
0  | Factor_2_not_present
|
       2  |          2  |          2  |   1  |   3 |
0.68746202700252 | WilksLambda
|
      2  |         2 |         2 |   1 |   4 |
0.72662382122884 | WilksLambdaPval
| 0.92526546488048
      2  |         2 |         2 |   1 |   5 |
0.33309697063248 | RoysLargestRoot
|
      2  |         2 |         2 |   1 |   6 |
0.64969180345486 | RoysLargestRootPval
| 0.87728416743329
      2  |         2 |         2 |   1 |   7 |
0.4242597521801 | HotellingsTrace
|
      2  |         2 |         2 |   1 |   8 |
0.72653876921139 | HotellingsTracePval
| 0.92521895525558
      2  |         2 |         2 |   1 |   9 |
0.33341347678564 | PillaisTrace
|
      2  |         2 |         2 |   1 |  10 |
0.66968322586599 | PillaisTracePval
   0.8908908287257
       2 |         2 |        2  |    1 |  11 |
2  | df
|
       2 |         2 |        2  |    1 |  12 |
 0.091162781547621 | Min Eigenvalue
|
       2 |         2 |        2  |    1 |  13 |
3  | number of groups
|
       2 |         2 |        3  |    1 |   1 |
0.091162781547621 | vector of characteristic roots for
factor1                              |
       2 |         2 |        3  |    2 |   1 |
0.33309697063248 | vector of characteristic roots for
 factor1                             |
       2 |         2 |         4 |     1|   1|
0.31705878371191 | matrix of characteristic vectors
(provided in columns) for factor1 |
      2 |         2 |          4 |      1|   2|
-0.060191048398572 | matrix of characteristic vectors
(provided in columns) for factor1 |
        2 |          2 |              4|  2|   1|
-392.22222222222 | matrix of characteristic vectors (provided
in columns) for factor1 |
       2|         2|          4|    2|    2|
0.10720096846819 | matrix of characteristic vectors (provided
in columns) for factor1 |

(42 rows)
```

Related Functions

category Analytics - Statistics
MANOVA_Two_WAY_TEST
ANOVA_CRD_TEST

MANOVA_Two_WAY_TEST - Multivariate Analyzsis of Variance in Two way set-ting

This stored procedure performs a completely randomized design MANOVA

Usage

The MANOVA_Two_WAY_TEST stored procedure has the following syntax:

MANOVA_Two_WAY_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table name

Type: NVARCHAR(ANY)

outtable
the output table name

Type: NVARCHAR(ANY)

factor1
the input table column identifying a first factor (so-called treatment in RBD/CRD nomenclature) used for type='column' only for type='trcv' these are the values for col-column equal 1

Type: NVARCHAR(ANY)

factor2
the input table column identifying a second factor (so-called block in RBD nomenclature)

Type: NVARCHAR(ANY) used for type='column' only for type='trcv' these are the values for col-column equal 2

incolumn
the input table observation columns (dependent variables), separated by a semi-colon (;). used for type='column' only for type='trcv' these are the values for col-column greater equal 3

Type: NVARCHAR(ANY)

type
the input table form: either 'columns' or 'trcv' trcv stands for "id_task, row, column, value" id_task must be positive integer >= 1. columns means the traditional table rep-resentation

Type: NVARCHAR(ANY)

Default: 'trcv'

id
the input table column which uniquely identifies records used for type='column' only for type='trcv' not needed due to the structure of the table

Type: NVARCHAR(ANY)

by
the input table column which splits the input table into subtables, on each of them a separate MANOVA is run If not specified, the whole input table is subject of a single MANOVA run. used for type='column' only for type='trcv' it is by default the column named id_task

Type: NVARCHAR(ANY)

Default: <none>

_timecheck
the output will be enriched with execution time of critical sections if set to yes If not specified, the whole input table is subject of a single MANOVA run. used for type='column' only for type='trcv' it is by default the column named id_task

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(2000) A string confirming execution of the process or indicating a failure. The real output is contained in the output table

Details

This stored procedure performs Two-way analysis of variance/covariance aiming to tell whether or not the groups of data identified by factor1 have the same mean value in all dependent variables or not.

Examples

```
CREATE TABLE wheattest2(fieldId INTEGER, variety

CHAR(1), yield DOUBLE, barrels INTEGER);
```

```
INSERT INTO wheattest2 VALUES(1,'A',80, 4);
INSERT INTO wheattest2 VALUES(2,'A',65, 3);
INSERT INTO wheattest2 VALUES(3,'A',50, 2);
INSERT INTO wheattest2 VALUES(4,'B',100, 5);
INSERT INTO wheattest2 VALUES(5,'B',85, 4);
INSERT INTO wheattest2 VALUES(6,'B',70, 3);
INSERT INTO wheattest2 VALUES(7,'C',60, 2);
INSERT INTO wheattest2 VALUES(8,'C',75, 3);
INSERT INTO wheattest2 VALUES(9,'C',90, 5);
CALL nza..MANOVA_Two_WAY_TEST('intable=wheattest2,id=fieldId,
incolumn= yield, factor2=barrels, factor1=variety,
outtable=outtab, type=columns');
SELECT * FROM outtab order by id_task,col;
CALL nza..DROP_TABLE('outtab'); CALL
nza..DROP_TABLE('wheattest2');
```

```
CREATE TABLE
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
    MANOVA_Two_WAY_TEST
---------------------------
(0 row)

 DROP_TABLE
------------
 t
(1 row)
```

```
 DROP_TABLE
------------
 t
(1 row)
```

```
CREATE TABLE wheatbytest(fieldId INTEGER, variety
CHAR(1), yield DOUBLE, barrels INTEGER, experiment
INT4); INSERT INTO wheatbytest VALUES(1,'A',65,3,1);
   suspect: INSERT INTO wheatbytest
VALUES(2,'A',66,4,1);
INSERT INTO wheatbytest VALUES(2,'A',65,3,1); INSERT
INTO wheatbytest VALUES(3,'A',64,2,1); INSERT INTO
wheatbytest VALUES(4,'B',84,3,1); INSERT INTO
wheatbytest VALUES(5,'B',85,4,1); INSERT INTO
wheatbytest VALUES(6,'B',86,5,1); INSERT INTO
wheatbytest VALUES(7,'C',75,3,1); INSERT INTO
wheatbytest VALUES(8,'C',76,4,1); INSERT INTO
wheatbytest VALUES(9,'C',74,2,1); INSERT INTO
wheatbytest VALUES(11,'A',80,4,2); INSERT INTO
wheatbytest VALUES(12,'A',65,3,2); INSERT INTO
wheatbytest VALUES(13,'A',50,2,2); INSERT INTO
wheatbytest VALUES(14,'B',100,5,2); INSERT INTO
wheatbytest VALUES(15,'B',85,4,2); INSERT INTO
wheatbytest VALUES(16,'B',70,3,2); INSERT INTO
wheatbytest VALUES(17,'C',60,2,2); INSERT INTO
wheatbytest VALUES(18,'C',75,3,2); INSERT INTO
wheatbytest VALUES(19,'C',90,5,2); CALL
nza..MANOVA_Two_WAY_TEST('intable=wheatbytest,
id=fieldid, incolumn=yield, factor2=barrels,
factor1=variety, by=experiment,
outtable=outbytab,type=columns');
SELECT * FROM outbytab  order by id_task,col,task_name;
```

```
CALL nza..DROP_TABLE('outbytab');
CALL nza..DROP_TABLE('wheatbytest');
CREATE TABLE
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
INSERT 0 1
    MANOVA_Two_WAY_TEST
---------------------------
(0 row)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
```

```
 t
(1 row)
```

Related Functions

category Analytics - Statistics
MANOVA_ONE_WAY_TEST
PRINT_MANOVA_Two_WAY_TEST
ANOVA_CRD_TEST

MEDIAN - Median value for a numeric attribute

This stored procedure calculates the median value of a numeric column

Usage

The MEDIAN stored procedure has the following syntax:

MEDIAN(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

incolumn
the input table column

Type: NVARCHAR(128)

Returns
REAL the median value

Details

This stored procedure calculates the median value of a numeric column using Torben Mogensen's algorithm. The median value is the value separating the input values in two sets (lower and higher values) of equal size.

Examples

```
CALL nza..MEDIAN('intable=nza..quant_iris,

incolumn=sepal_length');
```

```
 MEDIAN
--------
    5.8
(1 row)
```

Related Functions

category Analytics - Quantiles & Outliers
MEDIAN_DISC

MEDIAN_DISC - Median value for a discrete attribute

This stored procedure calculates the median value of a discrete column (when applicable)

Usage

The MEDIAN_DISC stored procedure has the following syntax:

MEDIAN_DISC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

incolumn
the input table column

Type: NVARCHAR(128)

Returns
NVARCHAR the median value

Details

This stored procedure calculates the median value of a discrete column. The median value is the value sep-arating the input values in two sets (lower and higher values) of equal size.

Examples

```
CALL nza..MEDIAN_DISC('intable=nza..censusincome,
incolumn=marital_status');
  MEDIAN_DISC
---------------
```

```
 Never married
(1 row)
```

Related Functions

category Analytics - Quantiles & Outliers
MEDIAN

METADATA_ANALYZE - Check and Repair Metadata Repository

This procedure can check the consistency of the metadata repository and repair some of the de-tected inconsistencies. It should also be used to ensure consistency of the metadata tables before a database backup and after a database restore.

Usage

The METADATA_ANALYZE stored procedure has the following syntax:

METADATA_ANALYZE(NVARCHAR(ANY))

Parameters

paramString
a comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

mode
The operation mode of the procedure. Supported modes are: check, repair, delete, undo, backup, restore.

Type: VARCHAR(ANY)

model
The name of a model to be checked/repaired. The procedure checks/repairs only the metadata of this one model. If the parameter is not specified, all models are checked/repaired. This parameter is allowed only if the mode is check or repair.
Type: NVARCHAR(ANY)

verbose
If this is true (the default), a detailed result report is printed. If it is set to false, only a summary is printed.

Type: BOOLEAN

Returns
INTEGER The number of unresolved problems (the number of problems found minus the number of problems that could be fixed).

Details

Check mode: The structure of the metadata tables and views are checked, and the contents of the tables is analyzed to find any illegal or inconsistent values. All problems are reported. If a problem can be repaired, this is printed. If a model is too corrupt and should be deleted, this is printed also.

Repair mode: The same checks are done like in "check mode", but any problems that can be repaired are re-paired immediately.

Delete mode: The models are deleted that are reported as too corrupt in "check mode".

Undo mode: All changes done in "repair mode" are undone. This works only if no other changes on the metadata tables have been performed since the last "repair mode" operation. Models that have been de-leted in "delete mode" cannot be recovered!

Backup mode and Restore mode: After database backup and restore of an INZA-enabled database some of the metadata can be wrong. This procedure can fix the wrong values when you call it in "restore mode" after the database restore operation. However, to be able to always fix all wrong values, the procedure should also be called before a database backup in "backup mode". In this mode only those inconsistencies are checked and repaired that are later needed in "repair mode" to repair the metadata after database re-store.

Examples

```
call nza..metadata_analyze();

NOTICE:
****************************************************************
*****************

NOTICE:  Metadata Repository Diagnostics and Repair

NOTICE:  INZA-Version: 3.0.0.27267

NOTICE:  Metadata-Version: 1.0

NOTICE:  System Case: Uppercase

NOTICE:  Operation Mode: check

NOTICE:  Execution Time: 2013-03-07 08:43:43

NOTICE:  Session User: ADMIN

NOTICE:
****************************************************************
*****************

NOTICE:

NOTICE: Checking metadata database objects

NOTICE: Checking analytic models NOTICE:


NOTICE:
****************************************************************
```

```
******************
NOTICE:  Summary
NOTICE:  Metadata Repository Structure: OK
NOTICE:  Number of checked models: 3
NOTICE:  Number of errors: 0
NOTICE:  Number of errors that were fixed: 0
NOTICE:
*******************************************************
**********************
NOTICE:
 METADATA_ANALYZE
------------------
                0
(1 row)
```

Related Functions

category Analytics - Model Management

MIGRATE_MODEL - Migrate an analytics model

This stored procedure migrate an older version of an analytics model to the latest version

Usage

The MIGRATE_MODEL stored procedure has the following syntax:

MIGRATE_MODEL(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to be migrated

Type: NVARCHAR(64)

Returns
TEXT A string indicating the model version before and after the migration separated by string ' => '

Details

This stored procedure migrates a given analytics model from an older version to the latest version supported. The version is available in column COMPONENTFORMAT of the view V_NZA_MODELS. The call is forwarded to a model-type specific migrate procedure of the form MIGRATE_<procedure-name>, where <procedure-name> is the name of the model building procedure. If there is no migrate procedure for the model type, an exception is raised. If the model has already the latest format, an exception is raised.

Related Functions

category Analytics - Model Management
LIST_MODELS

MODEL_EXISTS - Check if an analytics model exists

This stored procedure checks if the given model exists. The model can be searched in the current or in an-other given database.

Usage

The MODEL_EXISTS stored procedure has the following syntax:

MODEL_EXISTS(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to check. It can be qualified by a database name (<database>..<model>) if not in the current database.

Type: NVARCHAR(194)

verbose
flag indicating to raise an exception if the model does not exist (inverse=false) or exists (inverse=true)

Type: BOOLEAN

Default: false

inverse
flag indicating to invert the exception logic in the parameter

verbose. Type: BOOLEAN

Default: false

Returns
BOOLEAN true if the model exists, false if the model does not exists and verbose=false (otherwise an exception is raised)

Details

This stored procedure checks if the given model exists. No privileges are required. Even if the pro-cedure returns true for a model, the user needs the LIST privilege to further list properties of this model.

Examples

```
CALL nza..MODEL_EXISTS('model=nomodel,
verbose=false, inverse=false');
CALL nza..MODEL_EXISTS('model=nomodel,
verbose=true, inverse=false');
CALL nza..MODEL_EXISTS('model=nomodel,

verbose=true, inverse=true');
```

```
 MODEL_EXISTS
--------------
 f
(1 row)

 ERROR:  A model with name "NOMODEL" cannot be found.

 MODEL_EXISTS
--------------
 f
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS

MOMENTS - Moments of a column

This stored procedure calculates the moments of a numeric input column: mean, variance, stand-ard deviation, skewness and (excess) kurtosis as well as the count of cases, the minimum and the maximum.

Usage

The MOMENTS stored procedure has the following syntax:

MOMENTS(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the moments

into Type: NVARCHAR(256)

incolumn
the numeric input table

column Type: NVARCHAR(128)

by
the input table column which splits the data into groups for which the operation is to be per-formed

Type: NVARCHAR(128)

Default: <none>

Returns
INT8 the number of rows in the output table

Details

This stored procedure calculates the moments of a single numeric input column, i.e. its descriptive statistics, either in the whole input table or within the groups defined in the column specified by parameter <by>. A k-th order central moment is the sum of the k-th powers of differences between the mean and the actual value divided by the number of cases.

the mean (or average) is computed as the sum of values in the column divided by the number of cases,

the variance is called the second central moment and is obtained as the sum of squares of the difference between the estimated mean and the actual value, divided by the number of cases reduced by 1 (to estim-ate population),

the standard deviation is the square root of variance,

the skewness is the third central moment divided by the cube of standard deviation,

the (excess) Kurtosis is the forth central moment divided by the forth power of standard deviation minus 3 (so that kurtosis of normal distribution is zero).

Note that computing some of the moments may not make sense (in that case NULL is returned), e.g. mean for less than 1 cases, variance for less than 2 cases etc. If a value is missing, the complete row is ignored.

The output table is created with following columns: columnname, countt, average, variance, stddev, skewness, kurtosis, minimum, maximum. If the parameter by is specified, an additional column <by> is added to indicate for which group the moments have been calculated.

Examples

```
CALL nza..MOMENTS('intable=nza..iris,
incolumn=petallength, outtable=iris_mo_15');
SELECT * FROM iris_mo_15;
CALL nza..DROP_TABLE('iris_mo_15');
```

```
 MOMENTS
---------
       1
(1 row)
 COLUMNNAME  | COUNTT |     AVERAGE      |     VARIANCE
|     STDDEV      |      SKEWNESS       |      KURTOSIS
| MINIMUM | MAXIMUM
-------------+--------+-----------------
+-----------------+-----------------+------------------
+-----------------+---------+---------
PETALLENGTH |                            150 | 3.7586666666667 |
                                                 3.1131794183445
| 1.7644204199523 | -0.27080472910746 | -1.4060569067921
 |       1 |     6.9
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

```
CALL   nza..MOMENTS('intable=nza..adult,
incolumn=hours_per_week,   by=education,
outtable=adult_mo_13');
SELECT *FROM adult_mo_13 ORDER BY EDUCATION;
CALL nza..DROP_TABLE('adult_mo_13');
```

```
 MOMENTS
---------
      16
```

```
(1 row)
   COLUMNNAME    | COUNTT |   AVERAGE |     VARIANCE      |
STDDEV      |       SKEWNESS         |     KURTOSIS      | MINIMUM
| MAXIMUM |   EDUCATION
+---------------- +-------- +----------- +---------------- +------------------
  ----------------  +----------------------
+--------- +---------+--------------
 HOURS_PER_WEEK |      933 | 37.052519| 190.11204568768 |
13.788112477337 |     0.41947853887823 |  2.8194664494733 |
1 |       99 | 10th
 HOURS_PER_WEEK |     1175 | 33.925957| 195.03284352459 |
13.96541598108 |     0.13243191005983| 0.56796404718583 |
2 |       99 | 11th
 HOURS_PER_WEEK |      433 | 35.780600| 159.42628945343 |
12.626412374599 |      0.4030517521683 |  3.0001006846437 |
6 |       99 | 12th
 HOURS_PER_WEEK |      168 | 38.255952| 165.08978471628 |
12.848726968703 |     0.70491994474217 |  3.5673978626614 |
4 |       96  | 1st-4th
 HOURS_PER_WEEK |      333 | 38.897898| 111.33894135099 |
10.551726936904 |   -0.049526193734453 |  3.3875831061533 |
3 |       84  | 5th-6th
 HOURS_PER_WEEK |      646 | 39.366873| 201.69310245518 |
14.201869681672 |     0.73753513008848 |  3.8823103687329 |
2 |       99  | 7th-8th
 HOURS_PER_WEEK |      514 | 38.044747| 122.42099574487 |
11.064402186511 |    -0.13878017384913 |  3.5898830831323 |
1 |       99 | 9th
 HOURS_PER_WEEK |     1067 | 40.504217| 148.75865949489 |
12.196665917163 |    0.088267985649645 |  3.4615444339783 |
1 |       99 | Assoc-acdm
 HOURS_PER_WEEK |     1382 | 41.610709| 116.49714808477 |
10.793384459231 |     0.56242110270445 |  5.4862366279001 |
1 |       99 | Assoc-voc
 HOURS_PER_WEEK |     5355 | 42.614006| 131.01515681357 |
11.446185251583 |  0.00025610207183873 |  3.0060669086706 |
2 |       99 | Bachelors
 HOURS_PER_WEEK |      413 | 46.973366| 227.54055102377 |
15.08444732245 |     0.34961574790415|   2.2253595730787 |
1 |       99 | Doctorate
 HOURS_PER_WEEK |    10501 | 40.575374| 128.45405634837 |
11.333757379985 |      0.4752525126438 |  4.2257126981542 |
1 |       99 | HS-grad
```

```
 HOURS_PER_WEEK |                    1723 | 43.836332 | 150.74439350645 |
  12.277800841619 |                   0.19239697850573 |  3.1385685876645
                       1 |99 | Masters

     HOURS_PER_WEEK |                    51 | 36.647059 | 157.63294117647 |
  12.555195784076 |                   0.40243813132025 |  1.7918249561792
                      10 |75 | Preschool

   HOURS_PER_WEEK |                     576 | 47.425347 | 219.21876509662 |
  14.806038129649 |                   0.23696596519008 |  1.7289549218026
                       2 |99 | Prof-school

 HOURS_PER_WEEK |                    7291 | 38.852284 | 162.86610555246 |
  12.761900546253 |                   0.13124564892153 |  1.9985175214256
                       1 |99 | Some-college

              (16 rows)

               DROP_TABLE

              ------------

               t

              (1 row)
```

Related Functions

category Analytics - Statistics
KURTOSIS_AGG
SKEWNESS_AGG
SUMMARY1000

MSE - Mean Squared Error

This stored procedure calculates the mean squared error of Regression predictions

Usage

The MSE stored procedure has the following syntax:

MSE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

pred_table
the input table or view containing predicted values

Type: NVARCHAR(256)

pred_column
the input table column in <pred_table> containing predicted

values Type: NVARCHAR(128)

pred_id
the input table column in <pred_table> identifying a unique instance

id Type: NVARCHAR(128)

true_table
the input table or view containing real

values Type: NVARCHAR(256)

true_column
the input table column in <true_table> containing real

values Type: NVARCHAR(128)

true_id
the input table column in <true_table> identifying a unique instance

id Type: NVARCHAR(128)

check
flag indicating to check parameters or not. This may consume some time but prevents usage er-rors. Allowed values are: 'all' (check all), 'none' (check nothing), 'nulls' (check for nulls only). Type: NVARCHAR(ANY)

Default: all

Returns
DOUBLE the Mean Squared Error

Details

This stored procedure calculate the mean squared error of Regression predictions. This is done by comparing the predictions made when applying a Regression model onto data, and the real values for this data.

The MSE value is calculated as sum((true_i-pred_i)^2)/count(true_i) where true_i is the real value and pred_i is the predicted value.

Examples

```
CALL nza..GROW_REGTREE('model=wrt, intable=nza..weatherr,
id=instance, target=grade, maxdepth=4, minsplit=2');
CALL nza..PREDICT_REGTREE('model=wrt, intable=nza..weatherr,
id=instance, outtable=wpr, var=TRUE');
CALL
nza..MSE('pred_table=wpr,true_table=nza..weatherr,pred_column=cl
ass,true_column=grade,pred_id=id,true_id=instance');
CALL nza..DROP_MODEL('model=wrt');
CALL nza..DROP_TABLE('wpr');
```

```
 GROW_REGTREE
--------------
           13
(1 row)

 PREDICT_REGTREE
-----------------
              22
(1 row)

       MSE
-------------------
 0.090909090909091
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CERROR
MAE
RAE
RSE

MTBNET_DIFF - Show differences between multiple tree-shaped bayesian net-works

the procedure shows the differences between multiple tree-shaped bayesian networks for distict values of the class. In particular the columns V1,v2 feature the edge that is present in the group indicated in the column PRESENT_ON, but is absent in the group MISSING_ON

Usage

The MTBNET_DIFF stored procedure has the following syntax:

MTBNET_DIFF(nvarchar(ANY) paramString)

Parameters

paramString

A comma-separated list of <parameter>=<value> entries using the parameters below. Type: NVARCHAR(ANY)

model

The name of the input model containing the model data. Type: nvarchar(ANY)

modeldiff

The output table name that is to contain the model differences between classes. Type: NVARCHAR(ANY)

Returns

INT-0

Examples

```
call nza..drop_model('model=struc_iris');
call
nza..MTBNet_grow('intable=nza..iris,class=class,incolumn=SEPALLE
NGTH; SEPALWIDTH; PETALLENGTH; PETALWIDTH,model=struc_iris');
drop table struc_diff_iris;
call
nza..MTBNet_diff('model=struc_iris,modeldiff=struc_diff_iris');
select * from struc_diff_iris order by MISSING_ON ,
PRESENT_ON,v1,v2;
```

```
 MISSING_ON | PRESENT_ON |      V1      |      V2
------------+------------+-------------+-------------
 setosa     | versicolor | PETALLENGTH | SEPALLENGTH
 setosa     | virginica  | PETALLENGTH | SEPALLENGTH
 versicolor | setosa     | SEPALLENGTH | SEPALWIDTH
 versicolor | virginica  | SEPALLENGTH | SEPALWIDTH
 virginica  | setosa     | PETALLENGTH | PETALWIDTH
 virginica  | versicolor | PETALLENGTH | PETALWIDTH
(6 rows)
```

Related Functions

category Analytics - Regression
MTBNET_GROW

MTBNET_GROW - Build a multi-tree bayesian network for correlations

the procedure creates multiple tree-shaped bayesian networks for distict values of the class

Usage

The MTBNET_GROW stored procedure has the following syntax:

MTBNET_GROW(nvarchar(ANY) paramString)

Parameters

paramString
input parameters specification

Type: NVARCHAR(ANY)

intable
table name - the table with data to grow the

network Type: nvarchar(ANY)

incolumn
The input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

type: ':nom' (for nominal), ':cont' (for continuous). By default, all numerical types are continuous, other types are nominal

role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':col-weight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties. Note that this procedure only accepts continuous columns with role 'input'.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
The default type of the input table columns. Valid values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
The default role of the input table columns. Allowed values are 'input' and 'ignore'.

If the parameter is undefined, all columns are considered 'input' columns.

Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
The input table where column properties for the input table columns are stored. The format of this table is the output format of the nza..COLUMN_PROPERTIES() stored procedure.

If the parameter is undefined, the input table column properties is detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsupported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsupported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

baseidx
the numeric id to be assigned to the first variable, for easier internal management - for future use

Type: int4

samplesize
the size of the sample to take if the number of records is too large (for future

use). Type: int4

talk
if yes then additional information onm progress will be displayed. - for future

use Type: NVARCHAR(ANY)

class
- the target class ; this should be a nominal variable

Type: NVARCHAR(ANY)

edgelabsort
if edgelabsort=yes then the left end of the edge will have a name lower in alphabetic order than the right one

Type: NVARCHAR(ANY)

Default: <none>

model
result table name with the model

stored Type: nvarchar(ANY)

Returns
INT - currently 0, in future the count of records in the resulting table

Details

the multiple tree-shaped bayesian network is a set of tree-like bayesian networks such that the tree- structure is developed for each subset of data, identified by the class variable The difference to TAN_Grow is that the structure here can differ for each constituent network, whereas for TAN_grow the structure of the network is everywhere the same and only the correlation levels differ. With MTBNet_diff you can see which edges of the trees differ between various groups (class). The resultant model can be consumed by the TAN_apply procedure just like any TAN model.

Examples

```
call nza..drop_model('model=struc_iris');
call
nza..MTBNet_Grow('intable=nza..iris,class=class,incolumn=
SEPALLENGTH; SEPALWIDTH; PETALLENGTH;
PETALWIDTH,model=struc_iris,coldefrole=ignore');
select * from NZA_META_STRUC_IRIS_model order
by grouped_on,varxname,varyname;
```

```
 GROUPED_ON | BNID | VARXID |   VARXNAME   | VARXMEAN |
VARXSTDDEV     | VARYID |  VARYNAME     | VARYMEAN |
VARYSTDDEV     |        CORR
------------+------ +-------- +-------------   + ----------
+-----------------   +-------- +-------------   + ----------
+-----------------   +-----------------
 setosa     |     3 |     779 | PETALLENGTH |    1.464 |
 0.17351115943645 |    780 | PETALWIDTH   |    0.244 |
0.10720950308168  | 0.30630821115803
 setosa     |     3 |     777 | SEPALLENGTH |    5.006 |
 0.35248968721346 |    778 | SEPALWIDTH   |    3.418 |
0.38102439795469  | 0.74678037326394
 setosa     |     3 |    778 | SEPALWIDTH  |    3.418 |
 0.38102439795469 |    780 | PETALWIDTH   |    0.244 |
 0.10720950308168 | 0.27997288851691
 versicolo   |   3 |     779| PETALLENGTH |      4.26 |
0.46991097723996|     780 |PETALWIDTH   |    1.326 |
0.19775268000455| 0.78666808852281
 versicolo   |   3 |     777| SEPALLENGTH |     5.936 |
0.51617114706386|     779 |PETALLENGTH |     4.26 |
0.46991097723996| 0.75404895859202
 versicolo   |   3 |     778| SEPALWIDTH   |     2.77 |
0.31379832337841|     780 |PETALWIDTH   |    1.326 |
0.19775268000455|   0.6639987200241
 virginica   |   3 |     777| SEPALLENGTH |     6.588 |
0.63587959327443|     779 |PETALLENGTH |    5.552 |
0.55189469566398| 0.86422473293558
 virginica   |   3 |     778| SEPALWIDTH   |    2.974 |
0.32249663817264|     780 |PETALWIDTH   |    2.026 |
0.27465005563667| 0.53772802626619
 virginica   |   3 |     778| SEPALWIDTH   |    2.974 |
0.32249663817264|     777 |SEPALLENGTH |    6.588 |
0.63587959327443| 0.45722781639411
(9 rows)
```

Related Functions

category Analytics - Regression
TANET_APPLY
MTBNET_DIFF
TANET_GROW
TBNET_GROW
CORRELATION1000MATRIX

MUTUALINFO - Mutual Information

This stored procedure calculates the mutual information of two columns

Usage

The MUTUALINFO stored procedure has the following syntax:

MUTUALINFO(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable

the input table

Type: NVARCHAR(256)

incolumn
the two input table columns separated by a semicolon

(;) Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be performed. If specified, an output table must be indicated.

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the mutual information into. This parameter must be spe-cified if parameter by is specified.

Type: NVARCHAR(256)

Default: <none>

Returns
DOUBLE the mutual information of the input table columns, or the number of groups in the output table for which mutual information has been calculated

Details

This stored procedure calculates the mutual information of two input columns, either in the whole input table or within the groups defined in the column specified by parameter <by>. Mutual In-formation is a measure saying how easily it is to predict the value of one column from the value of the other column. It takes a positive value, the lower the better predictability.

If parameter 'by' is specified, an output table must be specified. The output table is created with following columns: over_<by>, mutualinfo. The mutual information of the input columns is given for each group of the <by> column.

Examples

```
CALL nza..MUTUALINFO('intable=nza..CensusIncome,

incolumn=age;wage_per_hour');


     MUTUALINFO

------------------

 0.11860701863848

(1 row)
```

```
CALL nza..MUTUALINFO('intable=nza..CensusIncome,
incolumn=age;wage_per_hour, outtable=resultTable, by=sex');
SELECT * FROM resultTable ORDER BY over_sex; CALL
nza..DROP_TABLE('resultTable');
 MUTUALINFO
------------
          2
(1 row)

    MUTUALINFO    | OVER_SEX
------------------+----------
 0.13547002479167 | Female
 0.13863338201418 | Male
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
COND_ENTROPY
ENTROPY
JOINT_ENTROPY
MUTUALINFO_AGG

MUTUALINFO_AGG - Mutual Information

This function calculates the mutual information of two input variables

Usage

The MUTUALINFO_AGG stored procedure has the following syntax:

MUTUALINFO_AGG(INT4 X, INT4 Y)

Parameters

X

the first variable

Type: INT4

Y

the second

variable Type: INT4

Returns

DOUBLE the mutual information, unless too few data (then null returned)

Details

This function calculates the mutual information of two input variables. Mutual Information is a measure saying how easily it is to predict the value of one column from the value of the other column. It takes a positive value, the lower the better predictability.

Examples

```
SELECT nza..MUTUALINFO_AGG(
nza.._cf_utl_discrete(petallength,
(SELECT MIN(petallength) FROM nza..iris),
(SELECT MAX(petallength) FROM nza..iris),
10),
nza.._cf_utl_discrete(sepallength,
(SELECT MIN(sepallength) FROM nza..iris),
(SELECT MAX(sepallength) FROM nza..iris),
10)
) FROM nza..iris;
SELECT -log(sqrt(1-c0*c0))/log(2.)
FROM (SELECT nza..CORR_AGG(sepallength,petallength) AS
c0 FROM nza..iris) beta;
```

```
 MUTUALINFO_AGG
-----------------
 1.2966720934458
(1 row)


     ?COLUMN?
```

```
-----------------
 1.0293125384505
(1 row)
```

Related Functions

category Analytics - Statistics
MUTUALINFO

MWW_TEST - Mann-Whitney-Wilcoxon test of independence

This procedure executes the Mann-Whitney-Wilcoxon test on an input column, whose values are split into two classes, to evaluate the significance of the difference of the class mean values

Usage

The MWW_TEST stored procedure has the following syntax:

MWW_TEST(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the input table column. It does not need to be numerical, but must be ordered in its

domain. Type: NVARCHAR(128)

class
the input table column which splits data into two classes. The class column name is followed by two class values preceded by a colon (:).

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be per-formed. If specified, an output table must be specified too.

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the MWW statistics into. This parameter is required if parameter by is

specified. Otherwise the parameter is ignored.

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(200) The test results or the number of rows in the output table. The test result can contain following results: uStat, u2Stat, mu_U, sigma_U, zStat, pp, lower. See the out-put table column description for more information on them.

Details

This stored procedure executes the Mann-Whitney-Wilcoxon test on a column whose values are split into two classes, either in the whole input table or within the groups defined in the column specified by parameter <by>. The Mann-Whitney-Wilcoxon test is a statistical hypothesis test that determines whether one of two samples of independent observations tends to have larger values than the other. This is indicated by the component of the output called pp.

The Mann-Whitney-Wilcoxon test is sometimes also referred to as: (1) The Mann-Whitney U test, (2) MWW, (3) The Wilcoxon rank-sum test.

The output table is created with following columns: n, n1, n2, ustat0, u2stat0, alphasum, norm1, ustat1, norm2, u2stat1, mu_u1, sigma_u, zstat, pp, ustat, u2stat, mu_u, nogroups, message, lower. If the parameter by is specified, an additional column <by> is added to indicate for which group the MWW test has been calculated. If pp < 0.05, then one of the two classes tends to have larger values than the other. The class which tends to have lower-ranked values is indicated.

Examples

```
CALL nza..MWW_TEST('intable=nza..adult,

incolumn=HOURS_PER_WEEK, class=sex');
```

```
MWW_TEST
-----------------------------------------------------------
-----------------------------------------------------------
-------------------

 uStat= 71896628.204303 u2Stat= 162803461.7957 mu_U=
117350045 sigma_U= 798032.67275233 zStat= -
56.95683691613 pp= 0 (lower: Female)

(1 row)
```

```
CALL nza..MWW_TEST('intable=nza..adult,
incolumn=HOURS_PER_WEEK, class=sex,
by=education, outtable=resmww_05');
SELECT education, pp, lower, message FROM resmww_05 ORDER
```

```
BY pp;
CALL nza..DROP_TABLE('resmww_05');
 MWW_TEST
----------
   5
(1 row)

 EDUCATION |          PP          | LOWER  | MESSAGE
-----------+----------------------+--------+---------
 10th      | 1.1653437612569e-19  | Female | O.K.
 11th      | 8.1862589474572e-18  | Female | O.K.
 12th      | 8.4349399121461e-08  | Female | O.K.
 1st-4th   | 8.5380864800925e-06  | Female | O.K.
 5th-6th   | 0.00011748909011573  | Female | O.K.
(5 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
CREATE VIEW addult AS SELECT hours_per_week::nvarchar(30)
AS chours_per_week, education, sex from nza..adult;
CALL nza..MWW_TEST('intable=addult, incolumn=chours_per_week,
class=sex');
CALL nza..DROP_TABLE('addult');

                                                              M
WW_TEST
---------------------------------------------------------------
---------------------------------------------------------------
---------

 uStat= 74212294.083753 u2Stat= 160487795.91625 mu_U= 117350045
sigma_U= 798032.67275233 zStat= -54.055118780375 pp= 0 (lower:
Female)
```

```
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
PMWW
T_UMD_TEST
WILCOXON_TEST

NAIVEBAYES - Build a Naive Bayes model

This stored procedure builds a Naive Bayes model

Usage

The NAIVEBAYES stored procedure has the following syntax:

NAIVEBAYES(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Naive Bayes model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the class

Type: NVARCHAR(128)

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are con-tinuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':colweight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPERTIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsupported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsupported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

disc
discretization type for numeric columns [ew, ef,

em] Type: NVARCHAR(ANY)

Default: 'ew'

bins
default number of bins for numeric

columns Type: INTEGER

Default: '10'

Returns
INTEGER the number of (column, value, class) statistics in the model

Details

This stored procedure builds a Naive Bayes model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipulate the model or access the model tables.

Building a Naive Bayes model works only on nominal <target> column. Only VARCHAR and NVARCHAR columns are treated as nominal attributes. Discretization is applied on numeric attrib-utes according to the <disc> and <bins> parameters.

The output of the building process is a contingency table that gathers statistics about the class la-bels per attribute and attribute value. The contingency table has following columns: attribute-name, val, class, classvalcount, classcount, totalcount.

This algorithm also supports missing data.

Examples

```
CALL nza..NAIVEBAYES('model=NB_soybean,
intable=nza..soybean_train, id=instance, target=class');

CALL nza..DROP_MODEL('model=NB_soybean');

 NAIVEBAYES

------------

      1881

(1 row)

 DROP_MODEL

------------

 t

(1 row)
```

```
CALL nza..NAIVEBAYES('model=NB_iris, intable=nza..iris,
coldeftype=cont,
incolumn=PETALWIDTH:nom;PETALLENGTH:ignore;class:nom:targ
et;id:id');

CALL nza..DROP_MODEL('model=NB_iris');
```

```
 NAIVEBAYES
------------
       126
(1 row)
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
PREDICT_NAIVEBAYES
LIST_MODELS

OUTLIERS - Detect outliers for a numeric attribute

This stored procedure detect outliers of a numeric column

Usage

The OUTLIERS stored procedure has the following syntax:

OUTLIERS(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

incolumn
the input table column

Type: NVARCHAR(128)

outtable
the output table to write outliers

to Type: NVARCHAR(ANY)

multiplier
the value of the IQR

multiplier Type: DOUBLE

Default: 1.5

Returns
INTEGER the number of outliers detected

Details

This stored procedure detects outliers as the values that fall out of the interval [Q1-multiplier*(Q3-Q1),Q3+multiplier*(Q3-Q1)]. Q1, Q3 are the first and third quartiles of the input column.

The output table contains only one column <incolumn> containing the outliers.

Examples

```
CALL nza..OUTLIERS('intable=nza..quant_iris,
incolumn=sepal_length, multiplier=0.5,
outtable=quant_outliers');
SELECT * FROM quant_outliers ORDER BY sepal_length;

CALL nza..DROP_TABLE('quant_outliers');
```

```
 OUTLIERS
----------
        9
(1 row)


 SEPAL_LENGTH
--------------
          4.3
          4.4
          7.1
          7.2
          7.3
          7.4
          7.6
          7.7
          7.9
(9 rows)


 DROP_TABLE
```

```
------------
 t
(1 row)
```

Related Functions

category Analytics - Quantiles & Outliers
IQR

PBERN - Cumulative Bernoulli Distribution

Given the success probability p, this function returns the probability that a variable following the Bernoulli distribution takes a value smaller or equal to x. The value x is the number of successes in a single Bernoulli trial.

Usage

The PBERN function has the following syntax:

PBERN(DOUBLE x, DOUBLE p)

Parameters

x

the value at which to

compute Type: DOUBLE

p

the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

A Bernoulli trial models tossing once a manipulated coin that in general does not have the same chance of heads (or success, 1) and tails (or failure, 0). The parameter p indicates the probability of getting heads (1). The Bernoulli distribution is a distribution of a discrete variable that takes values 0 and 1 according to a single Bernoulli trial.

The cumulative probability distribution returns the probability to get an outcome of the trial equal or less than x.

For x<0, PBERN(x,p) = 0,

For x>=0 and x<1, PBERN(x,p) = (1-p),

- For x>=1, PBERN(x,p) = 1.

If p is not between 0 and 1, PBERN(x,p) is null for all x values.

Examples

```
SELECT nza..PBERN(0.2,0.3);
 PBERN
-------
   0.7
(1 row)
```

```
SELECT nza..PBERN(0,0.3);
 PBERN
-------
   0.7
(1 row)
```

```
SELECT nza..PBERN(-1,0.3);
 PBERN
-------
     0
(1 row)
```

```
SELECT nza..PBERN(1,0.3);
 PBERN
-------
     1
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBERN
PBERN_H
QBERN

PBERN_H - Cumulative Bernoulli Distribution, high tail

Given the success probability p, this function returns the probability that a variable following the Bernoulli distribution takes a value greater than x. The value x is the number of successes in a single Bernoulli trial.

Usage

The PBERN_H function has the following syntax:

PBERN_H(DOUBLE x, DOUBLE p)

Parameters

x

the value at which to

compute Type: DOUBLE

p

the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns

DOUBLE the cumulative probability distribution from x to plus infinity

Details

PBERN_H(x,p) = 1-PBERN(x,p) for all x values and for p between 0 and 1.

If p is not between 0 and 1, PBERN_H(x,p) is null for all x values.

Examples

```
SELECT nza..PBERN_H(0.2, 0.3), nza..PBERN(0.2, 0.3);

 PBERN_H | PBERN
---------+-------
     0.3 |   0.7
(1 row)
```

```
SELECT nza..PBERN_H(0, 0.3), nza..PBERN(0, 0.3);
 PBERN_H | PBERN
---------+-------
     0.3 |   0.7
(1 row)
```

```
SELECT nza..PBERN_H(-1, 0.3), nza..PBERN(-1, 0.3);
 PBERN_H | PBERN
---------+-------
       1 |      0
(1 row)
```

```
SELECT nza..PBERN_H(1, 0.3), nza..PBERN(1, 0.3);
 PBERN_H | PBERN
---------+-------
       0 |      1
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBERN
PBERN

PBETA - Cumulative Beta Distribution

Given two shape parameters, this function returns the probability that a variable following the Beta distribution takes a value smaller or equal to x

Usage

The PBETA function has the following syntax:

PBETA(DOUBLE x,DOUBLE shapeOne, DOUBLE shapeTwo)

Parameters

x

the value at which to

compute Type: DOUBLE

shapeOne

the first shape of the

distribution Type: DOUBLE

Min: 0.00000000001

shapeTwo

the second shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Beta distribution is generic distribution, closely related to other distributions like the Fisher distribution via some closed-form mathematical relations. As the beta distribution has a bounded range with positive density (from 0 to 1), processes with natural lower and upper limits are modelled using it.

if a or b is 0 or less, PBETA_H(x,a,b) is null for all x values.

For density of this distribution see the documentation of DBETA.

Note that PBETA(x,a,b)=1-PBETA(1-x,b,a) for all x and for all positive a and b values.

Note also that PBETA(x,1,1) is a uniform distribution over the range [0,1], PBETA(x,1,1)=PUNIF(x,0,1)

Examples

```
SELECT nza..PBETA(0.0, 3, 0.4),nza..PBETA(0.1, 3,
0.4),nza..PBETA(0.2, 3, 0.4),nza..PBETA(0.3, 3,
0.4),nza..PBETA(0.4, 3, 0.4);
```

```
 PBETA|          PBETA         |          PBETA          |        PBETA
|       PBETA

         +---------------------          +--------------------

+---------------------------        +----------------
      0| 0.00023477562161745 | 0.0019774546733614 |
0.0070656037462229 | 0.0178553415291

(1 row)
```

Related Functions

category Analytics - Probability Distributions

DBETA
PBETA_H
PF
QBETA

PBETA_H - Cumulative Beta Distribution, high tail

Given two shape parameters, this function returns the probability that a variable following the Beta distribution takes a value greater than x

Usage

The PBETA_H function has the following syntax:

PBETA_H(DOUBLE x,DOUBLE shapeOne, DOUBLE shapeTwo)

Parameters

x
the value at which to

compute Type: DOUBLE

shapeOne
the first shape of the

distribution Type: DOUBLE

Min: 0.00000000001

shapeTwo
the second shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the cumulative probability distribution from x to plus infinity (effectively integral from x to 1 if x is below 1, and the integral is 0 if x is above 1)

Details

PBETA_H(x,a,b)=1-PBETA(x,a,b), for all x and for all positive a and b values.

if a or b is 0 or less, PBETA_H(x,a,b) is null for all x values.

Examples

```
SELECT nza..PBETA_H(0.0, 3, 0.4),nza..PBETA_H(0.1, 3,
0.4),nza..PBETA_H(0.2, 3, 0.4),nza..PBETA_H(0.3, 3,
0.4),nza..PBETA_H(0.4, 3, 0.4);
```

```
 PBETA_H |      PBETA_H        |       PBETA_H        |
PBETA_H        |      PBETA_H
```

```
---------+------------------+------------------
+------------------+-----------------

       1 | 0.99976522437838 | 0.99802254532664 |
0.99293439625378 | 0.9821446584709

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBETA
PBETA

PBINOM - Cumulative Binomial Distribution

Given the success probability p and the number of trials, this function returns the probability that a variable following the Binomial distribution takes a value smaller or equal to x. The value x is the number of suc-cesses in a serie of Bernoulli trials.

Usage

The PBINOM function has the following syntax:

PBINOM(DOUBLE x, INT8 N, DOUBLE p)

Parameters

x
the value at which to

compute Type: DOUBLE

N
the number of

trials Type: INT8

Min: 1

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

A Bernoulli trial models tossing once a manipulated coin that in general does not have the same chance of heads (or success, 1) and tails (or failure, 0). The parameter p indicates the probability of getting heads (1). The cumulative Binomial distribution returns the probability that in a serie of N Bernoulli trials you will have x or less successes.

If x is 0 or less, PBINOM(x,N,p) = 0 for all positive N values and p between 0 and 1. If x is greater or equal to N, PBINOM(x,N,p) = 1 for all positive N values and p between 0 and 1.

The Bernoulli distribution is a special case of Binomial distribution: PBERN(x,p)=PBINOM(x,1,p) for all x values and p between 0 and 1.

If N is 0 or less, PBINOM(x,N,p) is null for all x and p values.

If p is not between 0 and 1, PBINOM(x,N,p) is null for all x and N values.

Examples

```
SELECT nza..PBINOM(0,3,0.4),
nza..PBINOM(1.0,3,0.4), nza..PBINOM(2.0,3,0.4),
nza..PBINOM(3,3,0.4), nza..PBINOM(4,3,0.4);
  PBINOM| PBINOM | PBINOM | PBINOM | PBINOM
--------+--------+--------+--------+--------
   0.216|   0.648|   0.936|       1|       1
 (1 row)
```

```
SELECT nza..PBINOM(0,3,0.6),
nza..PBINOM(1.0,3,0.6), nza..PBINOM(2.0,3,0.6),
nza..PBINOM(3,3, 0.6), nza..PBINOM(4,3,0.6);
  PBINOM| PBINOM | PBINOM | PBINOM | PBINOM
--------+--------+--------+--------+--------
   0.064|   0.352|   0.784|       1|       1
 (1 row)
```

```
SELECT nza..PBINOM(3,5,0.6), nza..PBINOM(30,50,0.6),
nza..PBINOM(300,500,0.6), nza..PBINOM(3000,5000,0.6),
nza..PBINOM(30000,50000,0.6),
nza..PBINOM(300000,500000,0.6),
nza..PBINOM(3000000,5000000,0.6),
nza..PBINOM(30000000,50000000,0.6);
 PBINOM  |       PBINOM       |       PBINOM       |
PBINOM       |       PBINOM       |       PBINOM       |
PBINOM       |       PBINOM
```

```
---------+------------------+------------------
+-----------------+------------------+------------------
+------------------+------------------

 0.66304 | 0.55352362509135 | 0.51698820499616 |
0.5053741706129 | 0.50169957078773 | 0.50053750675188 |
0.50016988769766 | 0.50005361256692

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBINOM
PBERN
PBINOM_H
QBINOM

PBINOM_H - Cumulative Binomial Distribution, high tail

Given the success probability p and the number of trials, this function returns the probability that a variable following the Binomial distribution takes a value greater than x. The value x is the number of successes in a serie of Bernoulli trials.

Usage

The PBINOM_H function has the following syntax:

PBINOM_H(DOUBLE x, INT8 N, DOUBLE p)

Parameters

x
the value at which to

compute Type: DOUBLE

N
the number of

trials Type: INT8

Min: 1

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns

DOUBLE the cumulative probability distribution from x to plus infinity

Details

The function PBINOM_H returns the probability that in a serie of N Bernoulli trials you will have more than x successes.

PBINOM_H(x,N,p) = 1-PBINOM(x,N,p) for all x and all positive N values and for p between 0 and 1.

If N is 0 or less, PBINOM_H(x,N,p) is null for all x and p values.

If p is not between 0 and 1, PBINOM_H(x,N,p) is null for all x and N values.

Examples

```
SELECT nza..PBINOM_H(0,3,0.4),
nza..PBINOM_H(1.0,3,0.4), nza..PBINOM_H(2.0,3,0.4),
nza..PBINOM_H(3,3,0.4), nza..PBINOM_H(4,3,0.4);
  PBINOM_H| PBINOM_H | PBINOM_H | PBINOM_H | PBINOM_H
----------+----------+----------+----------+----------
     0.784|     0.352|     0.064|         0|         0
(1 row)
```

```
SELECT nza..PBINOM_H(0,3,0.6),
nza..PBINOM_H(1.0,3,0.6), nza..PBINOM_H(2.0,3,0.6),
nza..PBINOM_H(3,3,0.6), nza..PBINOM_H(4,3,0.6);
  PBINOM_H| PBINOM_H | PBINOM_H | PBINOM_H | PBINOM_H
----------+----------+----------+----------+----------
     0.936|     0.648|     0.216|         0|         0
(1 row)
```

```
SELECT nza..PBINOM_H(3,5,0.6), nza..PBINOM_H(30,50,0.6),
nza..PBINOM_H(300,500,0.6), nza..PBINOM_H(3000,5000,0.6),
nza..PBINOM_H(30000,50000,0.6),
nza..PBINOM_H(300000,500000,0.6),
nza..PBINOM_H(3000000,5000000,0.6),
nza..PBINOM_H(30000000,50000000,0.6);
 PBINOM_H |     PBINOM_H      |      PBINOM_H      |
PBINOM_H      |     PBINOM_H      |     PBINOM_H      |
PBINOM_H      |     PBINOM_H
```

```
----------+------------------+------------------
+------------------+------------------+------------------
+-----------------+------------------

  0.33696 | 0.44647637921055 | 0.48301175754114 |
0.49462586651671 | 0.49830048721356 | 0.49946256442591 |
0.4998300410389 | 0.49994631333962

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBINOM
PBINOM

PCA - Build a Principal Component Analysis model

This stored procedure builds a Principal Component Analysis model

Usage

The PCA stored procedure has the following syntax:

PCA(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Principal Component Analysis model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing a class or a value to predict, this column is ignored by the PCA.

Type: NVARCHAR(128)

Default: <none>

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are continuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':col-weight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties. The PCA stored procedure is executed only on columns of role ':input' and of type ':cont'. Nominal columns and columns of role ':target' are ignored.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPER-TIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsup-ported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsup-ported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

forceEigensolve
flag indicating to force using a less accurate but faster

method Type: BOOLEAN

Default: false

centerData
flag indicating to first center the data before building the model. Having data that is not centered violates the Principal Component Analysis assumptions.

Type: BOOLEAN

Default: true

scaleData
flag indicating to first scale the data before building the

model Type: BOOLEAN

Default: false

saveScores
flag indicating to save the PCA scores of individual

observations Type: BOOLEAN

Default: false

Returns
BOOLEAN always TRUE

Details

This stored procedurebuilds a Principal Component Analysis model of the data and provides a correspond-ing transformation into principal components, which can then be applied using the stored procedure nza..PROJECT_PCA.

Input data should be provided as datatable, with observations provided in rows, and attributes in columns. All attributes are assumed to be quantitative. The PCA model can be built using two strategies: SVD decomposition, which is more accurate, but at the expense of speed and memory, or by finding the eigenvectors of the unbiased covariance matrix estimator. If the parameter forceEigensolve is not TRUE, the best strategy, that is, the one providing the most accurate solution based on data size and memory availability is used.

Based on the parameters <centerData and scaleData, the input data can be centered and scaled. In that case the corresponding parameters, as well as the mean and variance estimators, are calculated and be-come part of the model. Centering and scaling is also performed during the application step.

Data centering (assuring that mean of each attribute is equal to 0) is an important assumption of PCA meth-od - failing to meet it usually causes serious model degradation. Data scaling (assuring that the variance of each attribute is equal to 1) usually provides better approximation of the data in case of the presence of at-tributes that differ in orders of magnitude. It is equivalent to perform the PCA using the correlation instead of covariance matrix.

In order to express the model being created, the procedure creates a set of matrices, using the model name to construct the matrix name. The set consists of following matrices:

NZA_META_{modelName}_PCA_ATTMEAN - row vector containing mean values of the attributes (when cen-terData is TRUE), NZA_META_{modelName}_PCA_ATTSD - row vector containing standard deviations of the attrib-utes (when scaleData is TRUE),

NZA_META_{modelName}_PCA_ATTSD_DIV - row vector containing reciprocals of non-zero stand-ard deviations of the attributes or value 1 (when scaleData is TRUE),

NZA_META_{modelName}_PCA_SDEV - row vector containing standard deviations of the principal components,

NZA_META_{modelName}_PCA - the matrix of loadings (a matrix whose columns contain the ei-genvectors of the covariance matrix),

NZA_META_{modelName}_PCA_SCORES - the matrix of scores containing projections of individual obervations to principal components (when saveScores is TRUE).

Examples

```
CALL nza..PCA('model=wq_pca,
intable=nza..WineQuality, id=id, scaleData=TRUE,
centerData=TRUE, forceEigensolve=FALSE');
CALL nza..DROP_MODEL('model=wq_pca');
```

```
 PCA
-----
 t
(1 row)

 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Data Transformation
PROJECT_PCA
LIST_MODELS

PCAUCHY - Cumulative Cauchy Distribution

Given the peak location and the interquartile range, this function returns the probability that a variable following the Cauchy distribution takes a value smaller or equal to x

Usage

The PCAUCHY function has the following syntax:

PCAUCHY(DOUBLE x, DOUBLE location, DOUBLE scale)

Parameters

x

the value at which to

compute Type: DOUBLE

location

the location of the peak of the Cauchy

distribution Type: DOUBLE

scale

a value corresponding to half of the interquartile range. Smaller values result in a narrower peak.

Type: DOUBLE

Min: 0.00000000001

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Cauchy distribution describes the cross-section of resonant nuclear scattering, derived from the prob-ability of a resonant state with a known lifetime. The cumulative distribution has the closed form: PCAUCHY(x,location,scale)= 1/PI . arctan((x-location)/scale) + 0.5.

The special property of this distribution is that neither a mean nor a variance can be computed. It may be of interest because, like a normal distribution, it is a "stable distribution", such that a linear combination of two independent variables following it has the same distribution, up to the location and scale parameters.

Thee Cauchy distribution is sometimes also referred to as the Breit-Wigner distribution or the Lorentz distri-bution.

If scale=0 or less, PCAUCHY(x, location, scale) is null for all x and location values.

Examples

```
SELECT nza..PCAUCHY(0, 3, 0.4),nza..PCAUCHY(1.0, 3,
0.4),nza..PCAUCHY(2.0, 3, 0.4),nza..PCAUCHY(3, 3,
0.4),nza..PCAUCHY(4, 3, 0.4);
```

```
       PCAUCHY        |        PCAUCHY        |        PCAUCHY        |
PCAUCHY |       PCAUCHY

                     +------------------- + -------------------

 ---------+------------------

 0.042192463158841 | 0.062832958189001 | 0.12111894159084 |
0.5 | 0.87888105840916
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DCAUCHY
PCAUCHY_H
QCAUCHY

PCAUCHY_H - Cumulative Cauchy Distribution, high tail

Given the peak location and the interquartile range, this function returns the probability that a variable following the Cauchy distribution takes a value greater than x

Usage

The PCAUCHY_H function has the following syntax:

PCAUCHY_H(DOUBLE x, DOUBLE location, DOUBLE scale)

Parameters

x
the value at which to

compute Type: DOUBLE

location
the location of the peak of the Cauchy

distribution Type: DOUBLE

scale
a value corresponding to half of the interquartile range. Smaller values result in a nar-rower peak.

Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

PCAUCHY_H(x,location,scale)=1-PCAUCHY(x,location,scale) for all x and location values and for scale between 0 and 1.

If scale is not between 0 and 1, PCAUCHY_H(x,location,scale) is null for all x and location values.

Examples

```
SELECT nza..PCAUCHY_H(0, 3, 0.4),nza..PCAUCHY_H(1.0, 3,
0.4),nza..PCAUCHY_H(2.0, 3, 0.4),nza..PCAUCHY_H(3, 3,
0.4),nza..PCAUCHY_H(4, 3, 0.4);
```

```
    PCAUCHY_H      |   PCAUCHY_H    |      PCAUCHY_H     |
PCAUCHY_H |    PCAUCHY_H
                   +---------------+-----------------
 -----------+ -----------------
 0.95780753684116 | 0.937167041811 | 0.87888105840916 |
0.5 | 0.12111894159084
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DCAUCHY
PCAUCHY

PCHISQ - Cumulative Chi-square Distribution

Given a degree of freedom, this function returns the probability that a variable following the Chi-square dis-tribution takes a value smaller or equal to x

Usage

The PCHISQ function has the following syntax:

PCHISQ(DOUBLE x, INT8 df)

Parameters

x

the value at which to

compute Type: DOUBLE

Min: 0.00000000001

df

the number of degrees of

freedom Type: INT8

Min: 1

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

If you have variables X1,...,Xn each of them following standard normal distribution, the variable X=X1^2+X2^2+...+Xn^2 follows the chi-square distribution with n degrees of freedom.

The Chi-square cumulative probability distribution has the form PCHISQ(x,df)=PGAMMA(x/2,df/2).

If df is 0 or less, PCHISQ(x,df) is null for all x values.

Examples

```
SELECT nza..PCHISQ(4.6188, 9);

      PCHISQ
------------------
 0.13380702913458
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DCHISQ
PCHISQ_H
PCHISQ_S
PGAMMA
QCHISQ

PCHISQ_H - Cumulative Chi-square Distribution, high tail

Given a degree of freedom, this function returns the probability that a variable following the Chi-square distribution takes a value greater than x

Usage

The PCHISQ_H function has the following syntax:

PCHISQ_H(DOUBLE x, INT8 df)

Parameters

x

the value at which to

compute Type: DOUBLE

Min: 0.00000000001

df

the number of degrees of freedom

Type: INT8

Min: 1

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

PCHISQ_H(x,df)=1-PCHISQ(x,df) for all x and df values.

If df is 0 or less, PCHISQ_H(x,df) is null for all x values.

Examples

```
SELECT nza..PCHISQ_H(4.6188, 9);

     PCHISQ_H
-----------------
 0.86619297086542
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DCHISQ
PCHISQ
PCHISQ_S

PCHISQ_S - Cumulative Chi-square Distribution with string argument

Given a degree of freedom, this function returns the probability that a variable following the Chi-square dis-tribution takes a value greater than x. It differs from PCHISQ in that it takes both parameters as a single string.

Usage

The PCHISQ_S function has the following syntax:

PCHISQ_S(NVARCHAR(200) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(200)

chi2Stat

the value at which to compute

Type: DOUBLE

Min: 0.00000000001

df
the number of degrees of

freedom Type: INT8

Min: 1

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

PCHISQ_S('chi2stat=<x>,df=<df>')=PCHISQ(<x>,<df>) for all <x> and <df> values.

Examples

```
SELECT nza..PCHISQ_S('chi2Stat=10.83, df=1');

     PCHISQ_S
------------------
 0.99900131362082
(1 row)
```

```
SELECT nza..PCHISQ_S(
nza..CHISQ_TEST_S_AGG(
case when sex='Female' then 0 when sex='Male' then 1
else -1 end,
case
when race='Amer Indian Aleut or Eskimo' then
1 when race='Black' then 2 when race='White'
then 3
when race='Asian or Pacific Islander' then

4 when race='Other' then 5 else -1 end

)) FROM nza..censusincome;

     PCHISQ_S
```

```
------------------
 0.99999885498064
(1 row)
```

```
SELECT nza..PCHISQ_S(
nza..CHISQ_TEST_S_AGG(
case when sex='Female' then 0 when sex='Male' then 1 else -1
end,
case
when race='Amer Indian Aleut or Eskimo' then 1
when race='Black' then 2 when race='White'
then 3
when race='Asian or Pacific Islander' then 4

when race='Other' then 5 else -1 end

))
,nza..CHISQ_TEST_S_AGG(
case when sex='Female' then 0 when sex='Male' then 1 else -1
end,
case
when race='Amer Indian Aleut or Eskimo' then 1
when race='Black' then 2 when race='White'
then 3
when race='Asian or Pacific Islander' then 4

when race='Other' then 5 else -1 end

)
FROM nza..censusincome;
```

```
     PCHISQ_S     |       CHISQ_TEST_S_AGG
------------------+-----------------------------
 0.99999885498064 | chi2Stat= 101.156, df= 4
(1 row)
```

```
SELECT nza..PCHISQ_S('chi2Stat=4.6188, df= 9');
     PCHISQ_S
------------------
 0.13380701958885
(1 row)
```

Related Functions

category Analytics - Probability Distributions
CHISQ_TEST_S_AGG
DCHISQ
PCHISQ
PCHISQ_H

PERCENTAGE_SPLIT - Build and evaluate a Classification model on a ran-domly split table

This stored procedure builds a Classification model on a part of the input data and evaluates its prediction quality on the rest of the data.

Usage

The PERCENTAGE_SPLIT stored procedure has the following syntax:

PERCENTAGE_SPLIT(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

modelType
the name of the procedure that builds a Classification model (e.g. naivebayes, dectree, knn)

Type: NVARCHAR(ANY)

model
the name of the Classification model to

build Type: NVARCHAR(ANY)

intable

the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the

class Type: NVARCHAR(128)

outtable
the output table where the predictions will be

stored Type: NVARCHAR(256)

fraction
the fraction of the data to build the model

on Type: FLOAT

Default: 0.5

Min: 0.0

Max: 1.0

seed
the seed of the random

function Type: FLOAT

Default: random()

Returns
FLOAT prediction accuracy and -1 if accuracy cannot be calculated

Details

This stored procedure builds a Classification model. The procedure randomly selects the given fraction of the input records to build the model, the rest of the records is used to evaluate the prediction quality of the model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipulate the model or access the model tables.

All parameters specific to a the given Classification stored procedure can be defined too: they will be used when building and testing the model.

A table <outtable> is created with the following columns: id, class. The column id matches the <id> column from intable and class is the predicted class label. The size of this table is the same as the size of <intable>.

Examples

```
CALL nza..PERCENTAGE_SPLIT('modelType=dectree,
intable=nza..iris, fraction=0.6, model=iris_c45,
target=class, id=id, outtable=iris_pred, seed=12345');
CALL nza..DROP_MODEL('model=iris_c45');
CALL nza..DROP_TABLE('iris_pred');
 PERCENTAGE_SPLIT
------------------
          0.933333
(1 row)
 DROP_MODEL
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
CROSS_VALIDATION
TRAIN_TEST
DECTREE
NAIVEBAYES
KNN
LIST_MODELS

PEXP - Cumulative Exponential Distribution

Given an exponential scale, this function returns the probability that a variable following the Expo-nential distribution takes a value smaller or equal to x

Usage

The PEXP function has the following syntax:

PEXP(DOUBLE x, DOUBLE scale)

Parameters

x

the value at which to

compute Type: DOUBLE

Min: 0.00000000001

scale
the exponential

scale Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The cumulative exponential distribution function is given in closed form: PEXP(x,scale)=1 - exp(-(x/scale)) for x greater than 0.

The exponential distribution may be encountered in behavior of technical systems for example in case of time between failures, provided that the probability of failure is very low and does not change over time.

If x is negative, PEXP(x,scale) is null for all scale values.

If scale is 0 or less, PEXP(x,scale) is null for all x values.

Examples

```
SELECT nza..PEXP(2,4);

        PEXP
------------------
 0.39346934028737
(1 row)
```

```
SELECT nza..PEXP(1e-20,1);

 PEXP
-------
 1e-20
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DEXP
PEXP_H
QEXP

PEXP_H - Cumulative Exponential Distribution, high tail

Given an exponential scale, this function returns the probability that a variable following the Expo-nential distribution takes a value greater than x

Usage

The PEXP_H function has the following syntax:

PEXP_H(DOUBLE x, DOUBLE scale)

Parameters

x

the value at which to

compute Type: DOUBLE

Min: 0.00000000001

scale

the exponential

scale Type: DOUBLE

Min: 0.00000000001

Returns

DOUBLE the cumulative probability distribution from x to plus infinity

Details

PEXP_H(x,scale)=1-PEXP(x,scale) for all x and df values.

If x is negative, PEXP_H(x,scale) is null for all scale values.

If scale is 0 or less, PEXP_H(x,scale) is null for all x values.

Examples

```
SELECT nza..PEXP_H(2,4),nza..PEXP(2,4);

      PEXP_H      |        PEXP
------------------+------------------
 0.60653065971263 | 0.39346934028737
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DEXP

PEXP

PF - Cumulative Fisher Distribution

Given the degrees of freedom of the nominator and of the denominator, this function returns the probabil-ity that a variable following the Fisher distribution takes a value smaller or equal to x

Usage

The PF function has the following syntax:

PF(DOUBLE x, INT8 dfNomin, INT8 dfDenom)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0.00000000001

dfNomin
the number of degrees of freedom of the

nominator Type: INT8

Min: 1

dfDenom
the number of degrees of freedom of the

denominator Type: INT8

Min: 1

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Fisher distribution, called also Fisher-Snedecor distribution or Fisher F-Distribution, describes the distri-bution of a quotient of two variables following a Chi-square distribution, both scaled by their number of de-grees of freedom (dfNomin, dfDenom respectively).

If x, dfNomin or dfDenom is 0 or less, PF(x,dfNomin,dfDenom) is null.

Examples

```
SELECT nza..PF(9.55, 2, 3);

        PF
-----------------
 0.9499857832907
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DF
PF_H
QF

PF_H - Cumulative Fisher Distribution, high tail

Given the degrees of freedom of the nominator and of the denominator, this function returns the probability that a variable following the Fisher distribution takes a value greater than x

Usage

The PF_H function has the following syntax:

PF_H(DOUBLE x, INT8 dfNomin, INT8 dfDenom)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0.00000000001

dfNomin
the number of degrees of freedom of the

nominator Type: INT8

Min: 1

dfDenom
the number of degrees of freedom of the

denominator Type: INT8

Min: 1

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

PF_H(x,dfNomin,dfDenom)= 1-PF(x,dfNomin,dfDenom) for all positive x, dfNomin and dfDenom values.

If x, dfNomin or dfDenom is 0 or less, PF(x,dfNomin,dfDenom) is null.

Examples

```
SELECT nza..PF_H(9.55, 2, 3);
```

```
         PF_H
------------------
 0.050014216709295
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DF
PF

PFISK - Cumulative Fisk (or log-logistic) Distribution

Given the median and the shape, this function returns the probability that a variable following the Fisk dis-tribution takes a value smaller or equal to x

Usage

The PFISK function has the following syntax:

PFISK(DOUBLE x, DOUBLE median, DOUBLE shape)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0.000000001

median
the median value of the distribution (also called

scale) Type: DOUBLE

Min: 0.000000001

shape
the shape of the

distribution Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Fisk distribution may be used in hydrology in models of precipitation or stream flow rates.

PFISK(x,median,shape)=x^shape/(median^shape+x^shape) for all positive x, median and shape values.

If x, median or shape is 0 or less, PFISK(x,median,shape) is null.

Examples

```
SELECT nza..PFISK(2.43,5,8);

        PFISK
--------------------
 0.0031027056133611
(1 row)
```

```
SELECT nza..PFISK(5,5,8);
 PFISK
-------
   0.5
(1 row)
```

```
SELECT nza..PFISK(2.43,2,3);
      PFISK
----------------
 0.642040659975
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DFISK
PFISK_H
QFISK
QFISK_H

PFISK_H - Cumulative Fisk (or log-logistic) Distribution, high tail

Given the median and the shape, this function returns the probability that a variable following the

Fisk distribution takes a value greater than x

Usage

The PFISK_H function has the following syntax:

PFISK_H(DOUBLE x, DOUBLE median, DOUBLE shape)

Parameters

x

the value at which to

compute Type: DOUBLE

Min: 0.000000001

median

the median value of the distribution (also called

scale) Type: DOUBLE

Min: 0.000000001

shape

the shape of the

distribution Type: DOUBLE

Min: 0.000000001

Returns

DOUBLE the cumulative probability distribution from x to plus infinity

Details

PFISK_H(x,median,shape)= 1-PFISK(x,median,shape) for all positive x, median and shape values.

If x, median or shape is 0 or less, PFISK_H(x,median,shape) is null.

Examples

```
SELECT nza..PFISK_H(2.43,5,8), nza..PFISK(2.43,5,8);

    PFISK_H      |        PFISK
------------------+--------------------
 0.99689729438664 | 0.0031027056133611

(1 row)
```

```
SELECT nza..PFISK_H(5,5,8), nza..PFISK(5,5,8);

 PFISK_H | PFISK
---------+-------
     0.5 |   0.5
```

```
(1 row)
```

```
SELECT nza..PFISK_H(2.43,2,3), nza..PFISK(2.43,2,3);
    PFISK_H     |     PFISK
----------------+----------------
 0.357959340025 | 0.642040659975
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DFISK
PFISK

PGAMMA - Cumulative Gamma Distribution

Given a shape and an inverted scale, this function returns the probability that a variable following the Gamma distribution takes a value smaller or equal to x

Usage

The PGAMMA function has the following syntax:

PGAMMA(DOUBLE x, DOUBLE shape, DOUBLE scaleInv)

Parameters

x
the value at which to

compute Type: DOUBLE

shape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

scaleInv
the inverted scale of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Gamma distribution is the distribution of a sum of random variables which are exponentially distributed. This can be observed for example for the time intervals between successes in the Poisson experiment, or with inter-spike intervals.

PGAMMA(x,1,scaleInv) = PEXP(x,1/scaleInv) for all x and all positive scaleInv values.

If shape or scaleInv is 0 or less, PGAMMA(x,shape,scaleInv) is null for all x values.

Examples

```
SELECT nza..PGAMMA(0,3,0.4),
nza..PGAMMA(1.0,3,0.4), nza..PGAMMA(2.0,3,0.4),
nza..PGAMMA(3,3,0.4), nza..PGamma(4,3,0.4);
   PGAMMA|           PGAMMA         |          PGAMMA          |       PGAMMA
|       PGAMMA

+-------------------------- +--------------------           + -------------------
                      +-----------------
       0| 0.0079263318672562 | 0.047422596071624 |
0.12051290121633 | 0.2166415101611

(1 row)
```

```
SELECT nza..PGAMMA(3,1,2), nza..PEXP(3,1./2);

       PGAMMA       |         PEXP

------------------+------------------

 0.99752124782333 | 0.99752124782333

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DGAMMA
PEXP
PGAMMA_H
QGAMMA

PGAMMA_H - Cumulative Gamma Distribution, high tail

Given a shape and an inverted scale, this function returns the probability that a variable following the Gamma distribution takes a value greater than x

Usage

The PGAMMA_H function has the following syntax:

PGAMMA_H(DOUBLE x, DOUBLE shape, DOUBLE scaleInv)

Parameters

x

the value at which to

compute Type: DOUBLE

shape

the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

scaleInv

the inverted scale of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

PGAMMA_H(x,shape,scaleInv)=1-PGAMMA(x,shape,scaleInv) for all x and all positive shape and scaleInv values.

if shape or scaleInv is 0 or less, PGAMMA_H(x,shape,scaleInv) is null for all x values.

Examples

```
SELECT nza..PGAMMA_H(0,3,0.4),
nza..PGAMMA_H(1.0,3,0.4), nza..PGAMMA_H(2.0,3,0.4),
nza..PGAMMA_H(3,3,0.4), nza..PGAMMA_H(4,3,0.4);
```

```
 PGAMMA_H |      PGAMMA_H      |      PGAMMA_H      |
PGAMMA_H      |     PGAMMA_H

----------+-------------------+------------------
+------------------+-----------------

          | 0.99207366813274 | 0.95257740392838
| 0.87948709878747 | 0.7833584898389

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DGAMMA
PGAMMA

PGEOM - Cumulative Geometric Distribution

Given the success probability p, this function returns the probability that a variable following the Geometric distribution takes a value smaller or equal to x. The value x is the number of failure before the first success in a serie of Bernoulli trials.

Usage

The PGEOM function has the following syntax:

PGEOM(DOUBLE x, DOUBLE p)

Parameters

x

the value at which to

compute Type: DOUBLE

p

the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

A Bernoulli trial models tossing once a manipulated coin that in general does not have the same chance of heads (or success, 1) and tails (or failure, 0). The parameter p indicates the probability of getting heads (1). The cumulative Geometric distribution returns the probability that in a serie of Bernoulli trials you will have x or less failures before the first success.

For x<0, PGEOM(x,p) = 0 for p between 0 and 1,

For x>=0, PGEOM(x,p) = 1-p*(1-p)^{x+1} for p between 0 and 1.

If p is not between 0 and 1, PGEOM(x,p) is null for all x values.

Examples

```
SELECT nza..PGEOM(0,0.4), nza..PGEOM(1,0.4), nza..PGEOM(2,0.4),
nza..PGEOM(3,0.4);
```

```
 PGEOM | PGEOM | PGEOM | PGEOM
```

```
-------+-------+-------+--------
    0.4 |   0.64 | 0.784 |  0.8704
(1 row)
```

```
SELECT nza..PGEOM(6,0.4);
    PGEOM
-----------
 0.9720064
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DGEOM
PBERN
PGEOM_H
QGEOM

PGEOM_H - Cumulative Geometric Distribution, high tail

Given the success probability p, this function returns the probability that a variable following the Geometric distribution takes a value greater than x. The value x is the number of failure before the first success in a serie of Bernoulli trials.

Usage

The PGEOM_H function has the following syntax:

PGEOM_H(DOUBLE x, DOUBLE p)

Parameters

x
the value at which to

compute Type: DOUBLE

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

The function PGEOM_H returns the probability that in a serie of Bernoulli trials you will have more than x failures before the first success. PGEOM_H(x,p) = 1-PGEOM(x,p) for all x values and for p between 0 and 1.

If p is not between 0 and 1, PGEOM_H(x,p) is null for all x values.

Examples

```
SELECT nza..PGEOM_H(0,0.4), nza..PGEOM_H(1,0.4),
nza..PGEOM_H(2,0.4), nza..PGEOM_H(3,0.4);
  PGEOM_H| PGEOM_H | PGEOM_H | PGEOM_H
---------+---------+---------+---------
      0.6|     0.36|    0.216|   0.1296
(1 row)
```

```
SELECT nza..PGEOM_H(6,0.4), nza..PGEOM(6,0.4);
  PGEOM_H  |   PGEOM
-----------+-----------
 0.0279936 | 0.9720064
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DGEOM
PGEOM

PHYPER - Cumulative Hypergeometric Distribution

Given the number of white and black balls in the urn and the number of trials, this function returns the probability that a variable following the Geometric distribution takes a value smaller or equal to x. The value x is the number of white balls drawn from an urn in a serie of trials without replacement.

Usage

The PHYPER function has the following syntax:

PHYPER(BIGINT x, BIGINT wu, BIGINT bu, BIGINT N)

Parameters

x
the number of white balls drawn without replacement from an urn which contains both black and white balls

Type: BIGINT

wu
the number of white balls in the

urn Type: BIGINT

Min: 0

bu
the number of black balls in the

urn Type: BIGINT

Min: 0

N
the number of balls drawn from the urn without

replacement Type: BIGINT

Min: 1

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

In an urn containing wu white balls and bu black balls, we draw N balls without replacement. Drawing a white ball is a success (1), a black ball is a failure (0). The cumulative Hypergeometric distribution calculates the probability that we get x or less successes in the N trials.

If the number of balls in the urn increases to "infinity" and the quotient bu/wu remains fixed, the Hypergeometric distribution can be approximated with the binomial distribution having p=wu/ (wu+bu).

If wu or bu is negative, PHYPER(x,wu,bu,N) is null for all x and N values.

If N is 0 or less, PHYPER(x,wu,bu,N) is null for all x, wu and bu values.

Examples

```
SELECT nza..PHYPER(1,1,1,1);

 PHYPER

--------
```

```
      1
(1 row)
```

```
SELECT nza..PHYPER(1,2,3,4);
 PHYPER
--------
    0.4
(1 row)
```

```
SELECT nza..PHYPER(10,20,30,40);
       PHYPER
---------------------
 1.7985883651357e-05
(1 row)
```

```
SELECT nza..PHYPER(10,40,20+30-40,20);
       PHYPER
---------------------
 1.7985883651357e-05
(1 row)
```

```
SELECT nza..PHYPER(0,3,11,4), nza..PHYPER(1.0,3,11,4),
nza..PHYPER(2.0,3,11,4), nza..PHYPER(3,3,11,4),
nza..PHYPER(4,3,11,4);
      PHYPER       |       PHYPER       |       PHYPER       |
PHYPER | PHYPER
+-------------------+------------------+------------------
          +--------
  0.32967032967033| 0.824175824175 82 | 0.98901098901099 |
1  |      1
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DHYPER
PHYPER_H
QHYPER

PHYPER_H - Cumulative Hypergeometric Distribution, high tail

Given the number of white and black balls in the urn and the number of trials, this function returns the probability that a variable following the Geometric distribution takes a value greater than x. The value x is the number of white balls drawn from an urn in a serie of trials without replace-ment.

Usage

The PHYPER_H function has the following syntax:

PHYPER_H(BIGINT x, BIGINT wu, BIGINT bu, BIGINT N)

Parameters

x
the number of white balls drawn without replacement from an urn which contains both black and white balls

Type: BIGINT

wu
the number of white balls in the

urn Type: BIGINT

Min: 0

bu
the number of black balls in the

urn Type: BIGINT

Min: 0

N
the number of balls drawn from the urn without

replacement Type: BIGINT

Min: 1

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

PHYPER_H(x,wu,bu,N) = 1-PHYPER(x,wu,bu,N) for all x and positive wu, bu and N values.

If wu or bu is negative, PHYPER_H(x,wu,bu,N) is null for all x and N values.

If N is 0 or less, PHYPER_H(x,wu,bu,N) is null for all x, wu and bu values.

Examples

```
SELECT nza..PHYPER_H(1,1,1,1);
 PHYPER_H
----------
      0
(1 row)
```

```
SELECT nza..PHYPER_H(1,2,3,4);
 PHYPER_H
----------
      0.6
(1 row)
```

```
SELECT nza..PHYPER_H(10,20,30,40);
     PHYPER_H
------------------
 0.99998201411635
(1 row)
```

```
SELECT nza..PHYPER_H(10,40,20+30-40,20);
     PHYPER_H
------------------
 0.99998201411635
(1 row)
```

```
SELECT nza..PHYPER_H(0,3,11,4),
nza..PHYPER_H(1.0,3,11,4), nza..PHYPER_H(2.0,3,11,4),
nza..PHYPER_H(3,3,11,4), nza..PHYPER_H(4,3,11,4);
     PHYPER_H     |      PHYPER_H      |      PHYPER_H
|      PHYPER_H        | PHYPER_H
------------------+------------------+------------------
+---------------------+----------
 0.67032967032967 | 0.17582417582418 | 0.010989010989011
| 4.4408920985006e-16 |        0
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DHYPER
PHYPER

PLNORM - Cumulative Galton (or LogNormal) Distribution

Given a logarithmic scale median and shape, this function returns the probability that a variable following the LogNormal distribution takes a value smaller or equal to x

Usage

The PLNORM function has the following syntax:

PLNORM(DOUBLE x, DOUBLE medlog, DOUBLE sdlog)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0.000000001

medlog
the median value on the logarithmic

scale Type: DOUBLE

sdlog
the shape on the logarithmic

scale Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The LogNormal distribution is defined as PLNORM(x,medlog,sdlog)=PNORM((ln(x)-medlog)/sdlog) for all medlog and for all positive x and sdlog values.

The properties of living tissues, like weight or skin area, tend to follow the Galton distribution.

If x or sdlog is 0 or less, PLNORM(x,medlog,sdlog) is null for all medlog values.

Examples

```
SELECT nza..PLNORM(2.43,0,1);

       PLNORM
------------------
 0.81270037603389
(1 row)
```

```
SELECT nza..PLNORM(2.43,2,3);

       PLNORM
------------------
 0.35542940976158
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DLNORM
PLNORM_H
PNORM
QLNORM

PLNORM_H - Cumulative Galton (or LogNormal) Distribution, high tail

Given a logarithmic scale median and shape, this function returns the probability that a variable following the LogNormal distribution takes a value greater than x

Usage

The PLNORM_H function has the following syntax:

PLNORM_H(DOUBLE x, DOUBLE medlog, DOUBLE sdlog)

Parameters

x

the value at which to

compute Type: DOUBLE

Min: 0.000000001

medlog

the median value on the logarithmic

scale Type: DOUBLE

sdlog

the shape on the logarithmic

scale Type: DOUBLE

Min: 0.000000001

Returns

DOUBLE the cumulative probability distribution from x to plus infinity

Details

PLNORM_H(x,medlog,sdlog)=1-PLNORM(x,medlog,sdlog) for all medlog and for all positive x and sdlog values.

If x or sdlog is 0 or less, PLNORM_H(x,medlog,sdlog) is null for all medlog values.

Examples

```
SELECT nza..PLNORM_H(2.43,0,1);

     PLNORM_H
------------------
 0.18729962396611
(1 row)
```

```
SELECT nza..PLNORM_H(2.43,2,3);

     PLNORM_H
------------------
 0.64457059023842
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DLNORM
PLNORM

PLOGIS - Cumulative Logistic Distribution

Given the mean and the scale, this function returns the probability that a variable following the Logistic dis-tribution takes a value smaller or equal to x

Usage

The PLOGIS function has the following syntax:

PLOGIS(DOUBLE x, DOUBLE mean, DOUBLE scale)

Parameters

x
the value at which to

compute Type: DOUBLE

mean
the mean value of the

distribution Type: DOUBLE

scale
the scale of the

distribution Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The logistic distribution is used in describing the spread of epidemics.

PLOGIS(x,mean,scale)=1./(1+exp(-(x-mean)/scale)) for all x and mean values and for all positive scale values.

If scale is 0 or less, PLOGIS(x,mean,scale) is null for all x and mean values.

Examples

```
SELECT nza..PLOGIS(2.43,0,1);

      PLOGIS
------------------
 0.91908653278453
```

```
(1 row)


SELECT nza..PLOGIS(2.43,2,3);
      PLOGIS
------------------
 0.53577211111408
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DLOGIS
PLOGIS_H
QLOGIS

PLOGIS_H - Cumulative Logistic Distribution, high tail

Given the mean and the scale, this function returns the probability that a variable following the Lo-gistic distribution takes a value greater than x

Usage

The PLOGIS_H function has the following syntax:

PLOGIS_H(DOUBLE x, DOUBLE mean, DOUBLE scale)

Parameters

x

the value at which to

compute Type: DOUBLE

mean

the mean value of the

distribution Type: DOUBLE

scale

the scale of the

distribution Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

PLOGIS_H(x,mean,scale)=1-PLOGIS(x,mean,scale) for all x and mean and for all positive scale values.

If scale is 0 or less, PLOGIS_H(x,mean,scale) is null for all x and mean values.

Examples

```
SELECT nza..PLOGIS_H(2.43,0,1);

     PLOGIS_H

-------------------

 0.080913467215465

(1 row)
```

```
SELECT nza..PLOGIS_H(2.43,2,3);

     PLOGIS_H

------------------

 0.46422788888592

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DLOGIS
PLOGIS

PMML_DECTREE - Convert a Decision Tree model to PMML

This stored procedure converts a Decision Tree model to the PMML format

Usage

The PMML_DECTREE stored procedure has the following syntax:

PMML_DECTREE(NVARCHAR(ANY) paramString)
Parameters
paramString
comma-separated list of <parameter>=<value> entries with parameters below

Type: NVARCHAR(ANY)

model
the name of the Decision Tree model to

convert Type: NVARCHAR(ANY)

outtable
the output table where the Decision Tree model is to be stored in PMML format. If the table does not exist it will be created. The PMML model is inserted into this table in one or several rows.

the output table should have following columns: seqid, modelname, model. The column modelname contains the name of the model, the PMML model is stored in one or several rows in the column model, the rows are sorted by the sequence ID in column seqid.

Type: NVARCHAR(ANY)

Returns
INTEGER the number of rows written into the output table

Details

This stored procedure converts a Decision Tree model to the PMML format and stores the conver-ted model into the given output table.

Examples

```
CALL nza..DECTREE('model=adult_tree,
intable=nza..adult_train, id=id, target=income,
minsplit=1000, eval=entropy,
valtable=nza..adult_prune, qmeasure=wAcc');
CALL nza..PMML_DECTREE('model=adult_tree,
outtable=mining_models');
CALL nza..DROP_MODEL('model=adult_tree');

CALL nza..DROP_TABLE('mining_models');
```

```
 DECTREE
---------
      13
(1 row)


 PMML_DECTREE
--------------
            1
```

```
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
DECTREE
GROW_DECTREE
PRUNE_DECTREE
PRINT_DECTREE
PMML_MODEL

PMML_MODEL - Generate a PMML representation of an analytics model

This stored procedure stores the given analytics model as PMML document to a table

Usage

The PMML_MODEL stored procedure has the following syntax:

PMML_MODEL(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to be stored as PMML

document Type: NVARCHAR(64)

type
the type of PMML document to be created: "standard" (default), or "spss"

Type: VARCHAR(16)

outtable
the output table to write the PMML document

into Type: NVARCHAR(ANY)

Returns
INTEGER the number of records written into the PMML table

Details

This stored procedure export the given analytics model as PMML document to a table. Since there is no LOB data type in the Netezza database, the PMML document is written into several rows of the output table referenced by a sequence id. If the output table does not exist, it will be created with the 3 columns below. If the output table exists, it must have two or three columns:

modelname containing the name of the model (optional, the type is NVARCHAR(128) or smaller),

seqid containing the model sequence id (mandatory, the type is one of INTEGER/SMALLINT/BI-GINT),

pmml containing the PMML document (mandatory, the type is NVARCHAR(1024) or greater).

If the table exists and has two columns, it must be empty. If it has three columns, the model name must not yet exist (so when you create two PMML documents of different type (standard,spss) for the same model, they cannot be stored in the same table).

If no PMML can be built for the model type, an exception is raised.

Examples

```
CALL                    nza..ARULE('intable=nza..retail,
model=mbamodel,    supporttype=percent,    support=5,
lvl=0, maxsetsize=5, confidence=0.5');
CALL nza..PMML_MODEL('model=mbamodel,
outtable=pmmlmodels');
CALL nza..DROP_MODEL('model=mbamodel');
CALL nza..DROP_TABLE('pmmlmodels');
```

```
NOTICE:
             RUNNING FPGrowth algorithm:
             DATASET : "NZA".."RETAIL"
             Transaction column : "TID"
             Item column : "ITEM"
             Group by : <none>
             Minimum support : 5 %
             Minimum confidence: 0.5
```

```
            Max frequent itemset size : 5
            Level of conditional dbs : 0
            Result tables prefix : "NZA_META_MBAMODEL"
 ARULE
-------
    14
(1 row)
 PMML_MODEL
------------
          2
(1 row)
NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS
EXPORT_PMML

PMML_NAIVEBAYES - Convert a Naive Bayes model to PMML

This stored procedure converts a Naive Bayes model to the PMML format

Usage

The PMML_NAIVEBAYES stored procedure has the following syntax:

PMML_NAIVEBAYES(NVARCHAR(ANY) paramString)

▲ Parameters

- ► **paramString**

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Naive Bayes model to

convert Type: NVARCHAR(ANY)

outtable
the output table where the Naive Bayes model is to be stored in PMML format. If the table does not exist it will be created. The PMML model is inserted into this table in one or several rows.

the output table should have following columns: seqid, modelname, model. The column modelname contains the name of the model, the PMML model is stored in one or several rows in the column model, the rows are sorted by the sequence ID in column seqid.

Type: NVARCHAR(ANY)

Returns
INTEGER the number of rows written into the output table

Details

This stored procedure converts a Naive Bayes model to the PMML format and stores the converted model into the given output table.

Examples

```
CALL nza..NAIVEBAYES('model=NB_soybean,
intable=nza..soybean_train, id=instance, target=class');

CALL nza..PMML_NAIVEBAYES('model=NB_soybean,

outtable=MINING_MODELS');

CALL nza..DROP_MODEL('model=NB_soybean');

CALL nza..DROP_TABLE('mining_models');
```

```
 NAIVEBAYES
------------
        1881
(1 row)


 PMML_NAIVEBAYES
-----------------
               16
(1 row)
```

```
 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
NAIVEBAYES
PREDICT_NAIVEBAYES
PMML_MODEL

PMWW - Cumulative Mann-Whitney-Wilcoxon Distribution

Given the number of items separated in two sets, the minimum number of items in set 1, this function re-turns the probability that a variable following the MWW distribution takes a value smaller or equal to MWWmin

Usage

The PMWW function has the following syntax:

PMWW(BIGINT MWWmin, BIGINT COUNTmin, BIGINT NoItems)

Parameters

MWWmin
the value at which to

compute Type: BIGINT

Min: 0

Max: COUNTmin*(NoItems+NoItems-COUNTmin+1)/2;

COUNTmin
the number of items in set

1 Type: BIGINT

Min: 1

Max: NoItems-1

NoItems
the total number of

items Type: BIGINT

Min: 1

Returns
DOUBLE the cumulative probability distribution from minus infinity to point MWWmin

Details

We have a set of observations of variable x split into two sets. We assume that the values of the variable x are distributed in both sets in the same way, and are independent. We assume that x is ordinal, so that we can rank all values of x. The statistics uStat is calculated as the sum of ranks of objects belonging to the first set or to the second set, whichever is lower.

The function PMWW returns the probability that uStat is smaller or equal to MWWmin.

If MWWmin, COUNTmin or NoItems are not in their validity interval, PMWW(MWWmin, Count-min, NoItems) returns null.

Examples

```
SELECT nza..PMWW(13,4,9);

         PMWW

-------------------

 0.0555555555555556

(1 row)
```

```
SELECT nza..PMWW(30,4,9);

 PMWW

------

    1

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DMWW
MWW_TEST

PMWW_H
QMWW

PMWW_H - Cumulative Mann-Whitney-Wilcoxon Distribution, high tail

Given the number of items separated in two sets, the minimum number of items in set 1, this function returns the probability that a variable following the MWW distribution takes a value greater than MWWmin

Usage

The PMWW_H function has the following syntax:

PMWW_H(BIGINT MWWmin, BIGINT COUNTmin, BIGINT NoItems)

Parameters

MWWmin
the value at which to

compute Type: BIGINT

Min: 0

Max: COUNTmin*(NoItems+NoItems-COUNTmin+1)/2;

COUNTmin
the number of items in set

1 Type: BIGINT

Min: 1

Max: NoItems-1

NoItems
the total number of

items Type: BIGINT

Min: 1

Returns
DOUBLE the cumulative probability distribution from MWWmin to plus infinity

Details

PMWW_H(MWWmin,COUNTmin,NoItems)=1-PMWW(MWWmin,COUNTmin,NoItems) for all MWWmin, COUNTmin and NoItems values in their respective validity interval.

If MWWmin, COUNTmin or NoItems are not in their validity
interval, PMWW_H(MWWmin,COUNTmin,NoItems) returns null.

Examples

```
SELECT nza..PMWW_H(13,4,9);

        PMWW_H
-----------------
```

```
 0.944444444444444
(1 row)
```

```
SELECT nza..PMWW_H(30,4,9);
 PMWW_H
--------
      0
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DMWW
PMWW

PNBINOM - Cumulative Negative Binomial Distribution

Given the success probability p and the number of successes needed, this function returns the probability that a variable following the Negative Binomial distribution takes a value smaller or equal to x. The value x is the number of failures in a serie of Bernoulli trials before the number of successes requested is reached.

Usage

The PNBINOM function has the following syntax:

PNBINOM(DOUBLE x, INT8 s, DOUBLE p)

Parameters

x

the value at which to

compute Type: DOUBLE

s

the number of successes needed to stop the serie of Bernoulli

trials Type: INT8

Min: 1

p

the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

A Bernoulli trial models tossing once a manipulated coin that in general does not have the same chance of heads (or success, 1) and tails (or failure, 0). The parameter p indicates the probability of getting heads (1). The cumulative Negative Binomial distribution returns the probability that in a serie of Bernoulli trials you get x or less failures before reaching s successes.

Note that the difference with a Binomial distribution lies in the difference in the stopping condition of the Bernoulli trial serie. While the Negative Binomial distribution limits the number of successes, the Binomial distribution limits the overall number of trials. Hence the domain of the Binomial distribution is finite, while that of the Negative Binomial distribution is infinite.

If s is 0 or less, PNBINOM(x,s,p) is null for all x and p values.

If p is not between 0 and 1, PNBINOM(x,s,p) is null for all x and s values.

Examples

```
SELECT nza..PNBINOM(0,3,0.4), nza..PNBINOM(1.0,3,0.4),
nza..PNBINOM(2.0,3,0.4), nza..PNBINOM(3,3,0.4),
nza..PNBINOM(4,3,0.4);
  PNBINOM| PNBINOM | PNBINOM | PNBINOM | PNBINOM
---------+---------+---------+---------+----------
    0.064|   0.1792|  0.31744|  0.45568|  0.580096
(1 row)
```

```
SELECT nza..PNBINOM(3,3,0.4), nza..PNBINOM(30,30,0.4),
nza..PNBINOM(300,300,0.4), nza..PNBINOM(3000,3000,0.4),
nza..PNBINOM(30000,30000,0.4);
 PNBINOM |       PNBINOM      |        PNBINOM       |
PNBINOM          | PNBINOM
---------+------------------- +--------------------
+--------------------         +---------
  0.45568 | 0.074623694097046 | 4.549861735637e-07 |
2.005553283824e-55 |        0
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNBINOM
PBINOM
PNBINOM_H
QNBINOM

PNBINOM_H - Negative Binomial Distribution, high tail

Given the success probability p and the number of successes needed, this function returns the probability that a variable following the Negative Binomial distribution takes a value greater than x. The value x is the number of failures in a serie of Bernoulli trials before the number of successes requested is reached.

Usage

The PNBINOM_H function has the following syntax:

PNBINOM_H(DOUBLE x, INT8 s, DOUBLE p)

Parameters

x
the value at which to

compute Type: DOUBLE

s
the number of successes needed to stop the serie of Bernoulli

trials Type: INT8

Min: 1

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

The function PBINOM_H returns the probability that in a serie of N Bernoulli trials you will have more than x failures while getting s successes.

PNBINOM_H(x,s,p) = 1-PNBINOM(x,s,p) for all x and all positive s values and for p between 0 and 1.

If s is 0 or less, PNBINOM_H(x,s,p) is null for all x and p values.

If p is not between 0 and 1, PNBINOM_H(x,s,p) is null for all x and s values.

Examples

```
SELECT nza..PNBINOM_H(0,3,0.4),nza..PNBINOM_H(1.0,3,0.4),
nza..PNBINOM_H(2.0,3,0.4), nza..PNBINOM_H(3,3,0.4),
nza..PNBINOM_H(4,3,0.4);
 PNBINOM_H| PNBINOM_H | PNBINOM_H | PNBINOM_H | PNBINOM_H
-----------+-----------+-----------+-----------+-----------
     0.936|     0.8208|    0.68256|    0.54432|   0.419904
(1 row)
```

```
SELECT nza..PNBINOM_H(3,3,0.4), nza..PNBINOM_H(30,30,0.4),
nza..PNBINOM_H(300,300,0.4), nza..PNBINOM_H(3000,3000,0.4),
nza..PNBINOM_H(30000,30000,0.4);
 PNBINOM_H|     PNBINOM_H     |     PNBINOM_H     | PNBINOM_H |
PNBINOM_H
          +-------------------+-------------------+ -----------
+----------------------
   0.54432| 0.92537630564857 | 0.99999954501382 |          1 |
1
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNBINOM
PBINOM_H
PNBINOM

PNORM - Cumulative Standard Normal Distribution

This function returns the probability that a variable following the Standard Normal distribution takes a value smaller or equal to x

Usage

The PNORM function has the following syntax:

PNORM(DOUBLE x)

Parameters

x

the value at which to

compute Type: DOUBLE

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Gaussian distribution, called also Normal distribution, is claimed to occur in many natural pro-cesses. In particular, a multitude of independent processes generating continuous numbers of whatever distribution tend to follow in average a normal distribution.

The Standard Normal Distribution has a mean equal to 0 and a variance equal to 1. If a variable X follows any normal distribution with mean mu and standard deviation std, then (X-mu)/std follows the Standard Normal Distribution.

PNORM(x)=PNORM3P(x,0,1) for all x values.

Examples

```
SELECT nza..PNORM(2.43);

      PNORM

------------------

 0.99245058858369

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNORM
PNORM3P
PNORM_H
QNORM

PNORM3P - Cumulative Normal Distribution

Given a mean value and a standard deviation, this function returns the probability that a variable following the Normal distribution takes a value smaller or equal to x

Usage

The PNORM3P function has the following syntax:

PNORM3P(DOUBLE x, DOUBLE mean, DOUBLE stdev)

Parameters

x

the value at which to

compute Type: DOUBLE

mean

the mean value of the

distribution Type: DOUBLE

stdev

the standard deviation of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Gaussian distribution, called also Normal distribution, is claimed to occur in many natural processes. In particular, a multitude of independent processes generating continuous numbers of whatever distribution tend to follow in average a normal distribution.

The Normal Distribution with a mean equal to 0 and a variance equal to 1 is called Standard Normal Distri-bution. PNORM3P(x,0,1)=PNORM(x) for all x values.

If stdev is 0 or less, PNORM3P(x,mean,stdev) is null for all x and mean values.

Examples

```
SELECT nza..PNORM3P(2.43,0,1);

     PNORM3P
------------------
 0.99245058858369
(1 row)
```

```
SELECT nza..PNORM3P(2.43+6,6,1);

     PNORM3P
------------------
 0.99245058858369
```

```
(1 row)


SELECT nza..PNORM3P(2.43*3+6,6,3);
     PNORM3P
------------------
 0.99245058858369
(1 row)



SELECT nza..PNORM3P(2.43*3-6,6,3);
      PNORM3P
-------------------
 0.058207555638553
(1 row)



SELECT nza..PNORM3P(18-2.43*3,6,3);
     PNORM3P
------------------
 0.94179244436145
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNORM3P
PNORM
QNORM3P

PNORM_H - Cumulative Standard Normal Distribution, high tail

This function returns the probability that a variable following the Standard Normal distribution takes a value greater than to x

Usage

The PNORM_H function has the following syntax:

PNORM_H(DOUBLE x)

Parameters

x

the value at which to

compute Type: DOUBLE

Returns

DOUBLE the cumulative probability distribution from point x to plus infinity

Details

PNORM_H(x)=1-PNORM(x) for all x values.

Examples

```
SELECT nza..PNORM_H(2.43);

      PNORM_H
--------------------
 0.0075494114163092
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNORM
PNORM

PPOINT - Percentage Point Distributions

This stored procedure computes the value x of a variable following a given distribution for which the prob-ability of being smaller or equal to x is equal to the given percentage

Usage

The PPOINT stored procedure has the following syntax:

PPOINT(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring

comma-separated list of <parameter>=<value> entries with parameters below

Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

type
the kind of distribution(s) to

use: n - normal (QNORM)

c - chi-square (QCHISQ)

t - t-student (QT)

u - uniform (QUNIF) e -

exponential (QEXP) w -

Weibull (QWEIBULL)

Note that several distributions can be calculated simultaneously by concatenating the distribution abbreviations in the parameter value.

Type: NVARCHAR(ANY)

incolumn
the numeric input table column containing the percentage. The percentage must be between 0 an 1.

Type: NVARCHAR(128)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

outtable
the output table Type:

NVARCHAR(256)

df
the number of degrees of freedom for a student or chi-square

distribution Type: INT8

Default: <none>

min
the minimum for a uniform

distribution Type: DOUBLE

Default: <none>

max
the maximum for a uniform

distribution Type: DOUBLE

Default: <none>

scale
the scale for an exponential or weibull

distribution Type: DOUBLE

Default: <none>

Min: 0.00000000001

shape
the shape for a weibull

distribution Type: DOUBLE

Default: <none>

mean
the mean value for a normal

distribution Type: DOUBLE

Default: <none>

variance
the variance for a normal

distribution Type: NVARCHAR(ANY)

Default: <none>

Min: 0.00000000001

Returns
INT8 the number of input table values for which a percentage point is calculated

Details

Formally the percentage point is the value for which a cumulative distribution function has a probability equal to the given percentage. The cumulative distribution function must be invertable. Hence, the percent-age point may be undefined if there exist several x values for which the cumulative distribution function has the same value.

The parameters for the distributions can contain literal values or expressions.

The output table has following columns: id, <incolumn>. Additionally, the output table contains a column for each distribution, named like the distribution density function, and containing the output of this function. It also contains a column per specific parameter for this distribution, named as the parameter, and containing the value calculated for it in each row.

Examples

```
CALL nza..CUMULATIVE('intable=nza..iris, id=id,
type="n", incolumn=petallength, outtable=iripetall,
mean=3.75, variance=3.11');
CALL nza..PPOINT('intable=iripetall, id=id, type="n",
incolumn=pnorm, outtable=iripetallpp, mean=mean,
variance=variance');
```

```
SELECT AVG(a.petallength-b.qnorm) FROM nza..iris a
INNER JOIN iripetallpp b ON a.id=b.id;
CALL nza..DROP_TABLE('iripetall');
CALL nza..DROP_TABLE('iripetallpp');
```

```
 CUMULATIVE
------------
        150
(1 row)


 PPOINT
--------
    150
(1 row)


         AVG
----------------------
 -2.2204460492503e-17
(1 row)


 DROP_TABLE
------------
 t
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Probability Distributions

QCHISQ
QEXP
QNORM
QT
QUNIF
QWEIBULL

PPOIS - Cumulative Poisson Distribution

Given the mean number of success within a fixed time interval, this function returns the probability that a variable following the Poisson distribution takes a value smaller or equal to x. The value x is the number of successes expected within this time interval.

Usage

The PPOIS function has the following syntax:

PPOIS(DOUBLE x, DOUBLE lambda)

Parameters

x

the value at which to

compute Type: DOUBLE

lambda

the mean number of successes within a fixed time

interval Type: DOUBLE

Min: 0.00000000001

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

In a Poisson process, the average rate of success over time is known. The probability of a single success within a time interval is proportional to its length and is independent of the probability outside of the inter-val. If the interval is getting shorter, the probability of getting more than 1 success goes down to zero. The random variable of a Poisson distribution takes on non-negative integer values, indicating the number of successes in the corresponding time interval.

Poisson distribution is also thought sometimes as an extension of the binomial distribution. PBINOM(x,N,p) is approximately PPOIS(x,lambda) if p*N=lambda and N grows to infinity.

If x is 0 or less, PPOIS(x,lambda) = 0 for all positive lambda values.

If lambda is 0 or less, PPOIS(x,lambda) is null for all x values.

Examples

```
SELECT nza..PPOIS(0,0.4), nza..PPOIS(1,0.4), nza..PPOIS(2,0.4),
nza..PPOIS(3,0.4);
```

```
       PPOIS        |       PPOIS       |       PPOIS        |
PPOIS
                    +----------------- +------------------
+------------------------------------
 0.67032004603564 | 0.9384480644499 | 0.99207366813275 |
0.99922374862379
(1 row)
```

```
SELECT nza..PPOIS(6,0.4);
       PPOIS
------------------
 0.99999977069309
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DPOIS
PBINOM
PPOIS_H
QPOIS

PPOIS_H - Cumulative Poisson Distribution, high tail

Given the mean number of success within a fixed time interval, this function returns the probabil-ity that a variable following the Poisson distribution takes a value greater than x. The value x is the number of successes expected within this time interval.

Usage

The PPOIS_H function has the following syntax:

PPOIS_H(DOUBLE x, DOUBLE lambda)

Parameters

x

the value at which to

compute Type: DOUBLE

lambda
the mean number of successes within a fixed time

interval Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

PPOIS_H(x,lambda) = 1-PPOIS(x,lambda) for all x and all positive lambda values.

If x is 0 or less, PPOIS(x,lambda) = 0 for all positive lambda values.

If lambda is 0 or less, PPOIS(x,lambda) is null for all x values.

Examples

```
SELECT nza..PPOIS_H(0,0.4), nza..PPOIS_H(1,0.4),
nza..PPOIS_H(2,0.4), nza..PPOIS_H(3,0.4);
    PPOIS_H       |       PPOIS_H       |       PPOIS_H        |
PPOIS_H
+--------------------------------------+-------------------+--------------------

 0.32967995396334 | 0.061551935550118 | 0.0079263318672562 |
0.0007762513762073
(1 row)
```

```
SELECT nza..PPOIS_H(6,0.4);
        PPOIS_H
---------------------
 2.2930691206771e-07
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DPOIS
PPOIS

PPV - Positive Predictive Value from a Confusion Matrix

This stored procedure calculates the Positive Predictive Value of a class from a confusion matrix

Usage

The PPV stored procedure has the following syntax:

PPV(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

matrixTable

the confusion matrix table

Type: NVARCHAR(256)

class

the class in the confusion matrix table to calculate the Positive Predictive Value

on Type: NVARCHAR(ANY)

Returns

DOUBLE the Positive Predictive Value

Details

This stored procedure calculates the Positive Predictive Value of a class from a confusion matrix. The Positive Predictive Value is the ratio of the number or correctly classified records into the giv-en class divided by the total number of predictions into this class.

The confusion matrix table has the following columns: real, prediction, cnt. The column cnt con-tains the frequency of making a given prediction for the given real value.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,
traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..CONFUSION_MATRIX('intable=nza..iris_test,
resulttable=iris_pred, id=id, resultid=id, target=class,
resulttarget=class, matrixTable=confMatrix');
CALL nza..PPV('matrixTable=confMatrix, class=virginica');
CALL nza..DROP_MODEL('model=iris_c45');
CALL nza..DROP_TABLE('iris_pred');
CALL nza..DROP_TABLE('confMatrix');
```

TRAIN_TEST

```
------------
   0.918919
(1 row)

 CONFUSION_MATRIX
------------------
                5
(1 row)

 PPV
-----
 0.9
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CONFUSION_MATRIX

PREDICT_ARULE - Predict an Association Rules model

This stored procedure applies an Association Rules model to new data. All rules or only some of the rules corresponding to given criteria can be applied.

Usage

The PREDICT_ARULE stored procedure has the following syntax:

PREDICT_ARULE(NVARCHAR(ANY) paramString)

Parameters

paramString

A comma-separated list of <parameter>=<value> entries using the parameters

below. Type: NVARCHAR(ANY)

intable

the input table

Type: NVARCHAR(ANY)

outtable

the output table Type:

NVARCHAR(ANY)

model

The name of the Association Rules model to

score. Type: NVARCHAR(ANY)

tid

the input table column identifying

transactions Type: NVARCHAR(ANY)

Default: tid

item

the input table column identifying items in

transactions Type: NVARCHAR(ANY)

Default: item

by

the input table column identifying groups of transactions if any. Association Rules min-ing is done separately on each of these groups. Leave the parameter undefined if no groups are to be considered.

Type: NVARCHAR(ANY)

Default: <none>

type

The type how the scoring algorithm should be applied to the input data. The following values are allowed: recommend, exclusiveRecommend.

recommend: A rule is returned if its left hand side itemset is a subset of the transaction.

exclusiveRecommend: A rule is returned if its left hand side itemset is a subset of the input itemset, and its right hand side itemset is not a subset of the transaction.

Type: VARCHAR(64)

Default: exclusiveRecommend

namemap
table which provides names of items and their associated mapped values in LHS_ITEMS, RHS_ITEMS columns of outtable

Type: NVARCHAR(ANY)

Default: <null>

itemname
the column name of namemap table where the item identifiers are

stored Type: NVARCHAR(128)

Default: item

itemnamemapped
the column name of namemap table where the item names are stored which should be used in-stead of the item identifier.

Type: NVARCHAR(128)

Default: item_name

minsize
The minimum number of items per association rule to be

applied. Type: INTEGER

Default: 1

Min: 1

Max: 64

maxsize
The maximum number of items per association rule to be

applied. Type: INTEGER

Default: 64

Min: 1

Max: 64

minsupp
The minimum support of an association rule to be

applied. Type: DOUBLE

Default: 0.0

Min: 0.0

Max: 1.0

maxsupp
The maximum support of an association rule to be

applied. Type: DOUBLE

Default: 1.0

Min: 0.0

Max: 1.0

minconf
The minimum confidence of an association rule to be

applied. Type: DOUBLE

Default: 0.0

Min: 0.0

Max: 1.0

maxconf
The maximum confidence of an association rule to be

applied. Type: DOUBLE

Default: 1.0

Min: 0.0

Max: 1.0

minlift
The minimum lift of an association rule to be

applied. Type: DOUBLE

Default: 0.0

Min: 0.0

maxlift
The maximum lift of an association rule to be

applied. Type: DOUBLE

Default: null (unlimited)

Min: 0.0

minconv
The minimum conviction of an association rule to be

applied. Type: DOUBLE

Default: 0.0

Min: 0.0

maxconv
The maximum conviction of an association rule to be

applied. Type: DOUBLE

Default: null (unlimited)

Min: 0.0

minaffi
The minimum affinity of an association rule to be

applied. Type: DOUBLE

Default: 0.0

Min: 0.0

Max: 1.0

maxaffi
The maximum affinity of an association rule to be

applied. Type: DOUBLE

Default: 1.0

Min: 0.0

Max: 1.0

minleve
The minimum leverage of an association rule to be

applied. Type: DOUBLE

Default: -0.25

Min: -0.25

Max: 1.0

maxleve
The maximum leverage of an association rule to be

applied. Type: DOUBLE

Default: 1.0

Min: -0.25

Max: 1.0

Returns
BITINT The number of transactions processed.

Details

This procedure predicts association rules of an Association Rules model. To select interesting rules from the set of all detected rules, the minimum/maximum constraints on the following measures of significance and interest can be used: support, confidence, lift and conviction.

- The support supp(X) of an itemset X is defined as the proportion of transactions in the dataset which con-tain all items of the itemset. For a rule, all items of the rule are considered.

The confidence of a rule X->Y is defined as: conf(X->Y) = supp({X,Y})/supp(X). The confidence can be interpreted as an estimation of the probability P(Y|X), the probability of finding the items of Y in transactions that also contain the items of X.

The lift of a rule X->Y is defined as: lift(X->Y) = supp({X,Y})/(supp(Y)*supp(X)). The lift is the ratio of the observed support for {X,Y} to the support expected if X and Y were independent.

The conviction of a rule X->Y is defined as: conv(X->Y) = (1 - supp(Y))/(1 - conf(X->Y)). The convic-tion can be interpreted as can be interpreted as the ratio of the expected frequency that X occurs without Y, which is the frequency that the rule makes an incorrect prediction, if X and Y were inde-pendent to the observed frequency of incorrect predictions.

Examples

```
CALL nza..ARULE('intable=nza..retail, model=assoc,
supporttype=percent, support=5, lvl=0,
maxsetsize=5, confidence=0.5');
CALL nza..PREDICT_ARULE('model=assoc,
intable=nza..retail, outtable=retail_score,
minsupp=0.08, minconf=0.6, minlift=1.33, minconv=1.3');
select * from retail_score;

drop table retail_score;

CALL nza..DROP_MODEL('model=assoc');
```

```
 ARULE
-------
    14
(1 row)
 PREDICT_ARULE
---------------
          88162
(1 row)


 GID |   TID   | LHS_SID | RHS_SID |  LHS_ITEMS | RHS_ITEMS
 |      SUPPORT       |     CONFIDENCE     |        LIFT
|   CONVICTION     |     AFFINITY      |      LEVERAGE
-----+--------+---------    +---------+-----------      +-----------
+-------------------       +-----------------     + -----------------
+----------------+-----------------             +-----------------

     |      4 |       12 |        2 | 39,41      | 48
  0.083550736144824 | 0.64534781846855 | 1.3503062625329
  1.4720704655452 | 0.15949591841154 | 0.021675339086308
```

```
     |    556 |      12  |       2 |  39,41     | 48       |
0.083550736144824  | 0.64534781846855 | 1.3503062625329 |
1.4720704655452  | 0.15949591841154 | 0.021675339086308
     | 32581 |       12  |       2 |  39,41     | 48       |
0.083550736144824  | 0.64534781846855 | 1.3503062625329 |
1.4720704655452  | 0.15949591841154 | 0.021675339086308
     | 33666 |       12  |       2 |  39,41     | 48       |
0.083550736144824  | 0.64534781846855 | 1.3503062625329 |
1.4720704655452  | 0.15949591841154 | 0.021675339086308
     | 34484 |       12  |       2 |  39,41     | 48       |
0.083550736144824  | 0.64534781846855 | 1.3503062625329 |
1.4720704655452  | 0.15949591841154 | 0.021675339086308
     | 52981 |       12  |       2 |  39,41     | 48       |
0.083550736144824  | 0.64534781846855 | 1.3503062625329 |
1.4720704655452  | 0.15949591841154 | 0.021675339086308
(6 rows)

DROP TABLE


 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Association Rules
ARULE

PREDICT_DECTREE - Apply a Decision Tree model

This stored procedure applies a Decision Tree model to generate classification predictions

Usage

The PREDICT_DECTREE stored procedure has the following syntax:

PREDICT_DECTREE(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Decision Tree model

Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the predictions will be

stored Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

Default: <id> column used to build the model

target
the input table column representing the

class. Type: NVARCHAR(128)

Default: <target> column used to build the model

prob
the flag indicating whether the probability of the predicted class should be included into the output table or not

Type: BOOLEAN

Default: false

outtableprob
if specified, the probability output table where class probability predictions will be stored

Type: NVARCHAR(256)

Default: NULL

Returns
INTEGER the number of input table records for which predictions were generated

Details

This stored procedure applies a Decision tree model to predict a class value for records of the in-put table.

The predictions are stored in an output table with following columns: id, class, prob. The id column matches the <id> column of the input table and the class column contains the predicted class label for the corresponding input table record. The prob column is included only if the prob argument is true, it contains the probability that the predicted value is correct.

Examples

```
CALL nza..DECTREE('model=adult_tree, intable=nza..adult_train,
id=id, target=income, minsplit=1000, eval=entropy,
valtable=nza..adult_prune, qmeasure=wAcc');
CALL nza..PREDICT_DECTREE('model=adult_tree,
intable=nza..adult_test, id=id,
outtable=adult_pred, prob=TRUE');
CALL nza..DROP_MODEL('model=adult_tree');
CALL nza..DROP_TABLE('adult_pred');
```

```
 DECTREE
---------
       13
(1 row)
 PREDICT_DECTREE
-----------------
            8140
(1 row)
 DROP_MODEL
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
DECTREE
GROW_DECTREE
PRUNE_DECTREE
LIST_MODELS

PREDICT_DIVCLUSTER - Apply a Hierarchical Clustering model

This stored procedure applies a Hierarchical Clustering model to cluster records of a dataset.

Usage

The PREDICT_DIVCLUSTER stored procedure has the following syntax:

PREDICT_DIVCLUSTER(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Hierarchical Clustering

model Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the assigned clusters will be

stored Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

Default: <id> column used to build the model

level
the level of the cluster hierarchy which should be applied to the data. For level=-1, only the leaves of the clustering tree are considered.

Type: INTEGER

Default: -1

Min: -1

Max: 60

Returns
BIGINT the number of input table records for which a cluster is assigned

Details

This stored procedure applies a Hierarchical Clustering model to cluster records of the input table.

The clusters assigned to the input table records are stored in an output table with following columns: id, cluster_id, distance. The id column matches the <id> column of the input table. Each input table record is associated with a cluster, where the distance from the record to the cluster center is the smallest. The cluster ID and the distance to the cluster center are given in the columns cluster_id and distance. The negative number of cluster_id identifies leafs of the cluster tree.

Examples

```
CALL nza..DIVCLUSTER('model=iris_mdl, intable=nza..iris,
outtable=iris_out, id=id, target=class, distance=euclidean,
maxiter=5, minsplit=5, maxdepth=3, randseed=12345');
CALL nza..DROP_TABLE('iris_out');
CALL nza..PREDICT_DIVCLUSTER('model=iris_mdl, intable=nza..iris,
outtable=iris_out, id=id, level=-1');
CALL nza..DROP_MODEL('model=iris_mdl');
CALL nza..DROP_TABLE('iris_out');
```

```
 DIVCLUSTER
------------
         15
(1 row)


 DROP_TABLE
------------
 t
(1 row)
 PREDICT_DIVCLUSTER
--------------------
                150
(1 row)
 DROP_MODEL
------------
 t
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Clustering
DIVCLUSTER
LIST_MODELS

PREDICT_GLM - Apply a Generalized Linear Model

This stored procedure applies a Generalized Linear Model to generate regression predictions

Usage

The PREDICT_GLM stored procedure has the following syntax:

PREDICT_GLM(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Generalized Linear model

Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the predictions will be

stored Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

Default: <id> column used to build the model

debug
flag indicating to display debug

information Type: BOOLEAN

Default: false

Returns
BIGINT the number of rows processed

Details

This stored procedure applies a Generalized Linear model to predict a numeric value for records of the input table.

The predictions are stored in an output table with following columns: id, pred.

Examples

```
CALL nza..GLM('model=adult_glm, intable=nza..adult_train, id=id,
target=age');
CALL nza..PREDICT_GLM('model=adult_glm, intable=nza..adult_test,
id=id, outtable=adult_pred');
CALL nza..DROP_MODEL('model=adult_glm');

CALL nza..DROP_TABLE('adult_pred');
```

```
 GLM
-----
  58
(1 row)

 PREDICT_GLM
-------------
        8140
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
GLM
LIST_MODELS

PREDICT_KMEANS - K-means Clustering

This stored procedure applies a K-means Clustering model to cluster records of a dataset.

Usage

The PREDICT_KMEANS stored procedure has the following syntax:

PREDICT_KMEANS(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the K-means Clustering

model Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the assigned clusters will be

stored Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

Default: <id> column used to build the model

Returns
BIGINT the number of input table records for which a cluster is assigned

Details

This stored procedure applies a K-means Clustering model to cluster records of the input table.

The clusters assigned to the input table records are stored in an output table with following columns: id, cluster_id, distance. The id column matches the <id> column of the input table. Each input table record is associated with a cluster, where the distance from the record to the cluster center is the smallest. The cluster ID and the distance to the cluster center are given in the columns cluster_id and distance.

Examples

```
CALL nza..KMEANS('model=adult_mdl, intable=nza..adult,
outtable=adult_out, id=id, target=income, transform=L,
distance=euclidean, k=3, maxiter=5, randseed=12345');
CALL nza..PREDICT_KMEANS('model=adult_mdl,
intable=nza..adult, outtable=adult_pred, id=id');
CALL nza..DROP_MODEL('model=adult_mdl');
CALL nza..DROP_TABLE('adult_out');
CALL nza..DROP_TABLE('adult_pred');
```

```
 KMEANS
--------
      3
(1 row)


  PREDICT_KMEANS
----------------
          32561
(1 row)


 DROP_MODEL
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Clustering
KMEANS
LIST_MODELS

PREDICT_KNN - Apply a K-Nearest Neighbors model

This stored procedure applies a K-Nearest Neighbors model to generate classification or regression predictions for a dataset.

Usage

The PREDICT_KNN stored procedure has the following syntax:

PREDICT_KNN(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the K-Nearest Neighbors

model Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the predictions will be

stored Type: NVARCHAR(ANY)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

Default: <id> column used to build the model

target
the input table column representing the

class. Type: NVARCHAR(128)

Default: <target> column used to build the model

distance
the distance function. Allowed values are: euclidean, manhatthan, canberra, maxim-

um.

Type: NVARCHAR(ANY)

Default: euclidean

k
number of nearest neighbors to

consider Type: INTEGER

Default: 3

stand
flag indicating whether the measurements in the input table are standardized before calculating the distance.

Type: BOOLEAN

Default: true

fast
flag indicating that the algorithm used coresets based

method. Type: BOOLEAN

Default: true

weights
the input table containing optional class weights for the input table <target> column.

The <weights> table is used only when the <target> column is not numeric. If the parameter is undefined, we assume that the weights are uniformly equal to 1.

The <weights> table contains following columns:

weight: a numeric column containing the class weight,

class: a column to be joined with the <target> column of <intable>, defining class weights.

For classes not occurring in this table, weights of 1 are assumed.

Type: NVARCHAR(256)

Default: <none>

Returns
BIGINT the number of input table records for which predictions were generated

Details

This stored procedure applies a K-Nearest Neighbors model to predict a class value or a numeric value for records of the input table.

The predictions are stored in an output table with following columns: id, class. The id column matches the <id> column of the input table and the class column contains the predicted class label or the predicted value for the corresponding input table record.

Examples

```
CALL nza..KNN('model=iris_mdl_c, intable=nza..iris, id=id,

target=class');
```

```
CALL nza..PREDICT_KNN('model=iris_mdl_c,
intable=nza..iris, outtable=iris_cla, id=id,
target=class, distance=euclidean, k=3,
stand=false, fast=false');
CALL nza..KNN('model=iris_mdl_r,
intable=nza..iris, id=id, target=petalwidth');
CALL nza..PREDICT_KNN('model=iris_mdl_r,
intable=nza..iris, outtable=iris_reg, id=id,
target=petalwidth, distance=euclidean, k=1,
stand=false, fast=false');
CALL nza..DROP_MODEL('model=iris_mdl_c');
CALL nza..DROP_MODEL('model=iris_mdl_r');
CALL nza..DROP_TABLE('iris_cla');
CALL nza..DROP_TABLE('iris_reg');
```

```
 KNN
-----
 150
(1 row)


 PREDICT_KNN
-------------
          150
(1 row)
 KNN
-----
 150
(1 row)


 PREDICT_KNN
-------------
          150
(1 row)


 DROP_MODEL
```

```
------------
 t
(1 row)
 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
KNN
LIST_MODELS

PREDICT_LINEAR_REGRESSION - Apply a Linear Regression Model

This stored procedure applies a Linear Regression model to generate regression predictions for a dataset

Usage

The PREDICT_LINEAR_REGRESSION stored procedure has the following syntax:

PREDICT_LINEAR_REGRESSION(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Linear Regression model

Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the predictions will be

stored Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

Default: <id> column used to build the model

Returns
BOOLEAN always true

Details

This stored procedure applies a Linear Regression model to predict one or several numeric values for records of the input table.

The predictions are stored in an output table with the <id> column of the input table and all pre-dicted columns of the Linear Regression model containing their predicted value for the corres-ponding input table record.

Examples

```
CREATE TABLE adultT1 AS SELECT id, age AS v1, fnlwgt
AS fnlwgt, education_num AS v3 FROM nza..adult;
CALL nza..LINEAR_REGRESSION('model=modelA,
intable=adultT1, id=id, target=fnlwgt');
CALL nza..PREDICT_LINEAR_REGRESSION('model=modelA,
intable=adultT1, outtable=adult_fnlwgt_pred,
id=id'); CALL nza..DROP_MODEL('model=modelA');
CALL nza..DROP_TABLE('adult_fnlwgt_pred');
CALL nza..DROP_TABLE('adultT1');
```

```
 LINEAR_REGRESSION
-------------------
 t
(1 row)


 PREDICT_LINEAR_REGRESSION
---------------------------
```

```
 t
(1 row)

 DROP_MODEL
------------
 t
(1 row)

  DROP_TABLE
------------
 t
(1 row)

  DROP_TABLE
------------
 t
(1 row)
```

```
CREATE TABLE adultT2 AS SELECT id, age, education_num,
income, sex FROM nza..adult;
CALL nza..LINEAR_REGRESSION('model=modelC, intable=adultT2,
id=id, target=age, nominalCols=income;sex,
calculateDiagnostics=TRUE');
CALL   nza..PREDICT_LINEAR_REGRESSION('model=modelC,
intable=adultT2,  outtable=adult_age_pred,  id=id');
CALL nza..DROP_MODEL('model=modelC');
CALL nza..DROP_TABLE('adult_age_pred');
CALL nza..DROP_TABLE('adultT2');
```

```
 LINEAR_REGRESSION
-------------------
 t
(1 row)
```

```
 PREDICT_LINEAR_REGRESSION
----------------------------
 t
(1 row)

 DROP_MODEL
------------
 t
(1 row)

  DROP_TABLE
------------
 t
(1 row)

  DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
LINEAR_REGRESSION

PREDICT_NAIVEBAYES - Apply a Naive Bayes model

This stored procedure applies a Naive Bayes model to generate classification predictions for a data-set.

Usage

The PREDICT_NAIVEBAYES stored procedure has the following syntax:

PREDICT_NAIVEBAYES(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Naive Bayes

model Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the predictions will be

stored Type: NVARCHAR(ANY)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

Default: <id> column used to build the model

target
the input table column representing the

class. Type: NVARCHAR(128)

Default: <target> column used to build the model

outtableProb
the output table where the probabilities for each of the classes will be stored. If not specified, the table will not be created.

Type: NVARCHAR(ANY)

Default: <none>

mestimation
flag indicating to use m-estimation for probabilities. This kind of estimation of probabilities may be slower but can give better results for small or heavy unbalanced datasets.

Type: NVARCHAR(ANY)

Default: false

Returns
INTEGER the number of input table records for which predictions were generated

Details

This stored procedure applies a Naive Bayes model to predict a class value for records of the input table.

The predictions are stored in an output table with following columns: id, class. The id column matches the <id> column of the input table and the class column contains the predicted class label for the corresponding input table record.

If the parameter <outtablePro

is specified, probabilities for predicting the class labels are stored in another output table with fol-lowing columns: id, class, prob, logprob. This table contains probabilities for each record of the in-put table and for each class label.

Examples

```
CALL nza..NAIVEBAYES('model=NB_soybean,
intable=nza..soybean_train, id=instance, target=class');
CALL nza..PREDICT_NAIVEBAYES('model=NB_soybean,
intable=nza..soybean_test, id=instance,
outtable=soybean_pred');
CALL nza..DROP_MODEL('model=NB_soybean');
CALL nza..DROP_TABLE('soybean_pred');
```

```
 NAIVEBAYES
------------
        1881
(1 row)


 PREDICT_NAIVEBAYES
--------------------
                 170
(1 row)


 DROP_MODEL
------------
 t
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
NAIVEBAYES
LIST_MODELS

PREDICT_REGTREE - Apply a Regression Tree model

This stored procedure applies a Regression Tree model to generate regression predictions for a dataset

Usage

The PREDICT_REGTREE stored procedure has the following syntax:

PREDICT_REGTREE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Regression Tree model

Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the predictions will be

stored Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

Default: <id> column used to build the model

target
the input table column representing the prediction target. The specified target column will not be used for prediction and is permitted to contain NULL values.

Type: NVARCHAR(128)

Default: <target> column used to build the model

var
a flag indicating whether the variance of the predictions should be included into the output table

Type: BOOLEAN

Default: false

Returns
INTEGER the number of input table records for which predictions were generated

Details

This stored procedure applies a Regression tree model to predict a numeric value for records of the input table.

The predictions are stored in an output table with following columns: id, class, var. The id column matches the <id> column of the input table and the class column contains the predicted value for the corresponding input table record. The var column is included only if the var argument is true, it contains the prediction variance.

Examples

```
CALL nza..REGTREE('model=wrt, intable=nza..weatherr,
id=instance, target=grade, minsplit=2, maxdepth=4');
CALL nza..PREDICT_REGTREE('model=wrt,
intable=nza..weatherr, id=instance, outtable=wpr,
var=TRUE');
CALL nza..DROP_MODEL('model=wrt');
CALL nza..DROP_TABLE('wpr');
```

```
 REGTREE
---------
      13
(1 row)
 PREDICT_REGTREE
-----------------
              22
(1 row)
 DROP_MODEL
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
GROW_REGTREE
LIST_MODELS
PRUNE_REGTREE
REGTREE

PREDICT_TWOSTEP - Apply a TwoStep Clustering model

This stored procedure applies a TwoStep Clustering model to score records of a dataset

Usage

The PREDICT_TWOSTEP stored procedure has the following syntax:

PREDICT_TWOSTEP(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the TwoStep Clustering model to be

used Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the clusters assigned will be

stored Type: NVARCHAR(ANY)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

Default: the id column used to build the TwoStep clustering model

Returns
BIGINT the number of records scored 8assigned to a cluster)

Details

This stored procedure applies a TWOSTEP Clustering model to cluster records of the input table.

The clusters assigned to the input table records are stored in an output table with following columns: id, cluster_id, distance. The id column matches the <id> column of the input table. Each input table record is associated with a cluster, where the distance from the record to the cluster is the smallest. The cluster ID and the distance to the cluster are given in the columns cluster_id and distance.

Examples

```
CALL nza..TWOSTEP('model=adult_mdl,
intable=nza..adult, distance=euclidean, id=id');
CALL nza..PREDICT_TWOSTEP('model=adult_mdl,
intable=nza..adult, outtable=adult_pred, id=id');
CALL nza..DROP_MODEL('model=adult_mdl'); CALL
nza..DROP_TABLE('adult_pred');
 TWOSTEP
---------
       2
(1 row)

 PREDICT_TWOSTEP
-----------------
           32561
(1 row)
 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Clustering
TWOSTEP
LIST_MODELS

PRINT_ARULE - Print an Association Rules model

This stored procedure displays the association rules of an Association Rules model. All rules or only some of the rules corresponding to given criteria can be displayed.

Usage

The PRINT_ARULE stored procedure has the following syntax:

PRINT_ARULE(NVARCHAR(ANY) paramString)

Parameters

paramString
A comma-separated list of <parameter>=<value> entries using the parameters

below. Type: NVARCHAR(ANY)

model
The name of the Association Rules model to be

printed. Type: NVARCHAR(ANY)

outtable
A table with Association Rules in a human readable format to be generated. Columns GRP, DRIVERS, DRIVER1, DRIVER2, .. DRIVERN, TARGET, NUM_DRIVERS, NUM_TARGET, SUPPORT_PCT, CONFIDENCE_PCT, LIFT, CONVICTION, ABSOLUTE_SUPPORT (Where DRIVERS are the concatenated ITEM resp. ITEM_DESCRIPTIONS of all DRIVERS) If 'null' no outtable is gener-ated

Type: NVARCHAR(ANY)

Default: null

namemap
the namemap table identifying items (column item) and there associated names (item_name). If namemap parameter is specified all items in textual output an in outtable, if specified, are replaced by there corresponding values from item names. Values from namemap column item are mapped to values from namemap column item_name. If a value is missing from namemap column item, its original value is displayed. If 'null', no name mapping is used.

Type: NVARCHAR(ANY)

Default: null

item
the namemap table column identifying items. The type of column item must be of the same kind (numerical/ nominal) as column item of intable specified when the model was created. Type: NVARCHAR(ANY)

Default: item

item_name
the namemap table column identifying the item name associated with

item Type: NVARCHAR(ANY)

Default: item_name

minsize
The minimum number of items per association rule to be displayed.

Type: INTEGER

Default: 1

Min: 1

Max: 64

maxsize
The maximum number of items per association rule to be

displayed. Type: INTEGER

Default: 64

Min: 1

Max: 64

minsupp
The minimum support of an association rule to be

displayed. Type: DOUBLE

Default: 0.0

Min: 0.0

Max: 1.0

maxsupp
The maximum support of an association rule to be

displayed. Type: DOUBLE

Default: 1.0

Min: 0.0

Max: 1.0

minconf
The minimum confidence of an association rule to be

displayed. Type: DOUBLE

Default: 0.0

Min: 0.0

Max: 1.0

maxconf
The maximum confidence of an association rule to be

displayed. Type: DOUBLE

Default: 1.0

Min: 0.0

Max: 1.0

minlift

The minimum lift of an association rule to be displayed.

Type: DOUBLE

Default: 0.0

Min: 0.0

maxlift
The maximum lift of an association rule to be

displayed. Type: DOUBLE

Default: 1e12

Min: 0.0

minconv
The minimum conviction of an association rule to be

displayed. Type: DOUBLE

Default: 0.0

Min: 0.0

maxconv
The maximum conviction of an association rule to be

displayed. Type: DOUBLE

Default: 1e12

Min: 0

Returns
TEXT A formatted output of the association rules.

Details

This procedure displays association rules of an Association Rules model. To select interesting rules from the set of all detected rules, the minimum/maximum constraints on the following measures of significance and interest can be used: support, confidence, lift and conviction.

- The support supp(X) of an itemset X is defined as the proportion of transactions in the dataset which con-tain all items of the itemset. For a rule, all items of the rule are considered.

- The confidence of a rule X->Y is defined as: conf(X->Y) = supp({X,Y})/supp(X). The confidence can be inter-preted as an estimation of the probability P(Y|X), the probability of finding the items of Y in transactions that also contain the items of X.

- The lift of a rule X->Y is defined as: lift(X->Y) = supp({X,Y})/(supp(Y)*supp(X)). The lift is the ratio of the ob-served support for {X,Y} to the support expected if X and Y were independent.

The conviction of a rule X->Y is defined as: conv(X->Y) = (1 - supp(Y))/(1 - conf(X->Y)). The conviction can be interpreted as can be interpreted as the ratio of the expected frequency that X occurs without Y, which is the frequency that the rule makes an incorrect prediction, if X and Y were independent to the observed fre-quency of incorrect predictions.

Examples

```
CREATE TABLE retailnamemap AS SELECT DISTINCT(item), 'item'||
item::VARCHAR(5) AS item_name from nza..retail;
DELETE FROM retailnamemap WHERE item=39;
CALL nza..ARULE('intable=nza..retail, model=assoc,
supporttype=percent, support=5, lvl=0,
maxsetsize=5, confidence=0.5');
CALL nza..PRINT_ARULE('model=assoc, minsize=3,
minsupp=0.05, minconf=0.6, minlift=1.3, minconv=1.3');
CALL nza..PRINT_ARULE('model=assoc,
namemap=retailnamemap, item=item, item_name=item_name,
outtable=assoc_out, minsize=3, minsupp=0.05,
minconf=0.6, minlift=1.3, minconv=1.3');
SELECT * FROM assoc_out ORDER BY support_pct
desc, confidence_pct DESC;
CALL nza..DROP_MODEL('model=assoc');
DROP TABLE assoc_out;
DROP TABLE retailnamemap;
```

```
INSERT 0 16470
DELETE 1
 ARULE
-------
    14
(1 row)

PRINT_ARULE
------------------------------------------------------
------------------------------------------------------
---------------------------------
        GRP= | {41,48} -> {39} [supp=0.083550736144824,
conf=0.81681082279885, lift=1.4210493489806,
conv=2.3211298697154, abs_supp=7366]
        GRP= | {39,41} -> {48} [supp=0.083550736144824,
conf=0.64534781846855, lift=1.3503062625329,
conv=1.4720704655452, abs_supp=7366]
        GRP= | {38,48} -> {39} [supp=0.069213493341803,
conf=0.76812688821752, lift=1.3363513116731,
conv=1.8337868834446, abs_supp=6102]
        GRP= | {32,39} -> {48} [supp=0.061273564574306,
conf=0.63891188645772, lift=1.3368399129912,
conv=1.4458326995372, abs_supp=5402]

(1 row)


PRINT_ARULE

----------------------------------------------------------------
----------------------------------------------------------------
---------------------

        GRP= | {item41,item48} -> {39}
[supp=0.083550736144824, conf=0.81681082279885,
lift=1.4210493489806, conv=2.3211298697154, abs_supp=7366]

        GRP= | {39,item41} -> {item48}
[supp=0.083550736144824, conf=0.64534781846855,
lift=1.3503062625329, conv=1.4720704655452, abs_supp=7366]

        GRP= | {item38,item48} -> {39}
[supp=0.069213493341803, conf=0.76812688821752,
lift=1.3363513116731, conv=1.8337868834446, abs_supp=6102]

        GRP= | {39,item32} -> {item48}
[supp=0.061273564574306, conf=0.63891188645772,
lift=1.3368399129912, conv=1.4458326995372, abs_supp=5402]

(1 row)

 GRP |    DRIVERS     | DRIVER1 | DRIVER2 | TARGET | NUM_DRIVERS
  NUM_TARGET | SUPPORT_PCT | CONFIDENCE_PCT | LIFT | CONVICTION
  ABSOLUTE_SUPPORT

-----+---------------        +---------+---------+--------
+------------  +------------+-------------+---------------
+------+------------         +-----------------

     | item41,item48 | item41  | item48  | 39     |           2
|          1 |      8.3551 |        81.6811 | 1.42 |        2.32
|             7366

     | 39,item41     | 39      | item41  | item48 |           2
|          1 |      8.3551 |        64.5348 | 1.35 |        1.47
|             7366

     | item38,item48 | item38  | item48  | 39     |           2
|          1 |      6.9213 |        76.8127 | 1.34 |        1.83
|             6102

     | item32,39     | item32  | 39      | item48 |           2
|          1 |      6.1274 |        63.8912 | 1.34 |        1.45
|             5402

(4 rows)

 DROP_MODEL

------------
```

```
 t
(1 row)
DROP TABLE
DROP TABLE
```

Related Functions

category Analytics - Association Rules
ARULE
PRINT_MODEL

PRINT_DECTREE - Print a Decision Tree model

This stored procedure displays the tree of a Decision Tree model

Usage

The PRINT_DECTREE stored procedure has the following syntax:

PRINT_DECTREE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Decision Tree model to

print Type: NVARCHAR(ANY)

Returns
TEXT pretty print of the decision tree

Details

This stored procedure displays a tree representation of a Decision Tree. The size of the presented tree is limited to the 12th depth level.

Examples

```
CALL nza..DECTREE('model=adult_tree,
intable=nza..adult_train, id=id, target=income,
minsplit=1000, eval=entropy,
valtable=nza..adult_prune, qmeasure=wAcc');
```

```
CALL nza..PRINT_DECTREE('model=adult_tree');
CALL nza..DROP_MODEL('model=adult_tree');
```

```
 DECTREE
---------
      13
(1 row)


PRINT_DECTREE
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
---------------------------------------------------------------
-------
 -- decision tree model: "ADULT_TREE" -
- MARITAL_STATUS = Married-civ-spouse
| EDUCATION_NUM <= 12
  | CAPITAL_GAIN <= 5013
  | | EDUCATION_NUM <= 8
  | | | if true then class -> small
  | | | CAPITAL_LOSS <= 1844
  | | | | if true then class -> small
  | | | | if false then class -> large
  | | if false then class -> large
  | if false then class -> large
  CAPITAL_GAIN <= 6849
  | if true then class -> small
  | if false then class -> large

(1 row)


 DROP_MODEL
------------
```

```
 t
(1 row)
```

Related Functions

category Analytics - Classification
DECTREE
GROW_DECTREE
PRUNE_DECTREE
PRINT_MODEL

PRINT_GLM - Print a Generalized Linear Model

This stored procedure displays the Generalized Linear Model

Usage

The PRINT_GLM stored procedure has the following syntax:

PRINT_GLM(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Generalized Linear Model to

print Type: NVARCHAR(ANY)

Returns
TEXT pretty print of the GLM model

Details

This stored procedure displays the variables (column or column=value) used in the Generalized Lin-ear model.

Examples

```
CALL nza..GLM('model=adult_glm,
intable=nza..adult_train, id=id, target=age');
CALL nza..PRINT_GLM('model=adult_glm');

CALL nza..DROP_MODEL('model=adult_glm');
```

```
 GLM
-----
  58
(1 row)

                                           PRINT_GLM
---------------------------------------------------------------
-----------------------------------------------------
 GLM coefficients for model: "ADULT_GLM"
| Parameter     | Beta          | Std Error     | Test
     | p-value  |
| CAPITAL_GAIN  | 1236476372.4326     | 1.261565 |
980113039.86098 | 0  |
| CAPITAL_LOSS  | 0  | 0  | 0  | 1  |
| [EDUCATION=10th]    | 70694.252506  | 9.9e-05  |
712294983.15725 | 0  |
| [EDUCATION=11th]    | 9457026.152379| 0.011683 |
809445741.10391 | 0  |
| [EDUCATION=12th]    | 1054976.097704| 0.00131  |
805531163.51935 | 0  |
| [EDUCATION=1st-4th]| 0  | 0  | 0  | 1  |
| [EDUCATION=5th-6th]| 5953.979105   | 7e-06    |
806110584.50755 | 0  |
| [EDUCATION=7th-8th]| 1699415.276319| 0.002126 |
799475249.68433 | 0  |
| [EDUCATION=9th]     | 517064.283118 | 0.000669 |
773444626.15156 | 0  |
| [EDUCATION=Assoc-acdm]   | -6487425.351825    | 0.007926 |
-818542637.29585| 0|
| [EDUCATION=Assoc-voc]    | 4297865.495047| 0.005344 |
804207685.01062 | 0  |
| [EDUCATION=Bachelors]    | 2790986.17114 | 0.003377 |
826572317.51956 | 0  |
| [EDUCATION=Doctorate]    | 10081.224693  | 1.2e-05  |
812254638.24876 | 0  |
| [EDUCATION=HS-grad]| 23996067.744298     | 0.029649 |
809341980.55466 | 0  |
| [EDUCATION=Masters]| -178807.154514| 0.000209 |
-855890549.04825| 0   |
| [EDUCATION=Preschool]    | 0   |0   | 0  | 1  |
| [EDUCATION=Prof-school]  | -66497403.583758    |
0.082528  | -805752687.99542    |0|
| [EDUCATION=Some-college] | -4792983.442041     |
0.005801  | -826293153.47292    |0|
| EDUCATION_NUM | -741594040.77619     | 0.919503 |
-806516120.1987 | 0   |
| FNLWGT   | 7048682.96056 | 0.008357 | 843448003.01712
     | 0  |
| HOURS_PER_WEEK| -2925425212.5927     | 3.599251 |
-812787155.18794| 0   |
| [INCOME=large]| -78590200.483261     | 0.097219 |
-808382324.63756| 0   |
| [MARITAL_STATUS=Divorced]      |10916381.920467      |
0.013598  | 802813969.22133      |0|
| [MARITAL_STATUS=Married-AF-spouse]  | 32516.293256   |
4e-05 | 807324374.62716    | 0   |
| [MARITAL_STATUS=Married-civ-spouse] | -90699696.605852
     | 0.112281 | -807793726.07924    | 0  |
| [MARITAL_STATUS=Married-spouse-absent]   |
3092290.106745  | 0.003832 | 806968757.90802    | 0   |
| [MARITAL_STATUS=Never-married]| 33610782.85697|
0.041477  | 810351610.16738      |0   |
| [MARITAL_STATUS=Separated]     |1413861.75504 |
0.001778  | 795394019.08737      |0   |
| [OCCUPATION=Adm-clerical]      |6831925.450798|
0.008485  | 805160127.85468      |0|
| [OCCUPATION=Armed-Forces]      |0   | 0  | 0  | 1   |
| [OCCUPATION=Craft-repair]      |7800946.988712|
0.009685  | 805454423.57801      |0|
| [OCCUPATION=Exec-managerial]   |7292348.517329|
0.009091  | 802136233.81722      |0|
| [OCCUPATION=Farming-fishing]   |52271.588155  |
0.000129  | 406690834.27643      |0   |
| [OCCUPATION=Handlers-cleaners]| 4848799.041996|
0.006019  | 805563061.65121      |0   |
| [OCCUPATION=Machine-op-inspct]| -28622648.118112    |
0.035411   | -808303537.86755   | 0  |
| [OCCUPATION=Other-service]    | 22945284.976713    | 0.02844
      | 806807222.15172    | 0|
| [OCCUPATION=Priv-house-serv]  | 0  |0 |0 |1         |
| [OCCUPATION=Prof-specialty]   | -56259524.59247    | 0.06996
      | -804161515.77365   | 0|
| [OCCUPATION=Protective-serv]  | -7135928.834456    | 0.008702
      | -820067345.11553   | 0|
| [OCCUPATION=Sales] | 3866031.731685| 0.004608 |
838909066.86626 | 0  |
| [OCCUPATION=Tech-support]     | 4926746.289357| 0.006112 |
806062900.07193 | 0|
| [RACE=Amer-Indian-Eskimo]     | -13090239.556102   | 0.016326
      | -801805296.83039   | 0|
| [RACE=Asian-Pac-Islander]     | -57148707.07129    | 0.070897
      | -806078747.30174   | 0|
  [RACE=Black] | 7073138.392589| 0.008752 | 808156798.35235
      | 0 |
| [RACE=Other]  | 56757.170433  | 7e-05    | 809453070.20306
      | 0   |
| [RELATIONSHIP=Husband]   | -90025569.639478    | 0.111572 |
-806885688.31952| 0|
| [RELATIONSHIP=Not-in-family]  | 21585833.265741    | 0.026898
      | 802503255.78684    | 0|
| [RELATIONSHIP=Other-relative]  | 8426225.551671| 0.010369 |
812598532.63938 | 0|
| [RELATIONSHIP=Own-child] | 13638284.064545    | 0.016768 |
813331234.32576 | 0|
| [RELATIONSHIP=Unmarried] | 12400492.327892    | 0.015344 |
808171903.33442 | 0|
| [SEX=Female]  | 47443608.699712    | 0.058642 |
809037545.9424  | 0   |
| [WORKCLASS=Federal-gov]  | 2275316.264219| 0.002843 |
800447560.49006 | 0|
| [WORKCLASS=Local-gov]    | -73500307.465652    | 0.091017 |
-807541076.89325| 0   |
| [WORKCLASS=Never-worked] | 0  | 0   | 0  | 1   |
| [WORKCLASS=Private] | 22128409.07369| 0.027512 |
804319208.69186 | 0   |
| [WORKCLASS=Self-emp-inc] | 954332.337204 | 0.001083
| 881332186.93148 | 0 |

| [WORKCLASS=Self-emp-not-inc]  | 6392886.257766|
0.007977  | 801380730.90913    | 0|

| [WORKCLASS=State-gov] | 7645950.859105| 0.009361 |
816778459.03935 | 0 |


 Residuals Summary:

| Residual Type | RSS      | df | p-value  |

| Pearson  |0|16222|0|

| Deviance |0|16222|0|


(1 row)


 DROP_MODEL

------------

 t

(1 row)
```

Related Functions

category Analytics - Regression
GLM
PRINT_MODEL

PRINT_KMEANS - Print a K-means model

Print the clusters, the centers or the column statistics of a K-means model.

Usage

The PRINT_KMEANS stored procedure has the following syntax:

PRINT_KMEANS(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters below

Type: NVARCHAR(ANY)

model
the K-means model to print

Type: NVARCHAR(ANY)

clusters
the list of cluster IDs of the model to print. The cluster IDs are separated by a semicolon (;). If not specified, information for all clusters are printed.

Type: NVARCHAR(ANY)

columns
the list of input column names of the model to print. The input column names are separated by a semicolon (;). If not specified, information for all input columns are printed.

Type: NVARCHAR(ANY)

mode
the display mode determining which information of the model to print. Allowed values are: clusters, centers, statistics.

Type: NVARCHAR(ANY)

Default: clusters

Returns
TEXT pretty print of the K-means model

Details

The information about the K-means model is printed out like a table for all clusters and all input columns that are indicated.

- If mode=clusters, a table with one row per cluster is returned with following columns: clusterid, name, de-scription, size, withinss.

If mode=centers, a table with one row per input column per cluster is returned with following columns: clusterid, columnname, cardinality, mode, minimum, maximum, mean, variance, count, importance. If the model was built with statistics=none, only columns clusterid, columnname, mode (for nominal columns) and mean (for numeric columns contain values.

If mode=statistics, a table with one row per value of the input columns and per cluster is returned with fol-lowing columns: clusterid, columnname, value, count, relfrequency, deviation, mean and variance. The table is empty if the model was built with statistics=none or statistics=columns.

The rows printed out are sorted by clusterid, columnname and value (as applicable). The number of rows printed out is limited to about 1 Million characters. If more rows have to be printed out, an exception is raised.

A generic stored procedure PRINT_MODEL is available for all types of models that have a print stored pro-cedure.

Examples

```
call nza..kmeans('model=iris_km, intable=nza..iris,
distance=euclidean, id=id, k=5, maxiter=3, outtable=km_out,
statistics=values:25');
```

```
CALL nza..PRINT_KMEANS('model=iris_km, mode=centers,
clusters=1;2, columns=class;petallength');
CALL nza..DROP_MODEL('model=iris_km');

CALL nza..DROP_TABLE('km_out');
```

```
 KMEANS
--------
      5
(1 row)



PRINT_KMEANS
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
----------------------------------------------------------
------------------------------------------------------------

  | CLUSTERID | COLUMNNAME | CARDINALITY | MODE         |
MINIMUM | MAXIMUM | MEAN             | VARIANCE         |
COUNT | IMPORTANCE       |

+-----------+-------------+-------------+-------------
+---------+---------+----------------+------------------
+-------+-----------------+

| 1         | CLASS       | 2           | virginica  |
|         |                  |                  | 41    |
1.68686331187861 |

| 1         | PETALLENGTH | 17          |            | 3
| 5.1     | 4.1604651162791 | 0.30906097560976 | 41    |
1.7900915450941 |

| 2         | CLASS       | 2           | versicolor |
|           |                 |                  | 37       |
1.0593264025352 |
| 2         | PETALLENGTH |  14           |             | 4.3
| 5.6      | 5.2209302325581 | 0.16519519519519 | 37      |
1.2790199297733 |
+-----------  +-------------  +-------------  +------------- +---------
+---------- +----------------  +-------------  +--------
+----------------- +


(1 row)

 DROP_MODEL
------------
 t
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Clustering
KMEANS
PRINT_MODEL

PRINT_MANOVA_ONE_WAY_TEST - Pretty print of Multivariate Analyzsis of Variance result in one way setting

This stored procedure prints the result of one way MANOVA output table

Usage

The PRINT_MANOVA_ONE_WAY_TEST stored procedure has the following syntax:

PRINT_MANOVA_ONE_WAY_TEST(NVARCHAR(ANY) paramString)

▲ Parameters

► **paramString**

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table name

Type: NVARCHAR(ANY)

maxtasks
the maximum number of tasks that will be

presented Type: integer

Default: 20

chooseindicator
- not required one of the values df PillaisTrace HotellingsTrace RoysLargestRoot WilksLambda PillaisTracePval HotellingsTracePval RoysLargestRootPval WilksLambdaPval

Type: NVARCHAR(ANY)

Default: <none>

choosecomparator
> or < - not required , but required if previous parameter is there

Type: NVARCHAR(ANY)

Default: <none>

choosevalue
- not required , but required if previous parameter is there

Type: DOUBLE

Default: <none>

Returns
NVARCHAR(2000) A string contaning the pretty print of the tasks

Details

This stored procedure outputs in a pretty form the results of one-way analysis of variance/covari-ance aiming to tell whether or not the groups of data identified by factor1 have the same mean value in all dependent variables or not. Note that the one way analysis could have been performed for a multitude of tasks. In that case for all of the tasks output is deliverd unless limitation is en-countered in terms of maxtasks parameter. Only up to maxtasks tasks will be displayed. You may also specify a condition for displaying tasks. For this purpose specify chooseindicator, choosecom-parator, choosevalue

Examples

```
select * from wheattest2trcv;

CREATE TABLE wheattest2trcv(

id_task    INTEGER
, row      INTEGER
, col      INTEGER
, val      DOUBLE);
   INSERT INTO wheattest2 VALUES(1,'A',80, 4);
INSERT INTO wheattest2trcv VALUES(0,9,1, 0);
INSERT INTO wheattest2trcv VALUES(0,9,2, 80);
INSERT INTO wheattest2trcv VALUES(0,9,3, 4);
   INSERT INTO wheattest2 VALUES(2,'A',65, 3);
INSERT INTO wheattest2trcv VALUES(0,1,1, 0);
INSERT INTO wheattest2trcv VALUES(0,1,2, 65);
INSERT INTO wheattest2trcv VALUES(0,1,3, 3);
   INSERT INTO wheattest2 VALUES(3,'A',50, 2);
INSERT INTO wheattest2trcv VALUES(0,2,1, 0);
INSERT INTO wheattest2trcv VALUES(0,2,2, 50);
INSERT INTO wheattest2trcv VALUES(0,2,3, 2);
   INSERT INTO wheattest2 VALUES(4,'B',100, 5);
INSERT INTO wheattest2trcv VALUES(0,3,1, 1);
INSERT INTO wheattest2trcv VALUES(0,3,2, 100);
INSERT INTO wheattest2trcv VALUES(0,3,3, 5);
   INSERT INTO wheattest2 VALUES(5,'B',85, 4);
INSERT INTO wheattest2trcv VALUES(0,4,1, 1);
INSERT INTO wheattest2trcv VALUES(0,4,2, 85);
INSERT INTO wheattest2trcv VALUES(0,4,3, 4);
   INSERT INTO wheattest2 VALUES(6,'B',70, 3);
INSERT INTO wheattest2trcv VALUES(0,5,1, 1);
INSERT INTO wheattest2trcv VALUES(0,5,2, 70);
INSERT INTO wheattest2trcv VALUES(0,5,3, 3);
   INSERT INTO wheattest2 VALUES(7,'C',60, 2);
INSERT INTO wheattest2trcv VALUES(0,6,1, 2);
INSERT INTO wheattest2trcv VALUES(0,6,2, 60);
INSERT INTO wheattest2trcv VALUES(0,6,3, 2);
   INSERT INTO wheattest2 VALUES(8,'C',75, 3);

INSERT INTO wheattest2trcv VALUES(0,7,1, 2);
INSERT INTO wheattest2trcv VALUES(0,7,2, 75);
INSERT INTO wheattest2trcv VALUES(0,7,3, 3);
   INSERT INTO wheattest2 VALUES(9,'C',90, 5);
INSERT INTO wheattest2trcv VALUES(0,8,1, 2);
INSERT INTO wheattest2trcv VALUES(0,8,2, 90);
INSERT INTO wheattest2trcv VALUES(0,8,3, 5);
CALL nza..MANOVA_ONE_WAY_TEST('intable=wheattest2trcv,
outtable=outtab');
CALL nza..PRINT_MANOVA_ONE_WAY_TEST('intable=outtab');
CALL nza..DROP_TABLE('outtab');
CALL nza..DROP_TABLE('wheattest2trcv');
```

```
 MANOVA statistics and significance for table : "OUTTAB"
 task: 0 one way MANOVA
                    | statistics         | p-value
Wilk`s Lambda       | 0.39512195121951   |
0.28038050472772
Roy`s Largest Root  | 1.44736237142      |
0.26118761661441
Hotelling`s Trace   | 1.4814814814815    |
0.26289561423837
Pillais` Trace      | 0.62439024390244   |
0.30419561076293
 degrees of freedom: 2
```

```
CREATE TABLE wheatbytest(fieldId INTEGER, variety
CHAR(1), yield DOUBLE, barrels INTEGER, experiment INT4);
INSERT INTO wheatbytest VALUES(1,'A',65,3,1);
   suspect: INSERT INTO wheatbytest
VALUES(2,'A',66,4,1);
INSERT INTO wheatbytest VALUES(2,'A',65,3,1);
INSERT INTO wheatbytest VALUES(3,'A',64,2,1);
INSERT INTO wheatbytest VALUES(4,'B',84,3,1);
INSERT INTO wheatbytest VALUES(5,'B',85,4,1);
INSERT INTO wheatbytest VALUES(6,'B',86,5,1);
INSERT INTO wheatbytest VALUES(7,'C',75,3,1);
INSERT INTO wheatbytest VALUES(8,'C',76,4,1);
INSERT INTO wheatbytest VALUES(9,'C',74,2,1);
INSERT INTO wheatbytest VALUES(11,'A',80,4,2);
INSERT INTO wheatbytest VALUES(12,'A',65,3,2);
INSERT INTO wheatbytest VALUES(13,'A',50,2,2);
INSERT INTO wheatbytest VALUES(14,'B',100,5,2);
INSERT INTO wheatbytest VALUES(15,'B',85,4,2);
INSERT INTO wheatbytest VALUES(16,'B',70,3,2);
INSERT INTO wheatbytest VALUES(17,'C',60,2,2);
INSERT INTO wheatbytest VALUES(18,'C',75,3,2);
INSERT INTO wheatbytest VALUES(19,'C',90,5,2);
CALL nza..MANOVA_ONE_WAY_TEST('intable=wheatbytest, id=fieldid,
incolumn=yield;barrels, factor1=variety, by=experiment,
outtable=outbytab,type=columns');
CALL nza..PRINT_MANOVA_ONE_WAY_TEST('intable=outbytab');
CALL nza..DROP_TABLE('outbytab'); CALL
nza..DROP_TABLE('wheatbytest');
```

```
 MANOVA statistics and significance for table : "OUTBYTAB"
 task: 1 - 1 one way MANOVA
                   | statistics          | p-value        |
Bonferroni correction
Wilk`s Lambda      | 1.5486982034876e-18         | 0      | 0
Roy`s Largest Root | 6.102377495087e+17 | 0      | 0
Hotelling`s Trace  | 6.102377495087e+17 | 0      | 0
Pillais` Trace     | 1.0549258936356    | 0.046366790504921
  0.090583701748115 degrees
 of freedom: 2 task: 2 - 2
 one way MANOVA
                   | statistics          | p-value         |
Bonferroni correction
Wilk`s Lambda      | 0.39512195121951   | 0.28038050472772
| 0.48214778202407
Roy`s Largest Root | 1.44736237142      | 0.26118761661441
| 0.4541562621561
```

```
Hotelling`s Trace   | 1.4814814814815      |
0.26289561423837       | 0.45667712449096
Pillais` Trace      | 0.62439024390244   |
0.30419561076293       | 0.51585625191842
  degrees of freedom: 2
```

Related Functions

category Analytics - Statistics
MANOVA_ONE_WAY_TEST

PRINT_MANOVA_Two_WAY_TEST - Pretty print of Multivariate Analyzsis of Variance result in two way setting

This stored procedure prints the result of Two way MANOVA output table

Usage

The PRINT_MANOVA_Two_WAY_TEST stored procedure has the following syntax:

PRINT_MANOVA_Two_WAY_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table name

Type: NVARCHAR(ANY)

maxtasks
the maximum number of tasks that will be

presented Type: integer

Default: 20

chooseindicator
- not required one of the values df PillaisTrace HotellingsTrace RoysLargestRoot WilksLambda PillaisTracePval HotellingsTracePval RoysLargestRootPval WilksLambdaPval

Type: NVARCHAR(ANY)

Default: <none>

choosecomparator
> or < - not required , but required if previous parameter is there

Type: NVARCHAR(ANY)

Default: <none>

choosevalue
- not required , but required if previous parameter is there

Type: DOUBLE

Default: <none>

Returns
NVARCHAR(2000) A string contaning the pretty print of the tasks

Details

This stored procedure outputs in a pretty form the results of Two-way analysis of variance/covariance aim-ing to tell whether or not the groups of data identified by factor1 have the same mean value in all depend-ent variables or not. Note that the Two way analysis could have been performed for a multitude of tasks. In that case for all of the tasks output is deliverd unless limitation is encountered in terms of maxtasks para-meter. Only up to maxtasks tasks will be displayed. You may also specify a condition for displaying tasks. For this purpose specify chooseindicator, choosecomparator, choosevalue

Related Functions

category Analytics - Statistics
PRINT_MANOVA_ONE_WAY_TEST
MANOVA_Two_WAY_TEST

PRINT_MODEL - Print an analytics model

This stored procedure displays the content of a given analytics model

Usage

The PRINT_MODEL stored procedure has the following syntax:

PRINT_MODEL(NVARCHAR(ANY))
Parameters
paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to be displayed

Type: NVARCHAR(64)

Returns
TEXT The printout of the model

Details

This stored procedure displays the content of a given analytics model. The call is forwarded to a model-type specific print procedure of the form PRINT_<procedure-name>, where <procedure-name> is the name of the model building procedure. If there is no print procedure for the model type, an excep-tion is raised.

Additional model-type specific parameters can be specified in the parameter string, they are for-warded to the specific print procedure.

Examples

```
CALL                  nza..ARULE('intable=nza..retail,
model=mbamodel,    supporttype=percent,    support=5,
lvl=0, maxsetsize=5, confidence=0.5');
CALL nza..PRINT_MODEL('model=mbamodel, minsize=3,
minsupp=0.05, minconf=0.6, minlift=1.3, minconv=1.3');
CALL nza..DROP_MODEL('model=mbamodel');
NOTICE:
             RUNNING FPGrowth algorithm:
             DATASET : "NZA".."RETAIL"
             Transaction column : "TID"
             Item column : "ITEM"
             Group by : <none>
             Minimum support : 5 %
             Minimum confidence: 0.5
             Max frequent itemset size : 5
             Level of conditional dbs : 0
             Result tables prefix : "NZA_META_MBAMODEL"

 ARULE
-------
    14
(1 row)

                                  PRINT_MODEL
----------------------------------------------------
----------------------------------------------------
----------------------------------------------------
----------------------------------------------------
----------------------------------------------------
```

```
----------------------------------------------------------------
----------------------------------------------------------------
----------------------------------------------------

     GRP=| {32,39} -> {48}
[supp=0.061273564574306, conf=0.63891188645772,
lift=1.3368399129912, conv=1.4458326995372]

     GRP=| {38,48} -> {39}
[supp=0.069213493341803, conf=0.76812688821752,
lift=1.3363513116731, conv=1.8337868834446]

     GRP=| {41,48} -> {39}
[supp=0.083550736144824, conf=0.81681082279885,
lift=1.4210493489806, conv=2.3211298697154]

     GRP=| {39,41} -> {48}
[supp=0.083550736144824, conf=0.64534781846855,
lift=1.3503062625329, conv=1.4720704655452]


(1 row)


NOTICE: Dropped: MBAMODEL

 DROP_MODEL

------------

 t

(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS

PRINT_REGTREE - Print a Regression Tree model

This stored procedure displays the tree of a Regression Tree model

Usage

The PRINT_REGTREE stored procedure has the following syntax:

PRINT_REGTREE(NVARCHAR(ANY) paramString)

▲ Parameters

- ► **paramString**

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Decision Tree model to

print Type: NVARCHAR(ANY)

Returns
TEXT pretty print of the regression tree

Details

This stored procedure displays a tree representation of a Regression Tree. The size of the presen-ted tree is limited to the 12th depth level.

Examples

```
CALL nza..REGTREE('model=wrt, intable=nza..weatherr,
id=instance, target=grade, minsplit=2, maxdepth=4');
CALL nza..PRINT_REGTREE('model=wrt'); CALL
nza..DROP_MODEL('model=wrt');
```

```
 REGTREE
---------
      13
(1 row)


PRINT_REGTREE
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
-------------------------------------------------------
--
 -- regression tree: "WRT" --
OUTLOOK = sun
  TEMPERATURE <= 72
  | TEMPERATURE <= 52
  | | if true then class value -> 4
 | | if false then class value -> 5
 | if false then class value -> 2
 OUTLOOK = cloudy
 | TEMPERATURE <= 12
 | | if true then class value -> 2
 | | if false then class value -> 3
 | HUMIDITY = low
 | | if true then class value -> 2
 | | if false then class value -> 1

(1 row)

DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
GROW_REGTREE
PRINT_MODEL
PRUNE_REGTREE
REGTREE
REGTREE
GROW_REGTREE
PRUNE_REGTREE
PREDICT_REGTREE

PRINT_TIMESERIES - Print Time Series predictions

Print the history, interpolation and forecast values for the given time series

Usage

The PRINT_TIMESERIES stored procedure has the following syntax:

PRINT_TIMESERIES(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Time Series model to

print Type: NVARCHAR(ANY)

series
the list of IDs for the time series to print. The IDs are separated by a semicolon (;). If not specified, all time series are printed.

Type: NVARCHAR(ANY)

history
a flag indicating whether the history data of the time series must be printed

too Type: BOOLEAN

Default: false

interpolation
a flag indicating whether the interpolated data of the time series must be printed

too Type: BOOLEAN

Default: false

plot
a flag indicating whether the time series must be printed as a plotter graph or as a table

Type: BOOLEAN

Default: false

Returns
TEXT pretty print of the time series

Details

The time series forecasts are printed out like a table with following columns: tsid, time, forecast. If parameter history is true, a column history is added. If parameter interpolation is true, a column interpolated is added. The rows printed out are sorted by tsid and time.

The number of rows printed out is limited to about 1 Million characters. If more rows have to be printed out, an exception is raised.

A generic stored procedure PRINT_MODEL is available for all types of models that have a print stored procedure.

Examples

```
CALL nza..TIMESERIES('model=curves_ts,

intable=nza..curves, time=x, target=y, by=curve,
algorithm=exponentialsmoothing');
CALL nza..PRINT_TIMESERIES('model=curves_ts,
series="sinus", plot=true');
CALL nza..DROP_MODEL('model=curves_ts');
```

```
 TIMESERIES
------------
          6
(1 row)


PRINT_TIMESERIES
----------------------------------------------------------------
----------------------------------------------------------------
----------------------------------------------------------------
----------------------------------------------------------------
----------------------------------------------------------------
----------------------------------------------------------------
----------------------------------------------------------------
----------------------------------------------------------------
----------------------------------------------------------------
----------------------------------------------------------------
------
 =================================================
sinus
=================================================
     |0                                       40.10^-1
     |+---------+---------+---------+ ---------+|->
 51  |                                          x
 52  |                                      x
 53  |                               x
 54  |                     x
 55  |           x
     |   x
     |x
     |   x
 59   |          x
 60   |                    x
```

```
61   |                              x
62   |                                     x
     |
     V  time

(+) history data     (i) interpolated value     (x)
forecast value



(1 row)


 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Time Series
TIMESERIES
PRINT_MODEL

PRINT_TWOSTEP - Print a TwoStep clustering model

Print the clusters, the centers or the column statistics of a TwoStep clustering model.

Usage

The PRINT_TWOSTEP stored procedure has the following syntax:

PRINT_TWOSTEP(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model

the TwoStep clustering model to print

Type: NVARCHAR(ANY)

clusters
the list of cluster IDs of the model to print. The cluster IDs are separated by a semicolon (;). If not specified, information for all clusters are printed.

Type: NVARCHAR(ANY)

columns
the list of input column names of the model to print. The input column names are separated by a semicolon (;). If not specified, information for all input columns are printed.

Type: NVARCHAR(ANY)

mode
the display mode determining which information of the model to print. Allowed values are: clusters, centers, statistics.

Type: NVARCHAR(ANY)

Default: clusters

Returns
TEXT pretty print of the TwoStep clustering model

Details

The information about the TwoStep clustering model is printed out like a table for all clusters and all input columns that are indicated.

- If mode=clusters, a table with one row per cluster is returned with following columns: clusterid, name, de-scription, size, withinss.

If mode=centers, a table with one row per input column per cluster is returned with following columns: clusterid, columnname, cardinality, mode, minimum, maximum, mean, variance, count, importance. If the model was built with statistics=none or statistics=columns, output column importance is empty.

If mode=statistics, a table with one row per value of the input columns and per cluster is returned with fol-lowing columns: clusterid, columnname, value, count, relfrequency, deviation, mean and variance.

The rows printed out are sorted by clusterid, columnname and value (as applicable). The number of rows printed out is limited to about 1 Million characters. If more rows have to be printed out, an exception is raised.

A generic stored procedure PRINT_MODEL is available for all types of models that have a print stored pro-cedure.

Examples

```
call nza..TWOSTEP('model=irisb, intable=nza..iris,
distance=norm_euclidean, id=id, statistics=values:25');
CALL nza..PRINT_TWOSTEP('model=irisb, mode=centers,
clusters=1;2, columns=class;petallength');
CALL nza..DROP_MODEL('model=irisb');
```

TWOSTEP

```
---------
       2
(1 row)


PRINT_TWOSTEP
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
--------------------------------------------------------
---------------
  | CLUSTERID | COLUMNNAME  | CARDINALITY | MODE        |
 MINIMUM | MAXIMUM |MEAN   | VARIANCE           | COUNT |
IMPORTANCE |
+-----------+-------------+------------- +------------
+---------+---------+-------+-------------------        +-------
+-----------  +
| 1          | CLASS       | 3            | versicolor |
|          |        |                   | 50     |
|
| 1          | PETALLENGTH|              |            | 1
| 1.9      | 1.464 |  0.028364102564103 | 50     |
|
| 2          | CLASS       | 3            | setosa      |
|          |        |                   | 100    |
|
| 2          | PETALLENGTH|              |            | 3
| 6.9      | 4.906 | 0.671688           | 100    |
|
+-----------+-------------+------------- +------------
+---------+---------+-------+-------------------        +-------
```

```
+------------+


(1 row)


 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Clustering
TWOSTEP
PRINT_MODEL

PROJECT_PCA - Apply a Principal Component Analysis model

This stored procedure applies a Principal Component Analysis model to project the input data along the principal components of the model

Usage

The PROJECT_PCA stored procedure has the following syntax:

PROJECT_PCA(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Principal Component Analysis

model Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table where the projected data will be

stored Type: NVARCHAR(256)

id

the input table column identifying a unique instance id

Type: NVARCHAR(128)

Default: <id> column used to build the model

pcNumber
number of Principal Components used in the

projection Type: NVARCHAR(ANY)

Returns
BOOLEAN Always TRUE

Details

This stored procedure applies a Principal Component Analysis model to project the input data along the principal components of the model.

The order of columns in the table of projected values is not important, the column names must match the column names of the input table on which the PCA model has been built.

Examples

```
CALL nza..PCA('model=wq_pca,
intable=nza..WineQuality, id=id, scaleData=TRUE,
centerData=TRUE, forceEigensolve=FALSE');
CALL nza..PROJECT_PCA('intable=nza..WineQuality,
model=wq_pca, id=id, outtable=wq_proj4,
pcNumber=4'); CALL nza..DROP_MODEL('model=wq_pca');
SELECT * FROM wq_proj4 ORDER BY id LIMIT
5; CALL nza..DROP_TABLE('wq_proj4');
```

```
 PCA
-----
 t
(1 row)

 PROJECT_PCA
-------------
 t
(1 row)

 DROP_MODEL
------------
```

```
 t
(1 row)


 ID |        PC1         |          PC2         |          PC3
|          PC4
----+-------------------+-------------------+-------------------
+-------------------
1 | -3.5429563417511 |              0.3550510560675 | -0.32579963947009
      -1.7352335210206
      2 | 0.61273723315898 | -0.28938152332064 |  0.81635108143025
      0.84864723812014
3 | -0.1423792719421 |              1.1679019509915 | -0.15305247901359
      0.19090003408588
  4 | -1.3793842424156 | -0.19956694987349 | -
0.32446338081778 | -0.40878181730268
  5 | -1.3793842424156 | -0.19956694987349 | -0.32446338081778
  -0.40878181730268
(5 rows)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Data Transformation
PCA
LIST_MODELS

PRUNE_DECTREE - Prune a Decision Tree model

This stored procedure prunes a previously built Decision Tree model

Usage

The PRUNE_DECTREE stored procedure has the following syntax:

PRUNE_DECTREE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Decision Tree model to

prune Type: NVARCHAR(ANY)

valtable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the

class Type: NVARCHAR(128)

qmeasure
the quality measure for pruning. Allowed values are Acc or

wAcc. Type: NVARCHAR(ANY)

Default: Acc

weights
the input table containing optional instance or class weights for the input table columns.

If the parameter is undefined, we assume that the weights are uniformly equal to

1. The <weights> table contains following columns:

weight: a numeric column containing the instance or class weight,

id: a column to be joined with the <id> column of <intable>, defining instance weights,

class: a column to be joined with the <target> column of <intable>, defining class weights.

The id or class column can be missing, at least one of them must be present. For in-stances or classes not occurring in this table, weights of 1 are assumed.

Type: NVARCHAR(256)

Default: <none>

Returns
INTEGER the number of nodes of the pruned tree (including leaves)

Details

This stored procedure prunes a Decision tree model. The existing model is replaced by the pruned Decision Tree model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipulate the model or access the model tables.

A bottom-up reduced error pruning algorithm is used. It bases on the prediction accuracy of the model against the input table.

Examples

```
CALL nza..GROW_DECTREE('model=adult_tree,
intable=nza..adult_train, id=id, target=income, eval=entropy,
minsplit=1000');
CALL nza..PRUNE_DECTREE('model=adult_tree,
valtable=nza..adult_prune, id=id, target=income,
qmeasure=wAcc');
CALL nza..DROP_MODEL('model=adult_tree');
```

```
 GROW_DECTREE
--------------
           25
(1 row)


 PRUNE_DECTREE
---------------
            13
(1 row)


 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
DECTREE
GROW_DECTREE
PRINT_DECTREE

PREDICT_DECTREE
LIST_MODELS

PRUNE_REGTREE - Prune a Regression Tree model

This stored procedure prunes a previously built Regression Tree model

Usage

The PRUNE_REGTREE stored procedure has the following syntax:

PRUNE_REGTREE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Regression Tree model to

prune Type: NVARCHAR(ANY)

valtable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the prediction

target Type: NVARCHAR(128)

qmeasure
the quality measure for pruning the tree. Allowed values are: mse, r2, pearson, spear-man.

Type: NVARCHAR(ANY)

Default: mse

Returns
INTEGER the number of nodes of the pruned tree (including leaves)

Details

This stored procedure prunes a Regression tree model. The existing model is replaced by the pruned Regression Tree model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipulate the model or access the model tables.

A bottom-up reduced error pruning algorithm is used. It bases on the prediction accuracy of the model against the input table.

Examples

```
CALL nza..GROW_REGTREE('model=wrt, intable=nza..weatherr,
id=instance, target=grade, minsplit=2, maxdepth=10');

CALL nza..PRUNE_REGTREE('model=wrt, valtable=nza..weatherr,
id=instance, target=grade, qmeasure=mse');

CALL nza..DROP_MODEL('model=wrt');
```

```
 GROW_REGTREE
--------------
           15
(1 row)
 PRUNE_REGTREE
---------------
            15
(1 row)
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
GROW_REGTREE
LIST_MODELS
PREDICT_REGTREE
PRINT_REGTREE
REGTREE

PT - Cumulative T-student Distribution

Given a degree of freedom, this function returns the probability that a variable following the T-student dis-tribution takes a value smaller or equal to x

Usage

The PT function has the following syntax:

PT(DOUBLE x, INT8 df)

Parameters

x

the value at which to

compute Type: DOUBLE

df

the number of degrees of

freedom Type: INT8

Min: 1

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

Considering n independent random variables Z1,...,Zn distributed according to the normal distribu-tion with mean mu and a fixed variance, we create a new variable Z as their average. If s is the standard deviation from the sample, then the variable X = (Z-mu)/(s/sqrt(n)) follows the t-Student distribution with n-1 degrees of freedom. If df is 0 or less, PT(x,df) is null for all x values.

Examples

```
SELECT nza..PT(0.683,30);

        PT
------------------
 0.75007611634962
(1 row)
```

```
SELECT nza..PT(-2.821,9);

        PT
-------------------
 0.010007152295943
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DT
PT_H
QT
T_LS_TEST
T_ME_TEST
T_PMD_TEST
T_UMD_TEST

PT - Cumulative T-student Distribution with string argument

Given a degree of freedom, this function returns the probability that a variable following the T-student distribution takes a value greater than x. It differs from PT in that it takes both parameters as a single string.

Usage

The PT function has the following syntax:

PT(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(200)

tStat
the value at which to

compute Type: DOUBLE

Min: 0.00000000001

df
the number of degrees of

freedom Type: INT4

Min: 1

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

PT('tStat=<x>,df=<df>')=PT(<x>,<df>) for all <x> and <df> values.

Examples

```
SELECT nza..PT( nza..T_ME_TEST_S_AGG(petallength,3.7) )
FROM nza..iris;
          PT
```

```
------------------
 0.65778704505736
(1 row)
```

```
SELECT nza..PT('tStat= 0.407226,        df= 149');
        PT
------------------
 0.65778704505736
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DT
T_LS_TEST
T_ME_TEST
T_PMD_TEST
T_UMD_TEST

PT_H - Cumulative T-student Distribution, high tail

Given a degree of freedom, this function returns the probability that a variable following the T-stu-dent distribution takes a value greater than x

Usage

The PT_H function has the following syntax:

PT_H(DOUBLE x, INT8 df)

Parameters

x

the value at which to

compute Type: DOUBLE

df

the number of degrees of

freedom Type: INT8

Min: 1

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

PT_H(x,df)=1-PT(x,df) for all x and all strictly positive df values.

If df is 0 or less, PT_H(x,df) is null for all x values.

Examples

```
SELECT nza..PT_H(0.683,30);

        PT_H
------------------
 0.24992388365038
(1 row)
```

```
SELECT nza..PT_H(-2.821,9);

        PT_H
------------------
 0.98999284770406
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DT
PT

PUNIF - Cumulative Uniform Distribution

Given a minimum and a maximum for the uniform interval, this function returns probability that a variable following the Uniform distribution takes a value smaller or equal to x

Usage

The PUNIF function has the following syntax:

PUNIF(DOUBLE x, DOUBLE minimum, DOUBLE maximum)
▲ Parameters

x
the value at which to

compute Type: DOUBLE

Min: <minimum>

Max: <maximum>

minimum
the left border of the Uniform

interval Type: DOUBLE

Max: <maximum>

maximum
the right border of the Uniform

interval Type: DOUBLE

Min: <minimum>

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Uniform distribution is the simplest form of a continuous probability distribution. Its probabil-ity density function is constant in the interval between minimum and maximum.

If minimum is not smaller than maximum or if x does not belong to the interval between minimum and maximum, PUNIF(x,minimum,maximum) is null.

Examples

```
SELECT nza..PUNIF(2,-3.0,11.3);

      PUNIF

------------------

 0.34965034965035

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DUNIF
PUNIF_H
QUNIF

PUNIF_H - Cumulative Uniform Distribution, high tail

Given a minimum and a maximum for the unifor interval, this function returns the probability that a variable following the Uniform distribution takes a value greater than to x

Usage

The PUNIF_H function has the following syntax:

PUNIF_H(DOUBLE x, DOUBLE minimum, DOUBLE maximum)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: <minimum>

Max: <maximum>

minimum
the left border of the Uniform

interval Type: DOUBLE

Max: <maximum>

maximum
the right border of the Uniform

interval Type: DOUBLE

Min: <minimum>

Returns
DOUBLE the cumulative probability distribution from point x to plus infinity

Details

PUNIF_H(x,minimum,maximum)=1-PUNIF(x,minimum,maximum) for all x, minimum and maximum values where x is between minimum and maximum.

If minimum is not smaller than maximum or if x does not belong to the interval between minimum and maximum, PUNIF_H(x,minimum,maximum) is null.

Examples

```
SELECT nza..PUNIF_H(2,-3.0,11.3);

     PUNIF_H
------------------
 0.65034965034965
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DUNIF
PUNIF

PWALD - Cumulative Wald Distribution

Given a location and a shape, this function returns the probability that a variable following the Wald distribution takes a value smaller or equal to x

Usage

The PWALD function has the following syntax:

PWALD(DOUBLE x, DOUBLE location, DOUBLE shape)

Parameters

x

the value at which to

compute Type: DOUBLE

location

the mean of the

distribution Type: DOUBLE

Min: 0.00000000001

shape

the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns

DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Wald distribution, called also Inverse Gaussian distribution, represents the first passage time for a Brownian motion. It can be used to represent market or fluid fluctuations.

If location or shape is 0 or less, PWALD(x,location,shape) is null for all x values.

Examples

```
SELECT nza..PWALD(2,2,2);

          PWALD
```

```
------------------
 0.66810200122317
(1 row)
```

```
SELECT nza..PWALD(2,2,2), nza..PWALD(1,1,1), nza..PWALD(2,1,1),
nza..PWALD(2,3,1), nza..PWALD(2,3,4);
      PWALD        |       PWALD        |        PWALD       |
PWALD         |      PWALD

                  +                    +------------------

+------------------------------------  +------------------------------------
 0.66810200122317 | 0.66810200122317 | 0.88547542598601 |
0.63918954568898 | 0.45124078603183
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DWALD
PWALD_H
QWALD

PWALD_H - Cumulative Wald Distribution, high tail

Given a location and a shape, this function returns the probability that a variable following the Wald distri-bution takes a value greater than x

Usage

The PWALD_H function has the following syntax:

PWALD_H(DOUBLE x, DOUBLE location, DOUBLE shape)

Parameters

x
the value at which to

compute Type: DOUBLE

location
the mean of the

distribution Type: DOUBLE

Min: 0.00000000001

shape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the cumulative probability distribution from x to plus infinity

Details

PWALD_H(x,location,shape) = 1-PWALD(x,location,shape) for all x and all positive location and shape values.

If location or shape is 0 or less, PWALD_H(x,location,shape) is null for all x values.

Examples

```
SELECT nza..PWALD_H(2,2,2), nza..PWALD_H(2,2,2)
+ nza..PWALD(2,2,2);
     PWALD_H      | ?COLUMN?
------------------+----------
 0.33189799877683 |        1
(1 row)
```

```
SELECT nza..PWALD_H(1,1,1), nza..PWALD_H(2,1,1),
nza..PWALD_H(2,3,1), nza..PWALD_H(2,3,4);
     PWALD_H      |       PWALD_H      |       PWALD_H      |
PWALD_H
                  + ------------------+ ------------------
+------------------ -------------------
 0.33189799877683 | 0.11452457401399 | 0.36081045431102 |
0.54875921396817
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DWALD
PWALD

PWEIBULL - Cumulative Weibull (or Rosin-Rammer) Distribution

Given a scale and a shape, this function returns the probability that a variable following the Weibull distribu-tion takes a value smaller or equal to x

Usage

The PWEIBULL function has the following syntax:

PWEIBULL(DOUBLE x, DOUBLE scale, DOUBLE kShape)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0

scale
the scale of the

distribution Type: DOUBLE

Min: 0.00000000001

kShape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the cumulative probability distribution from minus infinity to point x

Details

The Weibull distribution gives a distribution of time between failures x, for which the failure rate is propor-tional to a power of time. The shape parameter kshape may be understood as follows:

If it is lower than 1, then the failure rate decreases over time,

If it is equal to 1, then the failure rate is constant over time,

If it is greater than 1, then the failure rate increases over time ("aging process").

The cumulative Weibull distribution has the closed form: PWEIBULL(x,scale,kShape)=1-exp(-(x/scale)^kShape) for all positive x, scale and kShape values.

The Exponential distribution is a special case of the Weibull distribution: PWEIBULL(x,scale,1)=PEXP(x,scale).

If x is less than 0, or if scale or shape are 0 or less, PWEIBULL(x,scale,kShape) is null.

Examples

```
SELECT nza..PWEIBULL(2,4,1);

      PWEIBULL
------------------
```

```
 0.39346934028737
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DWEIBULL
PEXP
PWEIBULL_H
QWEIBULL

PWEIBULL_H - Cumulative Weibull (or Rosin-Rammer) Distribution, high tail

Given a scale and a shape, this function returns the probability that a variable following the Weibull distribution takes a value greater than to x

Usage

The PWEIBULL_H function has the following syntax:

PWEIBULL_H(DOUBLE x, DOUBLE scale, DOUBLE kShape)

Parameters

x
the value at which to

compute Type: DOUBLE

Min: 0

scale
the scale of the

distribution Type: DOUBLE

Min: 0.00000000001

kShape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the cumulative probability distribution from point x to plus infinity

Details

PWEIBULL_H(x,scale,kShape)=1-PWEIBULL(x,scale,kShape) for all positive x, scale and kShape values.

If x is less than 0, or if scale or shape are 0 or less, PWEIBULL_H(x,scale,kShape) is null.

Examples

```
SELECT nza..PWEIBULL_H(2,4,1);

    PWEIBULL_H
------------------
 0.60653065971263
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DWEIBULL
PWEIBULL

PWILCOX - Cumulative Wilcoxon Distribution

Given the number of items, this function returns the probability that a variable following the Wilcoxon dis-tribution takes a value smaller or equal to Wmin

Usage

The PWILCOX function has the following syntax:

PWILCOX(INT8 Wmin, INT8 NoItems)

Parameters

Wmin
the value at which to

compute Type: INT8

Min: 0

Max: NoItems*(NoItems+1)/2

NoItems
the number of

items Type: INT8

Min: 1

Max: 15

Returns

DOUBLE the cumulative probability distribution from minus infinity to point Wmin

Details

Given two variables x and y measured for the same objects, we split the objects into two sets: the first set contains objects where x>y and the second set objects where x<=y. for each object we compute the rank of |x-y|. The statistics sStat is calculated as the sum of ranks of objects belong-ing to the first set or to the second set, whichever is lower.

The function PWILCOX returns the probability that sStat is smaller or equal to Wmin. This function has a limitation: the number of ranked items must be lower than or equal 15. For a higher number of items, approximations via normal distribution exist.

If Wmin or NoItems are not in their validity interval, PWILCOX(Wmin, NoItems) returns null.

Examples

```
SELECT nza..PWILCOX(42,15);

      PWILCOX
------------------
 0.16513061523438
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DWILCOX
PWILCOX_H
QWILCOX
WILCOXON_TEST

PWILCOX_H - Cumulative Wilcoxon Distribution, high tail

Given the number of items, this function returns the probability that a variable following the Wil-coxon distribution takes a value smaller or equal to Wmin

Usage

The PWILCOX_H function has the following syntax:

PWILCOX_H(INT8 Wmin, INT8 NoItems)
Parameters
Wmin
the value at which to compute

Type: INT8

Min: 0

Max: NoItems*(NoItems+1)/2

NoItems
the number of

items Type: INT8

Min: 1

Max: 15

Returns
DOUBLE the cumulative probability distribution from Wmin+1 to plus infinity

Details

PWILCOX_H(Wmin,NoItems)=1-PWILCOX(Wmin,NoItems) for all Wmin and NoItems values in their respect-ive validity interval.

If Wmin or NoItems are not in their validity interval, PWILCOX_H(Wmin, NoItems) returns null.

Examples

```
SELECT nza..PWILCOX(42,15), nza..PWILCOX_H(42,15),
nza..PWILCOX(42,15)+nza..PWILCOX_H(42,15);
     PWILCOX       |     PWILCOX_H     | ?COLUMN?
-------------------+-------------------+----------
 0.16513061523438 | 0.83486938476562 |        1
(1 row)
```

```
SELECT nza..PWILCOX(282,35), nza..PWILCOX_H(282,35),
nza..PWILCOX(282,35)+nza..PWILCOX_H(282,35);
     PWILCOX       |     PWILCOX_H     | ?COLUMN?
-------------------+-------------------+----------
 0.29160523049112 | 0.70839476950888 |        1
(1 row)
```

```
SELECT nza..PWILCOX(420,150), nza..PWILCOX_H(420,150),
nza..PWILCOX(420,150)+nza..PWILCOX_H(420,150);
 PWILCOX | PWILCOX_H | ?COLUMN?
---------+-----------+----------
```

```
            0|            1|           1
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DWILCOX
PWILCOX

QBERN - Inverse Bernoulli Distribution

Given the success probability p, this function returns the value x of a variable following the Bernoulli distribution for which the probability of being smaller or equal to x is equal to the given percentage. The value x is the number of successes in a single Bernoulli trial.

Usage

The QBERN function has the following syntax:

QBERN(DOUBLE percentage, DOUBLE p)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns
INT8 the point x where PBERN(x,p)=percentage

Details

If PBERN(x,p)=perc, then QBERN(perc,p)=x for all positive x values and for p between 0 and 1.

If percentage is not between 0 and 1, QBERN(percentage,p) is null for all p values.

If p is not between 0 and 1, QBERN(percentage,p) is null for all percentage values.

Examples

```
SELECT nza..QBERN(0.95,0.330);

 QBERN
-------
     1
(1 row)
```

```
SELECT nza..QBERN(1.95,0.330);

 QBERN
-------

(1 row)
```

```
SELECT nza..QBERN(0.5,0.330);

 QBERN
-------
    0
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBERN
PBERN
QBERN_H

QBERN_H - Inverse Bernoulli Distribution, high tail

Given the success probability p, this function returns the value x of a variable following the Bernoulli distri-bution for which the probability of being greater than x is equal to the given percentage. The value x is the number of successes in a single Bernoulli trial.

Usage

The QBERN_H function has the following syntax:

QBERN_H(DOUBLE percentage, DOUBLE p)

Parameters

percentage

the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

p

the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns

INT8 the point x where PBERN_H(x,p)=percentage

Details

If PBERN_H(x,p)=perc, then QBERN_H(perc,p)=x for all positive x values and for p between 0 and 1.

QBERN_H(perc,p) = QBERN(1-perc,p) for all perc and p between 0 and 1.

If percentage is not between 0 and 1, QBERN_H(percentage,p) is null for all p values.

If p is not between 0 and 1, QBERN_H(percentage,p) is null for all percentage values.

Examples

```
SELECT nza..QBERN_H(0.95, 0.330), nza..QBERN(1-
0.95, 0.330);
 QBERN_H | QBERN
---------+-------
       0 |     0
(1 row)
```

```
SELECT nza..QBERN_H(0.05, 0.330), nza..QBERN(1-
0.05, 0.330);
 QBERN_H | QBERN
---------+-------
       1 |     1
```

```
(1 row)
```

```
SELECT nza..QBERN_H(0.6, 0.330), nza..QBERN(1-0.6, 0.330);
 QBERN_H | QBERN
---------+-------
       0 |      0
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBERN
PBERN_H
QBERN

QBETA - Inverse Beta Distribution

Given two shape parameters, this function returns the value x of a variable following the Beta distribution for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QBETA function has the following syntax:

QBETA(DOUBLE percentage, DOUBLE shape, DOUBLE shapeTwo)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

shapeOne
the first shape of the

distribution Type: DOUBLE

Min: 0.00000000001

shapeTwo
the second shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PBETA(x,shapeOne,shapeTwo)=percentage

Details

If PBETA(x,shapeOne,shapeTwo)=perc, then QBETA(perc,shapeOne,shapeTwo)=x for x between 0 and 1 and for all positive shapeOne and shapeTwo values. In this sense we speak about inverted function. Note that a function to be inverted must be strictly monotone in its domain. PBETA is so only for x between 0 an 1.

If percentage is not between 0 and 1, QBETA(percentage,shapeOne,shapeTwo) is null for all shape-One and shapeTwo values.

If shapeOne or shapeTwo is 0 or less, QBETA(percentage,shapeOne,shapeTwo) is null for all per-centage values.

Examples

```
SELECT nza..QBETA(0.0, 3,
0.4),nza..QBETA(0.00023477562161745, 3,
0.4),nza..QBETA(0.0019774546733614, 3,
0.4),nza..QBETA(0.0070656037462229, 3,
0.4),nza..QBETA(0.0178553415291, 3, 0.4);
```

```
QBETA  |      QBETA        |      QBETA        |
QBETA      | QBETA           |

-----------------+-----------------+-----------------
+-----------------+---------+

     0 | 0.10000000149012 | 0.20000000298023 |
0.29999998211861 | 0.40000000596046

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBETA
PBETA
QBETA_H

QBETA_H - Inverse Beta Distribution, high tail

Given two shape parameters, this function returns the value x of a variable following the Beta dis-tribution for which the probability of being greater than x is equal to the given percentage

Usage

The QBETA_H function has the following syntax:

QBETA_H(DOUBLE percentage, DOUBLE shapeOne, DOUBLE shapeTwo)

Parameters

percentage

the percentage for which x is to be

identified Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

shapeOne

the first shape of the

distribution Type: DOUBLE

Min: 0.00000000001

shapeTwo

the second shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns

DOUBLE the point x where PBETA_H(x,shapeOne,shapeTwo)=percentage

Details

If PBETA_H(x,shapeOne,shapeTwo)=perc, then QBETA_H(perc,shapeOne,shapeTwo)=x for x between 0 and 1 and for all positive shapeOne and shapeTwo values.

QBETA_H(perc,shapeOne,shapeTwo)=QBETA(1-perc,shapeOne,shapeTwo) for all positive shapeOne and shapeTwo values, and for all perc between 0 and 1.

If shapeOne or shapeTwo is 0 or less, QBETA_H(percentage,shapeOne,shapeTwo) is null for all percentage values.

Examples

```
SELECT nza..QBETA_H(1-0.0, 3, 0.4),nza..QBETA_H(1-
0.00023477562161745, 3, 0.4),nza..QBETA_H(1-0.0019774546733614,
3, 0.4),nza..QBETA_H(1-0.0070656037462229, 3,
0.4),nza..QBETA_H(1-0.0178553415291, 3, 0.4);
```

```
  QBETA_H|       QBETA_H       |       QBETA_H       |     QBETA_H
|      QBETA_H

+---------------------------  +------------------          + ------------------

                +------------------
        0| 0.10000000149012 | 0.20000000298023 |
0.29999998211861 | 0.40000000596046
```

```
(1 row)
```

```
SELECT nza..QBETA_H(1-0.0, 3,
0.4),nza..QBETA_H(0.00023477562161745, 3,
0.4),nza..QBETA_H(0.0019774546733614, 3,
0.4),nza..QBETA_H(0.0070656037462229, 3,
0.4),nza..QBETA_H(0.0178553415291, 3, 0.4);
```

```
  QBETA_H|     QBETA_H       |       QBETA_H      |
QBETA_H       |     QBETA_H

               +------------------          + ------------------
+---------------------------      +------------------
       0| 0.99999994039536 | 0.99999994039536 |
0.99999886751175 | 0.99998837709427
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBETA
PBETA_H
QBETA

QBINOM - Inverse Binomial Distribution

Given the success probability p and the number of trials, this function returns the value x of a variable following the Binomial distribution for which the probability of being smaller or equal to x is equal to the given percentage. The value x is the number of successes in a serie of Bernoulli trials.

Usage

The QBINOM function has the following syntax:

QBINOM(DOUBLE percentage, INT8 N, DOUBLE p)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

N
the number of

trials Type: INT8

Min: 1

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns
INT8 the point x where PBINOM(x,N,p)=percentage

Details

If PBINOM(x,N,p)=perc, then QBINOM(perc,N,p)=x for all positive x and N values and for p between 0 and 1.

If percentage is not between 0 and 1, QBINOM(percentage,N,p) is null for all p values.

If N is 0 or less, QBINOM(perc,N,p) is null for all perc and p values.

If p is not between 0 and 1, QBINOM(percentage,N,p) is null for all percentage and N values.

Examples

```
SELECT nza..QBINOM(0.95,1,0.330);

 QBINOM
--------
      1
(1 row)
```

```
SELECT nza..QBINOM(0.215,3,0.4), nza..QBINOM(0.216,3,0.4),
nza..QBINOM(0.648,3,0.4), nza..QBINOM(0.936,3,0.4),
nza..QBINOM(1.0,3,0.4), nza..QBINOM(1.3,3,0.4);
  QBINOM| QBINOM | QBINOM | QBINOM | QBINOM | QBINOM
--------+--------+--------+--------+--------+--------
       0|       0|       1|       2|        |
 (1 row)
```

```
SELECT nza..QBINOM(0.6,3,0.6), nza..QBINOM(0.6,30,0.6),

nza..QBINOM(0.6,300,0.6), nza..QBINOM(0.6,3000,0.6),
nza..QBINOM(0.6,30000,0.6), nza..QBINOM(0.6,300000,0.6),
nza..QBINOM(0.6,3000000,0.6);
 QBINOM | QBINOM | QBINOM | QBINOM | QBINOM | QBINOM
| QBINOM
       +--------+--------+--------+--------+ --------
+-------- ---------
      2|     19 |    182 |   1807 |  18022 | 180068 |
 1800215
(1 row)
```

```
SELECT nza..QBINOM(0.2151,3,0.4),
nza..QBINOM(0.2161,3,0.4),   nza..QBINOM(0.6481,3,0.4),
nza..QBINOM(0.9361,3,0.4),    nza..QBINOM(1.001,3,0.4),
nza..QBINOM(1.31,3,0.4);
  QBINOM| QBINOM | QBINOM | QBINOM | QBINOM | QBINOM
--------+--------+--------+--------+--------+--------
      0|       1|       2|       3|        |
 (1 row)
```

```
SELECT nza..QBINOM(0.215-0.0001,3,0.4),
nza..QBINOM(0.216-0.0001,3,0.4),
nza..QBINOM(0.648-0.0001,3,0.4),
nza..QBINOM(0.936-0.0001,3,0.4), nza..QBINOM(1.-
0.000001,3,0.4), nza..QBINOM(1.3-0.0001,3,0.4);
  QBINOM| QBINOM | QBINOM | QBINOM | QBINOM | QBINOM
--------+--------+--------+--------+--------+--------
      0|       0|       1|       2|       3|
 (1 row)
```

```
SELECT nza..qbinom(0.785,3,0.6),
nza..QBINOM(0.784,3,0.6), nza..QBINOM(0.352,3, 0.6),
nza..QBINOM(0.064,3,0.6), nza..QBINOM(0,3,0.6);
 QBINOM | QBINOM | QBINOM | QBINOM | QBINOM
```

```
--------+--------+--------+--------+--------
      3|       2|       1|       0|
(1 row)
```

```
SELECT nza..qbinom(0.785-0.0001,3,0.6), nza..QBINOM(0.784-
0.0001,3,0.6), nza..QBINOM(0.352-0.001,3,0.6),
nza..QBINOM(0.064-0.001,3,0.6), nza..QBINOM(0-0.001,3,0.6);
```

```
  QBINOM| QBINOM | QBINOM | QBINOM | QBINOM
--------+--------+--------+--------+--------
       3|       2|       1|       0|
 (1 row)
```

```
SELECT nza..QBINOM(0.6,3000000000,0.6);
```

```
   QBINOM
------------
 1800006798
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBINOM
PBINOM
QBINOM_H

QBINOM_H - Inverse Binomial Distribution, high tail

Given the success probability p and the number of trials, this function returns the value x of a variable fol-lowing the Binomial distribution for which the probability of being greater than x is equal to the given per-centage. The value x is the number of successes in a serie of Bernoulli trials.

Usage

The QBINOM_H function has the following syntax:

QBINOM_H(DOUBLE percentage, INT8 N, DOUBLE p)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

N
the number of

trials Type: INT8

Min: 1

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns
INT8 the point x where PBINOM_H(x,N,p)=percentage

Details

If PBINOM_H(x,N,p)=perc, then QBINOM_H(perc,N,p)=x for all positive x and N values and for p between 0 and 1.

QBINOM_H(perc,N,p) = QBINOM(1-perc,N,p) for all positive x and N values and for p between 0 and 1.

If percentage is not between 0 and 1, QBINOM_H(percentage,N,p) is null for all p values.

If N is 0 or less, QBINOM_H(perc,N,p) is null for all perc and p values.

If p is not between 0 and 1, QBINOM_H(percentage,N,p) is null for all percentage and N values.

Examples

```
SELECT nza..QBINOM_H(0.95,1,0.330);
```

```
 QBINOM_H
----------
        0
(1 row)
```

```
SELECT nza..QBINOM_H(1-0.215,3,0.4), nza..QBINOM_H(1-
0.216,3,0.4), nza..QBINOM_H(1-0.648,3,0.4), nza..QBINOM_H(1-
0.936,3,0.4), nza..QBINOM_H(1-1.0,3,0.4), nza..QBINOM_H(1-
1.3,3,0.4);
```

```
 QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H
| QBINOM_H
----------+----------+----------+----------+----------
+----------
        0|         0|         1|         2|           |
(1 row)
```

```
SELECT nza..QBINOM_H(1-0.6, 3, 0.6), nza..QBINOM_H(1-
0.6,30,0.6), nza..QBINOM_H(1-0.6,300,0.6), nza..QBINOM_H(1-
0.6,3000,0.6), nza..QBINOM_H(1-0.6,30000,0.6), nza..QBINOM_H(1-
0.6,300000,0.6), nza..QBINOM_H(1-0.6,3000000,0.6);
```

```
 QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H
| QBINOM_H | QBINOM_H
----------+----------+----------+----------+ ----------
+----------+----------
        2 |       19 |      182 |     1807 |    18022 |
180068 |  1800215
(1 row)
```

```
SELECT nza..QBINOM_H(1-0.2151,3,0.4), nza..QBINOM_H(1-
0.2161,3,0.4), nza..QBINOM_H(1-0.6481,3,0.4), nza..QBINOM_H(1-
0.9361,3,0.4), nza..QBINOM_H(1-1.001,3,0.4), nza..QBINOM_H(1-
1.31,3,0.4);
```

```
 QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H
| QBINOM_H
----------+----------+----------+----------+----------
+----------
        0|         1|         2|         3|           |
(1 row)
```

```
SELECT nza..QBINOM_H(1-0.215-0.0001,3,0.4), nza..QBINOM_H(1-
0.216-0.0001,3,0.4), nza..QBINOM_H(1-0.648-0.0001,3,0.4),
nza..QBINOM_H(1-0.936-0.0001,3,0.4), nza..QBINOM_H(1-1.-
0.000001,3,0.4), nza..QBINOM_H(1-1.3-0.0001,3,0.4);
```

```
 QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H
| QBINOM_H
----------+----------+----------+----------+----------
+----------
    0|                                     1|2|    3|    |
(1 row)
```

```
SELECT nza..QBINOM_H(1-0.785,3,0.6), nza..QBINOM_H(1-
0.784,3,0.6), nza..QBINOM_H(1-0.352,3,0.6),
nza..QBINOM_H(1-0.064,3,0.6), nza..QBINOM_H(1-0,3,0.6);
```

```
  QBINOM_H| QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H
----------+----------+----------+----------+----------
         3|         2|         1|         0|
(1 row)
```

```
SELECT nza..QBINOM_H(1-0.785-0.0001,3,0.6),
nza..QBINOM_H(1-0.784-0.0001,3,0.6), nza..QBINOM_H(1-
0.352-0.001,3,0.6), nza..QBINOM_H(1-0.064-
0.001,3,0.6), nza..QBINOM_H(1-0-0.001,3,0.6);
```

```
  QBINOM_H| QBINOM_H | QBINOM_H | QBINOM_H | QBINOM_H
----------+----------+----------+----------+----------
         3|         3|         2|         1|         0
(1 row)
```

```
SELECT nza..QBINOM_H(1-0.6, 3000000000, 0.6);
```

```
   QBINOM_H
------------
 1800006798
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DBINOM
PBINOM_H
QBINOM

QCAUCHY - Inverse Cauchy Distribution

Given the peak location and the interquartile range, this function returns the value x of a variable following the Cauchy distribution for which the probability of being smaller or equal to x is equal to the given percent-age.

Usage

The QCAUCHY function has the following syntax:

QCAUCHY(DOUBLE percentage, double location, double scale)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

location
the location of the peak of the Cauchy

distribution Type: DOUBLE

scale
a value corresponding to half of the interquartile range. Smaller values result in a narrower peak.

Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PCAUCHY(x,location,scale)=percentage

Details

If PCAUCHY(x,location,scale)=perc, then QCAUCHY(perc,location,scale)=x for all x and location values and for all positive scale values. In this sense we speak about inverted function. Note that a function to be inverted must be strictly monotone in its domain. PCAUCHY is so because its derivative DCAUCHY is positive every-where.

If scale=0 or less, QCAUCHY(perc,location,scale) is null for all perc and location values.

If percentage is not between 0 and 1, QCAUCHY(percentage,location,scale) is null for all location and scale values.

Examples

```
SELECT nza..QCAUCHY(0.95, 1, 0.330);

     QCAUCHY
-----------------
 3.0835379998428
(1 row)
```

```
SELECT        nza..QCAUCHY(0.215,        3,        0.4),
nza..QCAUCHY(0.216,   3,   0.4),nza..QCAUCHY(0.648,   3,
0.4),nza..QCAUCHY(0.936,  3,  0.4),nza..QCAUCHY(1.0,  3,
0.4),nza..QCAUCHY(1.3, 3, 0.4);
     QCAUCHY     |     QCAUCHY     |     QCAUCHY     |
QCAUCHY      | QCAUCHY | QCAUCHY
-----------------+-----------------+-----------------
+-----------------+---------+---------
 2.5007183854588 | 2.5039203343718 | 3.2006544803026 |
4.9625560021795 |         |
(1 row)
```

```
SELECT nza..QCAUCHY(0.215, 3, 0.4),nza..QCAUCHY(0.215,
3, 1),nza..QCAUCHY(0.215, 3, 4);
     QCAUCHY     |     QCAUCHY     |     QCAUCHY
-----------------+-----------------+------------------
 2.5007183854588 | 1.751795963647 | -
1.9928161454122 (1 row)
```

Related Functions

category Analytics - Probability Distributions
DCAUCHY
PCAUCHY
QCAUCHY_H

QCAUCHY_H - Inverse Cauchy Distribution, high tail

Given the peak location and the interquartile range, this function returns the value x of a variable following the Cauchy distribution for which the probability of being greater than x is equal to the given percentage.

Usage

The QCAUCHY_H function has the following syntax:

QCAUCHY_H(DOUBLE percentage, double location, double scale)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

location
the location of the peak of the Cauchy

distribution Type: DOUBLE

scale
a value corresponding to half of the interquartile range. Smaller values result in a narrower peak.

Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PCAUCHY_H(x,location,scale)=percentage

Details

If PCAUCHY_H(x,location,scale)=perc, then QCAUCHY_H(perc,location,scale)=x.

QCAUCHY_H(perc,location,scale)=QCAUCHY(1-perc,location,scale) for all location values, for scale greater than 0 and for perc between 0 and 1.

If scale=0 or less, QCAUCHY_H(perc,location,scale) is null for all perc and location values.

If percentage is not between 0 and 1, QCAUCHY_H(percentage,location,scale) is null for all location and scale values.

Examples

```
SELECT nza..QCAUCHY_H(0.95,1, 0.330);

    QCAUCHY_H
------------------
 -1.0835379998428
(1 row)
```

```
SELECT nza..QCAUCHY_H(0.215, 3, 0.4),
nza..QCAUCHY_H(0.216, 3, 0.4),nza..QCAUCHY_H(0.648, 3,
0.4),nza..QCAUCHY_H(0.936, 3, 0.4),nza..QCAUCHY_H(1.0, 3,
0.4),nza..QCAUCHY_H(1.3, 3, 0.4);
```

```
    QCAUCHY_H      |      QCAUCHY_H     |     QCAUCHY_H      |
QCAUCHY_H      | QCAUCHY_H | QCAUCHY_H
-----------------+-----------------+-----------------
+-----------------+-----------   +-----------
 3.4992816145412 | 3.4960796656282 | 2.7993455196974 |
1.0374439978205 |            |
(1 row)
```

```
SELECT nza..QCAUCHY_H(0.215, 3,
0.4),nza..QCAUCHY_H(0.215, 3, 1),nza..QCAUCHY_H(0.215, 3,
4);
```

```
    QCAUCHY_H     |    QCAUCHY_H     |     QCAUCHY_H
-----------------+----------------+-----------------
 3.4992816145412 | 4.248204036353 |
7.9928161454122 (1 row)
```

Related Functions

category Analytics - Probability Distributions
DCAUCHY
PCAUCHY_H
QCAUCHY

QCHISQ - Inverse Chi-square Distribution

Given a degree of freedom, this function returns the value x of a variable following the Chi-square distribution for which the probability of being smaller or equal to x is equal to the given percent-age.

Usage

The QCHISQ function has the following syntax:

QCHISQ(DOUBLE percentage, INT8 df)

Parameters

percentage

the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

df

the number of degrees of

freedom Type: INT8

Min: 1

Returns

DOUBLE the point x where PCHISQ(x,df)=percentage

Details

If PCHISQ(x,df)=perc, then QCHISQ(perc,df)=x. In this sense we speak about inverted function. Note that a function to be inverted must be strictly monotone in its domain. PCHISQ is so only for positive arguments because its derivative DCHISQ is positive only for positive values.

If percentage is not between 0 and 1, QCHISQ(percentage,df) is null for all df values.

If df is 0 or less, QCHISQ(percentage,df) is null for all percentage values.

Examples

```
SELECT nza..QCHISQ(0.95, 30);

     QCHISQ
------------------
  43.772971802033
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DCHISQ
PCHISQ
PCHISQ_S
QCHISQ_H

QCHISQ_H - Inverse Chi-square Distribution, high tail

Given a degree of freedom, this function returns the value x of a variable following the Chi-square distribution for which the probability of being greater than x is equal to the given percentage.

Usage

The QCHISQ_H function has the following syntax:

QCHISQ_H(DOUBLE percentage, INT8 df)

Parameters

percentage

the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

df

the number of degrees of

freedom Type: INT8

Min: 1

Returns

DOUBLE the point x where PCHISQ_H(x,df)=percentage

Details

If PCHISQ_H(x,df)=perc, then QCHISQ_H(perc,df)=perc.

QCHISQ_H(perc,df)=QCHISQ(1-perc,df) for df greater than 0 and for perc between 0 and 1.

If percentage is not between 0 and 1, QCHISQ_H(percentage,df) is null for all df values.

If df is 0 or less, QCHISQ_H(percentage,df) is null for all percentage values.

Examples

```
SELECT nza..QCHISQ_H(1-0.95, 30);

    QCHISQ_H
-----------------
 43.772971802033
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DCHISQ
PCHISQ_H
QCHISQ

QEXP - Inverse Exponential Distribution

Given an exponential scale, this function returns the value x of a variable following the Exponential distribu-tion for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QEXP function has the following syntax:

QEXP(DOUBLE percentage, DOUBLE scale)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

scale
the exponential

scale Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PEXP(x,scale)=percentage

Details

If PEXP(x,scale)=perc, then QEXP(perc,scale)=x.

If percentage is not between 0 and 1, QEXP(percentage,scale) is null for all df values.

If scale is 0 or less, QEXP(percentage,scale) is null for all percentage values.

Examples

```
SELECT nza..QEXP(0.2, 4);

        QEXP
------------------
 0.89257420525684
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DEXP
PEXP
QEXP_H

QEXP_H - Inverse Exponential Distribution, high tail

Given an exponential scale, this function returns the value x of a variable following the Exponential distribution for which the probability of being greater than x is equal to the given percentage.

Usage

The QEXP_H function has the following syntax:

QEXP_H(DOUBLE percentage, DOUBLE scale)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

scale
the exponential

scale Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PEXP_H(x,scale)=percentage

Details

If PEXP_H(x,scale)=perc, then QEXP_H(perc,scale)=x.

QEXP_H(perc,scale)=QEXP(1-perc,scale) for scale greater than 0 and for perc between 0 and 1.

If percentage is not between 0 and 1, QEXP_H(percentage,scale) is null for all scale values.

If scale is 0 or less, QEXP_H(percentage,scale) is null for all percentage values.

Examples

```
SELECT nza..QEXP_H(0.2, 4), nza..QEXP(1-0.2, 4);
```

```
      QEXP_H       |       QEXP
------------------+-----------------
 6.4377516497364 | 6.4377516497364
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DEXP
PEXP_H
QEXP

QF - Inverse Fisher Distribution

Given the degrees of freedom of the nominator and of the denominator, this function returns the value x of a variable following the Fisher distribution for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QF function has the following syntax:

QF(DOUBLE percentage, INT8 dfNomin, INT8 dfDenom)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

dfNomin
the number of degrees of freedom of the

nominator Type: INT8

Min: 1

dfDenom
the number of degrees of freedom of the

denominator Type: INT8

Min: 1

Returns
DOUBLE the point x where PF(x,dfNomin,dfDenom)=percentage

Details

If PF(x,dfNomin,dfDenom)=perc, then QF(perc,dfNomin,dfDenom)=x.

If percentage is not between 0 and 1, QF(percentage,dfNomin,dfDenom) is null for all dfNomin and dfDenom values.

If dfNomin or dfDenom is 0 or less, QF(percentage,dfNomin,dfDenom) is null for all percentage values.

Examples

```
SELECT nza..QF(0.2, 2, 3);

        QF

------------------

 0.24059582296099

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DF
PF
QF_H

QF_H - Inverse Fisher Distribution, high tail

Given an exponential scale, this function returns the value x of a variable following the Fisher dis-tribution for which the probability of being greater than x is equal to the given percentage.

Usage

The QF_H function has the following syntax:

QF_H(DOUBLE percentage, INT8 dfNomin, INT8 dfDenom)

Parameters

percentage

the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

dfNomin

the number of degrees of freedom of the nominator

Type: INT8

Min: 1

dfDenom
the number of degrees of freedom of the

denominator Type: INT8

Min: 1

Returns
DOUBLE the point x where PF_H(x,dfNomin,dfDenom)=percentage

Details

If PF_H(x,dfNomin,dfDenom)=perc, then QF_H(perc,dfNomin,dfDenom)=x.

If percentage is not between 0 and 1, QF_H(percentage,dfNomin,dfDenom) is null for all dfNomin and df-Denom values.

If dfNomin or dfDenom is 0 or less, QF_H(percentage,dfNomin,dfDenom) is null for all percentage values.

Examples

```
SELECT nza..QF_H(0.2, 2, 3), nza..QF(1-0.2, 2, 3);

      QF_H       |        QF
-----------------+-----------------
 2.886026349282 | 2.8860267314914
(1 row)
```

```
SELECT nza..QF_H(nza..PF_H(8,2,3), 2,3);

      QF_H
-----------------
 7.9999994809429
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DF
PF_H
QF

QFISK - Inverse Fisk (or log-logistic) Distribution

Given the median and the shape, this function returns the value x of a variable following the Fisk distribution for which the probability of being smaller or equal to x is equal to the given percent-age.

Usage

The QFISK function has the following syntax:

QFISK(DOUBLE percentage, DOUBLE median, DOUBLE shape)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

median
the median value of the distribution (also called

scale) Type: DOUBLE

Min: 0.000000001

shape
the shape of the

distribution Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the point x where PFISK(x,median,shape)=percentage

Details

The Inverse Fisk distribution has the closed form:

QFISK(p,median,shape) = median * (p/(1-p))^{1/shape}

If percentage is not between 0 and 1, QFISK(percentage,median,shape) is null for all positive medi-an and shape values.

If median or shape is 0 or less, QFISK(percentage,median,shape) is null for all percentage values.

Examples

```
SELECT nza..QFISK(0.0031027056133611,5,8);

 QFISK
-------
```

```
  2.43
(1 row)
```

```
SELECT nza..QFISK(nza..PFISK(0.7,5,4),5,4);
 QFISK
-------
   0.7
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DFISK
PFISK
QFISK_H

QFISK_H - Inverse Fisk (or log-logistic) Distribution, high tail

Given the median and the shape, this function returns the value x of a variable following the Fisk distribu-tion for which the probability of being greater than x is equal to the given percentage.

Usage

The QFISK_H function has the following syntax:

QFISK_H(DOUBLE percentage, DOUBLE median, DOUBLE shape)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

median
the median value of the distribution (also called

scale) Type: DOUBLE

Min: 0.000000001

shape
the shape of the distribution

Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the point x where PFISK_H(x,median,shape)=percentage

Details

If PFISK_H(x,median,shape)=perc, then QFISK_H(perc,median,shape)=x for all positive x, median and shape values.

QFISK_H(perc,median,shape)=QFISK(1-perc,median,shape) for perc between 0 and 1 and for all positive median and shape values.

If percentage is not between 0 and 1, QFISK_H(percentage,median,shape) is null for all positive median and shape values.

If median or shape is 0 or less, QFISK_H(percentage,median,shape) is null for all percentage values.

Examples

```
SELECT nza..QFISK_H(0.0031027056133611,5,8),
nza..QFISK(1-0.0031027056133611,5,8);
     QFISK_H     |      QFISK
-----------------+-----------------
 10.288065843621 | 10.288065843621
(1 row)
```

```
SELECT nza..QFISK_H(nza..PFISK_H(0.7,5,4),5,4);
     QFISK_H
------------------
 0.70000000000005
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DFISK
PFISK_H
QFISK

QGAMMA - Inverse Gamma Distribution

Given a shape and an inverted scale, this function returns the value x of a variable following the Gamma dis-tribution for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QGAMMA function has the following syntax:

QGAMMA(DOUBLE percentage, DOUBLE shape, DOUBLE scaleInv)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

shape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

scaleInv
the inverted scale of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PGAMMA(x,shape,scaleInv)=percentage

Details

If PGAMMA(x,shape,scaleInv)=perc, then QGAMMA(perc,shape,scaleInv)=x for all x and for all positive shape and scaleInv values.

QGAMMA(percentage,shape,scaleInv)=QGAMMA_H(1-percentage,shape,scaleInv) for percentage between 0 and 1 and for all positive shape and scaleInv values.

If percentage is not between 0 and 1, QGAMMA(percentage,shape,scaleInv) is null for all shape and scaleInv values.

If shape or scaleInv is 0 or less, QGAMMA(percentage,shape,scaleInv) for all percentage values.

Examples

```
SELECT nza..QGAMMA(0.215,3,0.4), nza..QGAMMA(0.216,3,0.4),
nza..QGAMMA(0.648,3,0.4), nza..QGAMMA(0.936,3,0.4),
nza..QGAMMA(1.0,3,0.4), nza..QGAMMA(1.3,3,0.4);
```

```
     QGAMMA       |      QGAMMA       |      QGAMMA       |
QGAMMA       | QGAMMA | QGAMMA

-----------------+-----------------+-----------------
+-----------------+--------+--------

 3.9841075165197 | 3.9937921699306 | 8.3431316468005 |
14.887879308886 |        |

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DGAMMA
PGAMMA
QGAMMA_H

QGAMMA_H - Inverse Gamma Distribution, high tail

Given a shape and an inverted scale, this function returns the value x of a variable following the Gamma distribution for which the probability of being greater than x is equal to the given percent-age

Usage

The QGAMMA_H function has the following syntax:

QGAMMA_H(DOUBLE percentage, DOUBLE shape, DOUBLE scaleInv)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

shape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

scaleInv
the inverted scale of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PGAMMA_H(x,shape,scaleInv)=percentage

Details

If PGAMMA_H(x,shape,scaleInv)=perc, then QGAMMA_H(perc,shape,scaleInv)=x for all x and for all positive shape and scaleInv values.

QGAMMA_H(perc,shape,scaleInv)=QGAMMA(1-perc,shape,scaleInv) for all positive shapeOne and shapeT-wo values, and for all perc between 0 and 1.

If percentage is not between 0 and 1, QGAMMA_H(percentage,shape,scaleInv) is null for all shape and scaleInv values.

If shapeOne or scaleInv is 0 or less, QGAMMA_H(percentage,shape,scaleInv) is null for all percentage values.

Examples

```
SELECT nza..QGAMMA_H(0.215,3,0.4), nza..QGAMMA_H(0.216,3,0.4),
nza..QGAMMA_H(0.648,3,0.4), nza..QGAMMA_H(0.936,3,0.4),
nza..QGAMMA_H(1.0,3,0.4), nza..QGAMMA_H(1.3,3,0.4);
   QGAMMA_H       |    QGAMMA_H      |     QGAMMA_H      |
QGAMMA_H       | QGAMMA_H | QGAMMA_H

                    +                       +----------------

+---------------------------------          +--------------------------- +----------
  10.410824461052 | 10.392306644756| 5.265106393617 |
 2.2672819877043 |             |
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DGAMMA
PGAMMA_H
QGAMMA

QGEOM - Inverse Geometric Distribution

Given the success probability p, this function returns the value x of a variable following the Geometric distri-bution for which the probability of being smaller or equal to x is equal to the given percentage. The value x is the number of failure before the first success in a serie of Bernoulli trials.

Usage

The QGEOM function has the following syntax:

QGEOM(DOUBLE percentage, DOUBLE p)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

Returns
INT8 the point x where PGEOM(x,p)=percentage

Details

If PGEOM(x,p)=perc, then QGEOM(perc,p)=x for all positive x values and for p between 0 and 1.

If percentage is not between 0 and 1, QGEOM(percentage,p) is null for all p values.

If p is not between 0 and 1, QGEOM(percentage,p) is null for all percentage values.

Examples

```
SELECT nza..QGEOM(0.670320,0.4),
nza..QGEOM(0.93844807,0.4),
nza..QGEOM(0.992073669,0.4), nza..QGEOM(0.999224,0.4);
 QGEOM  | QGEOM  | QGEOM  | QGEOM
-------+-------+-------+-------
      2|      5|      9|     14
(1 row)
```

```
SELECT
nza..QGEOM(nza..PGEOM(3,0.3)*0.4+nza..PGEOM(2,0.3)*0.6,0.
3);
 QGEOM
-------
      3
(1 row)
```

```
SELECT nza..QGEOM(0.2,0.330);
 QGEOM
-------
    0
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DGEOM
PGEOM
QGEOM_H

QGEOM_H - Inverse Geometric Distribution, high tail

Given the success probability p, this function returns the value x of a variable following the Geometric distri-bution for which the probability of being greater than x is equal to the given percentage. The value x is the number of failure before the first success in a serie of Bernoulli trials.

Usage

The QGEOM_H function has the following syntax:

QGEOM_H(DOUBLE percentage, DOUBLE p)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

Returns
INT8 the point x where PGEOM_H(x,p)=percentage

Details

If PGEOM_H(x,p)=perc, then QGEOM_H(perc,p)=x for all positive x values and for p between 0 and 1.

QGEOM_H(perc,p) = QGEOM(1-perc,p) for all perc and p between 0 and 1.

If percentage is not between 0 and 1, QGEOM_H(percentage,p) is null for all p values.

If p is not between 0 and 1, QGEOM_H(percentage,p) is null for all percentage values.

Examples

```
SELECT nza..QGEOM_H(1-0.670320,0.4),
nza..QGEOM_H(1-0.93844807,0.4), nza..QGEOM_H(1-
0.992073669,0.4), nza..QGEOM_H(1-0.999224,0.4);
 QGEOM_H | QGEOM_H | QGEOM_H | QGEOM_H
---------+---------+---------+---------
       2 |       5 |       9 |      14
(1 row)
```

```
SELECT
nza..QGEOM_H(nza..PGEOM_H(3,0.3)*0.1+nza..PGEOM_H(2,0.3)*
0.9,0.3);
 QGEOM_H
---------
       3
(1 row)
```

```
SELECT nza..QGEOM_H(0.2,0.330);
 QGEOM_H
---------
      4
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DGEOM
PGEOM_H
QGEOM

QHYPER - Inverse Hypergeometric Distribution

Given the number of white and black balls in the urn and the number of trials, this function returns the value x of a variable following the Hypergeometric distribution for which the probability of being smaller or equal to x is equal to the given percentage. The value x is the number of white balls drawn from an urn in a serie of trials without replacement.

Usage

The QHYPER function has the following syntax:

QHYPER(DOUBLE percentage, BIGINT wu, BIGINT bu, BIGINT N)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

wu
the number of white balls in the

urn Type: BIGINT

Min: 0

bu
the number of black balls in the

urn Type: BIGINT

Min: 0

N
the number of balls drawn from the urn without

replacement Type: BIGINT

Min: 1

Returns
BIGINT the point x where PHYPER(x,wu,bu,N)=percentage

Details

If PHYPER(x,wu,bu,N)=percentage, then QHYPER(percentage,wu,bu,N)=x for all x and for all positive wu, bu and N values.

If percentage is not between 0 and 1, QHYPER(percentage,wu,bu,N) is null for all N, wu and bu val-ues.

If wu or bu is negative, QHYPER(percentage,wu,bu,N) is null for all percentage and N values.

If N is 0 or less, QHYPER(percentage,wu,bu,N) is null for all percentage, wu and bu values.

Examples

```
SELECT nza..QHYPER(0.95,4,5,6), nza..QHYPER(0.5,4,5,6);

 QHYPER | QHYPER
--------+--------
      4 |       3
(1 row)
```

```
SELECT nza..QHYPER(0.32967032967033-0.0001,3,11,4),
nza..QHYPER( 0.82417582417582-0.0001,3,11,4),
nza..QHYPER(0.98901098901099-0.0001,3,11,4), nza..QHYPER(
0.32967032967033+0.0001,3,11,4),
nza..QHYPER( 0.82417582417582+0.0001,3,11,4),
nza..QHYPER(0.98901098901099+0.0001,3,11,4),
nza..QHYPER(nza..PHYPER(2,3,11,4)*0.2+nza..PHYPER(1,3,11,
4)*0.8,3,11,4);

 QHYPER | QHYPER | QHYPER | QHYPER | QHYPER | QHYPER
| QHYPER
--------+--------+--------+--------+--------+ --------
+--------
      0 |       1 |       2 |       1 |       2 |       3 |
 2
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DHYPER
PHYPER
QHYPER_H

QHYPER_H - Inverse Hypergeometric Distribution, high tail

Given the number of white and black balls in the urn and the number of trials, this function returns the value x of a variable following the Hypergeometric distribution for which the probability of being greater than x is equal to the given percentage. The value x is the number of white balls drawn from an urn in a serie of trials without replacement.

Usage

The QHYPER_H function has the following syntax:

QHYPER_H(DOUBLE percentage, BIGINT wu, BIGINT bu, BIGINT N)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

wu
the number of white balls in the

urn Type: BIGINT

Min: 0

bu
the number of black balls in the

urn Type: BIGINT

Min: 0

N
the number of balls drawn from the urn without

replacement Type: BIGINT

Min: 1

Returns
BIGINT the point x where PHYPER_H(x,wu,bu,N)=percentage

Details

If PHYPER_H(x,wu,bu,N)=percentage, then QHYPER_H(percentage,wu,bu,N)=x for all x and for all positive wu, bu and N values.

QHYPER_H(percentage,wu,bu,N) = QHYPER(1-percentage,wu,bu,N) for percentage between 0 and 1 and for all positive wu, bu and N values.

If percentage is not between 0 and 1, QHYPER_H(percentage,wu,bu,N) is null for all N, wu and bu values.

If wu or bu is negative, QHYPER_H(percentage,wu,bu,N) is null for all percentage and N values.

If N is 0 or less, QHYPER_H(percentage,wu,bu,N) is null for all percentage, wu and bu values.

Examples

```
SELECT nza..QHYPER_H(1-0.95,4,5,6),
nza..QHYPER_H(1-0.5,4,5,6);
 QHYPER_H | QHYPER_H
----------+----------
        4 |        3
(1 row)
```

```
SELECT nza..QHYPER_H(0.32967032967033-0.0001,3,11,4),
nza..QHYPER_H( 0.82417582417582-0.0001,3,11,4),
nza..QHYPER_H(0.98901098901099-0.0001,3,11,4),
nza..QHYPER_H( 0.32967032967033+0.0001,3,11,4),
nza..QHYPER_H( 0.82417582417582+0.0001,3,11,4),
nza..QHYPER_H(0.98901098901099+0.0001,3,11,4),
nza..QHYPER_H(nza..PHYPER_H(2,3,11,4)*0.5+nza..PHYPER_H(1
,3,11,4)*0.5,3,11,4);
 QHYPER_H | QHYPER_H | QHYPER_H | QHYPER_H | QHYPER_H
| QHYPER_H | QHYPER_H
          +----------+----------+----------+ ----------
+----------+----------
        1 |        0 |        0 |        1 |        0 |
0  |        2
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DHYPER
PHYPER_H
QHYPER

QLNORM - Inverse Galton (or LogNormal) Distribution

Given a logarithmic scale median and shape, this function returns the value x of a variable follow-ing the LogNormal distribution for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QLNORM function has the following syntax:

QLNORM(DOUBLE percentage, DOUBLE medlog, DOUBLE sdlog)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

medlog
the median value on the logarithmic

scale Type: DOUBLE

sdlog
the shape on the logarithmic

scale Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the point x where PLNORM(x,median,shape)=percentage

Details

If PLNORM(x,medlog,sdlog)=perc, then QLNORM(perc,medlog,sdlog)=x for all medlog and for all positive x and sdlog values.

If percentage is not between 0 and 1, QLNORM(percentage,medlog,sdlog) is null for all medlog and all posit-ive sdlog values.

If sdlog is 0 or less, QLNORM(percentage,medlog,sdlog) is null for all percentage and medlog values.

Examples

```
SELECT nza..QLNORM(0.35542940976158,2,3);

    QLNORM
-----------------
 2.4299999999999
(1 row)
```

```
SELECT nza..QLNORM(nza..PLNORM(0.7,5,4),5,4);

 QLNORM
--------
```

```
     0.7
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DLNORM
PLNORM
QLNORM_H

QLNORM_H - Inverse Galton (or LogNormal) Distribution, high tail

Given a logarithmic scale median and shape, this function returns the value x of a variable follow-ing the LogNormal distribution for which the probability of being greater than x is equal to the giv-en percentage.

Usage

The QLNORM_H function has the following syntax:

QLNORM_H(DOUBLE percentage, DOUBLE medlog, DOUBLE sdlog)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

medlog
the median value on the logarithmic

scale Type: DOUBLE

sdlog
the shape on the logarithmic

scale Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the point x where PLNORM_H(x,medlog,sdlog)=percentage

Details

If PLNORM_H(x,medlog,sdlog)=perc, then QLNORM_H(perc,medlog,sdlog)=x for all medlog and for all positive x and sdlog values.

QLNORM_H(perc,medlog,sdlog)=QLNORM(1-p,medlog,sdlog) for perc between 0 and 1, for all medlog and for all positive sdlog values.

If percentage is not between 0 and 1, QLNORM_H(percentage,medlog,sdlog) is null for all medlog and for all positive sdlog values.

If sdlog is 0 or less, QLNORM_H(percentage,medlog,sdlog) is null for all percentage and medlog values.

Examples

```
SELECT nza..QLNORM_H(0.35542940976158,2,3),nza..QLNORM(1-0.35542940976158,2,3);
    QLNORM_H     |      QLNORM
-----------------+-----------------
 22.468374485955 | 22.468374485955
(1 row)
```

```
SELECT nza..QLNORM_H(1-0.35542940976158,2,3),nza..QLNORM(0.35542940976158,2,3);
    QLNORM_H     |      QLNORM
-----------------+-----------------
 2.4300000014364 | 2.4300000014364
(1 row)
```

```
SELECT nza..QLNORM_H(nza..PLNORM_H(0.7,5,4),5,4);
 QLNORM_H
----------
      0.7
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DLNORM
PLNORM_H

QLNORM

QLOGIS - Inverse Logistic Distribution

Given the mean and the scale, this function returns the value x of a variable following the Logistic distribution for which the probability of being smaller or equal to x is equal to the given percent-age.

Usage

The QLOGIS function has the following syntax:

QLOGIS(DOUBLE percentage, DOUBLE mean, DOUBLE scale)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

mean
the mean value of the

distribution Type: DOUBLE

scale
the scale of the

distribution Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the point x where PLOGIS(x,mean,scale)=percentage

Details

If PLOGIS(x,mean,scale)=perc then QLOGIS(perc,mean,scale)=x for all x and mean and for all posit-ive scale values.

If percentage is not between 0 and 1, QLOGIS(percentage,mean,scale) is null for all mean and for all positive scale values.

If scale is 0 or less, QLOGIS(percentage,mean,scale) is null for all percentage and mean values.

Examples

```
SELECT nza..QLOGIS(0.53577211111408,2,3);
```

QLOGIS

```
--------
   2.43
(1 row)
```

```
SELECT nza..QLOGIS(nza..PLOGIS(0.7,5,4),5,4);
 QLOGIS
--------
    0.7
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DLOGIS
PLOGIS
QLOGIS_H

QLOGIS_H - Inverse Logistic Distribution, high tail

Given the mean and the scale, this function returns the value x of a variable following the Logistic distribu-tion for which the probability of being greater than x is equal to the given percentage.

Usage

The QLOGIS_H function has the following syntax:

QLOGIS_H(DOUBLE percentage, DOUBLE mean, DOUBLE scale)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

mean
the mean value of the

distribution Type: DOUBLE

scale
the scale of the distribution

Type: DOUBLE

Min: 0.000000001

Returns
DOUBLE the point x where PLOGIS_H(x,mean,scale)=percentage

Details

If PLOGIS_H(x,mean,scale)=perc, then QLOGIS_H(perc,mean,scale)=x for all x and mean and for all positive scale values.

QLOGIS_H(perc,mean,scale)=QLOGIS(1-perc,mean,scale) for perc between 0 and 1, for all mean and for all positive scale values.

If percentage is not between 0 and 1, QLOGIS_H(percentage,mean,scale) is null for all mean for all positive scale values.

If scale is 0 or less, QLOGIS_H(percentage,mean,scale) is null for all percentage and mean values.

Examples

```
SELECT nza..QLOGIS_H(nza..PLOGIS_H(0.7,5,4),5,4);
```

```
 QLOGIS_H
----------
       0.7
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DLOGIS
PLOGIS_H
QLOGIS

QMWW - Inverse Mann-Whitney-Wilcoxon Distribution

Given the number of items separated in two sets, the minimum number of items in set 1, This function returns the value x of a variable following the MWW distribution for which the probability of being smaller or equal to x is equal to the given percentage

Usage

The QMWW function has the following syntax:

QMWW(DOUBLE percentage, BIGINT COUNTmin, BIGINT NoItems)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.0000001

Max: 0.9999999

COUNTmin
the number of items in set

1 Type: BIGINT

Min: 1

Max: NoItems-1

NoItems
the total number of

items Type: BIGINT

Min: 1

Returns
BIGINT the point x where PMWW(x,COUNTmin,NoItems)=percentage

Details

If PMWW(x,COUNTmin,NoItems)=perc, then QMWW(perc,COUNTmin,NoItems)=x for all x, COUNTmin and NoItems values in their respective validity interval.

If percentage is not between 0 and 1, QMWW(percentage,COUNTmin,NoItems) is null for all COUNTmin and NoItems values.

If COUNTmin or NoItems are not in their validity interval, QMWW(percentage,COUNTmin,NoItems) returns null fo all percentage values.

Examples

```
SELECT nza..QMWW(0.055,4,9);

 QMWW
------
   13
(1 row)



SELECT nza..QMWW(0.99,4,9);

 QMWW
------
```

```
   28
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DMWW
PMWW
QMWW_H

QMWW_H - Inverse Mann-Whitney-Wilcoxon Distribution, high tail

Given the number of items separated in two sets, the minimum number of items in set 1, This function returns the value x of a variable following the MWW distribution for which the probability of being greater than x is equal to the given percentage.

Usage

The QMWW_H function has the following syntax:

QMWW_H(DOUBLE percentage, BIGINT COUNTmin, BIGINT NoItems)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.0000001

Max: 0.9999999

COUNTmin
the number of items in set

1 Type: BIGINT

Min: 1

Max: NoItems-1

NoItems
the total number of

items Type: BIGINT

Min: 1

Returns
BIGINT the x

Details

If PMWW_H(x,COUNTmin,NoItems)=perc, then QMWW_H(perc,COUNTmin,NoItems)=x for all x, COUNTmin and NoItems in their respective validity interval.

QMWW_H(perc,COUNTmin,NoItems)=QMWW(1-perc,COUNTmin,NoItems) for perc between 0 and 1, for all COUNTmin and NoItems in their respective validity interval.

If percentage is not between 0 and 1, QMWW_H(percentage,COUNTmin,NoItems) is null for all COUNTmin and NoItems.

If COUNTmin or NoItems are not in their validity interval, QMWW_H(percentage,COUNTmin,NoItems) re-turns null fo all percentage values.

Examples

```
SELECT nza..QMWW_H(1-0.055,4,9);

 QMWW_H
--------
      13
(1 row)
```

```
SELECT nza..QMWW_H(1-0.99,4,9);

 QMWW_H
--------
      28
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DMWW
PMWW_H
QMWW

QNBINOM - Inverse Negative Binomial Distribution

Given the success probability p and the number of successes needed, this function returns the value x of a variable following the Negative Binomial distribution for which the probability of being smaller or equal to x is equal to the given percentage. The value x is the number of failures in a serie of Bernoulli trials before the number of successes requested is reached.

Usage

The QNBINOM function has the following syntax:

QNBINOM(DOUBLE percentage, INT8 s, DOUBLE p)

Parameters

percentage

the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

s

the number of successes needed to stop the serie of Bernoulli

trials Type: INT8

Min: 1

p

the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns

INT8 the point x where PNBINOM(x,s,p)=percentage

Details

If PNBINOM(x,s,p)=perc, then QNBINOM(perc,s,p)=x for all positive x and s values and for p between 0 and 1.

If percentage is not between 0 and 1, QNBINOM(percentage,s,p) is null for all p values.

If s is 0 or less, QNBINOM(perc,s,p) is null for all perc and p values.

If p is not between 0 and 1, QNBINOM(percentage,s,p) is null for all percentage and s values.

Examples

```
SELECT nza..QNBINOM(0.95,1,0.330);

 QNBINOM
-------
      7
(1 row)
```

```
SELECT nza..QNBINOM(0.215,3,0.4), nza..QNBINOM(0.1792,3,0.4),
nza..QNBINOM(0.31744,3,0.4), nza..QNBINOM(0.45568,3,0.4),
nza..QNBINOM(0.580096,3,0.4), nza..QNBINOM(1.3,3,0.4);
  QNBINOM| QNBINOM | QNBINOM | QNBINOM | QNBINOM | QNBINOM
---------+---------+---------+---------+---------+---------
        2|        1|        2|        3|        4|
(1 row)
```

```
SELECT nza..QNBINOM(0.215,30,0.4), nza..QNBINOM(0.1792, 30,0.4),
nza..QNBINOM(0.31744,30,0.4), nza..QNBINOM(0.45568,30,0.4),
nza..QNBINOM(0.580096,30,0.4), nza..QNBINOM(1.3,30,0.4);
  QNBINOM| QNBINOM | QNBINOM | QNBINOM | QNBINOM | QNBINOM
---------+---------+---------+---------+---------+---------
       36|       35|       39|       43|       46|
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNBINOM
PNBINOM
QBINOM
QNBINOM_H

QNBINOM_H - Inverse Negative Binomial Distribution, high tail

Given the success probability p and the number of successes needed, this function returns the value x of a variable following the Negative Binomial distribution for which the probability of being greater than x is equal to the given percentage. The value x is the number of failures in a serie of Bernoulli trials before the number of successes requested is reached.

Usage

The QNBINOM_H function has the following syntax:

QNBINOM_H(DOUBLE percentage, INT8 s, DOUBLE p)

▲ Parameters

► **percentage**

the probability limit requested

Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

s
the number of successes needed to stop the serie of Bernoulli

trials Type: INT8

Min: 1

p
the success probability

Type: DOUBLE

Min: 0.00000000001

Max: 1-0.00000000001

Returns
INT8 the point x where PNBINOM_H(x,s,p)=percentage

Details

If PNBINOM_H(x,s,p)=perc, then QNBINOM_H(perc,s,p)=x for all positive x and s values and for p between 0 and 1.

QNBINOM_H(perc,s,p) = QNBINOM(1-perc,s,p) for all positive s values and for percentage and p between 0 and 1.

If percentage is not between 0 and 1, QNBINOM_H(percentage,s,p) is null for all p values.

If s is 0 or less, QNBINOM_H(perc,s,p) is null for all perc and p values.

If p is not between 0 and 1, QNBINOM_H(percentage,s,p) is null for all percentage and s values.

Examples

```
SELECT nza..QNBINOM_H(1-0.95,1,0.330);

 QNBINOM_H
-----------
          7
(1 row)
```

```
SELECT nza..QNBINOM_H(0.215,3,0.4),
nza..QNBINOM_H(0.1792,3,0.4),
nza..QNBINOM_H(0.31744,3,0.4),
nza..QNBINOM_H(0.45568,3,0.4),
nza..QNBINOM_H(0.580096,3,0.4), nza..QNBINOM_H(1.3,3,0.4);
```

```
 QNBINOM_H | QNBINOM_H | QNBINOM_H | QNBINOM_H | QNBINOM_H
| QNBINOM_H
-----------+-----------+-----------+-----------+ -----------
+-----------
         7 |         7 |         5 |         4 |         3 |
 (1 row)
```

```
SELECT nza..QNBINOM_H(0.215,30,0.4), nza..QNBINOM_H(0.1792,
30,0.4), nza..QNBINOM_H(0.31744,30,0.4),
nza..QNBINOM_H(0.45568,30,0.4), nza..QNBINOM_H(0.580096,30,0.4),
nza..QNBINOM_H(1.3,30,0.4);
```

```
 QNBINOM_H | QNBINOM_H | QNBINOM_H | QNBINOM_H | QNBINOM_H
| QNBINOM_H
-----------+-----------+-----------+-----------+ -----------
+-----------
        53 |        55 |        49 |        46 |        42 |
 (1 row)
```

Related Functions

category Analytics - Probability Distributions
DNBINOM
PNBINOM_H
QBINOM_H
QNBINOM

QNORM - Inverse Standard Normal Distribution

This function returns the value x of a variable following the Standard Normal distribution for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QNORM function has the following syntax:

QNORM(DOUBLE percentage)

▲ Parameters

- ► **percentage**

the probability limit requested

Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

Returns
DOUBLE the point x where PNORM(x)=percentage

Details

If PNORM(x)=perc, then QNORM(perc)=x for all x values.

If percentage is not between 0 and 1, QNORM(percentage) is null.

Examples

```
SELECT nza..QNORM(0.7);

        QNORM
------------------
 0.52440051270804
(1 row)
```

```
SELECT nza..QNORM(nza..PNORM(0.7));

 QNORM
-------
    0.7
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNORM
PNORM
QNORM_H

QNORM3P - Inverse Normal Distribution

Given a mean value and a standard deviation, this function returns the value x of a variable following the Normal distribution for which the probability of being smaller or equal to x is equal to the given per-centage.

Usage

The QNORM3P function has the following syntax:

QNORM3P(DOUBLE percentage, DOUBLE mean, DOUBLE stdev)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

mean
the mean value of the

distribution Type: DOUBLE

stdev
the standard deviation of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PNORM3P(x,mean,stdev)=percentage

Details

If PNORM3P(x,mean,stdev)=perc, then QNORM3P(perc,mean,stdev)=x for all x and mean values and for all strictly positive stdev values.

If percentage is not between 0 and 1, QNORM3P(percentage,mean,stdev) is null for all mean and stdev val-ues.

If stdev is 0 or less, QNORM3P(percentage,mean,stdev) is null for all percentage and mean values.

Examples

```
SELECT nza..QNORM3P(0.99245058858369,0,1);

     QNORM3P
-----------------
 2.4299999999999
(1 row)
```

```
SELECT nza..QNORM3P(0.99245058858369,6,1);
```

```
     QNORM3P
-----------------
 8.4299999999999
(1 row)
```

```
SELECT nza..QNORM3P(0.99245058858369,6,3);
 QNORM3P
---------
   13.29
(1 row)
```

```
SELECT nza..QNORM3P(1-0.99245058858369,6,3);
     QNORM3P
------------------
 -1.2899999999998
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNORM3P
PNORM3P
QNORM

QNORM_H - Inverse Standard Normal Distribution, high tail

This function returns the value x of a variable following the Standard Normal distribution for which the probability of being greater than x is equal to the given percentage.

Usage

The QNORM_H function has the following syntax:

QNORM_H(DOUBLE percentage)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

Returns
DOUBLE the point x where PNORM_H(x)=percentage

Details

If PNORM_H(x)=perc, then QNORM_H(perc)=x for all x values.

QNORM_H(percentage)=QNORM(1-percentage) for percentage between 0 and 1.

If percentage is not between 0 and 1, QNORM_H(percentage) is null.

Examples

```
SELECT nza..QNORM_H(0.7);

       QNORM_H
-------------------
 -0.52440051270804
(1 row)
```

```
SELECT nza..QNORM_H(nza..PNORM_H(0.7));

 QNORM_H
---------
     0.7
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DNORM
PNORM_H
QNORM

QPOIS - Inverse Poisson Distribution

Given the mean number of success within a fixed time interval, this function returns the value x of a variable following the Poisson distribution for which the probability of being smaller or equal to x is equal to the given percentage. The value x is the number of successes expected within this time interval.

Usage

The QPOIS function has the following syntax:

QPOIS(DOUBLE percentage, DOUBLE lambda)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

lambda
the mean number of successes within a fixed time

interval Type: double

Min: 0.00000000001

Returns
INT8 the point x where PPOIS(x,lambda)=percentage

Details

If PPOIS(x,lambda)=perc, then QPOIS(perc,lambda)=x for all positive x and lambda values.

If percentage is not between 0 and 1, QPOIS(percentage,lambda) is null for all lambda values.

If lambda is 0 or less, PPOIS(x,lambda) is null for all x values.

Otherwise the probability of at most x successes is greater or equal to perc but the probability of at most x-1 successes is smaller than perc Therefore, if one wants to draw a sample from the Pois-son distribution with given lambda e.g. =3, then one shall call select nza..QPOIS(random(),3) ....

Examples

```
SELECT nza..QPOIS(0.670320,0.4),
nza..QPOIS(0.93844807,0.4),
nza..QPOIS(0.992073669,0.4), nza..QPOIS(0.999224,0.4);
 QPOIS | QPOIS | QPOIS | QPOIS
-------+-------+-------+-------
      0|      1|      2|      3
(1 row)
```

```
SELECT
nza..QPOIS(nza..PPOIS(3,0.3)*0.7+nza..PPOIS(2,0.3)*0.3,0.3);

 QPOIS

-------

      3

(1 row)
```

```
SELECT nza..QPOIS(0.2,0.330);

 QPOIS

-------

      0

(1 row)
```

Related Functions

category Analytics - Probability Distributions
DPOIS
PPOIS
QPOIS_H

QPOIS_H - Inverse Poisson Distribution, high tail

Given the mean number of success within a fixed time interval, this function returns the value x of a variable following the Poisson distribution for which the probability of being greater than x is equal to the given per-centage. The value x is the number of successes expected within this time interval.

Usage

The QPOIS_H function has the following syntax:

QPOIS_H(DOUBLE percentage, DOUBLE lambda)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

lambda
the mean number of successes within a fixed time

interval Type: double

Min: 0.00000000001

Returns
INT8 the point x where PPOIS_H(x,lambda)=percentage

Details

If PPOIS_H(x,lambda)=perc, then QPOIS_H(perc,lambda)=x for all positive x and lambda values.

QPOIS_H(perc,lambda) = QPOIS(1-perc,lambda) for all positive lambda values and for perc between 0 and 1.

If percentage is not between 0 and 1, QPOIS_H(percentage,lambda) is null for all lambda values.

If lambda is 0 or less, PPOIS_H(x,lambda) is null for all x values.

Otherwise the probability of at most x successes is greater or equal to 1-perc but the probability of at most x-1 successes is smaller than 1-perc Therefore, if one wants to draw a sample from the Poisson distribution with given lambda e.g. =3, then one shall call select nza..QPOIS(random(),3) ....

Examples

```
SELECT nza..QPOIS_H(1-0.670320,0.4),
nza..QPOIS_H(1-0.93844807,0.4), nza..QPOIS_H(1-
0.992073669,0.4), nza..QPOIS_H(1-0.999224,0.4);
 QPOIS_H | QPOIS_H | QPOIS_H | QPOIS_H
---------+---------+---------+---------
       0|        1|        2|        3
(1 row)

SELECT
nza..QPOIS_H(nza..PPOIS_H(3,0.3)*0.5+nza..PPOIS_H(2,0.3)*
0.5,0.3);
 QPOIS_H
---------
       3
(1 row)

SELECT nza..QPOIS_H(1-0.2,0.330);
```

```
 QPOIS_H
---------
        0
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DPOIS
PPOIS_H
QPOIS

QT - Inverse t-Student Distribution

Given a degree of freedom, this function returns the value x of a variable following the T-student distribu-tion for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QT function has the following syntax:

QT(DOUBLE percentage, INT8 df)

Parameters

percentage

the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

df

the number of degrees of

freedom Type: INT8

Min: 1

Returns

DOUBLE the point x where PT(x,df)=percentage

Details

If PT(x,df)=perc, then QT(perc,df)=x for all x and all strictly positive df values.

If percentage is not between 0 and 1, QT(percentage,df) is null for all df values.

If df is 0 or less, QT(percentage,df) is null for all percentage values.

Examples

```
SELECT nza..QT(0.95,30);

        QT
-----------------
 1.6972612018151
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DT
PT
QT_H

QT_H - Inverse t-Student Distribution, high tail

Given a degree of freedom, this function returns the value x of a variable following the T-student distribution for which the probability of being greater than x is equal to the given percentage.

Usage

The QT_H function has the following syntax:

QT_H(DOUBLE percentage, INT8 df)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

df
the number of degrees of

freedom Type: INT8

Min: 1

Returns
DOUBLE the point x where PT_H(x,df)=percentage

Details

If PT_H(x,df)=perc, then QT_H(perc,df)=x for all x and for all strictly positive df values.

QT_H(perc,df)=QT(1-perc,df) for perc between 0 and 1, for all strictly positive df values.

If percentage is not between 0 and 1, QT_H(percentage,df) is null for all strictly positive df values.

If df is 0 or less, QT_H(percentage,df) is null for all percentage values.

Examples

```
SELECT nza..QT_H(0.95,30),  nza..QT(1-0.95,30);


        QT_H        |         QT
-------------------+------------------
 -1.6972612018151 | -1.6972612018151
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DT
PT_H
QT

QUANTILE - Quantile for a numeric attribute

This stored procedure calculates quantile limit(s) for a numeric column

Usage

The QUANTILE stored procedure has the following syntax:

QUANTILE(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable

the input table or view

Type: NVARCHAR(256)

incolumn

the input table column

Type: NVARCHAR(128)

quantiles
the list of quantiles to be calculated, separated by semicolon (;). Quantiles are values between 0 and 1 indicating the percentage of sorted values to be considered in each quantile.

Type: NVARCHAR(ANY)

outtable
the output table to write outliers to. This parameter must be specified if more than one quantile have to be calculated. It is ignored and can be omitted if only one quantile has to be calculated

Type: NVARCHAR(ANY)

Default: <none>

Returns
REAL If only one quantile is requested, the value of the quantile; otherwise, the number of calculated quantiles

Details

This stored procedure calculate the limits of the specified quantiles for a numeric column. Each quantile is specified by the percentage (between 0 and 1) of input values that are below its limit.

If more than one quantiles are calculated, the output table contains following columns: p, value. The column p contains the quantile percentage as indicated in parameter <quantiles> and the column value contains the quantile limit.

Examples

```
CALL nza..QUANTILE('intable=nza..quant_iris,
incolumn=sepal_length, quantiles=0.3;0.7,
outtable=quant_qt');
SELECT * FROM quant_qt ORDER BY p;
CALL nza..DROP_TABLE('quant_qt');
```

```
 QUANTILE
----------
         2
(1 row)


     | VALUE
-----+-------
```

```
  0.3  |  5.27
  0.7  |   6.3
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..QUANTILE('intable=nza..quant_iris,
incolumn=sepal_length, quantiles=0.21');
 QUANTILE
----------
    5.029
(1 row)
```

Related Functions

category Analytics - Quantiles & Outliers
QUANTILE_DISC

QUANTILE_DISC - Quantile for a discrete attribute

This stored procedure calculates quantile limit(s) for a discrete column (when applicable)

Usage

The QUANTILE_DISC stored procedure has the following syntax:

QUANTILE_DISC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

incolumn
the input table column

Type: NVARCHAR(128)

quantiles
the list of quantiles to be calculated, separated by semicolon (;). Quantiles are values between 0 and 1 indicating the percentage of sorted values to be considered in each quantile.

Type: NVARCHAR(ANY)

outtable
the output table to write outliers to. This parameter must be specified if more than one quantile have to be calculated. It is ignored and can be omitted if only one quantile has to be calculated

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR If only one quantile is requested, the value of the quantile; otherwise, the number of calculated quantiles

Details

This stored procedure calculate the limits of the specified quantiles for a discrete column. Each quantile is specified by the percentage (between 0 and 1) of input values that are below its limit.

If more than one quantiles are calculated, the output table contains following columns: p, value. The column p contains the quantile percentage as indicated in parameter <quantiles> and the column value contains the quantile limit.

Examples

```
CALL nza..QUANTILE_DISC('intable=nza..censusincome,
incolumn=marital_status, quantiles=0.3;0.7,
outtable=quant_qt');
SELECT * FROM quant_qt ORDER BY p;
CALL nza..DROP_TABLE('quant_qt');
```

```
 QUANTILE_DISC
---------------
 2
(1 row)


  P  |                VALUE
-----+--------------------------------
```

```
 0.3 | Married-civilian spouse present
 0.7 | Never married
(2 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..QUANTILE_DISC('intable=nza..censusincome,
incolumn=marital_status, quantiles=0.21');
           QUANTILE_DISC
----------------------------------
 Married-civilian spouse present
(1 row)
```

Related Functions

category Analytics - Quantiles & Outliers
QUANTILE

QUARTILE - Quartile for a numeric attribute

This stored procedure calculates a quartile limit for a numeric column

Usage

The QUARTILE stored procedure has the following syntax:

QUARTILE(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

incolumn
the input table column

Type: NVARCHAR(128)

quartile
the quartile to be

calculated Type: INT4

Default: 1

Min: 1

Max: 3

Returns
REAL the quartile limit

Details

This stored procedure calculates the quartile limit for a numeric column. The quartile parameter indicates which quartile limit has to be calculated: quartile=1 (0.25 quantile), quartile=2 (median value) and quartile=3 (0.75 quantile).

Examples

```
CALL nza..QUARTILE('intable=nza..quant_iris,
incolumn=sepal_length, quartile=3');
 QUARTILE
----------
      6.4
(1 row)
```

```
CALL nza..QUARTILE('intable=nza..quant_iris,
incolumn=sepal_length');
 QUARTILE
----------
      5.1
(1 row)
```

Related Functions

category Analytics - Quantiles & Outliers
QUANTILE
QUARTILE_DISC

QUARTILE_DISC - Quartile for a discrete attribute

This stored procedure calculates a quartile limit for a discrete column (when applicable)

Usage

The QUARTILE_DISC stored procedure has the following syntax:

QUARTILE_DISC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

incolumn
the input table column

Type: NVARCHAR(128)

quartile
the quartile to be

calculated Type: INT4

Default: 1

Min: 1

Max: 3

Returns
NVARCHAR(ANY) the quartile limit

Details

This stored procedure calculates the quartile limit for a discrete column. The quartile parameter indicates which quartile limit has to be calculated: quartile=1 (0.25 quantile), quartile=2 (median value) and quartile=3 (0.75 quantile).

Examples

```
CALL nza..QUARTILE_DISC('intable=nza..censusincome,
incolumn=marital_status, quartile=3');
     QUARTILE_DISC
```

```
---------------------
  Never married
(1 row)
```

```
CALL nza..QUARTILE_DISC('intable=nza..censusincome,
incolumn=marital_status');
          QUARTILE_DISC
---------------------------------
 Married-civilian spouse present
(1 row)
```

Related Functions

category Analytics - Quantiles & Outliers
QUANTILE_DISC
QUARTILE

QUNIF - Inverse Uniform Distribution

Given a minimum and a maximum for the uniform interval, this function returns the value x of a variable following the Uniform distribution for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QUNIF function has the following syntax:

QUNIF(DOUBLE percentage, DOUBLE minimum, DOUBLE maximum)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

minimum
the left border of the Uniform interval

Type: DOUBLE

Max: <maximum>

maximum
the right border of the Uniform

interval Type: DOUBLE

Min: <minimum>

Returns
DOUBLE the point x where PUNIF(x,minimum,maximum)=percentage

Details

If PUNIF(x,minimum,maximum)=perc, then QUNIF(perc,minimum,maximum)=x for all x, minimum and max-imum values where x is between minimum and maximum.

If percentage is not between 0 and 1, QUNIF(percentage,minimum,maximum) is null for all minimum and maximum values.

If minimum is not smaller than maximum, QUNIF(percentage,minimum,maximum) is null for all percentage values.

Examples

```
SELECT nza..QUNIF(nza..PUNIF(2,-3.0,11.3),-3.0,11.3);

 QUNIF

-------

     2

(1 row)
```

Related Functions

category Analytics - Probability Distributions
QUNIF
PUNIF
QUNIF_H

QUNIF_H - Inverse Uniform Distribution, high tail

Given a minimum and a maximum for the uniform interval, this function returns the value x of a variable fol-lowing the Uniform distribution for which the probability of being greater than x is equal to the given per-centage.

Usage

The QUNIF_H function has the following syntax:

QUNIF_H(DOUBLE percentage, DOUBLE minimum, DOUBLE maximum)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

minimum
the left border of the Uniform

interval Type: DOUBLE

Max: <maximum>

maximum
the right border of the Uniform

interval Type: DOUBLE

Min: <minimum>

Returns
DOUBLE the point x where PUNIF_H(x,minimum,maximum)=percentage

Details

If PUNIF_H(x,minimum,maximum)=perc, then QUNIF_H(perc,minimum,maximum)=x for all x, min-imum and maximum values where x is between minimum and maximum.

QUNIF_H(percentage,minimum,maximum)=QUNIF(1-percentage,minimum,maximum) for percentage between 0 and 1 and for all minimum and maximum values where minimum < maximum.

If percentage is not between 0 and 1, QUNIF_H(percentage,minimum,maximum) is null for all min-imum and maximum values.

If minimum is not smaller than maximum, QUNIF_H(percentage,minimum,maximum) is null for all percentage values.

Examples

```
SELECT petallength, nza..PUNIF_H(petallength,1,6.9) as
pp_H, nza..QUNIF_H(pp_H,1,6.9) AS inverse FROM
nza..iris ORDER BY pp_H LIMIT 10;
```

```
 PETALLENGTH|        PP_H        | INVERSE
-------------+--------------------+---------
         6.9|                   0|
         6.7| 0.033898305084746 |      6.7
         6.7| 0.033898305084746 |      6.7
```

```
                6.6 | 0.050847457627119 |     6.6
                6.4 | 0.084745762711864 |     6.4
                6.3 |  0.10169491525424 |     6.3
                6.1 |  0.13559322033898 |     6.1
                6.1 |  0.13559322033898 |     6.1
                6.1 |  0.13559322033898 |     6.1
                  6 |  0.15254237288136 |       6
(10 rows)
```

```
SELECT nza..QUNIF_H(nza..PUNIF_H(2,-3.0,11.3),-3.0,11.3);
 QUNIF_H
---------
       2
(1 row)
```

Related Functions

category Analytics - Probability Distributions
QUNIF
PUNIF_H
QUNIF

QWALD - Inverse Wald Distribution

Given a location and a shape, this function returns the value x of a variable following the Wald distribution for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QWALD function has the following syntax:

QWALD(DOUBLE percentage, DOUBLE location, DOUBLE shape)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

location
the mean of the

distribution Type: DOUBLE

Min: 0.00000000001

shape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PWALD(x,location,shape)=percentage

Details

If PWALD(x,location,shape)=perc, then QWALD(perc,location,shape)=x for all x and all positive loc-ation and shape values.

If percentage is not between 0 and 1, QWALD(percentage,location,shape) is null for all location and shape values.

If location or shape is 0 or less, QWALD(percentage,location,shape) is null for all percentage val-ues.

Examples

```
SELECT nza..QWALD(0.95,1,0.330);

       QWALD
------------------
 3.9202609534676
(1 row)
```

```
SELECT nza..QWALD(0.215,3,0.4), nza..QWALD(0.216,3,0.4),
nza..QWALD(0.648,3,0.4), nza..QWALD(0.936,3,0.4),
nza..QWALD(1.0,3,0.4), nza..QWALD(1.3,3,0.4);
      QWALD        |       QWALD        |       QWALD       |
QWALD       | QWALD | QWALD
------------------+------------------+-----------------
+-----------------+-------+-------
 0.23157796263695 | 0.23250064253807 | 1.2571559704842 |
10.634243061658 |       |
(1 row)
```

```
SELECT nza..QWALD(0.215, 3, 0.4),nza..QWALD(0.215, 3,
1),nza..QWALD(0.215, 3, 4);
      QWALD       |       QWALD       |       QWALD
------------------+------------------+-----------------
 0.23157796263695 | 0.49881085753441 | 1.2064697228954
(1 row)
```

```
SELECT nza..PWALD(nza..QWALD(0.215,3,0.4),3,0.4),
nza..PWALD(nza..QWALD(0.215,3,1),3,1),
nza..PWALD(nza..QWALD(0.215,3,4),3,4);
      PWALD       |       PWALD       |       PWALD
------------------+------------------+------------------
 0.21500002412485 | 0.21499999261113 |
0.21499998376111 (1 row)
```

Related Functions

category Analytics - Probability Distributions
DWALD
PWALD
QWALD_H

QWALD_H - Inverse Wald Distribution, high tail

Given a location and a shape, this function returns the value x of a variable following the Wald distribution for which the probability of being greater than x is equal to the given percentage.

Usage

The QWALD_H function has the following syntax:

QWALD_H(DOUBLE percentage, DOUBLE location, DOUBLE shape)

Parameters

percentage

the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

location
the mean of the

distribution Type: DOUBLE

Min: 0.00000000001

shape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PWALD_H(x,location,shape)=percentage

Details

If PWALD_H(x,location,shape)=perc, then QWALD_H(perc,location,shape)=x for all x and all posit-ive location and shape values.

QWALD_H(perc,location,shape)=QWALD(1-perc,location,shape) for all x and all positive location and shape values.

If percentage is not between 0 and 1, QWALD_H(percentage,location,shape) is null for all location and shape values.

If location or shape is 0 or less, QWALD_H(percentage,location,shape) is null for all percentage val-ues.

Examples

```
SELECT nza..QWALD_H(0.95,1,0.330),
nza..QWALD(1-0.95,1,0.330);
      QWALD_H       |        QWALD
-------------------+-------------------
 0.075281053781509 |
0.075281053781509 (1 row)
```

```
SELECT nza..QWALD_H(0.215,3,0.4),
nza..QWALD_H(0.216,3,0.4), nza..QWALD_H(0.648,3,0.4),
nza..QWALD_H(0.936,3,0.4), nza..QWALD_H(1.0,3,0.4),
nza..QWALD_H(1.3,3,0.4);
     QWALD_H      |      QWALD_H      |      QWALD_H       |
QWALD_H        | QWALD_H | QWALD_H
----------------- +-----------------          +-------------------
+-----------------  +---------    +---------
 2.6490991284655 |  2.6320744413665 | 0.38724514320892 |
0.10962650179863 |          |
(1 row)
```

```
SELECT nza..QWALD_H(0.215,3,0.4), nza..QWALD_H(0.215,3,1),
nza..QWALD_H(0.215,3,4);
     QWALD_H     |      QWALD_H     |      QWALD_H
-----------------+-----------------+-----------------
 2.6490991284655 | 3.6559213043218 |
4.1445034958828 (1 row)
```

```
SELECT nza..PWALD_H(nza..QWALD_H(0.215,3,0.4),3,0.4),
nza..PWALD_H(nza..QWALD_H(0.215,3,1),3,1),
nza..PWALD_H(nza..QWALD_H(0.215,3,4),3,4);
     PWALD_H      |      PWALD_H      |      PWALD_H
------------------+------------------+------------------
 0.21500000178488 | 0.21500000089451 |
0.21499999734624 (1 row)
```

Related Functions

category Analytics - Probability Distributions
DWALD
PWALD_H
QWALD

QWEIBULL - Inverse Weilbull (or Rosin-Rammer) Distribution

Given a scale and a shape, this function returns the value x of a variable following the Weibull distribution for which the probability of being smaller or equal to x is equal to the given percentage.

Usage

The QWEIBULL function has the following syntax:

QWEIBULL(DOUBLE percentage, DOUBLE scale, DOUBLE kShape)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

scale
the scale of the

distribution Type: DOUBLE

Min: 0.00000000001

kShape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PWEIBULL(x,scale,kShape)=percentage

Details

If PWEIBULL(x,scale,kShape)=perc then QWEIBULL(perc,scale,kShape)=x for all positive x, scale and kShape values.

If percentage is not between 0 and 1, QWEIBULL(percentage,scale,kShape) is null for all scale and kShape values.

If scale or kShape is 0 or less, QWEIBULL(percentage,scale,kShape) is null for all percentage values.

Examples

```
SELECT nza..QWEIBULL(nza..PWEIBULL(2,4,1),4,1);

 QWEIBULL
----------
         2

(1 row)
```

Related Functions

category Analytics - Probability Distributions

DWEIBULL
PWEIBULL
QWEIBULL_H

QWEIBULL_H - Inverse Weilbull (or Rosin-Rammer) Distribution, high tail

Given a scale and a shape, this function returns the value x of a variable following the Weibull distribution for which the probability of being greater than x is equal to the given percentage.

Usage

The QWEIBULL_H function has the following syntax:

QWEIBULL_H(DOUBLE percentage, DOUBLE scale, DOUBLE kShape)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.00000000001

Max: 0.99999999999

scale
the scale of the

distribution Type: DOUBLE

Min: 0.00000000001

kShape
the shape of the

distribution Type: DOUBLE

Min: 0.00000000001

Returns
DOUBLE the point x where PWEIBULL_H(x,scale,kShape)=percentage

Details

If PWEIBULL_H(x,scale,kShape)=perc then QWEIBULL_H(perc,scale,kShape)=x for all positive x, scale and kShape values.

QWEIBULL_H(perc,scale,kShape)=QWEIBULL(1-perc,scale,kShape) for percentage between 0 and 1 and for all positive scale and kShape values.

If percentage is not between 0 and 1, QWEIBULL_H(percentage,scale,kShape) is null for all scale and kShape values.

If scale or kShape is 0 or less, QWEIBULL_H(percentage,scale,kShape) is null for all percentage values.

Examples

```
SELECT nza..QWEIBULL_H(nza..PWEIBULL_H(2,4,1),4,1);
```

```
  QWEIBULL_H
------------
           2
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DWEIBULL
PWEIBULL_H
QWEIBULL

QWILCOX - Inverse Wilcoxon Distribution

Given the number of items, This function returns the value x of a variable following the Wilcoxon distribution for which the probability of being smaller or equal to x is equal to the given percent-age

Usage

The QWILCOX function has the following syntax:

QWILCOX(DOUBLE percentage, INT8 NoItems)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.0000001

Max: 0.9999999

NoItems
the number of

items Type: INT8

Min: 1

Max: 15

Returns
INT8 the point x where PWILCOX(x,NoItems)=percentage

Details

If PWILCOX(Wmin,NoItems)=perc then QWILCOX(perc,NoItems)=Wmin for all Wmin and NoItems values in their respective validity interval.

If percentage is not between 0 and 1, QWILCOX(percentage,NoItems) is null for all NoItems values.

If NoItems is not between 1 and 15, QWILCOX(percentage,NoItems) returns null fo all percentage values.

Examples

```
SELECT nza..QWILCOX(0.16513565477462,15);

 QWILCOX
---------
       42
(1 row)
```

```
SELECT
nza..QWILCOX(nza..PWILCOX(30,15)*0.7+nza..PWILCOX(29,15)*0.3,15)
;

 QWILCOX
---------
       30
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DWILCOX
PWILCOX
QWILCOX_H

QWILCOX_H - Inverse Wilcoxon Distribution, high tail

Given the number of items, This function returns the value x of a variable following the Wilcoxon distribu-tion for which the probability of being greater than x is equal to the given percentage

Usage

The QWILCOX_H function has the following syntax:

QWILCOX_H(double percentage, int8 NoItems)

Parameters

percentage
the probability limit

requested Type: DOUBLE

Min: 0.0000001

Max: 0.9999999

NoItems
the number of

items Type: INT8

Min: 1

Max: 15

Returns
INT8 the point x where PWILCOX_H(x,NoItems)=percentage

Details

If PWILCOX_H(Wmin,NoItems)=perc then QWILCOX_H(perc,NoItems)=Wmin for all Wmin and NoItems values in their respective validity interval.

QWILCOX_H(perc,NoItems)=QWILCOX(1-perc,NoItems) for all perc and NoItems values in their re-spective validity interval.

If percentage is not between 0 and 1, QWILCOX_H(percentage,NoItems) is null for all NoItems val-ues.

If NoItems is not between 1 and 15, QWILCOX_H(percentage,NoItems) returns null fo all percent-age values.

Examples

```
SELECT nza..QWILCOX(0.16513,15),
nza..QWILCOX_H(1-0.16513,15);
QWILCOX | QWILCOX_H
---------+-----------
      42|          42
(1 row)



 QWILCOX_H
-----------
        30
```

```
(1 row)
```

Related Functions

category Analytics - Probability Distributions
DWILCOX
PWILCOX_H
QWILCOX

RAE - Relative Absolute Error

This stored procedure calculates the relative absolute error of Regression predictions

Usage

The RAE stored procedure has the following syntax:

RAE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

pred_table
the input table or view containing predicted

values Type: NVARCHAR(256)

pred_column
the input table column in <pred_table> containing predicted

values Type: NVARCHAR(128)

pred_id
the input table column in <pred_table> identifying a unique instance

id Type: NVARCHAR(128)

true_table
the input table or view containing real

values Type: NVARCHAR(256)

true_column
the input table column in <true_table> containing real

values Type: NVARCHAR(128)

true_id
the input table column in <true_table> identifying a unique instance

id Type: NVARCHAR(128)

check

flag indicating to check parameters or not. This may consume some time but prevents usage errors. Allowed values are: 'all' (check all), 'none' (check nothing), 'nulls' (check for nulls only).

Type: NVARCHAR(ANY)

Default: all

Returns
DOUBLE the Relative Absolute Error

Details

This stored procedure calculate the relative absolute error of Regression predictions. This is done by comparing the predictions made when applying a Regression model onto data, and the real val-ues for this data.

The RAE value is calculated as sum(abs(true_i-pred_i))/sum(abs(true_i-true_m)) where true_i is the real value, pred_i is the predicted value and true_m is the mean value of true_i.

Examples

```
CALL nza..GROW_REGTREE('model=wrt,
intable=nza..weatherr, id=instance, target=grade,
maxdepth=4, minsplit=2'); CALL
nza..PREDICT_REGTREE('model=wrt, intable=nza..weatherr,
id=instance, outtable=wpr, var=TRUE');
CALL
nza..RAE('pred_table=wpr,true_table=nza..weatherr,pred_co

lumn=class,true_column=grade,pred_id=id,true_id=instance' );

CALL nza..DROP_MODEL('model=wrt');

CALL nza..DROP_TABLE('wpr');
```

```
 GROW_REGTREE
--------------

           13

(1 row)


 PREDICT_REGTREE
-----------------

              22

(1 row)
```

```
        RAE
-------------------
 0.074829931972789
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CERROR
MAE
MSE
RSE

RANDOM_SAMPLE - Random Sample

This stored procedure creates a random sample of a table with a fixed size or a fixed probability

Usage

The RANDOM_SAMPLE stored procedure has the following syntax:

RANDOM_SAMPLE(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable

the input table

Type: NVARCHAR(ANY)

outtable
the output table to write the sample

into Type: NVARCHAR(ANY)

num
the number of rows in the sample (alias of size). If specified, the parameter <fraction> must not be specified. Only one of both parameters <num> and <size> must be spe-cified.

Type: BIGINT

Min: 0

Max: the number of rows in the input table if replace=false

size
the number of rows in the sample (alias of num). If specified, the parameter <fraction> must not be specified. Only one of both parameters <num> and <size> must be specified.

Type: BIGINT

Min: 0

Max: the number of rows in the input table if replace=false

fraction
the probability of each row to be in the sample. If specified, the parameters <num> and <size> must not be specified. Otherwise, one of both parameters <num> or <size> must be specified.

Type: DOUBLE

Default: <none>

Min: 0.0

Max: 1.0 if replace=false

by
the column used to stratify the input table. If indicated, stratified sampling is done: it ensures that each value of the column is represented in the sample in about the same percentage as in the original input table.

Type: NVARCHAR(128)

Default: <none>

outsignature
the input table columns to keep in the sample, separated by a semi-colon (;). If not specified, all columns are kept in the output table.

Type: NVARCHAR(ANY)

Default: <none>

outclear
flag indicating whether the output table should be overwritten or

not Type: BOOLEAN

Default: false

replace
flag indicating if sampling should be done with

replacement Type: BOOLEAN

Default: false

randseed
the seed of the random

function Type: INT4

Default: random()*1000000.0

outtabletype
the type of the output table. It can be 'table' or

'temporary'. Type: NVARCHAR(16)

Default: 'table'

Returns
BIGINT the number of record in the sample output table

Details

This stored procedure creates a random sample of the rows of a table. It can ensure an exact number of rows in the sample or a fixed probability for each row.

Examples

```
CALL nza..RANDOM_SAMPLE('intable=nza..adult, size=1000,
outtable=adult_size, outsignature=id;income, outclear=true,
replace=true, randseed=11213');
CALL nza..DROP_TABLE('adult_size');
```

```
 RANDOM_SAMPLE
---------------
          1000
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..RANDOM_SAMPLE('intable=nza..adult, fraction=0.2,
outtable=adult_fraction, randseed=11213'); CALL
nza..DROP_TABLE('adult_fraction');
 RANDOM_SAMPLE
---------------
          6513
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Sampling

REGISTER_MODEL - Register a version 1.x analytics model to model man-agement

This stored procedure adds a model created in version 1.x to the model management infrastruc-ture of version 2. If the value of a parameter is not known anymore a question mark (?) could be specified if the default should not be used. But this could result in a model which could not be used or deliver wrong results in subsequent calls. Note that the calling user needs to have select privilages on the original model tables.

Usage

The REGISTER_MODEL stored procedure has the following syntax:

REGISTER_MODEL(NVARCHAR(ANY))

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to be registered

Type: NVARCHAR(64)

procedure
the stored procedure used to create the model. Allowed procedure names are: dectree, di-vcluster, kmeans, knn, linear_regression, naivebayes, pca, regtree, tanet_grow, tbnet_grow, tb-net1g, tbnet1g2p, tbnet2g

Type: NVARCHAR(ANY)

intable
the input table used to build the model. Except for procedure=kmeans where it is not mandat-ory, the parameter intable needs to be specified. If not available anymore a table with the same column layout as used for scoring the model would also be fine.

Type: NVARCHAR(ANY)

Default: <none>

copy
flag indicating that the original model table should be kept. It is not recommended to use

false Type: NVARCHAR(ANY)

Default: true

outtable
the name where the scores should be stored. Allowed for procedure value: kmeans, divcluster, tbnet1g, tbnet1g2p and tbnet2g

Type: NVARCHAR(ANY)

Default: <none>

id
the column name which uniquely identifies each row. Allowed for procedure value: kmeans, di-vcluster, dectree, regtree knn, naivebayes and linear_regression

Type: NVARCHAR(ANY)

Default: <none>

target
name of the target column. Allowed for procedure value: kmeans, divcluster, dectree, regtree knn, naivebayes and linear_regression

Type: NVARCHAR(ANY)

Default: <none>

distance
the function to calculate the distance: euclidean, manhattan, maximum or canberra. Allowed for procedure value: divcluster and kmeans

Type: NVARCHAR(ANY)

Default: euclidean

k

the number of centers. Allowed for procedure value: kmeans

Type: INTEGER

Default: 3

Min: 2

maxiter
the number of iterations to perform. Allowed for procedure value: kmeans and di-vcluster

Type: INTEGER

Default: 5

Min: 1

Max: 1000

randseed
the seed for the random number generation. Allowed for procedure value: kmeans and divcluster

Type: INTEGER

Default: 12345

minsplit
the minimum number of instances to split. Allowed for procedure value: divcluster, dectree and regtree

Type: INTEGER

Default: 5 (divcluster) 2 (dectree, regtree)

Min: 2

maxdepth
the maximum depth of the hierachy. Allowed for procedure value: divcluster, dectree and regtree

Type: INTEGER

Default: 3 (divcluster) 62 (dectree) 10 (regtree)

Min: 1

weights
table contain the weighs information. Allowed for procedure value: dectree

Type: NVARCHAR(ANY)

Default: <none>

eval
the function used for split evaluation. Allowed for procedure value: dectree and regtree

dectree values: entropy, gini

regtree values: variance

Type: NVARCHAR(ANY)

Default: entropy (dectree) variance (regtree)

minimprove
the minimum improvement required to split. Allowed for procedure value: dectree and regtree

Type: INTEGER

Default: 0.01 (dectree) 0.1 (regtree)

Min: 0.0

valtable
the tablename containing the pruning dataset. Allowed for procedure value: dectree

Type: NVARCHAR(ANY)

Default: <none>

qmeasure
the function of the quality measure for pruning. Allowed for procedure value: dectree and regtree

regtree values: mse, r2, pearson or spearman

dectree values: acc or wacc

Type: NVARCHAR(ANY)

Default: acc (dectree) mse (regtree)

nominalCols
the list of nominal columns. Allowed for procedure value: linear_regression

Type: NVARCHAR(ANY)

Default: <none>

useSVDSolver
the way to solve the matrix equation. Allowed for procedure value: linear_regression

Type: BOOLEAN

Default: false

includeIntercept
the way to handle the intercept term. Allowed for procedure value: linear_regression

Type: BOOLEAN

Default: true

calculateDiagnostics
define if diagnostics information should be displayed. Allowed for procedure value: linear_re-gression

Type: BOOLEAN

Default: false

forceEigensolve
force use of less accurate but faster method of finding PCA. Allowed for procedure value: pca

Type: BOOLEAN

Default: false

centerData
should procedure center the data before finding PCA (lack of data centering violates PCA assumptions). Allowed for procedure value: pca

Type: BOOLEAN

Default: true

scaleData
should procedure scale the data before finding PCA. Allowed for procedure value: pca

Type: BOOLEAN

Default: false

saveScores
should the PCA scores of individual observations be saved. Allowed for procedure value: pca

Type: BOOLEAN

Default: false

varlist
the semicolon-separated list of columns in intable to compute BN, real. Allowed for procedure value: tbnet1g and tbnet_grow

Type: NVARCHAR(ANY)

Default: <none>

varlist1
the semicolon-separated list of columns in intable to compute BN, real. Allowed for procedure value: tbnet2g and tbnet1g2p

Type: NVARCHAR(ANY)

Default: <none>

varlist2
the semicolon-separated list of columns in intable to compute BN, real. Allowed for procedure value: tbnet2g and tbnet1g2p

Type: NVARCHAR(ANY)

Default: <none>

baseidx
the numeric id to be assigned to the first variable, for easier internal management. Al-lowed for procedure value: tbnet1g, tbnet2g, tbnet1g2p and tbnet_grow

Type: INTEGER

Default: 777

samplesize

the size of the sample to take if the number of records is too large. Allowed for procedure value: tbnet1g, tbnet_grow

Type: INTEGER

Default: 330000

tanmodel
result table name with the tan model stored. Allowed for procedure value: tanet_grow

Type: NVARCHAR(ANY)

Default: <none>

class
the target class. This should be a nominal variable. Allowed for procedure value: tanet_grow

Type: NVARCHAR(ANY)

Default: <none>

Returns
INTEGER The model ID when successfully registered the model

Details

This stored procedure registers in the model management infrastructure an analytics model that has been created with version 1.x. The user needs to have SELECT privilege on the 1.x model to register the model.

The model will be migrated to the new table layout and the new parameter style.

Note: FPGROWTH model will no longer be supported. Therefore it is also not supported in the register func-tion.

Examples

```
CREATE TABLE kmeans_iris (cluster_id INTEGER, cluster_size
BIGINT, cluster_withinss DOUBLE, class VARCHAR(16), petallength
DOUBLE, petalwidth DOUBLE, sepallength DOUBLE, sepalwidth
DOUBLE);
INSERT INTO kmeans_iris SELECT (MIN(id)-1)/50, COUNT(*), 0,
class, AVG(petallength), AVG(petalwidth), AVG(sepallength),
AVG(sepalwidth) FROM nza..iris GROUP BY class;
CALL nza..register_model('procedure=kmeans, model=kmeans_iris,
id=id, intable=nza..iris, outtable=kmeans_iris_out');
CALL nza..drop_model('model=kmeans_iris');
CALL nza..drop_table('kmeans_iris');
CALL nza..drop_table('kmeans_iris_out');
```

```
CREATE TABLE
INSERT 0 3
 REGISTER_MODEL
----------------
```

```
               40
(1 row)

NOTICE:  Dropped: KMEANS_IRIS
 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
INITIALIZE
IS_INITIALIZED

REGTREE - Build then prune a Regression Tree model

This stored procedure builds a Regression Tree model by growing and pruning a tree

Usage

The REGTREE stored procedure has the following syntax:

REGTREE(NVARCHAR(ANY) paramString)

▲ Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Regression Tree model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the prediction

target Type: NVARCHAR(128)

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are con-tinuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':colweight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPER-TIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsup-ported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsup-ported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

eval
the split evaluation measure. Allowed values are: variance.

Type: NVARCHAR(ANY)

Default: variance

minimprove
the minimum improvement of the split evaluation measure

required Type: DOUBLE

Default: 0.1

Min: 0.00001

minsplit
the minimum number of instances per tree node that can be

split Type: INTEGER

Default: 50

Min: 2

maxdepth
the maximum number of tree levels (including

leaves) Type: INTEGER

Default: 10

Min: 1

Max: 62

valtable
the input table containing the validation dataset. If this parameter is undefined, no pruning will be performed.

Type: NVARCHAR(256)

Default: <none>

qmeasure
the quality measure for pruning the tree. Allowed values are: mse, r2.

Type: NVARCHAR(ANY)

Default: mse

statistics
flags indicating which statistics to collect. Allowed values are: none, columns, values:n,

all. If statistics=none, no statistics are collected.

If statistics=columns, statistics on the input table columns like mean value are collected.

If statistics=values:n with n a positive number, statistics about the columns and the column val-ues are collected. Up to <n> column value statistics are collected:

If a nominal column contains more than <n> values, only the <n> most frequent column stat-istics are kept.

If a numeric column contains more than <n> values, the values will be discretized and the stat-istics will be collected on the discretized values.

Indicating statistics=all is equal to statistics=values:100.

Type: NVARCHAR(ANY)

Default: 'none'

Returns
INTEGER the number of Regression Tree nodes (including leaves)

Details

This stored procedure builds a Regression tree model by growing and (optionally) pruning the tree. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipulate the model or access the model tables.

A top-down tree growing algorithm is used with the following features:

binary splits (equality-based for nominal attributes, inequality-based for continuous attributes),

no missing value handling,

variance for split evaluation,

stop criteria satisfied when further splits do not improve the variance by at least <minimprove>,

stop criteria satisfied when the number of instances is less than <minsplit>,

stop criteria satisfied when the tree depth reaches <maxdepth>.

A bottom-up reduced error pruning algorithm is used. It bases on the prediction accuracy of the model against the validation dataset. The pruning is activated when parameter <valtable> is specified.

Examples

```
CALL nza..REGTREE('intable=nza..weatherr, id=instance,
target=grade, model=wrt, minsplit=2, maxdepth=4');
CALL nza..DROP_MODEL('model=wrt');
 REGTREE
```

```
---------
      13
(1 row)


 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
GROW_REGTREE
LIST_MODELS
PREDICT_REGTREE
PRINT_REGTREE
PRUNE_REGTREE
GROW_REGTREE

REVOKE_MODEL - Revoke privileges on an analytics model

This stored procedure revokes one or more privileges on an analytics model from users and/or groups

Usage

The REVOKE_MODEL stored procedure has the following syntax:

REVOKE_MODEL(NVARCHAR(ANY))

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the model to revoke privileges

from Type: NVARCHAR(64)

privilege
a semicolon-separated list of privileges. Allowed privileges are: list, select, alter, up-

date, drop.

Type: VARCHAR(256)

user
a semicolon-separated list of users to revoke privileges from. If not specified, no user privileges are revoked, and the parameter group has to be specified.

Type: NVARCHAR(256)

Default: <none>

group
a semicolon-separated list of groups to revoke privileges from. If not specified, no group priv-ileges are revoked, and the parameter user has to be specified.

Type: NVARCHAR(256)

Default: <none>

Returns
BOOLEAN always true (otherwise an exception is raised)

Details

This stored procedure revokes privileges from users and groups on the given model. The possible privileges are:

LIST: Allows to list a model and its properties (using the views and the list procedures),

SELECT: Allows to read the model contents (to SELECT the model tables, print the model, convert the mod-el to PMML),

ALTER: Allows to change the model properties (name, owner, ...),

UPDATE: Allows to change the model contents using specific procedures,

DROP: Allows to drop a model.

To revoke a privilege from a user or group (including group "PUBLIC"), you must have the LIST privilege on this user or group. By default, the owner of a model, the ADMIN user, and the database owner have all priv-ileges on a model.

Examples

```
CALL nza..ARULE('intable=nza..retail, model=mbamodel,
supporttype=percent, support=5, lvl=0, maxsetsize=5,
confidence=0.5');
CALL nza..GRANT_MODEL('model=mbamodel, privilege=LIST;SELECT,
user=inzauser');
CALL nza..REVOKE_MODEL('model=mbamodel,
privilege=LIST;SELECT, user=inzauser');
CALL nza..DROP_MODEL('model=mbamodel');
```

```
NOTICE:
```

```
          RUNNING FPGrowth algorithm:
          DATASET : "NZA".."RETAIL"
          Transaction column : "TID"
          Item column : "ITEM"
          Group by : <none>
          Minimum support : 5 %
          Minimum confidence: 0.5
          Max frequent itemset size : 5
          Level of conditional dbs : 0
          Result tables prefix : "NZA_META_MBAMODEL"

 ARULE
-------
    14
(1 row)

 GRANT_MODEL
-------------
 t
(1 row)

 REVOKE_MODEL
-------------
 t
(1 row)

NOTICE:  Dropped: MBAMODEL
 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Model Management
LIST_MODELS
GRANT_MODEL

RSE - Relative Squared Error

This stored procedure calculates the relative squared error of Regression predictions

Usage

The RSE stored procedure has the following syntax:

RSE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

pred_table
the input table or view containing predicted

values Type: NVARCHAR(256)

pred_column
the input table column in <pred_table> containing predicted

values Type: NVARCHAR(128)

pred_id
the input table column in <pred_table> identifying a unique instance

id Type: NVARCHAR(128)

true_table
the input table or view containing real

values Type: NVARCHAR(256)

true_column
the input table column in <true_table> containing real

values Type: NVARCHAR(128)

true_id
the input table column in <true_table> identifying a unique instance

id Type: NVARCHAR(128)

check
flag indicating to check parameters or not. This may consume some time but prevents usage er-

rors. Allowed values are: 'all' (check all), 'none' (check nothing), 'nulls' (check for nulls only).

Type: NVARCHAR(ANY)

Default: all

Returns
DOUBLE the Relative Squared Error

Details

This stored procedure calculate the relative squared error of Regression predictions. This is done by comparing the predictions made when applying a Regression model onto data, and the real val-ues for this data.

The RSE value is calculated as sum((true_i-pred_i)^2)/sum((true_i-true_m)^2) where true_i is the real value, pred_i is the predicted value and true_m is the mean value of true_i.

Examples

```
CALL nza..GROW_REGTREE('model=wrt,
intable=nza..weatherr, id=instance, target=grade,
maxdepth=4, minsplit=2'); CALL
nza..PREDICT_REGTREE('model=wrt, intable=nza..weatherr,
id=instance, outtable=wpr, var=TRUE');
CALL
nza..RSE('pred_table=wpr,true_table=nza..weatherr,pred_co

lumn=class,true_column=grade,pred_id=id,true_id=instance' );

CALL nza..DROP_MODEL('model=wrt');

CALL nza..DROP_TABLE('wpr');

 GROW_REGTREE
--------------

           13

(1 row)


 PREDICT_REGTREE
-----------------

               22

(1 row)


       RSE
```

```
-------------------
 0.046413502109705
(1 row)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CERROR
MAE
RAE
MSE

SET_CLUSTERNAME - set name and/or description of a K-means cluster

This stored procedure allows modification of the name and/or description of a cluster in a Clustering model.

Usage

The SET_CLUSTERNAME stored procedure has the following syntax:

SET_CLUSTERNAME(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model

the name of clustering model

Type: NVARCHAR(ANY)

clusterid
the number of the

cluster Type: INTEGER

name
the name of the cluster

Type: NVARCHAR(100)

Default: clusterid

description
textual cluster description

Type: NVARCHAR(10000)

Default: null

Returns
BOOLEAN true if update was successful, false otherwise

Details

This stored procedure allows updates of <name> and/or <description> for a cluster with <cluster-id> of K-means clustering model <model>.

Examples

```
CALL nza..KMEANS('model=iris_mdl, intable=nza..iris,
outtable=iris_out, id=id, distance=euclidean, k=3,
maxiter=5, randseed=12345');
CALL nza..SET_CLUSTERNAME('model=iris_mdl,
clusterid=2, name= versicolor, description= Cluster
with mostly versicolor');
CALL nza..DROP_MODEL('model=iris_mdl');

CALL nza..DROP_TABLE('iris_out');
```

```
 KMEANS
--------
       3
(1 row)
 SET_CLUSTERNAME
-----------------
 t
(1 row)
```

```
 DROP_MODEL
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Clustering
KMEANS

SET_COLUMN_PROPERTIES - Set columns role, type or weight in a column properties table

This stored procedure modifies the roles, types or weights of the columns in a column properties table

Usage

The SET_COLUMN_PROPERTIES stored procedure has the following syntax:

SET_COLUMN_PROPERTIES((NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

colPropertiesTable
the name of the column properties table to

modify Type: NVARCHAR(ANY)

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are con-tinuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore', ':objweight', ':trials'.

- its weight: ':colweight(<wgt>)' where <wgt> is a numeric value of the weight.

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the columns of the column properties table. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, the column type is not modified per

default. Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the columns of the column properties table. Allowed values are 'input' and 'ignore'.

If the parameter is undefined, all columns are considered 'input' columns per

default. Type: NVARCHAR(ANY)

Default: input

Returns
BOOLEAN always true (otherwise an exception is raised)

Details

This stored procedure modifies the role, type or weight of the columns defined in the given column properties table. The column properties table is modified in place, no other output table is created. All columns referenced in parameter incolumn are modified accordingly. All other columns are modified to the type and role defined in parameters coldeftype or coldefrole, their weight is not modified.

Examples

```
CALL nza..COLUMN_PROPERTIES('intable=nza..weather,
outtable=weatherDefSchema, coldeftype=nom
,incolumn=temperature;WINDY:nom:ignore');
CALL nza..SET_COLUMN_PROPERTIES('intable=nza..weather,
colPropertiesTable=weatherDefSchema, coldeftype=nom
,incolumn=instance:cont:input:colweight(0.1);
WINDY:nom:ignore');
SELECT * FROM weatherDefSchema ORDER BY idcol;
CALL nza..DROP_TABLE('weatherDefSchema');

 COLUMN_PROPERTIES
-------------------
```

```
                  6
(1 row)

 SET_COLUMN_PROPERTIES
-----------------------
 t
(1 row)

 IDCOL |    COLNAME    |           COLDATATYPE           | COLTYPE
| COLROLE | COLWEIGHT
-------+-------------   +--------------------------------
+--------- +---------   +-----------
     1 |  INSTANCE    |  INTEGER                         | cont
| input    |        0.1
     2 |  OUTLOOK     |  NATIONAL CHARACTER VARYING(10)  | nom
| input    |          1
     3 |  TEMPERATURE |  NATIONAL CHARACTER VARYING(10)  | nom
| input    |          1
     4 |  HUMIDITY    |  NATIONAL CHARACTER VARYING(10)  | nom
| input    |          1
     5 |  WINDY       |  NATIONAL CHARACTER VARYING(10)  | nom
| ignore   |          1
     6 |  PLAY        |  NATIONAL CHARACTER VARYING(3)   | nom
| input    |          1
(6 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Column Properties
COLUMN_PROPERTIES

SKEWNESS_AGG - Skewness

This function calculates the Skewness value of a single numeric variable, as the third central mo-ment divided by the cube of the standard deviation

Usage

The SKEWNESS_AGG aggregate has the following syntax:

SKEWNESS_AGG(DOUBLE X)

Parameters

X

the input variable

Type: DOUBLE

Returns

DOUBLE the Skewness value of the input variable

Details

This function calculate the Skewness value of a single numeric variable. The skewness is a measure of the shift of the distribution around the mean value. If the skewness is negative, then the tail on the left side of the probability density function may be longer than that on the right side. the ma-jority of the values would probably lie to the left of the mean value. If the skewness is positive, then the opposite will be true.

The Skewness is calculated as the third central moment divided by the cube of the standard devi-ation. Note that the normal distribution has a Skewness of 0, as its density function is symmetric around the mean. A k-th order central moment is the sum of the k-th powers of differences between the mean and the actual value divided by the number of cases. Because of the fact that we want to know the moments for a population but we are computing them from the given sample values, diverse corrections are taken into account. This leads to many formulas for assess-ing the Skewness. In this implementation we followed a "midway" policy dividing the estimated central moments by the number of cases minus 1. This policy is a generally established practice for variance but not for Skewness. Therefore the implementations match each other for large number of cases only.

If a value is missing, the whole row is ignored.

Examples

```
SELECT nza..SKEWNESS_AGG(petallength) FROM nza..iris;
```

```
    SKEWNESS_AGG
-------------------
 -0.27080472910746
```

```
(1 row)
```

Related Functions

category Analytics - Statistics
KURTOSIS_AGG
MOMENTS
SUMMARY1000

SPEARMAN_CORR - Spearman Rank Correlation

This procedure calculates the Spearman rank correlation on two ordered input columns to evaluate the de-pendence between these columns

Usage

The SPEARMAN_CORR stored procedure has the following syntax:

SPEARMAN_CORR(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the two ordinal input table columns, separated by a semicolon (;). Optionally, a third numeric column can be specified for weights followed by :objweight.

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be per-formed. If specified, an output table must be specified too.

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the Spearman rank correlation into. This parameter is required if para-meter by is specified. Otherwise the parameter is ignored.

Type: NVARCHAR(ANY)

Default: <none>

Returns

DOUBLE The Spearman rank correlation or the number of rows in the output table

Details

This stored procedure calculates the Spearman rank correlation between two columns whose val-ues are ordered in their respective domain, either in the whole input table or within the groups defined in the column specified by parameter <by>. If both columns are of type double, or int, or date, or time, the order is obviously guaranteed. In case of character columns, it is assumed that the order of their values is lexicographic. The Spearman rank correlation is a non-parametric meas-ure of dependence between two variables. It takes a value between -1 (inversely correlated) and 1 (correlated), 0 means that the two columns are independent.

The output table is created with following columns: rho (correlation), n (number of records). If the parameter by is specified, an additional column <by> is added to indicate for which group the Spearman test has been calculated. Note that only records where both columns are not null are considered.

Examples

```
CALL nza..SPEARMAN_CORR('intable=nza..adult,
incolumn=workclass;education');
   SPEARMAN_CORR
--------------------
 0.0059993907642534
(1 row)

create view xadult as select * from nza..adult;
CALL nza..SPEARMAN_CORR('intable=xadult,
incolumn=workclass;education');
drop view  xadult;
   SPEARMAN_CORR
--------------------
 0.0059993907642534
(1 row)


CALL nza..SPEARMAN_CORR('intable=nza..adult,
incolumn=workclass;education;hours_per_week:objweight');
   SPEARMAN_CORR
--------------------
```

```
 0.0040295248906052
(1 row)

create view xadult as select * from nza..adult; CALL
nza..SPEARMAN_CORR('intable=xadult,
incolumn=workclass;education;hours_per_week:objweight');
drop view xadult;
   SPEARMAN_CORR
--------------------
 0.0040295248906052
(1 row)


CALL nza..SPEARMAN_CORR('intable=nza..WineQuality,
incolumn=RESIDUALSUGAR;CHLORIDES');
  SPEARMAN_CORR
------------------
 0.22784390383091
(1 row)


CALL nza..SPEARMAN_CORR('intable=nza..WineQuality,
incolumn=RESIDUALSUGAR;CHLORIDES, by=quality, outtable=spc_08');
SELECT * FROM spc_08 ORDER BY quality; CALL
nza..DROP_TABLE('spc_08');
 SPEARMAN_CORR
---------------
             7
(1 row)

  QUALITY|        RHO        |   N
---------+-------------------+------
        3|   0.3393673843897|    20
        4| 0.30520232940759 |   163
        5 | 0.16059812368123| 1457
        6 | 0.19412664982365| 2198
        7 | 0.17084455078142 | 880
        8 | 0.20282460473778 | 175
        9 |              0.4 |   5
(7 rows)

 DROP_TABLE
------------
 t
(1 row)
```

```
create view xadult as select * from nza..WineQuality;
CALL nza..SPEARMAN_CORR('intable=xadult,
incolumn=RESIDUALSUGAR;CHLORIDES, by=quality,
outtable=spc_08');
SELECT * FROM spc_08 ORDER BY quality;
CALL nza..DROP_TABLE('spc_08'); drop
view xadult;
```

```
 SPEARMAN_CORR
---------------
              7
(1 row)

 QUALITY |         RHO        |   N
---------+------------------+------
        3|   0.3393673843897|    20
        4| 0.30520232940759 |   163
        5| 0.16059812368123 | 1457
        6| 0.19412664982365 | 2198
        7| 0.17084455078142 |   880
        8| 0.20282460473778 |   175
```

```
         9 |                 0.4 |     5
(7 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
CORR
SPEARMAN_CORR_S

SPEARMAN_CORR_S - Spearman Rank Correlation as string

This procedure calculates the Spearman rank correlation on two ordered input columns to evaluate the de-pendence between these columns

Usage

The SPEARMAN_CORR_S stored procedure has the following syntax:

SPEARMAN_CORR_S(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the two ordinal input table columns, separated by a semicolon (;). Optionally, a third numeric column can be specified for weights followed by :objweight.

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be per-formed. If specified, an output table must be specified too.

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the Spearman rank correlation into. This parameter is re-quired if parameter by is specified. Otherwise the parameter is ignored.

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(300) The Spearman rank variables or the number of rows in the output table The Spearman rank variables can contain following results: rho, n, df, tstat, pp. See the output table column description for more information on them.

Details

This stored procedure calculates the Spearman rank correlation between two columns whose val-ues are ordered in their respective domain, either in the whole input table or within the groups defined in the column specified by parameter <by>. If both columns are of type double, or int, or date, or time, the order is obviously guaranteed. In case of character columns, it is assumed that the order of their values is lexicographic. The Spearman rank correlation is a non-parametric meas-ure of dependence between two variables. It takes a value between -1 (inversely correlated) and 1 (correlated), 0 means that the two columns are independent.

The output table is created with following columns: rho (correlation), n (number of records), df (degree of freedom, tstat (t-Student statistic), pp. If the parameter by is specified, an additional column <by> is added to indicate for which group the Spearman test has been calculated. Note that only records where both columns are not null are considered.

Examples

```
CALL nza..SPEARMAN_CORR_S('intable=nza..WineQuality,
incolumn=RESIDUALSUGAR;CHLORIDES');
```

```
                          SPEARMAN_CORR_S
----------------------------------------------------------
--------
  pp= 1, tStat= 16.373215814186, df= 4896,
rho= 0.22784390383091
(1 row)
```

```
CALL nza..SPEARMAN_CORR_S('intable=nza..adult,
incolumn=age;capital_gain;hours_per_week:objweight');
```

```
                          SPEARMAN_CORR_S
----------------------------------------------------------
```

```
--------
  pp= 1, tStat= 141.05273667172, df= 1316682,
rho= 0.12200689727741
(1 row)
```

```
CALL nza..SPEARMAN_CORR_S('intable=nza..WineQuality,
incolumn=RESIDUALSUGAR;CHLORIDES, by=quality,outtable=spc_08');
SELECT * FROM spc_08 ORDER BY quality; CALL
nza..DROP_TABLE('spc_08');
```

```
 SPEARMAN_CORR_S
-----------------
   7
(1 row)

 QUALITY |         RHO        |   N  |  DF |        TSTAT       |
PP
         +------------------+------+------+------------------
+---------------------------
       3 |   0.3393673843897|    20|    18|   1.5306520895463|
0.92837964137658
       4 | 0.30520232940759 |   163|   161|   4.0666115052229|
0.99996276229036
       5 | 0.16059812368123 | 1457 | 1455 |   6.2064900537945|
 0.9999999996729
       6 | 0.19412664982365 | 2198 | 2196 |   9.2734799031864|
1
       7 | 0.17084455078142 |   880|   878|   5.1378425368414|
0.99999982872532
       8 | 0.20282460473778 |   175|   173|   2.7243669010278|
0.99644797613402
       9 |               0.4|     5|     3| 0.75592894601845 |
0.74768421227827
(7 rows)

 DROP_TABLE
------------
```

```
 t
(1 row)
```

Related Functions

category Analytics - Statistics
CORR
SPEARMAN_CORR

SPLIT_DATA - Split a table into training and testing sets

This stored procedure randomly splits the input data into two separated subsets

Usage

The SPLIT_DATA stored procedure has the following syntax:

SPLIT_DATA(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

traintable
the output table that will contain the given fraction of the input

records Type: NVARCHAR(256)

testtable
the output table that will contain the rest (1-<fraction>) of the input

records Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

fraction
the fraction of the data to

split Type: FLOAT

Default: 0.5

Min: 0.0

Max: 1.0

seed
the seed of the random

function Type: FLOAT

Default: random()

outtabletype
the type of the output table. It can be 'table' or

'temporary'. Type: NVARCHAR(16)

Default: 'table'

Returns
FLOAT number of records in traintable

Details

Two tables <traintable> and <testtable> are created. They have the same structure as <intable>. All records of <intable> are copied into the one or the other table with following ratio: <fraction> into <traintable>, 1-<fraction> into <testtable>.

Those two tables can be used to build and to test the prediction quality of a Classification or a Regression model.

Examples

```
CALL nza..SPLIT_DATA('intable=nza..iris, id=id,
traintable=split_iris_train,
testtable=split_iris_test, fraction=0.6, seed=1');
CALL nza..DROP_TABLE('split_iris_train');

CALL nza..DROP_TABLE('split_iris_test');
```

```
 SPLIT_DATA
------------
        90
(1 row)
 DROP_TABLE
------------
 t
(1 row)
 DROP_TABLE
------------
 t
```

```
(1 row)
```

Related Functions

category Analytics - Data Transformation
TRAIN_TEST

STD_NORM - Standardization and Normalization

This stored procedure standardizes or normalizes columns of the input data

Usage

The STD_NORM stored procedure has the following syntax:

STD_NORM(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the input table columns to consider, separated by a semi-colon (;).

Each column name may be followed by :L to leave it unchanged, by :S to standardize its values, by :N to normalize its values or by :U to make it of unit length. Additionally, two columns may be indicated, separated by a slash (/), followed by :C to make the columns be a row unit vector or by :V to divide the column values by the length of the longest row vector.

Type: NVARCHAR(ANY)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

outtable
the output table with the modified

data Type: NVARCHAR(256)

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

outtabletype
the type of the output table. It can be 'table' or

'temporary'. Type: NVARCHAR(16)

Default: 'table'

Returns
NVARCHAR(1000) the number of transformed columns in the output. Columns specified with suffix :L are not counted.

Details

This stored procedure standardizes or normalizes columns of the input table, and write the transformed columns into the given output table. The parameter incolumn specifies the columns to be considered and which transformation should be applied:

<column>:L means that the <column> is leaved as is. The output table contains the same column with the same values.

<column>:S means that the <column> is standardized. The output table contains a column STD_<column> that contains the standardized input values. A standardized value S is equal to (x-mean)/stddev, where x is the input value, mean the mean value of the column and stddev the standard deviation of the column. The standardized values range from minus infinity to plus infinity.

<column>:N means that the <column> is normalized. The output table contains a column NRM_<column> that contains the normalized input values. A normalized value N is equal to x/absmax, where x is the input value and absmax the maximum absolute value of the column. The normalized values range from -1 to 1.

<column>:U means that the <column> is normalized to a unit vector. The output table contains a column NRU_<column> that contains the euclidean-normalized input values. An euclidean normalized value U is equal to x/sqrt(ssq), where x is the input value and ssq the sum of square values of the column. The euc-lidean normalized values range from -1 to 1.

<col1>/<col2>:C means that [<col1> <col2>] are normalized to be a unit vector in the space. The output table contains a column NRC_<rank>_<col1> and a column NRC_<rank>_<col2>, with <rank> the rank of this transformation in the list of :C or :V transformations, beginning with 1. Both columns contain their own nor-malized input values. The normalized value U1 for <col1> is equal to x/sqrt(x^2+y^2), where x is the input value of <col1> and y the input value of <col2>. The normalized value U2 for <col2> is equal to y/sqrt(x^2+y^2), where x is the input value of <col1> and y the input value of <col2>. The normalized values range from -1 to 1.

<col1>/<col2>:V means that [<col1> <col2>] are normalized according to the longest row vector in the data. The output table contains a column NRM_<rank>_<col1> and a column NRM_<rank>_<col2>, with <rank> the rank of this transformation in the list of :C or :V transformations, beginning with 1. Both columns contain their own normalized input values. The normalized value V1 for <col1> is equal to x/sqrt(maxssq), where x is the input value of <col1> and maxssq the maximum of the square sum of the values of <col1> and <col2>. The normalized value V2 for <col2> is equal to y/sqrt(maxssq), where y is the input value of <col2> and maxssq the maximum of the square sum of the values of <col1> and <col2>. The normalized val-ues range from -1 to 1.

The output table always contains the <id> column, plus the output column implied by the definition of parameter incolumn. If the parameter by is specified, an additional column <by> is added to indicate for which group the transformation has been calculated. The naming convention of the output columns imposes the following limitations: One input column should not appear twice in paramet-er incolumn with the same suffix :L, :S, :N or :U.

Examples

```
CALL nza..STD_NORM('intable=nza..iris,
incolumn=petallength:S;petallength:L;petallength:N;petall
ength:U;sepallength/petallength:C, id=id,
outtable=result7');
SELECT * FROM result7 WHERE id <= 10 ORDER BY

id; CALL nza..DROP_TABLE('result7');
```

```
 STD_NORM
----------
 5
(1 row)


 ID | STD_PETALLENGTH    | PETALLENGTH |NRM_PETALLENGTH   |
NRU_PETALLENGTH    | NRC_1_SEPALLENGTH |NRC_1_PETALLENGTH
----+-----------------  +-------------+-----------------
+..........                  +.....
+..........
  1 | -1.3367940202882 |          1.4|  0.20289855072464|
0.027546462351378  | 0.96432614791712 |  0.26471698178117
  2 | -1.3367940202882 |          1.4|  0.20289855072464|
0.027546462351378  | 0.96152394764082 |  0.27472112789738
  3 | -1.3934698549528 |          1.3|  0.18840579710145|
0.025578857897708  |  0.9638111202542 |   0.2665860545384
  4 | -1.2801181856237 |          1.5|  0.21739130434783|
0.029514066805048  | 0.95072983948148 |  0.31002059983092
  5 | -1.3367940202882 |          1.4|  0.20289855072464|
0.027546462351378  | 0.96296401971418 |  0.26962992551997
  6 | -1.1667665162945 |          1.7|   0.2463768115942|
0.033449275712387  |  0.9538492507392 |  0.30028587523271
  7 | -1.3367940202882 |          1.4|  0.20289855072464|
0.027546462351378  | 0.95667388042886 |   0.2911616157827
  8 | -1.2801181856237 |          1.5|  0.21739130434783|
0.029514066805048  | 0.95782628522115 |  0.28734788556635
```

```
  9 | -1.3367940202882 |         1.4|  0.20289855072464|
 0.027546462351378 | 0.95292578001326 |  0.30320365727695
 10 | -1.2801181856237 |         1.5|  0.21739130434783|
 0.029514066805048 | 0.95619995550743 |  0.29271427209411
(10 rows)


 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..STD_NORM('intable=nza..iris,
incolumn=petallength:S;petallength:L;petallength:N;petallength:U
;sepallength/petallength:C, id=id,outtable=result7, by=class');
SELECT * FROM result7 WHERE id % 15 = 0 ORDER BY id, class;
CALL nza..DROP_TABLE('result7');
```

```
 STD_NORM
----------
 5
(1 row)


   CLASS    | ID  |   STD_PETALLENGTH | PETALLENGTH |
NRM PETALLENGTH   | NRU PETALLENGTH  | NRC 1 SEPALLENGTH |
NRC_1_PETALLENGTH
------------+-----  +-------------------+-------------
+-----------------     +------------------+-------------------
+------------------
 setosa     |  15 |   -1.5215159696786|          1.2 |
0.63157894736842 |    0.115129433468 |  0.9792604195071 |
0.20260560403595
 setosa     |  30 |   0.78381125710714|          1.6 |
0.84210526315789  | 0.15350591129067 | 0.94664990605014 |
0.3222637978043
 setosa     |  45 |    2.5128066771964|          1.9 |
1 | 0.18228826965767 |  0.93708211483265 |  0.34910902317295
 versicolor |  60 |  -0.7661025543912  |          3.9 |
0.76470588235294 | 0.12870516118045 |               0.8 |
0.6
 versicolor |  75  | 0.085122506043467|          4.3 |
0.84313725490196  | 0.14190569053229 |  0.83004959978259 |
0.55768957485393
 versicolor |  90  | -0.55329628928254|            4 |
0.7843137254902 | 0.13200529351841 |  0.80873608430319 |
0.58817169767505
 virginica  | 105 |    0.4493610863602|          5.8 |
0.84057971014493  | 0.14702827760322 |  0.74614130128354 |
0.66578762268377
 virginica  | 120 |   -1.0001908051243|            5 |
0.72463768115942  | 0.12674851517519 |  0.76822127959738 |
0.64018439966448
 virginica  | 135 |   0.08697311348907|          5.6 |
0.81159420289855  | 0.14195833699621 |  0.73665265810312 |
0.67627129268483
 virginica  | 150  | -0.81899681868875|          5.1 |
0.73913043478261 |   0.1292834854787 |  0.75653461485851 |
0.65395365013193
(10 rows)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Data Transformation

SUMMARY1000 - Summary of up to 1000 columns

This stored procedure calculates summary statistics of up to 1000 input columns. For continuous columns, following statistics are gathered: missing value count, non missing value count, average, variance, standard deviation, skewness, (excess) kurtosis, minimum and maximum. For discrete columns, the number of missing and non missing values, the number of distinct values and the fre-quency of the most frequent value are gathered.

Usage

The SUMMARY1000 stored procedure has the following syntax:

SUMMARY1000(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the summary statistics into. Additionally, other tables will be created depending on the type of the columns to be analyzed:

<outtable>_num - for numeric columns (boolean, int4, int8, float, double, numeric)

<outtable>_char - for character columns (char, nchar, varchar, nvarchar)

<outtable>_date - for date columns

<outtable>_time - for time columns (time, timetz)

<outtable>_timestamp - for timestamp columns

<outtable>_interval - for interval columns

The <outtable> itself contains all the data from those tables put together.

Type: NVARCHAR(256)

incolumn
the input table columns separated by a semicolon (;). If this parameter is not specified, all input table columns are analyzed.

Type: NVARCHAR(ANY)

Default: <none>

by
the input table column which splits the data into groups for which the operation is to be per-formed

Type: NVARCHAR(128)

Default: <none>

talk
flag indicating whether additional information on the progress of the analysis must be

displayed Type: NVARCHAR(ANY)

Default: no

Returns
NVARCHAR(ANY) an informative string

Details

This stored procedure gathers statistics about the input table columns. No more than 1000 columns are accepted. Null values are not part of the statistics computation (per column), but are counted.

More than one output table is created. For each type of column encountered, one table is created: <outtable>_num (numeric), <outtable>_char (character), <outtable>_date, <outtable>_time, <out-table>_timestamp, <outtable>_interval. See the corresponding stored procedures SUMMARY100_<type> for a detailed description of these tables.

An output table <outtable> is created too, concatening all the data of the type-specific output tables. The output table contains following columns: columnname, distinctvalues, mostfrequent-value, mostfrequentcases, average, variance, stddev, skewness, kurtosis, minimum, maximum, nonmissingcases, missing. If the parameter by is specified, an additional column grouped_on is added to indicate for which group the statistics have been gathered. A detailed description of the statistics computed here can be found in the documentation of the stored procedure MOMENTS. When applicable, statistics are gathered for each input columns. Some statistics are type-specific, some statistics depends on the number of values (e.g. at least 2 values for calculating the average). If statistics cannot be gathered, the output table contains a NULL value.

Since more than one output table is actually generated, the stored procedure DROP_SUM-MARY1000 can be used to drop all of them.

Examples

```
CALL nza..SUMMARY1000('intable=nza..winequality,
outtable=wq_mo_05, talk=yes');
SELECT * FROM wq_mo_05 ORDER BY columnname; CALL
nza..DROP_SUMMARY1000('intable=wq_mo_05');
```

```
 SUMMARY1000
-------------
 Done
(1 row)
      COLUMNNAME       | DISTINCTVALUES |
MOSTFREQUENTVALUE | MOSTFREQUENTCASES |      AVERAGE
|      VARIANCE        |       STDDEV        |       SKEWNESS
|     KURTOSIS      | MINIMUM | MAXIMUM | NONMISSINGCASES
| MISSING
----------------------+----------------
+------------------+------------------
+------------------+--------------------
+------------------+--------------------
+-----------------+---------+---------+----------------
+---------
```

```
 ALCOHOL              |                 |                  |
| 10.514267047775    |     1.5144269817875 | 1.2306205677574   |
0.48714299689412 | -0.6994070978127 | 8        | 14.2    |
4898 |        0
 CHLORIDES            |                 |                  |
| 0.045772356063699 | 0.00047733370982461 | 0.021847968093729 |
5.0212795064905 |  37.516765256893 | 0.009   | 0.346    |
4898 |        0
 CITRIC_ACID         |                 |                  |
| 0.33419150673744  |    0.014645793009328 | 0.12101980420298 |
1.2813969516998 |  6.1655025701792 | 0       | 1.66     |
4898 |        0
 DENSITY             |                 |                  |
| 0.9940273764802   | 8.9455241841782e-06 | 0.002990906916669 |
0.97737385720246 |  9.7799453864398 | 0.98711 | 1.03898 |
4898 |        0
 FIXED_ACIDITY       |                 |                  |
| 6.8547876684361   |     0.71211358570046 | 0.84386822768751 |
0.64748697830986 |  2.1676816699878 | 3.8     | 14.2     |
4898 |        0
 FREE_SULFUR_DIOXIDE  |                 |                  |
| 35.308084932626   |      289.24271999932 | 17.007137325233  |
1.4061705044746 |  11.450465023891 | 2       | 289      |
4898 |        0
 ID                  |                 |                  |
| 2449.5            |            1999608.5 | 1414.0751394463  |
1.3490952610585e-15 | -1.2003675969572 | 1       | 4898     |
4898 |        0
 PH                  |                 |                  |
| 3.1882666394447   |    0.022801181084077 | 0.15100059961496 |
0.45759561970729 | 0.52828803496513 | 2.72    | 3.82     |
4898 |        0
 QUALITY             |                 |                  |
| 5.8779093507554   |     0.78435568547105 | 0.88563857496783 |
0.15573278138988 | 0.21442370898296 | 3       | 9        |
4898 |        0
 RESIDUALSUGAR       |                 |                  |
| 6.3914148632095   |      25.725770164386 | 5.0720577840149  |
1.0766539468053 |   3.4637343590186 | 0.6     | 65.8     |
4898 |        0
 SULPHATES           |                 |                  |
| 0.48984687627603  |    0.013024705974517 | 0.11412583394884 |
0.97679466587694 |  1.5871445688284 | 0.22    | 1.08     |
4898 |        0
 TOTAL_SULFUR_DIOXIDE |                 |                  |
| 138.36065741119   |      1806.0854908481 |
42.498064554143    |    0.39055030313114 |
0.56931602037303 | 9        | 440    |           4898 |
0
 VOLATILE_ACIDITY      |                 |
|                    | 0.27824111882401   |
0.010159540992173 | 0.10079454842487   |
1.5763355750639 |   5.0835541889412 | 0.08   | 1.1     |
4898 |        0
(13 rows)
 DROP_SUMMARY1000
------------------
 Done
(1 row)
```

```
CALL nza..SUMMARY1000('intable=nza..winequality,
incolumn=FIXED_ACIDITY;VOLATILE_ACIDITY;CITRIC_ACID;RESID
UALSUGAR;CHLORIDES;FREE_SULFUR_DIOXIDE;TOTAL_SULFUR_DIOXI
DE;DENSITY;PH;SULPHATES;ALCOHOL;QUALITY,
outtable=wq_mo_05');
SELECT * FROM wq_mo_05 ORDER BY columnname; CALL
nza..DROP_SUMMARY1000('intable=wq_mo_05');
```

```
 SUMMARY1000
-------------
 Done
(1 row)
      COLUMNNAME       | DISTINCTVALUES |
MOSTFREQUENTVALUE | MOSTFREQUENTCASES |      AVERAGE
|      VARIANCE        |      STDDEV       |     SKEWNESS
|     KURTOSIS     | MINIMUM | MAXIMUM | NONMISSINGCASES
| MISSING
----------------------+----------------
+--------------------+--------------------
+--------------------+---------------------
+--------------------+------------------
+-----------------+---------+---------+----------------
+---------
 ALCOHOL               |                 |
|                    | 10.514267047775   |
1.5144269817875 | 1.2306205677574    | 0.48714299689486 |
-0.6994070978158 | 8          | 14.2    |            4898 |
0
 CHLORIDES              |                  |                   |
| 0.045772356063699 | 0.00047733370982461 | 0.021847968093729 |
5.0212795064905 |  37.516765256893 | 0.009   | 0.346    |
4898 |         0
 CITRIC_ACID           |                 |                    |
| 0.33419150673744  |    0.014645793009328 | 0.12101980420298 |
1.2813969516998 |  6.1655025701792 | 0       | 1.66     |
4898 |         0
 DENSITY               |                 |                    |
| 0.9940273764802   | 8.9455241841782e-06 | 0.002990906916669 |
0.97737385720246 |  9.7799453864398 | 0.98711 | 1.03898 |
4898 |         0
 FIXED_ACIDITY         |                 |                    |
| 6.8547876684361   |     0.71211358570046 | 0.84386822768751 |
0.64748697830986 |  2.1676816699878 | 3.8     | 14.2     |
4898 |         0
 FREE_SULFUR_DIOXIDE  |                  |                    |
| 35.308084932626   |      289.24271999932 | 17.007137325233  |
1.4061705044746 |  11.450465023891 | 2       | 289      |
4898 |         0
 PH                    |                 |                    |
| 3.1882666394447   |    0.022801181084074 | 0.15100059961495 |
0.45759561970738 | 0.52828803485671 | 2.72    | 3.82     |
4898 |         0
 QUALITY               |                 |                    |
| 5.8779093507554   |     0.78435568547105 | 0.88563857496783 |
0.15573278138988 | 0.21442370898296 | 3       | 9        |
4898 |         0
 RESIDUALSUGAR         |                 |                    |
| 6.3914148632095   |      25.725770164386 | 5.0720577840149  |
1.0766539468053 |   3.4637343590186 | 0.6     | 65.8     |
4898 |         0
 SULPHATES             |                 |                    |
| 0.48984687627603  |    0.013024705974517 | 0.11412583394884 |
0.97679466587694 |  1.5871445688284 | 0.22    | 1.08     |
4898 |         0
 TOTAL_SULFUR_DIOXIDE |                  |                    |
| 138.36065741119   |      1806.0854908481 | 42.498064554143  |
0.39055030313114 | 0.56931602037303 | 9       | 440      |
4898 |         0
 VOLATILE_ACIDITY      |                 |                    |
| 0.27824111882401  |    0.010159540992173 | 0.10079454842487 |
1.5763355750639 |  5.0835541889412 | 0.08     | 1.1    |
4898 |        0

(12 rows)

 DROP_SUMMARY1000

------------------

 Done

(1 row)
```

```
CALL nza..SUMMARY1000('intable=nza..iris,
incolumn=sepalwidth;sepallength;petalwidth;petallength
, outtable=Result72');
SELECT * FROM Result72 ORDER BY columnname; CALL

nza..DROP_SUMMARY1000('intable=Result72');
```

```
 SUMMARY1000

-------------

 Done

(1 row)

 COLUMNNAME  | DISTINCTVALUES | MOSTFREQUENTVALUE |
MOSTFREQUENTCASES |      AVERAGE      |      VARIANCE     |
STDDEV        |     SKEWNESS       |     KURTOSIS        |
MINIMUM | MAXIMUM | NONMISSINGCASES | MISSING

                 +----------------          +-----------------  +------------------
+------------------------------       +----------------
+------------------ +-------------------
+------------------  +---------    +---------
+----------------- +---------

 PETALLENGTH |                 |                  |
| 3.7586666666667 |  3.1131794183445 | 1.7644204199523  |
-0.27080472910747 |  -1.4060569067921 | 1       | 6.9
|              150|       0

 PETALWIDTH  |                 |                  |
| 1.1986666666667 | 0.58241431767338 | 0.76316074170084 |
-0.10359660798221 |  -1.3463440065037 | 0.1     | 2.5
|              150|       0

 SEPALLENGTH |                 |                  |
| 5.8433333333333 | 0.68569351230425 | 0.82806612797787 |
0.31071214388165 | -0.58974416259619 | 4.3     | 7.9
|              150|       0
```

```
 SEPALWIDTH   |                 |                    |
| 3.054           | 0.18800402684564| 0.43359431136217 |
0.32959862667676 |   0.21983367738595| 2         | 4.4     |
150 |        0

(4 rows)

 DROP_SUMMARY1000

------------------

 Done

(1 row)
```

CALL nza..SUMMARY1000('intable=nza..iris, outtable=Result72'); SELECT * FROM Result72 ORDER BY columnname; CALL nza..DROP_SUMMARY1000('intable=result72');

```
 SUMMARY1000

-------------

 Done

(1 row)

 COLUMNNAME  | DISTINCTVALUES | MOSTFREQUENTVALUE |
MOSTFREQUENTCASES |      AVERAGE       |     VARIANCE      |
STDDEV        |        SKEWNESS       |      KURTOSIS      |
MINIMUM | MAXIMUM | NONMISSINGCASES | MISSING

+------------------------------ +----------------            +------------------+-----------------
                                  +---------------
+------------------          + ---------------------          +-------------------
+--------- +---------+----------------          +---------

 CLASS        |              3 | virginica         |
50 |                 |                  |                  |
|                   |         |         |              150 |
0

 ID           |                |                   |
| 75.5              |           1887.5 | 43.445367992457  |
-1.4196448216781e-15 |  -1.2121059602649 | 1       | 150     |
150 |        0

 PETALLENGTH |                 |                   |
| 3.7586666666667 |  3.1131794183445 | 1.7644204199523   |
-0.27080472910747 |  -1.4060569067921 | 1        |6.9      |
150 |        0

 PETALWIDTH  |                 |                   |
| 1.1986666666667 | 0.58241431767338 | 0.76316074170084 |
-0.10359660798221 |  -1.3463440065037 | 0.1      |2.5      |
150 |        0
```

```
 SEPALLENGTH |                   |                    |
| 5.8433333333333 | 0.68569351230425 | 0.82806612797787 |
0.31071214388165 | -0.58974416259619 | 4.3      | 7.9
|              150|        0

 SEPALWIDTH   |                  |                    |
| 3.054           | 0.18800402684564 | 0.43359431136217 |
0.32959862667676 |    0.21983367738595 | 2        | 4.4
|              150|        0

(6 rows)

 DROP_SUMMARY1000
------------------

 Done

(1 row)
```

```
CALL nza..SUMMARY1000('intable=nza..iris, by=class,
incolumn=sepalwidth;sepallength;petalwidth;petallength
, outtable=Result72');
SELECT * FROM Result72 ORDER BY columnname, grouped_on;

CALL nza..DROP_SUMMARY1000('intable=Result72');
```

```
 SUMMARY1000
-------------

 Done

(1 row)

 GROUPED_ON | COLUMNNAME  | DISTINCTVALUES |
MOSTFREQUENTVALUE | MOSTFREQUENTCASES | AVERAGE |
VARIANCE       |       STDDEV       |       SKEWNESS      |
KURTOSIS       | MINIMUM | MAXIMUM | NONMISSINGCASES |
MISSING

------------+-------------+----------------
+-------------------+-------------------+---------
+-------------------+------------------
+--------------------+-------------------+---------
+---------+----------------+---------

 setosa     | PETALLENGTH |                |
|                   | 1.464   | 0.030106122448979 |
0.17351115943644 |   0.06897229018574 |  0.73739158718476
|1       |1.9      |                50|        0

 versicolor | PETALLENGTH |                |
|                   | 4.26    |  0.22081632653061 |
0.46991097723996 |   -0.58224738191143 | -0.13291378666874 | 3
| 5.1       |               50 |       0

 virginica  | PETALLENGTH |                  |
|                    | 5.552   |  0.30458775510204 |
0.55189469566398 |    0.52746680546659 | -0.31134291510743 | 4.5
| 6.9       |               50 |       0

 setosa     | PETALWIDTH   |                  |
|                    | 0.244   |  0.01149387755102 |
0.10720950308168 |      1.149353251038 |   1.2105459872159 | 0.1
| 0.6       |               50 |       0

 versicolor | PETALWIDTH   |                  |
|                    | 1.326   | 0.039106122448979 |
0.19775268000454 | -0.029932414130041  | -0.53807593528485 | 1
| 1.8       |               50 |       0

 virginica  | PETALWIDTH   |                  |
|                    | 2.026   | 0.075432653061223 |
0.27465005563667 |   -0.12429785366125 | -0.70812104544654 | 1.4
| 2.5       |               50 |       0

 setosa     | SEPALLENGTH |                  |
|                    | 5.006   |  0.12424897959184 |
0.35248968721346 |    0.11528350655587 | -0.39884938205815 | 4.3
| 5.8       |               50 |       0

 versicolor | SEPALLENGTH |                  |
|                    | 5.936   |  0.26643265306123 |
0.51617114706387 |    0.10116251260099 | -0.64685079391119 | 4.9
| 7         |               50 |       0

 virginica  | SEPALLENGTH |                  |
|                    | 6.588   |  0.40434285714286 |
0.63587959327443 |    0.11329451486242 | -0.14618338696454 | 4.9
| 7.9       |               50 |       0

 setosa     | SEPALWIDTH   |                  |
|                    | 3.418   |  0.14517959183674 |
0.3810243979547  |    0.10277069798361 |  0.61143137974919 | 2.3
| 4.4       |               50 |       0

 versicolor | SEPALWIDTH   |                  |
|                    | 2.77    | 0.098469387755103 |
0.31379832337841 |   -0.34833105003606 | -0.49930646192858 | 2
| 3.4       |               50 |       0

 virginica  | SEPALWIDTH   |                  |
|                    | 2.974   |  0.10400408163266 |
0.32249663817264 |    0.35131111148685 |  0.44937061679896 | 2.2
| 3.8       |               50 |       0

(12 rows)

 DROP_SUMMARY1000
```

```
------------------
 Done
(1 row)
```

```
CREATE TABLE irisnull AS SELECT * FROM nza..iris;
INSERT INTO irisnull(id,petallength) SELECT
id+300, petallength FROM nza..iris;
INSERT INTO irisnull(id,sepallength,class) SELECT
id+600, sepallength, class FROM nza..iris;
CALL nza..SUMMARY1000('intable=irisnull,
incolumn=SEPALLENGTH;SEPALWIDTH;PETALLENGTH;SEPALWIDTH
, outtable=Result7');
SELECT * FROM result7 ORDER BY columnname; CALL
nza..DROP_SUMMARY1000('intable=Result7'); CALL
nza..DROP_TABLE('irisnull');
```

```
 SUMMARY1000
-------------
 Done
(1 row)
 COLUMNNAME   | DISTINCTVALUES | MOSTFREQUENTVALUE |
MOSTFREQUENTCASES |      AVERAGE      |      VARIANCE     |
STDDEV        |     SKEWNESS      |    KURTOSIS        |
MINIMUM | MAXIMUM | NONMISSINGCASES | MISSING
             +-----------------          +------------------ +------------------
+--------------------------------         +-----------------
+------------------  +--------------------
+------------------   + ---------+---------
+-----------------+  ---------

 PETALLENGTH |                |                   |
| 3.7586666666667 |  3.1027674470457 | 1.7614674129957  |
-0.27125871891336 |  -1.4007081044659 | 1         | 6.9
|              300|     150

 SEPALLENGTH |                 |                  |
| 5.8433333333333 | 0.68340022296544 | 0.82668024227354 |
0.31123303635777 | -0.58165605575527 | 4.3      | 7.9
|              300|      150

 SEPALWIDTH   |                 |                  |
| 3.054           | 0.18800402684564 | 0.43359431136217 |
0.32959862667676 |   0.21983367738595| 2          | 4.4     |
150 |      300

 SEPALWIDTH  |                   |                    |
| 3.054           | 0.18800402684564| 0.43359431136217 |
0.32959862667676 |   0.21983367738595| 2          | 4.4     |
150 |      300

(4 rows)

 DROP_SUMMARY1000

------------------

 Done

(1 row)

 DROP_TABLE

------------

 t

(1 row)
```

```
CREATE TABLE withothers AS SELECT

'true'::boolean a, 'true'::boolean b

,'10:11:12'::time c, '11:09:12'::time d

,'2010-11-12'::date e, '2011-09-12'::date f

,'2010-11-12 11:10:15'::timestamp g, '2011-09-12
11:10:15'::timestamp h

,'10:11:12+01'::timetz i, '11:09:12-03'::timetz j

,'1 day 10:11:12'::interval k, '11:09:12'::interval l;

INSERT INTO withothers VALUES( 'true'::boolean ,

'true'::boolean

,'10:11:12'::time , '11:09:12'::time

,'2010-11-12'::date , '2011-09-12'::date

,'2010-11-12 11:10:15'::timestamp , '2011-09-12
11:10:15'::timestamp

,'10:11:12+01'::timetz , '11:09:12-03'::timetz

,'1 day 10:11:12'::interval ,

'11:09:12'::interval); INSERT INTO withothers

VALUES( 'true'::boolean , 'true'::boolean

,'10:11:12'::time , '11:09:12'::time
,'2010-11-12'::date , '2011-09-12'::date
,'2010-11-12 11:10:15'::timestamp , '2011-09-12
11:10:15'::timestamp
,'10:11:12+01'::timetz , '11:09:12-03'::timetz
,'1 day 10:11:12'::interval ,
'11:09:12'::interval); INSERT INTO withothers
VALUES( 'false'::boolean , 'false'::boolean
,'20:11:12'::time , '01:09:12'::time
,'2012-11-12'::date , '2011-02-12'::date
,'2013-11-12 11:10:15'::timestamp , '2011-09-12
12:10:15'::timestamp
,'10:11:12+03'::timetz , '12:09:12-03'::timetz
,'2 days 10:11:12'::interval , '5 days
11:09:12'::interval);
CALL nza..SUMMARY1000('intable=withothers,
outtable=wd_05');
SELECT * FROM wd_05 ORDER BY columnname; CALL
nza..DROP_SUMMARY1000('intable=wd_05'); CALL
nza..DROP_TABLE('withothers');
```

```
 SUMMARY1000
-------------
 Done
(1 row)
 COLUMNNAME | DISTINCTVALUES | MOSTFREQUENTVALUE |
MOSTFREQUENTCASES |         AVERAGE          |     VARIANCE
|       STDDEV      |      SKEWNESS        |     KURTOSIS
|         MINIMUM       |        MAXIMUM        |
NONMISSINGCASES | MISSING
      +----------------            +-------------------
+------------------                +------------------
+--------------------    +-----------------
+--------------------    +------------------
+--------------------      +---------------------
+-----------------  +----------
 A            |                |                    |
| 0.75                  |                0.25 | 0.5
|                   -1 |              -1.25 | 0
| 1                   |                  4 |       0

 B           |                |                  |
| 0.75                |              0.25 | 0.5             |
-1 |            -1.25 | 0                    | 1
|                4 |       0

 C           |                |                  |
| 12:41:12            |         324000000 | 05:00:00        |
1 |             -1.25 | 10:11:12             | 20:11:12
|                4 |       0

 D           |                |                  |
| 08:39:12            |         324000000 | 05:00:00        |
-0.99999999999999 |            -1.25 | 01:09:12            |
11:09:12            |                4 |       0

 E           |                |                  |
| 2011-05-14          |         133590.25 | 366 days        |
0.99999999999937 | -1.2500000000061 | 2010-11-12           |
2012-11-12          |                4 |       0

 F           |                |                  |
| 2011-07-21          |             11236 | 106 days        |
-1.0000000000256 |            -1.25 | 2011-02-12           |
2011-09-12          |                4 |       0

 G           |                |                  |
| 2011-08-13 11:10:15 | 2.24175734784e+15 | 548 days        |
1.0000000000001 | -1.2500000000038 | 2010-11-12  11:10:15 |
2013-11-12 11:10:15 |                4 |       0

 H           |                |                  |
| 2011-09-12 11:25:15 |    3239988.0881722 | 00:30:00        |
0 | -3186575.5274879 | 2011-09-12 11:10:15 | 2011-09-13
12:10:15 |                4 |       0

 I           |                |                  |
| 08:41:12            |          12960000 | 01:00:00        |
-1.0000000000006 | -1.2500000000112 | 07:11:12             |
09:11:12            |                4 |       0

 J           |                |                  |
| 14:24:12            |    3239999.9999997 | 00:30:00        |
1.0000000000103 | -1.2499999990159 | 14:09:12             |
15:09:12            |                4 |       0

 K           |                |                  |
| 1 DAY 16:11:12      |        1866240000 | 12:00:00        |
1 | -1.2500000000003 | 1 DAYS 10:11:12      | 2 DAYS 10:11:12
|                4 |       0

 L           |                |                  |
| 1 DAY 17:09:12      |       46656000000 | 2 DAYS 12:00:00 |
1 |             -1.25 | 11:09:12             | 5 DAYS 11:09:12
|                4 |       0
```

```
(12 rows)
 DROP_SUMMARY1000
------------------
 Done
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
DROP_SUMMARY1000
KURTOSIS_AGG
MOMENTS
SKEWNESS_AGG
SUMMARY1000NUM
SUMMARY1000CHAR
SUMMARY1000DATE
SUMMARY1000TIME
SUMMARY1000TIMESTAMP
SUMMARY1000INTERVAL

SUMMARY1000CHAR - Summary of up to 1000 character columns

This stored procedure calculates summary statistics of up to 1000 character input columns. the number of missing and non missing values, the number of distinct values and the frequency of the most frequent value are gathered.

Usage

The SUMMARY1000CHAR stored procedure has the following syntax:

SUMMARY1000CHAR(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable

the input table

Type: NVARCHAR(256)

outtable
the output table to write the summary statistics

into Type: NVARCHAR(256)

incolumn
the input table columns of type char, nchar, varchar or nvarchar of any length separated by a semicolon (;). If this parameter is not specified, all input table columns of character type are analyzed.

Type: NVARCHAR(ANY)

Default: <none>

by
the input table column which splits the data into groups for which the operation is to be per-formed

Type: NVARCHAR(128)

Default: <none>

talk
flag indicating whether additional information on the progress of the analysis must be

displayed Type: NVARCHAR(ANY)

Default: no

Returns
NVARCHAR(ANY) an informative string

Details

This stored procedure gathers statistics about the input table columns of type char, nchar, varchar or nvarchar of any length. No more than 1000 columns are accepted. Null values are not part of the statistics computation (per column), but are counted.

An output table <outtable> is created with following columns: colname, distinctvalues, mostfrequentvalue, mostfrequentcases, nonmissingcases, missing. If the parameter by is specified, an additional column grouped_on is added to indicate for which group the statistics have been gathered. A detailed description of the statistics computed here can be found in the documentation of the stored procedure MOMENTS. If stat-istics cannot be gathered, the output table contains a NULL value.

Examples

```
CALL nza..SUMMARY1000CHAR('intable=nza..iris,
outtable=Result72');
SELECT * FROM Result72;
CALL nza..DROP_TABLE('Result72');
```

```
 SUMMARY1000CHAR
-----------------
```

```
 Done
(1 row)
 COLNAME | DISTINCTVALUES | MOSTFREQUENTVALUE |
MOSTFREQUENTCASES | NONMISSINGCASES | MISSING
   +--------------        +-----------------
                  +-----------------          +---------
 CLASS   |                 3 | virginica          |
50 |              150 |        0
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..SUMMARY1000CHAR('intable=nza..adult,
outtable=Result71');
SELECT * FROM Result71 ORDER BY colname;
CALL nza..DROP_TABLE('Result71');
```

```
 SUMMARY1000CHAR
-----------------
 Done
(1 row)
    COLNAME      | DISTINCTVALUES | MOSTFREQUENTVALUE  |
MOSTFREQUENTCASES | NONMISSINGCASES | MISSING
----------------+---------------- +--------------------
+-----------------+----------------      +---------
 EDUCATION       |              16 | HS-grad            |
10501 |           32561 |        0
 INCOME          |               2 | small              |
24720 |           32561 |        0
 MARITAL_STATUS  |               7 | Married-civ-spouse |
14976 |           32561 |        0
 OCCUPATION      |              14 | Prof-specialty     |
5983 |           32561 |        0
 RACE            |               5 | White              |
27816  |          32561  |      0
 RELATIONSHIP    |               6 | Husband              |
13193  |          32561  |      0
 SEX             |               2 | Male                 |
21790  |          32561  |      0
 WORKCLASS       |               8 | Private              |
24532  |          32561  |      0
(8 rows)
 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..SUMMARY1000CHAR('intable=nza..adult,
incolumn=education;race, outtable=Result71');
SELECT * FROM Result71 ORDER BY colname; CALL
nza..DROP_TABLE('Result71');
```

```
 SUMMARY1000CHAR
-----------------
 Done
(1 row)
  COLNAME | DISTINCTVALUES | MOSTFREQUENTVALUE |
MOSTFREQUENTCASES | NONMISSINGCASES | MISSING
           +----------------+------------------ +--------------------
                                          +---------
 EDUCATION |              16 | HS-grad            |
10501  |          32561  |       0
 RACE      |               5 | White              |
27816  |          32561  |       0
(2 rows)
 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..SUMMARY1000CHAR('intable=nza..adult,
outtable=Result73, by=sex');
SELECT * FROM Result73 ORDER  BY colname, grouped_on;
CALL nza..DROP_TABLE('Result73');
  SUMMARY1000CHAR
-----------------
 Done
(1 row)
    COLNAME     | GROUPED_ON | DISTINCTVALUES  |
MOSTFREQUENTVALUE   | MOSTFREQUENTCASES | NONMISSINGCASES
| MISSING
+---------------------------------  +------------            +----------------
                         +--------------------
+----------------      +---------
 EDUCATION      | Female     |             16 | HS-grad
|             3390  |           10771 |
 EDUCATION      | Male       |             16 | HS-grad
|             7111  |           21790 |
 INCOME         | Female     |              2 | small
|             9592  |           10771 |
 INCOME         | Male       |              2 | small
|            15128  |           21790 |
 MARITAL_STATUS | Female     |              7 | Never-
married       |              4767 |            10771 |
 MARITAL_STATUS | Male       |              7 | Married-
civ-spouse |             13319 |           21790 |
 OCCUPATION     | Female     |             13 | Adm-
clerical        |             2537 |            10771 |
 OCCUPATION     | Male       |             14 | Craft-
repair        |              3877 |            21790 |
 RACE           | Female     |              5 | White
|             8642  |           10771 |
 RACE           | Male       |              5 | White
|            19174  |           21790 |
 RELATIONSHIP   | Female     |              6 | Not-in-
family      |              3875 |            10771 |
 RELATIONSHIP   | Male       |              6 | Husband
|            13192  |           21790 |
 SEX            | Female       |              1 | Female
 |            10771  |          10771  |
 SEX            | Male         |              1 | Male
 |            21790  |          21790  |
 WORKCLASS      | Female       |              8 | Private
 |             8591  |          10771  |
 WORKCLASS      | Male         |              8 | Private
 |            15941  |          21790  |
(16 rows)
 DROP_TABLE
------------
 t
(1 row)
```

CALL nza..SUMMARY1000CHAR('intable=nza..adult, incolumn=occupation;relationship, outtable=Result73, by=sex'); SELECT * FROM Result73 ORDER BY colname, grouped_on; CALL nza..DROP_TABLE('Result73');

```
 SUMMARY1000CHAR
-----------------
 Done
(1 row)
   COLNAME     | GROUPED_ON | DISTINCTVALUES | MOSTFREQUENTVALUE
| MOSTFREQUENTCASES   | NONMISSINGCASES | MISSING
              +------------           +----------------
+-------------------------------        +------------------       +------------------
+---------
 OCCUPATION   | Female     |              13 | Adm-clerical
|               2537|            10771 |
 OCCUPATION   | Male       |              14 | Craft-repair
|               3877|            21790 |
 RELATIONSHIP | Female     |               6 | Not-in-family
|               3875|            10771 |
 RELATIONSHIP | Male       |               6 | Husband
|              13192|            21790 |
(4 rows)
 DROP_TABLE
```

```
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
SUMMARY1000
MOMENTS

SUMMARY1000DATE - Summary of up to 1000 date columns

This stored procedure calculates summary statistics of up to 1000 input columns of type date. the missing value count, non missing value count, average, variance, standard deviation, skewness, (excess) kurtosis, minimum and maximum of the input columns is gathered.

Usage

The SUMMARY1000DATE stored procedure has the following syntax:

SUMMARY1000DATE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the summary statistics

into Type: NVARCHAR(256)

incolumn
the input table columns of type date separated by a semicolon (;). If this parameter is not specified, all input table columns of type date are analyzed.

Type: NVARCHAR(ANY)

Default: <none>

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

talk
flag indicating whether additional information on the progress of the analysis must be displayed Type: NVARCHAR(ANY)

Default: no

Returns
NVARCHAR(ANY) an informative string

Details

This stored procedure gathers statistics about the input table columns of type date. No more than 1000 columns are accepted. Null values are not part of the statistics computation (per column), but are counted.

An output table <outtable> is created with following columns: columnname, columnid, countt, average, variance, stddev, skewness, kurtosis. minimum, maximum, missing. If the parameter by is specified, an addi-tional column grouped_on is added to indicate for which group the statistics have been gathered. A detailed description of the statistics computed here can be found in the documentation of the stored procedure MO-MENTS. If statistics cannot be gathered, for example when there are less than 2 values for average, the out-put table contains a NULL value.

Note that dates are stored internally as integers representing the number of days since January 1st, 2000. The average, minimum and maximum is displayed as a date. The standard deviation is displayed as an inter-val (usually in days). The variance is expressed in "squared days".

Examples

```
CREATE TABLE withDates(a date, b date);
INSERT INTO withDates VALUES(date('2012-01-02'), date('2012-01-
05'));
INSERT INTO withDates VALUES(date('2012-01-12'), date('2012-01-
25'));
INSERT INTO withDates VALUES(date('2012-01-22'), date('2012-02-
13'));
INSERT INTO withDates VALUES(date('2012-02-01'), date('2012-03-
04'));
CALL nza..SUMMARY1000DATE('intable=withDates, incolumn=a;b,
outtable=wd_05');
SELECT * FROM wd_05 ORDER BY columnname;
CALL nza..DROP_TABLE('wd_05'); CALL
nza..DROP_TABLE('withDates');
```

```
 SUMMARY1000DATE
-----------------
 Done
(1 row)
```

```
 COLUMNNAME | COLUMNID | COUNTT |  AVERAGE    |
VARIANCE     | STDDEV   |       SKEWNESS        |
KURTOSIS     |  MINIMUM    | MAXIMUM    | MISSING
               +----------+---------+--------     +------------
+------------------
+----------------- +-----------          +------------  +---------
 A          |        0 |      4 | 2012-01-17 |
166.66666666667 | 13 days | -1.4183288621365e-08 |
-1.769997 | 2012-01-02 | 2012-02-01 |        0
 B          |        1 |      4 | 2012-02-03 |
640.33333333333 | 25 days |  1.8833927739782e-09 |
-1.7553965310125 | 2012-01-05 | 2012-03-04 |        0
(2 rows)
 DROP_TABLE
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
MOMENTS
SUMMARY1000

SUMMARY1000INTERVAL - Summary of up to 1000 interval columns

This stored procedure calculates summary statistics of up to 1000 input columns of type interval. the missing value count, non missing value count, average, variance, standard deviation, skewness, (excess) kurtosis, minimum and maximum of the input columns is gathered.

Usage

The SUMMARY1000INTERVAL stored procedure has the following syntax:

SUMMARY1000INTERVAL(NVARCHAR(ANY) paramString)

▲ Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the summary statistics

into Type: NVARCHAR(256)

incolumn
the input table columns of type interval separated by a semicolon (;). If this parameter is not specified, all input table columns of type interval are analyzed.

Type: NVARCHAR(ANY)

Default: <none>

by
the input table column which splits the data into groups for which the operation is to be per-formed

Type: NVARCHAR(128)

Default: <none>

talk
flag indicating whether additional information on the progress of the analysis must be

displayed Type: NVARCHAR(ANY)

Default: no

Returns
NVARCHAR(ANY) an informative string

Details

This stored procedure gathers statistics about the input table columns of type interval. No more than 1000 columns are accepted. Null values are not part of the statistics computation (per column), but are counted.

An output table <outtable> is created with following columns: columnname, columnid, countt, average, variance, stddev, skewness, kurtosis. minimum, maximum, missing. If the parameter by is specified, an addi-tional column grouped_on is added to indicate for which group the statistics have been gathered. A detailed description of the statistics computed here can be found in the documentation of the stored procedure MO-MENTS. If statistics cannot be gathered, for example when there are less than 2 values for average, the out-put table contains a NULL value.

Note that intervals are stored internally as a structure comprising an integer representing the number of months and a big integer representing the number of microseconds. For the analysis, the structure is flattened to an integer by assigning a month an average number of days. The average value, standard deviation, minimum and maximum are displayed as an interval. The variance is expressed in "squared seconds".

Examples

```
CREATE TABLE withintervals(a interval, b interval);
INSERT INTO withintervals VALUES('1 day'::interval,
'3 days'::interval);
INSERT INTO withintervals VALUES('11 days'::interval,
'23 days'::interval);
INSERT INTO withintervals VALUES('21 days'::interval,
'43 days'::interval);
INSERT INTO withintervals VALUES('31 days'::interval,
'63 days'::interval);
CALL nza..SUMMARY1000INTERVAL('intable=withintervals,
incolumn=a;b, outtable=wd_05');
SELECT * FROM wd_05 ORDER BY columnname;
CALL nza..DROP_TABLE('wd_05');
CALL nza..DROP_TABLE('withintervals');
```

```
 SUMMARY1000INTERVAL
---------------------
 Done
(1 row)
 COLUMNNAME | COLUMNID | COUNTT | AVERAGE |   VARIANCE
|          STDDEV          |       SKEWNESS        |
KURTOSIS | MINIMUM | MAXIMUM  | MISSING
------------+----------+--------+---------
+---------------+------------------------
+----------------------+----------+---------+----------
+---------
 A          |        0 |      4 | 16 days | 1244160000000
| 12 days 21:50:19.203707 |                  0 |
-1.77 | 1 days  | 31 days  |       0
 B          |        1 |      4 | 33 days | 4976640000000
| 25 days 19:40:38.407415 | 8.5071745671901e-16 |
-1.77 | 3 days  | 63 days  |       0
(2 rows)
 DROP_TABLE
------------
 t
```

```
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
MOMENTS
SUMMARY1000

SUMMARY1000NUM - Summary of up to 1000 numeric columns

This stored procedure calculates summary statistics of up to 1000 input columns of type boolean, int1, int2, int4, int8, float, double or numeric. the missing value count, non missing value count, average, variance, standard deviation, skewness, (excess) kurtosis, minimum and maximum of the input columns is gathered.

Usage

The SUMMARY1000NUM stored procedure has the following syntax:

SUMMARY1000NUM(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the summary statistics

into Type: NVARCHAR(256)

incolumn
the input table columns of type boolean, int1, int2, int4, int8, float, double or numeric separ-ated by a semicolon (;). If this parameter is not specified, all input table columns of those types are analyzed.

Type: NVARCHAR(ANY)

Default: <none>

by
the input table column which splits the data into groups for which the operation is to be per-

formed

Type: NVARCHAR(128)

Default: <none>

talk
flag indicating whether additional information on the progress of the analysis must be displayed

Type: NVARCHAR(ANY)

Default: no

Returns
NVARCHAR(ANY) an informative string

Details

This stored procedure gathers statistics about the input table columns of type boolean, int1, int2, int4, int8, float, double or numeric. No more than 1000 columns are accepted. Null values are not part of the statistics computation (per column), but are counted.

An output table <outtable> is created with following columns: columnname, columnid, countt, average, variance, stddev, skewness, kurtosis. minimum, maximum, missing. If the parameter by is specified, an additional column grouped_on is added to indicate for which group the statistics have been gathered. A detailed description of the statistics computed here can be found in the documentation of the stored procedure MOMENTS. If statistics cannot be gathered, for example when there are less than 2 values for average, the output table contains a NULL value.

All of these numeric column types are handled as double, where boolean values are mapped to 0 (false) and 1 (true).

Examples

```
CALL nza..SUMMARY1000NUM('intable=nza..winequality,
incolumn=FIXED_ACIDITY;VOLATILE_ACIDITY;CITRIC_ACID;RESID
UALSUGAR;CHLORIDES;FREE_SULFUR_DIOXIDE;TOTAL_SULFUR_DIOXI
DE;DENSITY;PH;SULPHATES;ALCOHOL;QUALITY, outtable=wq_mo_05,
talk=yes');
SELECT * FROM wq_mo_05 ORDER BY columnname;

CALL nza..DROP_TABLE('wq_mo_05');
```

```
 SUMMARY1000NUM
----------------
 Done
(1 row)

     COLUMNNAME       | COLUMNID | COUNTT |       AVERAGE
|      VARIANCE       |       STDDEV       |      SKEWNESS
|     KURTOSIS       | MINIMUM | MAXIMUM | MISSING
```

```
---------------------    +---------- +-------- +-------------------
+--------------------    +-------------------        +------------------
+------------------   +---------+---------    + ---------
 ALCOHOL              |        10 |    4898 |    10.514267047775 |
1.5144269817875  |  1.2306205677574 | 0.48714299689436 |
-0.69940709781905 |        8 |    14.2 |         0
 CHLORIDES            |         4 |    4898 | 0.045772356063699 |
0.00047733370982461 | 0.021847968093729 |  5.0212795064904 |
37.516765256893  |  0.009 |   0.346 |         0
 CITRIC_ACID          |         2 |    4898 |  0.33419150673744 |
0.014645793009328 |  0.12101980420298 |   1.2813969516998 |
6.1655025701792  |       0 |    1.66 |         0
 DENSITY              |         7 |    4898 |    0.9940273764802 |
8.9455241841782e-06 | 0.002990906916669 | 0.97737385720246 |
9.7799453864398  |0.98711 | 1.03898 |         0
 FIXED_ACIDITY        |         0 |    4898 |    6.8547876684361 |
0.71211358570046 |  0.84386822768751 | 0.64748697830986 |
2.1676816699878  |     3.8 |    14.2 |         0
 FREE_SULFUR_DIOXIDE  |         5 |    4898 |    35.308084932626 |
289.24271999932  |  17.007137325233 |   1.4061705044746 |
11.450465023891  |       2 |     289 |         0
 PH                   |         8 |    4898 |    3.1882666394447 |
0.022801181084077 |  0.15100059961496 | 0.45759561971141 |
0.52828803485579 |    2.72 |    3.82 |         0
 QUALITY              |        11 |    4898 |    5.8779093507554 |
0.78435568547105 |  0.88563857496783 | 0.15573278138988 |
0.21442370898296 |       3 |       9 |         0
 RESIDUALSUGAR        |         3 |    4898 |    6.3914148632095 |
25.725770164386  |  5.0720577840149 |   1.0766539468053 |
3.4637343590186  |     0.6 |    65.8 |         0
 SULPHATES            |         9 |    4898 |  0.48984687627603 |
0.013024705974517 |  0.11412583394884 | 0.97679466587694 |
1.5871445688284  |    0.22 |    1.08 |         0
 TOTAL_SULFUR_DIOXIDE |         6 |    4898 |    138.36065741119 |
1806.0854908481  |  42.498064554143 | 0.39055030313114 |
0.56931602037303 |       9 |     440 |         0
 VOLATILE_ACIDITY     |         1 |    4898 |  0.27824111882401 |
0.010159540992173 |  0.10079454842487 |   1.5763355750639 |
5.0835541889412  |    0.08 |     1.1 |         0
(12 rows)
 DROP_TABLE
------------
```

```
 t
(1 row)
```

```
CALL nza..SUMMARY1000NUM('intable=nza..iris,
incolumn=sepalwidth;sepallength;petalwidth;petallength
, outtable=Result72');
SELECT * FROM Result72 ORDER BY columnname;
CALL nza..DROP_TABLE('Result72');
```

```
 SUMMARY1000NUM
----------------
 Done
(1 row)
 COLUMNNAME  | COLUMNID | COUNTT |      AVERAGE      |
VARIANCE     |        STDDEV      |      SKEWNESS      |
KURTOSIS       | MINIMUM | MAXIMUM | MISSING
-------------+----------+--------    +------------------
+------------------+------------------
+------------------+------------------   +---------
+---------+---------
 PETALLENGTH |        3 |     150 | 3.7586666666667 |
3.1131794183445 |   1.7644204199523 | -0.27080472910747 |
-1.4060569067921 |        1 |     6.9 |         0
 PETALWIDTH  |        2 |     150 | 1.1986666666667 |
0.58241431767338 | 0.76316074170084 | -0.10359660798221 |
-1.3463440065037 |       0.1 |     2.5 |         0
 SEPALLENGTH |        1 |     150| 5.8433333333333 |
0.68569351230425  | 0.82806612797787 | 0.31071214388165 |
-0.58974416259619 |      4.3 |       7.9|         0
 SEPALWIDTH  |        0 |     150|            3.054 |
0.18800402684564  | 0.43359431136217 | 0.32959862667676 |
0.21983367738595  |        2 |     4.4 |         0
(4 rows)
 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..SUMMARY1000NUM('intable=nza..iris, outtable=Result72,
talk=yes');
SELECT * FROM Result72 ORDER BY columnname;
CALL nza..DROP_TABLE('Result72');
```

```
 SUMMARY1000NUM
----------------
 Done
(1 row)
 COLUMNNAME  | COLUMNID  | COUNTT|     AVERAGE      |
VARIANCE     |       STDDEV     |       SKEWNESS         |
KURTOSIS      | MINIMUM | MAXIMUM | MISSING
-------------+---------- +--------+-----------------
+------------------ +------------------          +---------------------
+------------------ +---------+--------- +---------
 ID          |        4 |     150|            75.5 |
1887.5 |  43.445367992457 | -1.4196448216781e-15 |
-1.2121059602649 |        1 |    150 |       0
 PETALLENGTH |        1 |     150| 3.7586666666667 |
3.1131794183445 |   1.7644204199523 |   -0.27080472910746 |
-1.4060569067921 |        1 |    6.9 |       0
 PETALWIDTH  |        0 |     150| 1.1986666666667 |
0.58241431767338 | 0.76316074170084 |    -0.10359660798221 |
-1.3463440065036 |      0.1 |    2.5 |       0
 SEPALLENGTH |        3 |     150| 5.8433333333333 |
0.68569351230426 | 0.82806612797787 |     0.31071214388144 |
-0.58974416259623 |     4.3 |     7.9 |       0
 SEPALWIDTH  |        2 |     150|           3.054 |
0.18800402684564 | 0.43359431136217 |     0.32959862667676 |
0.21983367738595 |        2 |    4.4 |       0
(5 rows)
 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..SUMMARY1000NUM('intable=nza..iris,
incolumn=sepalwidth;sepallength;petalwidth;petallength,outtable=
Result72, by=class');
SELECT * FROM Result72 ORDER BY columnname, grouped_on;
```

```
CALL nza..DROP_TABLE('Result72');
 SUMMARY1000NUM
----------------
 Done
(1 row)
 COLUMNNAME  | GROUPED_ON | COLUMNID | COUNTT | AVERAGE |
VARIANCE      |       STDDEV       |      SKEWNESS       |
KURTOSIS      | MINIMUM | MAXIMUM | MISSING

+------------+-------------      +----------  +          +---------
 -------------------+-----------------
+-------------------- +--------------------        +---------
+---------+---------

 PETALLENGTH | setosa     |         3 |      50 |    1.464 |
0.03010612244898 | 0.17351115943645 |   0.068972290185229
|   0.73739158718861|       1 |     1.9 |        0

 PETALLENGTH | versicolor |         3 |      50 |     4.26 |
0.22081632653061 | 0.46991097723996 |   -0.58224738191143
| -0.13291378666874 |       3 |     5.1 |        0

 PETALLENGTH | virginica  |         3 |      50 |    5.552 |
0.30458775510205 | 0.55189469566399 |   0.52746680546555
| -0.31134291509779 |     4.5 |     6.9 |        0

 PETALWIDTH  | setosa     |         2 |      50 |    0.244 |
0.01149387755102 | 0.10720950308168 |      1.149353251038
|    1.2105459872159|     0.1 |     0.6 |        0

 PETALWIDTH  | versicolor |         2 |      50 |    1.326 |
0.039106122448979 | 0.19775268000454 | -0.029932414130041
| -0.53807593528488 |       1 |     1.8 |        0

 PETALWIDTH  | virginica  |         2 |      50 |    2.026 |
0.075432653061225 | 0.27465005563667 |   -0.12429785366124
|   -0.7081210454404|     1.4 |     2.5 |        0

 SEPALLENGTH | setosa     |         1 |      50 |    5.006 |
0.12424897959184 | 0.35248968721346 |   0.11528350655587
| -0.39884938205815 |     4.3 |     5.8 |        0

 SEPALLENGTH | versicolor |         1 |      50 |    5.936 |
0.26643265306123 | 0.51617114706387 |   0.10116251260099
| -0.64685079389838 |     4.9 |       7 |        0

 SEPALLENGTH | virginica  |         1 |      50 |    6.588 |
0.40434285714286 | 0.63587959327443 |   0.11329451486242
| -0.14618338696454 |     4.9 |     7.9 |        0

 SEPALWIDTH  | setosa     |         0 |      50 |    3.418 |
0.14517959183674 | 0.38102439795469 |   0.10277069798464  |
0.61143137973313 |       2.3 |     4.4  |        0

 SEPALWIDTH  | versicolor |         0  |     50  |    2.77 |
0.098469387755103 | 0.31379832337841  |  -0.34833105003606|
-0.49930646192565  |        2 |    3.4  |        0

 SEPALWIDTH  | virginica   |         0  |     50  |   2.974 |
0.10400408163266 | 0.32249663817264 |   0.35131111148706  |
0.4493706167937 |       2.2 |    3.8 |        0

(12 rows)

 DROP_TABLE
------------

 t

(1 row)
```

```
CREATE TABLE irisnull AS SELECT * FROM nza..iris;
INSERT INTO irisnull(id,petallength) SELECT id+300, petallength
FROM nza..iris;
INSERT INTO irisnull(id,sepallength,class) SELECT
id+600, sepallength, class FROM nza..iris;
CALL nza..SUMMARY1000NUM('intable=irisnull,
incolumn=SEPALLENGTH;SEPALWIDTH;PETALLENGTH;SEPALWIDTH
, outtable=Result7');
SELECT * FROM result7 ORDER BY columnname,
columnid; CALL nza..DROP_TABLE('Result7'); CALL
nza..DROP_TABLE('irisnull');
```

```
 SUMMARY1000NUM
----------------

 Done

(1 row)

 COLUMNNAME  | COLUMNID | COUNTT |      AVERAGE      |
VARIANCE     |       STDDEV       |      SKEWNESS       |
KURTOSIS      | MINIMUM | MAXIMUM | MISSING

-------------+----------+--------+-----------------
+------------------+------------------+-------------------
+-------------------+---------+---------+---------

 PETALLENGTH |        2 |     300 | 3.7586666666667 |
3.1027674470457 |  1.7614674129957 | -0.27125871891336 |
-1.4007081044659 |        1 |      6.9 |     150
```

```
 SEPALLENGTH |          0 |     300 | 5.8433333333333 |
0.68340022296544 | 0.82668024227354 |  0.31123303635777 |
-0.58165605575527 |      4.3 |      7.9 |       150
 SEPALWIDTH   |          1 |     150 |            3.054 |
0.18800402684564 | 0.43359431136217 |  0.32959862667676 |
0.21983367738595 |        2 |     4.4 |       300
 SEPALWIDTH   |          3 |     150 |            3.054 |
0.18800402684564 | 0.43359431136217 |  0.32959862667676 |
0.21983367738595 |        2 |     4.4 |       300
(4 rows)
 DROP_TABLE
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

```
CREATE TABLE withbooleans as select 'true'::boolean
a, 'true'::boolean b;
INSERT INTO withbooleans
VALUES('true'::boolean, 'true'::boolean);
INSERT INTO withbooleans VALUES('true'::boolean,
'false'::boolean);
INSERT INTO withbooleans VALUES('false'::boolean,
'false'::boolean);
CALL nza..SUMMARY1000NUM('intable=withbooleans,
incolumn=a;b, outtable=wd_05');
SELECT * FROM wd_05 ORDER BY columnname;
CALL nza..DROP_TABLE('wd_05');
CALL nza..DROP_TABLE('withbooleans');
```

```
 SUMMARY1000NUM
----------------
 Done
```

```
(1 row)

 COLUMNNAME | COLUMNID | COUNTT | AVERAGE |      VARIANCE     |
STDDEV      |        SKEWNESS       | KURTOSIS | MINIMUM |
MAXIMUM | MISSING

-----------  +----------  +--------  +---------+ -----------------
+------------------+----------------------         + ---------+---------
+---------+---------

 A          |         0 |      4 |    0.75 |              0.25 |
0.5 |                     -1 |    -1.25 |       0 |        1 |
0

 B          |         1 |      4 |     0.5 | 0.333333333333333 |
0.57735026918963 | -2.8844440295753e-16 |     -2.25 |       0 |
1 |       0

(2 rows)

 DROP_TABLE

------------

 t

(1 row)

 DROP_TABLE

------------

 t

(1 row)
```

Related Functions

category Analytics - Statistics
MOMENTS
SUMMARY1000

SUMMARY1000TIME - Summary of up to 1000 time columns

This stored procedure calculates summary statistics of up to 1000 input columns of type time or timetz. the missing value count, non missing value count, average, variance, standard deviation, skewness, (excess) kur-tosis, minimum and maximum of the input columns is gathered.

Usage

The SUMMARY1000TIME stored procedure has the following syntax:

SUMMARY1000TIME(NVARCHAR(ANY) paramString)

▲ Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the summary statistics

into Type: NVARCHAR(256)

incolumn
the input table columns of type time or timetz separated by a semicolon (;). If this parameter is not specified, all input table columns of type time or timetz are analyzed. Type: NVARCHAR(ANY)

Default: <none>

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

talk
flag indicating whether additional information on the progress of the analysis must be displayed

Type: NVARCHAR(ANY)

Default: no

Returns
NVARCHAR(ANY) an informative string

Details

This stored procedure gathers statistics about the input table columns of type time or timetz. No more than 1000 columns are accepted. Null values are not part of the statistics computation (per column), but are counted.

An output table <outtable> is created with following columns: columnname, columnid, countt, average, variance, stddev, skewness, kurtosis. minimum, maximum, missing. If the parameter by is specified, an additional column grouped_on is added to indicate for which group the statistics have been gathered. A detailed description of the statistics computed here can be found in the documentation of the stored procedure MOMENTS. If statistics cannot be gathered, for example when there are less than 2 values for average, the output table contains a NULL value.

Note that times are stored internally as bigint representing the number of microseconds passed since the begin of the day, plus, for timetz times, an integer representing the number of hours the time zone is shifted from the Greenwich line (plus means towards East). For purposes of analysis the timetz structure is flattened to a bigint indicating time in microseconds at Greenwich. The average, standard devi-ation, minimum and maximum is displayed as an interval. The interval is needed because the timetz may represent the time on the same day as is at Greenwich, the next day (more than 24 hours away) or the pre-vious day ("negative time"). The variance is expressed in "squared seconds".

Examples

```
CREATE TABLE withtimes AS SELECT '00:00:00'::time
a, '00:00:00'::time b;
INSERT INTO withtimes VALUES('00:00:00'::time,
'00:00:00'::time);
INSERT INTO withtimes VALUES('00:30:00'::time,
'00:50:00'::time);
INSERT INTO withtimes VALUES('01:00:00'::time,
'00:10:00'::time);
CALL nza..SUMMARY1000TIME('intable=withtimes, outtable=wd_05');
SELECT * FROM wd_05 ORDER BY columnname;
CALL nza..DROP_TABLE('wd_05');
CALL nza..DROP_TABLE('withtimes');
```

```
 SUMMARY1000TIME
-----------------
 Done
(1 row)
 COLUMNNAME | COLUMNID | COUNTT | AVERAGE  | VARIANCE |
STDDEV      |       SKEWNESS      |      KURTOSIS     | MINIMUM  |
MAXIMUM  | MISSING
------------ +----------- +---------    + ----------+----------
+-----------------+------------------  +-------------------
+----------+----------      +---------
 A          |        0 |      4 | 00:22:30 |  2970000  |
00:28:43.368793 | 0.42728151916399 | -1.7789256198347  |
00:00:00 | 01:00:00 |        0
 B          |        1 |      4 | 00:15:00 |  2040000  |
00:23:48.285685 | 0.88958970044132 | -1.3365051903114  |
00:00:00 | 00:50:00 |        0
(2 rows)
 DROP_TABLE
------------
 t
```

```
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

```
CREATE TABLE withtimetzs AS SELECT
'06:00:00+01'::timetz a, '07:00:00-03'::timetz b;
INSERT INTO withtimetzs VALUES('00:00:00-
01'::timetz, '00:00:00'::timetz);
INSERT INTO withtimetzs VALUES('00:30:00-
02'::timetz, '00:50:00'::timetz);
INSERT INTO withtimetzs VALUES('01:00:00-
03'::timetz, '00:10:00'::timetz);
INSERT INTO withtimetzs VALUES('01:00:00+03'::timetz,
'23:10:00-03'::timetz);
CALL nza..SUMMARY1000TIME('intable=withtimetzs,
outtable=wd_05');
SELECT * FROM wd_05 ORDER BY columnname;
CALL nza..DROP_TABLE('wd_05');
CALL nza..DROP_TABLE('withtimetzs');
```

```
SUMMARY1000TIME
-----------------
 Done
(1 row)
 COLUMNNAME | COLUMNID | COUNTT | AVERAGE  |  VARIANCE  |
STDDEV      |      SKEWNESS      |     KURTOSIS       |
MINIMUM      |      MAXIMUM      | MISSING
------------+----------    +---------+----------      +------------
+-----------------+-------------------
+------------------ +------------------ +-----------------
+---------
 A          |        0 |       5 | 02:06:00 |   97848000 |
02:44:51.814798 | -0.46926215253497 |   -1.386798824613 |
-1 days 22:00:00 | 05:00:00         |       0
 B          |        1 |      5 | 07:26:00 | 1649628000 |
11:16:55.612761 |  0.95908656819197 | -0.97954655695623 |
00:00:00         | 1 days 02:10:00 |       0
(2 rows)
 DROP_TABLE
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
MOMENTS
SUMMARY1000

SUMMARY1000TIMESTAMP - Summary of up to 1000 timestamp columns

This stored procedure calculates summary statistics of up to 1000 input columns of type timestamp. the missing value count, non missing value count, average, variance, standard deviation, skewness, (excess) kur-tosis, minimum and maximum of the input columns is gathered.

Usage

The SUMMARY1000TIMESTAMP stored procedure has the following syntax:

SUMMARY1000TIMESTAMP(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the summary statistics

into Type: NVARCHAR(256)

incolumn
the input table columns of type timestamp separated by a semicolon (;). If this parameter is not

specified, all input table columns of type timestamp are analyzed.

Type: NVARCHAR(ANY)

Default: <none>

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

talk
flag indicating whether additional information on the progress of the analysis must be displayed

Type: NVARCHAR(ANY)

Default: no

Returns
NVARCHAR(ANY) an informative string

Details

This stored procedure gathers statistics about the input table columns of type timestamp. No more than 1000 columns are accepted. Null values are not part of the statistics computation (per column), but are counted.

An output table <outtable> is created with following columns: columnname, columnid, countt, average, variance, stddev, skewness, kurtosis. minimum, maximum, missing. If the parameter by is specified, an additional column grouped_on is added to indicate for which group the statistics have been gathered. A detailed description of the statistics computed here can be found in the documentation of the stored procedure MOMENTS. If statistics cannot be gathered, for example when there are less than 2 values for average, the output table contains a NULL value.

Note that timestamps are stored internally as big integers representing the number of microseconds since January 1st, 2000, 00:00:00. The average, minimum and maximum is displayed as a timestamp. The standard deviation is displayed as an interval. The variance is expressed in "squared seconds".

Examples

```
CREATE TABLE withtimestamps(a timestamp, b
timestamp); INSERT INTO withtimestamps VALUES('2012-
01-02'::timestamp, '2012-01-05'::timestamp);
INSERT INTO withtimestamps VALUES('2012-01-
12'::timestamp, '2012-01-25'::timestamp);
INSERT INTO withtimestamps VALUES('2012-01-
22'::timestamp, '2012-02-13'::timestamp);
```

```
INSERT INTO withtimestamps VALUES('2012-02-01'::timestamp,
'2012-03-03'::timestamp);
CALL nza..SUMMARY1000TIMESTAMP('intable=withtimestamps,
incolumn=a;b, outtable=wd_05');
SELECT * FROM wd_05 ORDER BY columnname;
CALL nza..DROP_TABLE('wd_05');
CALL nza..DROP_TABLE('withtimestamps');
```

```
 SUMMARY1000TIMESTAMP
----------------------
 Done
(1 row)
 COLUMNNAME | COLUMNID | COUNTT |       AVERAGE       |
VARIANCE     |      STDDEV      |       SKEWNESS       |
KURTOSIS     |       MINIMUM        |       MAXIMUM        |
MISSING
------------+----------+--------+---------------------
+-----------------+------------------+---------------------
+------------------+---------------------+---------------------
+---------
 A          |        0 |      4 | 2012-01-17 00:00:00 |
1244159999990.7 | 13 days 21:50:19 | -1.4272670526506e-08 |
-1.7700068011873 | 2012-01-02 00:00:00 | 2012-02-01 00:00:00
| 0
 B          |        1 |      4 | 2012-02-03 06:00:00 |
4635118079998.6 | 25 days 22:02:12 |   -0.024261370611219 |
-1.7622896861944 | 2012-01-05 00:00:00 | 2012-03-03 00:00:00
| 0
(2 rows)
 DROP_TABLE
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
MOMENTS
SUMMARY1000

T_LS_TEST - T-Student test for the linear relationship of two columns

This stored procedure calculates the t-Student statistics of two numeric input columns to evaluate the significance of the linear relationship between them

Usage

The T_LS_TEST stored procedure has the following syntax:

T_LS_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the two numeric input table columns, separated by a semicolon (;). One column must be followed by :X, the other column by :Y.

Type: NVARCHAR(ANY)

slope
the expected direction of dependence

Y=X*slope+constant Type: DOUBLE

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the t-Student statistics

into Type: NVARCHAR(256)

Returns
DOUBLE the probability of the dependence of the two input table columns, or the number of groups in the output table for which t-Student statistics have been calculated

Details

This stored procedure calculates the t-Student statistics between two input columns, either in the whole in-put table or within the groups defined in the column specified by parameter <by>. This t-Student test is a measure saying whether or not the two columns are linearly related with a given slope.

The output table is created with following columns: percentage, t_ls_test. If the parameter by is specified, an additional column <by> is added to indicate for which group the t-Student statistics have been calcu-lated. The column t_ls_test contains a string with the t-Student value, the degree of freedom, the variance and the linear coefficients relating both columns. The column percentage indicates the probability of the de-pendence of the two columns:

If the percentage ranges from 0 to 0.05, the slope is too high,

If the percentage ranges between 0.05 and 0.95, the indicated slope is acceptable, the lower the percent-age the more independent the columns are,

If the percentage ranges between 0.95 and 1, the slope is too low.

Examples

```
CALL nza..T_LS_TEST('intable=nza..iris,
incolumn=petallength:X;sepallength:Y, slope=1.5,
outtable=Result7');
SELECT * FROM result7;
CALL nza..DROP_TABLE('result7');
```

```
 T_LS_TEST
-----------
0.27454143618784
(1 row)


    PERCENTAGE     |
T_LS_TEST
------------------
+------------------------------------------------------------
--------------------
 0.27454143618784 | tStat= -0.600513,    df= 148,
equation= y=4.30557+x*0.409126 , varE=
0.164597 (1 row)


 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..T_LS_TEST('intable=nza..iris,
incolumn=petallength:X;sepallength:Y,
slope=1.5, outtable=Result7, by=class');
SELECT * FROM result7 ORDER BY class;
CALL nza..DROP_TABLE('result7');
```

```
 T_LS_TEST
-----------
         3
(1 row)


     PERCENTAGE       |
T_LS_TEST                                    |  CLASS
--------------------
-------------------------------------------       +------------
 0.0079567225658825 | tStat= -2.4994,    df= 48,
equation= y=4.2212+x*0.536063 , varE= 0.115598       |
setosa
   0.12846187162989 | tStat= -1.14735,   df= 48,
equation= y=2.40752+x*0.828281 , varE= 0.114942     |
versicolor
   0.21891760885789 | tStat= -0.782378,          df= 48,
equation= y=1.05966+x*0.995739 , varE= 0.102345    |
virginica
(3 rows)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
T_ME_TEST
T_PMD_TEST
T_UMD_TEST

T_LS_TEST_S_AGG - T-Student test between linearly dependent samples as string

This function calculates the t-Student statistics of two numeric variables to evaluate the significance of the linear relationship between them

Usage

The T_LS_TEST_S_AGG aggregate has the following syntax:

T_LS_TEST_S_AGG(DOUBLE X, DOUBLE Y, DOUBLE Slope)

Parameters

X
the first variable

Type: DOUBLE

Y
the second variable

Type: DOUBLE

Slope
the constant value indicating the expected direction of dependence

Y=X*Slope+constant Type: DOUBLE

Returns
NVARCHAR(200) a string containing the t-Student statistics, the degree of freedom, the linear equa-tion relating X and Y and the variance of the equation

Details

This function calculates the t-Student statistics between two input variables. This t-Student test is a measure saying whether or not the two columns are linearly related with a given slope.

The tStatistics is Student-t distributed with countX-2 degrees of freedom. The SQL procedure to calculate the same statistics on a given table would look like: SELECT (avgBeta-betaZero) * sqrt(countX-2)/sqrt(varE*(countX-1) + varX*(countX-1)) AS tStatistics FROM (SELECT COUNT(x-y) AS countX, VAR(y-avg-Beta*x-avgAlpha) AS varE, VAR(x) AS varX FROM myTable, (SELECT SUM((x-avgix)*(y-avgiy))/SUM((x-avgix)*(x-avgix)) AS avgBeta avgiy-avgix*SUM((x-avgix)*(y-avgiy))/SUM((x-avgix)*(x-avgix)) AS avgAlpha FROM myTable, (SELECT AVG(x) AS avgix, AVG(y) AS avgiy FROM myTable) AS One) as Two)

Examples

```
SELECT nza..T_LS_TEST_S_AGG(petallength,sepallength,1.5),
nza..PT(nza..T_LS_TEST_S_AGG(petallength,sepallength,1.5)
) FROM nza..iris;

                                  T_LS_TEST_S_AGG
|        PT

---------------------------------------------------------
------------------------+-----------------
 tStat= -0.600513,       df=148,         equation=
 y=4.30557+x*0.409126 , varE=0.164597    |
0.27454143618784

(1 row)
```

Related Functions

category Analytics - Statistics
PT
T_LS_TEST

T_ME_TEST - T-Student test for the expected mean of a column

This stored procedure calculates the t-Student statistics of a numeric input column to evaluate the significance of the difference between the sample mean and an expected mean value

Usage

The T_ME_TEST stored procedure has the following syntax:

T_ME_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the numeric input table

column Type: NVARCHAR(128)

mean
the expected mean value of the input column

Type: DOUBLE

by
the input table column which splits the data into groups for which the operation is to be per-formed

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the t-Student statistics

into Type: NVARCHAR(256)

Returns
DOUBLE the probability of the input table column to have the expected mean, or the number of groups in the output table for which t-Student statistics have been calculated

Details

This stored procedure calculates the t-Student statistics of an input column with the expected mean, either in the whole input table or within the groups defined in the column specified by parameter <by>. This t-Stu-dent test is a measure saying whether or not the column has the given mean.

The output table is created with following columns: percentage, t_me_test. If the parameter by is specified, an additional column <by> is added to indicate for which group the t-Student statistics have been calcu-lated. The column t_me_test contains a string with the t-Student value and the degree of freedom. The column percentage indicates the probability of the column to have the expected mean value:

If the percentage ranges from 0 to 0.05, the expected mean value is significantly too high,

If the percentage ranges between 0.05 and 0.95, the expected mean value matches the mean value of the column,

If the percentage ranges between 0.95 and 1, the expected mean value is significantly too low.

Examples

```
CALL nza..T_ME_TEST('intable=nza..iris, incolumn=petallength,
mean=3.76, outtable=Result7');
SELECT * FROM result7;
CALL nza..DROP_TABLE('result7');
```

```
    T_ME_TEST
-----------------
 0.4963139801387
(1 row)


    PERCENTAGE   |           T_ME_TEST
-----------------+ -------------------------------
  0.4963139801387| tStat= -0.00925513,      df= 149
```

```
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL
nza..T_ME_TEST('intable=nza..iris,incolumn=petallength
, mean=3.76, outtable=Result7, by=class');
SELECT * FROM result7 ORDER BY class;
CALL nza..DROP_TABLE('result7');
```

```
 T_ME_TEST
-----------
         3
(1 row)

    PERCENTAGE    |          T_ME_TEST             |   CLASS
+------------------------------ +----------------------------

                0 | tStat= -93.5685,   df= 49  | setosa
  0.99999999948581 | tStat= 7.52384,    df= 49    |
versicolor
                1 | tStat= 22.9597,    df= 49    |
virginica
(3 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
T_LS_TEST
T_PMD_TEST
T_UMD_TEST

T_ME_TEST_S_AGG - T-Student test for the expected mean of a variable as string

This function calculates the t-Student statistics of a numeric variable to evaluate the significance of the dif-ference between the sample mean and an expected mean value

Usage

The T_ME_TEST_S_AGG aggregate has the following syntax:

T_ME_TEST_S_AGG(DOUBLE X, DOUBLE mean)

Parameters

X
the input variable

Type: DOUBLE

mean
a constant indicating the expected mean value of the input

variable Type: DOUBLE

Returns
NVARCHAR(200) a string containing the t-Student statistics and the degree of freedom of the input variable

Details

This function calculates the t-Student statistics and the degree of freedom of an input column with the expected mean. This t-Student test is a measure saying whether or not the column has the given mean.

Examples

```
SELECT nza..T_ME_TEST_S_AGG(petallength,3.76) FROM nza..iris;

         T_ME_TEST_S_AGG
--------------------------------
  tStat= -0.00925513,    df= 149
 (1 row)
```

Related Functions

category Analytics - Statistics
T_ME_TEST

T_PMD_TEST - T-Student test for the expected mean difference between two paired columns

This stored procedure calculates the t-Student statistics of two paired numeric input columns to evaluate the significance of the difference of their mean values compared with an expected value

Usage

The T_PMD_TEST stored procedure has the following syntax:

T_PMD_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the t-Student statistics

into Type: NVARCHAR(256)

incolumn
the two numeric input table columns, separated by a semicolon (;). One column must be followed by :X, the other column by :Y.

Type: NVARCHAR(ANY)

expdiff
the expected difference between the mean values of the input columns (Y -

X) Type: DOUBLE

Default: 0

by
the input table column which splits the data into groups for which the operation is to be performed

Type: NVARCHAR(128)

Default: <none>

Returns

DOUBLE the probability of the two input table columns to take different values by expdiff in aver-age, or the number of groups in the output table for which t-Student statistics have been calculated

Details

This stored procedure calculates the t-Student statistics of two paired columns, either in the whole input table or within the groups defined in the column specified by parameter <by>. This t-Student test is a meas-ure saying whether or not the two columns take different values, on average distinct by <expdiff>.

The output table is created with following columns: percentage, tstudpairedmeandiff. If the parameter by is specified, an additional column <by> is added to indicate for which group the t-Student statistics have been calculated. The column tstudpairedmeandiff contains a string with the t-Student value and the degree of freedom. The column percentage indicates the probability of the column to have the expected mean value:

If the percentage ranges from 0 to 0.05, the column Y has significantly bigger values than the column X,

If the percentage ranges between 0.05 and 0.95, the expected mean difference value matches the differ-ence between the mean values of the two columns,

If the percentage ranges between 0.95 and 1, the column Y has significantly smaller values than the column X.

Examples

```
CALL nza..T_PMD_TEST('intable=nza..iris,
incolumn=petallength:X;sepallength:Y,
outtable=Result7, by=class');
SELECT * FROM result7 ORDER BY class;
CALL nza..DROP_TABLE('result7');
```

```
 T_PMD_TEST
------------
          3
(1 row)

 PERCENTAGE |     TSTUDPAIREDMEANDIFF      |    CLASS
------------+-------------------------- +------------
           0| tStat= -71.6829,   df= 49  | setosa
           0| tStat= -34.0059,   df= 49  | versicolor
           0| tStat= -22.8981,   df= 49  | virginica
(3 rows)

 DROP_TABLE
------------
 t
```

```
(1 row)


CALL nza..T_PMD_TEST('intable=nza..iris,
incolumn=petallength:X;sepallength:Y,
outtable=Result7'); SELECT * FROM result7;
CALL nza..DROP_TABLE('result7');
 T_PMD_TEST
------------
          0
(1 row)

 PERCENTAGE |     TSTUDPAIREDMEANDIFF
------------+----------------------------
          0 | tStat= -22.8226,   df= 149
(1 row)

 DROP_TABLE
------------
 t
(1 row)


CALL nza..T_PMD_TEST('intable=nza..iris,
incolumn=petallength:X;sepallength:Y,
outtable=Result7, expdiff=-2');
SELECT * FROM result7;
CALL nza..DROP_TABLE('result7');
 T_PMD_TEST
------------
0.17773404645354
(1 row)
```

```
    PERCENTAGE    |      TSTUDPAIREDMEANDIFF
------------------+------------------------------
 0.17773404645354 | tStat= -0.926918,    df= 149
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
T_LS_TEST
T_ME_TEST
T_UMD_TEST
WILCOXON_TEST

T_PMD_TEST_S_AGG - T-Student test for the expected mean difference between two paired variables as string

This function calculates the t-Student statistics of two paired numeric input columns to evaluate the signific-ance of the difference of their mean values compared with an expected value

Usage

The T_PMD_TEST_S_AGG aggregate has the following syntax:

T_PMD_TEST_S_AGG(DOUBLE X, DOUBLE Y, DOUBLE expdiff)

Parameters

X
the first input variable

Type: DOUBLE

Y
the second input

variable Type: DOUBLE

expdiff
a constant indicating the expected difference between the mean values of X and Y

Type: DOUBLE

Returns
NVARCHAR(200) a string containing the t-Student statistics and the degree of freedom of the input variables

Details

This function calculates the t-Student statistics and the degree of freedom of two paired columns. This t-Student test is a measure saying whether or not the two columns take different values, on average distinct by <expdiff>.

Examples

```
SELECT nza..T_PMD_TEST_S_AGG(petallength,sepallength,-2)
FROM nza..iris;

       T_PMD_TEST_S_AGG
------------------------------
 tStat= -0.926918,      df= 149
(1 row)
```

Related Functions

category Analytics - Statistics
T_PMD_TEST

T_TEST_AGG - T-Student test of a variable split into two classes

This function calculates the t-Student statistics of a numeric variable split into two classes

Usage

The T_TEST_AGG aggregate has the following syntax:

T_TEST_AGG(INT4 class, DOUBLE X)

Parameters

class
the class (1 or 2) of the input variable value. Rows with a class other than 1 and 2 are ignored

Type: INT4

Min: 1

Max: 2

X
the input variable

Type: DOUBLE

Returns
DOUBLE the t-Student statistics for the two classes of the input variable

Details

This function calculates the t-Student statistics for an input variable whose values are split into two classes 1 and 2. The classes can be of unequal size and the values in it have different variances.

Examples

```
SELECT nza..T_TEST_AGG(case when class='setosa' then 1 when
class='virginica' then 2 when class='versicolor' then 0 else
0 end,petallength) FROM nza..iris;
    T_TEST_AGG
------------------
 -49.965703359356
(1 row)
```

Related Functions

category Analytics - Statistics
T_TEST_S_AGG

T_TEST_S_AGG - T-Student test of a variable split into two classes as string

This function calculates the t-Student statistics of a numeric variable split into two classes

Usage

The T_TEST_S_AGG aggregate has the following syntax:

T_TEST_S_AGG(INT4 class, DOUBLE X)
Parameters
class
the class (1 or 2) of the input variable value. Rows with a class other than 1 and 2 are ignored Type: INT4

Min: 1

Max: 2

X
the input variable

Type: DOUBLE

Returns
NVARCHAR(200) a string containing the t-Student statistics and the degree of freedom for the two classes of the input variable

Details

This function calculates the t-Student statistics and the degree of freedom for an input variable whose values are split into two classes 1 and 2. The classes can be of unequal size and the values in it have different variances.

Examples

```
SELECT nza..PT(nza..T_TEST_S_AGG(case when
class='setosa' then 0 when class='virginica' then 1 when
class='versicolor' then 2 else 0 end,petallength)),
nza..T_TEST_S_AGG(case when class='setosa' then 0 when
class='virginica' then 1 when class='versicolor' then 2
else 0 end,petallength) FROM nza..iris;
 PT |        T_TEST_S_AGG
----+---------------------------
  1 | tStat= 12.6038,    df= 95
(1 row)
```

Related Functions

category Analytics - Statistics
PT
T_TEST_AGG

T_UMD_TEST - T-Student test for the expected mean difference between class values of a column

This stored procedure calculates the t-Student statistics of a numeric input column, whose values are split into two classes, to evaluate the significance of the difference of the class mean values

Usage

The T_UMD_TEST stored procedure has the following syntax:

T_UMD_TEST(NVARCHAR(ANY) paramString)

▲ Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

outtable
the output table to write the t-Student statistics

into Type: NVARCHAR(256)

incolumn
the numeric input table

column Type: NVARCHAR(128)

class
the input table column which splits data into two classes. The class column name is followed by two class values preceded by a colon (:).

Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be per-formed

Type: NVARCHAR(128)

Default: <none>

Returns
DOUBLE the probability of the input table column to have similar mean values in both classes, or the number of groups in the output table for which t-Student statistics have been calculated

Details

This stored procedure calculates the t-Student statistics of a column whose values are split into two classes, either in the whole input table or within the groups defined in the column specified by parameter <by>. This t-Student test is a measure saying whether or not the two classes have the same mean value.

The output table is created with following columns: percentage, t_umd_test. If the parameter by is spe-cified, an additional column <by> is added to indicate for which group the t-Student statistics have been cal-culated. The column t_umd_test contains a string with the t-Student value and the degree of freedom. The column percentage indicates the probability of the column to have the expected mean value:

If the percentage ranges from 0 to 0.05, the second class has a significantly bigger mean value than the first class,

If the percentage ranges between 0.05 and 0.95, the two classes have the same mean value,

If the percentage ranges between 0.95 and 1, the second class has a significantly smaller mean value than the first class.

Examples

```
CALL nza..T_UMD_TEST('intable=nza..iris, incolumn=petallength,
class=class:"virginica":"setosa",
outtable=Result7'); SELECT * FROM result7;
CALL nza..DROP_TABLE('result7');
```

```
 T_UMD_TEST
------------
          1
(1 row)

 PERCENTAGE |         T_UMD_TEST
------------+---------------------------
          1 | tStat= 49.9657,    df= 58
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..T_UMD_TEST('intable=nza..iris,
incolumn=sepalwidth,
class=class:"virginica":"versicolor", outtable=Result7');
SELECT * FROM result7;
CALL nza..DROP_TABLE('result7');
```

```
    T_UMD_TEST
------------------
 0.99908780317504
(1 row)

    PERCENTAGE    |         T_UMD_TEST
------------------+---------------------------
 0.99908780317504 | tStat= 3.20576,      df= 97
```

```
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
PT
T_LS_TEST
T_ME_TEST
T_PMD_TEST
MWW_TEST

TANET_APPLY - Apply a tree-augmented network model

This stored procedure applies a tree-augmented network model to generate regression predictions for a dataset

Usage

The TANET_APPLY stored procedure has the following syntax:

TANET_APPLY(NVARCHAR(ANY) paramString)

Parameters

paramString

A comma-separated list of <parameter>=<value> entries using the parameters below. Type: NVARCHAR(ANY)

model

The Bayesian Network model to apply. Type: NVARCHAR(ANY)

intable

The name of the table containing input. Type: NVARCHAR(256)

id

The name of the column in the input table that identifies a unique instance ID. Type: NVARCHAR(128)

target

The model variable to be predicted.

Type: NVARCHAR(128)

outtable
The name of the output table where the predictions are to be

stored. Type: NVARCHAR(256)

type
The type of prediction to be made. Valid values are: best (most correlated neighbor).

Type: NVARCHAR(ANY)

Default: best

Returns
NVARCHAR(3000) A termination message

Details

This procedure predict values of a continuous variable using a tree-augmented network model generated by TANET_GROW. Only one approach may be exploited:

type=best: most strongly correlated neighbor. In the tree-augmented network, the target vari-able's direct neighbors are identified. The neighbor is selected that has the strongest correlation to the target variable, according to its class. The input table column value corresponding to this neighbor is then used for prediction.

The output table contains following columns: <id>, <target>_pred.

Examples

```
CALL nza..TBNET_GROW('model=struc_iris,
intable=nza..iris,
incolumn=SEPALLENGTH;SEPALWIDTH;PETALLENGTH;PETALWIDTH');

CALL nza..TANET_GROW('model=plstruc_iris,
intable=nza..iris, class=class, inmodel=struc_iris');

CALL nza..TANET_APPLY('model=plstruc_iris,
intable=nza..iris, id=id, target=PETALLENGTH,
outtable=iris_pred');

SELECT a.*, b.petallength, b.class FROM iris_pred
a,nza..iris b WHERE a.id=b.id AND mod(a.id,50)<3 ORDER
BY id;
CALL nza..DROP_MODEL('model=struc_iris');

CALL nza..DROP_MODEL('model=plstruc_iris');

CALL nza..DROP_TABLE('iris_pred');
```

```
             TBNET_GROW
-------------------------------------
```

```
 Over node no4in TBNet_Grow process
(1 row)

 TANET_GROW
------------
          9
(1 row)

 TANET_APPLY
-------------
 Done
(1 row)

ID   | PETALLENGTH_PRED | PETALLENGTH |   CLASS
-----+----------------- +-------------+-----------
   1  |  1.4695964749536|         1.4| setosa
   2  |  1.4695964749536|         1.4| setosa
  50  |  1.4695964749536|         1.4| setosa
  51  |  4.4346825882007|         4.7| versicolor
  52  |  4.6216150587153|         4.5| versicolor
 100  |  4.2477501176862|         4.1| versicolor
 101  |  5.3484352725181|           6| virginica
 102  |  4.9733948945806|         5.1| virginica
 150  |  5.0484029701681|         5.1| virginica
(9 rows)

 DROP_MODEL
------------
 t
(1 row)

 DROP_MODEL
------------
```

```
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
TANET_GROW
TBNET_APPLY
TBNET_GROW

TANET_CLASSAPPLY - Apply a tree-augmented network

The prediction is done based on the closest neighbor.

Usage

The TANET_CLASSAPPLY stored procedure has the following syntax:

TANET_CLASSAPPLY

Parameters

paramString
input parameters specification

Type: NVARCHAR(ANY)

intable
table name

Type: NVARCHAR(ANY)

model
the name of table with the

model Type: NVARCHAR(ANY)

id
the name of the variable that identifies the cases in the

intable Type: NVARCHAR(ANY)

alpha
- degree of mixture of TAN and naive bayes

Type: NVARCHAR(ANY)

locality
= L or G for local or global estimate

Type: NVARCHAR(ANY)

outtable
result table name;

Type: NVARCHAR(ANY)

Returns
NVARCHAR(ANY) - temporarily a termination message

Details

The Bayesian network, which is described by a model that is generated by TANet_Grow, is used for value prediction in a continuous table. The prediction is based on the formula E(Y|X) = EY +* r sigma_y *{X-EX}/sigma_x}.

Prediction is done by the most strongly correlated neighbor in the Bayesian network (type=best).

In the Bayesian network, the direct neighbors of the target variable are identified. Their correlations to the target variable are compared through the absolute value, and the variable that has the strongest correlation to the target variable is selected. The selected variable is then used for prediction.

Examples

```
drop table struc_iris;

call nza..TBNet_Grow('intable=nza..iris,incolumn=SEPALLENGTH;
SEPALWIDTH; PETALLENGTH; PETALWIDTH,model=struc_iris');

drop table plstruc_iris;

call
nza..TANet_Grow('intable=nza..iris,class=class,inmodel=struc_iri
s,model=plstruc_iris');
drop table xxxx;

call nza..TANet_classapply('intable=nza..iris,id=id

,outtable=xxxx,model=plstruc_iris');

select xxxx.*,iris.class from xxxx,nza..iris
where xxxx.id=iris.id and mod(xxxx.id,50)<3;
```

```
 ID  |        setosa        |     versicolor    |      virginica
|   THECLASS   |   CLASS

-----+---------------------+------------------
+-------------------+--------------+------------

  52 |    5832.1062454441 | 0.32584847709342 |
3.5956098612882 | "versicolor" | versicolor

 100 |    2205.8997420564 | 0.16809775183382 |
53.604305455093 | "versicolor" | versicolor

   2 |  0.079752356340823 |  1400.5304766943 |
1325.0715820345 | "setosa"     | setosa

  50 |  0.027765922281455 |  1098.7174459793 |
1054.1646366836 | "setosa"     | setosa

 102 |     10243.200694846 |  6.3633234501984 |
3.6539363034276 | "virginica"    | virginica

 150 |    9943.6666708225 |  8.8681276552651 |
2.2810345426083 | "virginica"  | virginica

   1 | 0.0057680745330313 |  899.42153810855 |
869.97595458162 | "setosa"     | setosa

 101 |     35319.288016761 |  411.01353877088 |
0.025474879139092 | "virginica"  | virginica

  51 |    7135.0623567413 |  2.8102743005517 |
0.12221517332065 | "virginica" | versicolor

(9 rows)
```

Related Functions

category Analytics - Regression
TANET_GROW

TANET_GROW - Build a tree-augmented network model

This stored procedure builds a tree-augmented network model from a tree-like Bayesian Network model. The Bayesian Network model is augmented according to the classes of a nominal target column.

Usage

The TANET_GROW stored procedure has the following syntax:

TANET_GROW(NVARCHAR(ANY) paramString)

Parameters

paramString

A comma-separated list of <parameter>=<value> entries using the parameters below. Type: NVARCHAR(ANY)

model
The tree-augmented Network model to

build. Type: NVARCHAR(ANY)

inmodel
The name of the input Bayesian Network

model. Type: NVARCHAR(ANY)

intable
The name of the table containing input. This should be the same input table as used in TBNET_GROW to build <inmodel>, otherwise it must contain the same columns.
Type: NVARCHAR(256)

class
The nominal column of the input table representing the

class. Type: NVARCHAR(128)

edgelabsort
if edgelabsort=yes then the left end of the edge will have a name lower in alphabetic order than the right one

Type: NVARCHAR(ANY)

Default: <none>

Returns
INT8 The number of correlations in the model.

Details

This procedure builds a tree-augmented network model, which is a set of tree-like Bayesian Networks such that the tree structure is developed for the whole dataset but the actual correlations are derived for a specific subset of the data, identified by the class variable. The model is stored as a set of edges, storing for each class the correlation between two columns and the mean and standard deviation of both columns.

The model can be applied using stored procedure TANET_APPLY.

Examples

```
CALL nza..TBNET_GROW('model=struc_iris, intable=nza..iris,
incolumn=SEPALLENGTH;SEPALWIDTH;PETALLENGTH;PETALWIDTH,coldefrol
e=ignore');
CALL nza..TANET_GROW('model=plstruc_iris,
intable=nza..iris, class=class, inmodel=struc_iris');
SELECT * FROM nza_meta_plstruc_iris_model ORDER BY
grouped_on, varxname, varyname;
CALL nza..DROP_MODEL('model=struc_iris');
CALL nza..DROP_MODEL('model=plstruc_iris');

             TBNET_GROW
-------------------------------------
```

```
 Over node no4in TBNet_Grow process
(1 row)

 TANET_GROW
------------
          9
(1 row)

 GROUPED_ON |  VARXNAME   |    VARXMEAN      |
VARXSTDDEV    |  VARYNAME   |      VARYMEAN     |
VARYSTDDEV    |       CORR
           +-------------       +---------------- +------------------
+------------------------------        +------------
+------------------  +------------------
 setosa     | PETALLENGTH | 1.4938775510204 |
0.17351115943645 | PETALWIDTH  | 0.24897959183673 |
0.10720950308168  | 0.30630821115803
 setosa     | PETALLENGTH | 1.4938775510204 |
0.17351115943645 | SEPALLENGTH |  5.1081632653061 |
0.35248968721346  | 0.26387409291868
 setosa     | SEPALWIDTH  | 3.4877551020408 |
0.38102439795469 | PETALLENGTH |  1.4938775510204 |
0.17351115943645 |   0.1766946286968
 versicolor | PETALLENGTH | 4.3469387755102 |
0.46991097723996 | PETALWIDTH  |  1.3530612244898 |
0.19775268000454 |   0.7866680885228
 versicolor | PETALLENGTH | 4.3469387755102 |
0.46991097723996 | SEPALLENGTH |  6.0571428571429 |
0.51617114706387  | 0.75404895859202
 versicolor | SEPALWIDTH  | 2.8265306122449 |
0.31379832337841 | PETALLENGTH |  4.3469387755102 |
0.46991097723996  | 0.56052209169299
 virginica  | PETALLENGTH |   5.665306122449 |
0.55189469566398 | PETALWIDTH  |  2.0673469387755 |
0.27465005563667 |   0.3221082159003
 virginica  | PETALLENGTH |   5.665306122449 |
0.55189469566398 | SEPALLENGTH |  6.7224489795918 |
0.63587959327443  | 0.86422473293558
 virginica  | SEPALWIDTH  |   3.034693877551 |
0.32249663817264 | PETALLENGTH |    5.665306122449 |
0.55189469566398 | 0.40104457734279

(9 rows)


 DROP_MODEL
------------
 t
(1 row)


 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
CORRELATION1000MATRIX
TANET_APPLY
TBNET_GROW

TBNET1G - Build a tree-like Bayesian Network model

This stored procedure builds a tree-like Bayesian Network for continuous variables. A spanning tree is con-structed joining all the variables on grounds of most strong correlations. This gives the user an overview of most significant interrelations governing the whole set of variables.

Usage

The TBNET1G stored procedure has the following syntax:

TBNET1G(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Bayesian Network model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
The input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

type: ':nom' (for nominal), ':cont' (for continuous). By default, all numerical types are continuous, other types are nominal

role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':col-weight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties. Note that this procedure only accepts continuous columns with role 'input'.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
The default type of the input table columns. Valid values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
The default role of the input table columns. Allowed values are 'input' and 'ignore'.

If the parameter is undefined, all columns are considered 'input' columns.

Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
The input table where column properties for the input table columns are stored. The format of this table is the output format of the nza..COLUMN_PROPERTIES() stored procedure.

If the parameter is undefined, the input table column properties is detected automat-ically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsup-ported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsup-ported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

baseidx
the numeric id to be assigned to the first

variable Type: int4

Default: 777

samplesize
the sample size to take if the number of records is too

large Type: int4

Default: 330000

talk
if talk=yes then additional information on progress will be

displayed Type: NVARCHAR(ANY)

Default: <none>

nocheck
if nocheck=yes then no exception is thrown when a column in <incolumn> does not

exist Type: NVARCHAR(ANY)

Default: <none>

edgelabsort
if edgelabsort=yes then the left end of the edge will have a name lower in alphabetic order than the right one

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(3000) a termination message

Details

This stored procedure builds a Bayesian Network over the given input table columns. The model is stored as a set of edges, storing the correlation between two columns. A sampling approach is taken to overcome the computational complexity.

If parameter talk=yes, the stored procedure displays notices during the computation. This can be useful for a larger number of columns.

The model cannot be applied using stored procedure as a model built by TBNET_GROW.

Examples

```
CALL  nza..TBNET1G('model=struc_iris,  intable=nza..iris,
incolumn=SEPALLENGTH;SEPALWIDTH;PETALLENGTH;PETALWIDTH,
talk=yes,coldefrole=ignore');
SELECT varxname, varyname, corr::numeric(6,4) AS corr FROM

nza_meta_struc_iris_model ORDER BY varxname, varyname;
```

```
CALL nza..DROP_MODEL('model=struc_iris');
             TBNET1G
----------------------------------
 Over node no4in TBNet1g process
(1 row)

  VARXNAME    |  VARYNAME    |  CORR
------------- +-------------+---------
 PETALLENGTH | PETALWIDTH  |  0.9628
 PETALLENGTH | SEPALLENGTH |  0.8718
 PETALLENGTH | SEPALWIDTH  | -0.4205
(3 rows)

 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
TBNET1G2P
TBNET2G
TBNET_GROW

TBNET1G2P - Build a tree-like Bayesian Network model

This stored procedure builds a tree-like Bayesian Network for continuous variables. A spanning tree is constructed joining all the variables on grounds of most strong correlations. This gives the user an overview of most significant interrelations governing the whole set of variables.

The stored procedure constructs the tree in an incremental manner. It calculates correlations on one set of variables, then on the other set of variables, then between variables of the 2 sets. The final model is obtained by joining the three sub-models.

Usage

The TBNET1G2P stored procedure has the following syntax:

TBNET1G2P(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Bayesian Network model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
The input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

type: ':nom' (for nominal), ':cont' (for continuous). By default, all numerical types are continu-ous, other types are nominal

role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':colweight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties. Note that this procedure only accepts continuous columns with role 'input'. Additionally, each column is followed by a colon (:) and either X or Y to distinguish the two sets of variables.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
The default type of the input table columns. Valid values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
The default role of the input table columns. Allowed values are 'input' and 'ignore'.

If the parameter is undefined, all columns are considered 'input' columns.

Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
The input table where column properties for the input table columns are stored. The format of this table is the output format of the nza..COLUMN_PROPERTIES() stored procedure.

If the parameter is undefined, the input table column properties is detected automat-ically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsup-ported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsup-ported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

baseidx
the numeric id to be assigned to the first

variable Type: int4

Default: 777

talk
if talk=yes then additional information on progress will be

displayed Type: NVARCHAR(ANY)

Default: <none>

nocheck
if nocheck=yes then no exception is thrown when a column in <incolumn> does not exist

Type: NVARCHAR(ANY)

Default: <none>

edgelabsort
if edgelabsort=yes then the left end of the edge will have a name lower in alphabetic order than the right one

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(3000) a termination message

Details

This stored procedure builds a Bayesian Network over the given input table columns of set X, then of set Y, and then between variables of X and Y. All three sub-models are merged into one Bayesian Network model. The model is stored as a set of edges, storing the correlation between two columns.

If parameter talk=yes, the stored procedure displays notices during the computation. This can be useful for a larger number of columns.

The model cannot be applied using stored procedure as a model built by TBNET_GROW.

Examples

```
CALL nza..TBNET1G2P('model=struc_iris, intable=nza..iris,
incolumn=SEPALLENGTH:X;SEPALWIDTH:X;PETALLENGTH:Y;PETALWIDTH:Y,c
oldefrole=ignore');
SELECT varxname, varyname, corr::numeric(6,4) AS corr FROM
nza_meta_struc_iris_model ORDER BY varxname, varyname;
CALL nza..DROP_MODEL('model=struc_iris');
```

```
       TBNET1G2P
-----------------------
 Over node no2 plus  2
(1 row)

  VARXNAME   |  VARYNAME   |  CORR
-------------+-------------+---------
 PETALLENGTH | PETALWIDTH  |  0.9628
 SEPALLENGTH | PETALLENGTH |  0.8718
 SEPALWIDTH  | PETALLENGTH | -0.4205
(3 rows)

 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
TBNET1G
TBNET2G
TBNET_GROW

TBNET2G - Build a tree-like Bayesian Network model in bi-partite mode

This stored procedure builds a tree-like Bayesian Network for continuous variables. A spanning tree is constructed joining all the variables on grounds of most strong correlations. This gives the user an overview of most significant interrelations governing the whole set of variables.

The stored procedure operates with two sets of variables and the resulting tree will be bi-partite. The correlations between variables within each set will not be calculated. This feature is useful when the two sets characterize distinct objects and only links between the objects are of interest.

Usage

The TBNET2G stored procedure has the following syntax:

TBNET2G(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the Bayesian Network model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
The input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

type: ':nom' (for nominal), ':cont' (for continuous). By default, all numerical types are continuous, other types are nominal

role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':col-weight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties. Note that this procedure only accepts continuous columns with role 'input'. Addition-ally, each column is followed by a colon (:) and either X or Y to distinguish the two sets of variables.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype

The default type of the input table columns. Valid values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
The default role of the input table columns. Allowed values are 'input' and 'ignore'.

If the parameter is undefined, all columns are considered 'input' columns.

Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
The input table where column properties for the input table columns are stored. The format of this table is the output format of the nza..COLUMN_PROPERTIES() stored procedure.

If the parameter is undefined, the input table column properties is detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsupported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsupported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

baseidx
the numeric id to be assigned to the first

variable Type: int4

Default: 777

talk
if talk=yes then additional information on progress will be

displayed Type: NVARCHAR(ANY)

Default: <none>

nocheck
if nocheck=yes then no exception is thrown when a column in <incolumn> does not

exist Type: NVARCHAR(ANY)

Default: <none>

edgelabsort
if edgelabsort=yes then the left end of the edge will have a name lower in alphabetic order than the right one

Type: NVARCHAR(ANY)

Default: <none>

Returns

NVARCHAR(3000) a termination message

Details

This stored procedure builds a Bayesian Network over the given input table columns between set X and Y. The model is stored as a set of edges, storing the correlation between a column of set X and a column of set Y. A sampling approach is taken to overcome the computational complexity.

If parameter talk=yes, the stored procedure displays notices during the computation. This can be useful for a larger number of columns.

The model cannot be applied using stored procedure as a model built by TBNET_GROW.

Examples

```
CALL nza..TBNET2G('model=struc_iris, intable=nza..iris,
incolumn=SEPALLENGTH:X;SEPALWIDTH:X;PETALLENGTH:Y;PETALWI
DTH:Y,coldefrole=ignore');
SELECT varxname, varyname, corr::numeric(6,4) AS
corr FROM nza_meta_struc_iris_model ORDER BY
varxname, varyname;
CALL nza..DROP_MODEL('model=struc_iris');
```

```
        TBNET2G
-----------------------
 Over node no2 plus  2
(1 row)

  VARXNAME   |   VARYNAME   |  CORR
-------------+-------------+---------
 SEPALLENGTH | PETALLENGTH |  0.8718
 SEPALLENGTH | PETALWIDTH  |  0.8180
 SEPALWIDTH  | PETALLENGTH | -0.4205
(3 rows)

 DROP_MODEL
------------
 t
(1 row)
```

```
CALL nza..TBNET2G('model=struc_iris, intable=nza..iris,
incolumn=SEPALLENGTH|SEPALWIDTH:X;PETALLENGTH|
PETALWIDTH:Y,coldefrole=ignore');
SELECT varxname, varyname, corr::numeric(6,4) AS corr FROM
nza_meta_struc_iris_model ORDER BY varxname, varyname;
CALL nza..DROP_MODEL('model=struc_iris');
```

```
 TBNET2G
-----------------------
 Over node no2 plus  2
(1 row)

  VARXNAME    |  VARYNAME    |  CORR
-------------+-------------+---------
 SEPALLENGTH | PETALLENGTH |  0.8718
 SEPALLENGTH | PETALWIDTH  |  0.8180
 SEPALWIDTH  | PETALLENGTH | -0.4205
(3 rows)

 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
TBNET1G
TBNET1G2P
TBNET_GROW

TBNET_APPLY - Apply a tree-like Bayesian Network model

This procedure applies a tree-like Bayesian model to generate regression predictions for a dataset.

Usage

The TBNET_APPLY stored procedure has the following syntax:

TBNET_APPLY(NVARCHAR(ANY) paramString)

Parameters

paramString

A comma-separated list of <parameter>=<value> entries using the parameters below. Type: NVARCHAR(ANY)

model

The Bayesian Network model to apply. Type: NVARCHAR(ANY)

intable

The name of the table containing input. Type: NVARCHAR(256)

id

The column of the input table that identifies a unique instance ID. Type: NVARCHAR(128)

target

The model variable to be predicted. Type: NVARCHAR(128)

outtable

The name of the output table where the predictions are to be stored. Type: NVARCHAR(256)

type

The type of prediction to be made. Valid values are best (most correlated neighbor), neighbors (weighted prediction of neighbors), and nn-neighbors (non null neighbors). Type: NVARCHAR(ANY)

Default: best

Returns

NVARCHAR(3000) A termination message.

Details

This procedure predicts values of a continuous variable using a Bayesian Network model generated by TBNET_GROW. Three different approaches may be exploited:

type=best: most strongly correlated neighbor. In the Bayesian network, the target variable's dir-ect neighbors are identified. The neighbor is selected that has the strongest correlation to the tar-get variable. The input table column value corresponding to this neighbor is then used for predic-tion.

type=neighbors: all direct neighbors. In the Bayesian network, the target variable's direct neighbors are identified. The input table column values corresponding to these neighbors is then used for prediction, Their contribution is weighted by their squared correlation in the model.

type=nn-neighbors: all non-null direct neighbors. The prediction is made as in (2), but taking into ac-count non-null column values of the direct neighbors only. Note at this point that no prediction at all is made in case (2) when there are any missing values among the neighbors of the target variable.

The output table contains following columns: <id>, <target>_pred.

Examples

```
CALL nza..TBNET_GROW('model=struc_iris, intable=nza..iris,
incolumn=SEPALLENGTH;SEPALWIDTH;PETALLENGTH;PETALWIDTH');
CALL nza..TBNET_APPLY('model=struc_iris, intable=nza..iris,
id=id, target=PETALLENGTH, outtable=iris_pred');
SELECT a.*, b.petallength, b.class FROM iris_pred a, nza..iris b
WHERE a.id=b.id AND mod(a.id,50)<3 ORDER BY id;
CALL nza..DROP_MODEL('model=struc_iris');
CALL nza..DROP_TABLE('iris_pred');
```

```
             TBNET_GROW
-------------------------------------
 Over node no4in TBNet_Grow process
(1 row)

 TBNET_APPLY
-------------
 Done
(1 row)

ID   | PETALLENGTH_PRED | PETALLENGTH |    CLASS
-----+------------------ +-------------+------------
   1  |  1.5357492071881 |          1.4| setosa
   2  |  1.5357492071881 |          1.4| setosa
  50  |  1.5357492071881 |          1.4| setosa
  51  |  4.2068115750528 |          4.7| versicolor
  52  |  4.4294001057082 |          4.5| versicolor
 100  |  3.9842230443974 |          4.1| versicolor
 101  |  6.6552854122622 |            6| virginica
 102 |  5.3197542283298 |          5.1 | virginica
 150 |  5.0971656976744 |          5.1 | virginica
(9 rows)

 DROP_MODEL
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
TBNET_GROW

TBNET_GROW - Build a tree-like Bayesian Network model

This stored procedure builds a tree-like Bayesian Network for continuous variables. A spanning tree is constructed joining all the variables on grounds of most strong correlations. This gives the user an overview of most significant interrelations governing the whole set of variables.

Usage

The TBNET_GROW stored procedure has the following syntax:

TBNET_GROW(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model

the Bayesian Network model to build

Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
The input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

type: ':nom' (for nominal), ':cont' (for continuous). By default, all numerical types are continu-ous, other types are nominal

role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported, i.e. ':objweight' same as ':ignore').

(Remark: ':colweight(<wgt>)' is unsupported, i.e. ':colweight(<wgt>)' same as ':colweight(1)' same as ':input').

If the parameter is undefined, all columns of the input table have default properties. Note that this procedure only accepts continuous columns with role 'input'.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
The default type of the input table columns. Valid values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
The default role of the input table columns. Allowed values are 'input' and 'ignore'.

If the parameter is undefined, all columns are considered 'input' columns.

Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
The input table where column properties for the input table columns are stored. The format of this table is the output format of the nza..COLUMN_PROPERTIES() stored procedure.

If the parameter is undefined, the input table column properties is detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsupported, i.e. same as 'ignore')

(Remark: colPropertiesTable with "COLWEIGHT" column with value '<wgt>' is unsupported, i.e. same as '1')

Type: NVARCHAR(256)

Default: <none>

baseidx
the numeric id to be assigned to the first

variable Type: int4

Default: 777

samplesize
the sample size to take if the number of records is too

large Type: int4

Default: 330000

talk
if talk=yes then additional information on progress will be

displayed Type: NVARCHAR(ANY)

Default: <none>

sizewarn
if sizewarn=yes then no exception is thrown when there are less records than 3 times the number of columns. Instead, a notice is displayed and the stored procedure re-turns 'sizewarn'.

Type: NVARCHAR(ANY)

Default: <none>

edgelabsort
if edgelabsort=yes then the left end of the edge will have a name lower in alphabetic order than the right one

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(3000) a termination message

Details

This stored procedure builds a Bayesian Network over the given input table columns. The model is stored as a set of edges, storing the correlation between two columns and the mean and standard deviation of both columns.

A sampling approach is taken to overcome the computational complexity. If parameter talk=yes, the stored procedure displays notices during the computation. This can be useful for a larger num-ber of columns.

The model can be applied using stored procedure TBNET_APPLY.

Examples

```
CALL nza..TBNET_GROW('model=struc_iris,
intable=nza..iris,
incolumn=SEPALLENGTH;SEPALWIDTH;PETALLENGTH;PETALWIDTH,co
ldefrole=ignore');
SELECT varxname, varyname, corr::numeric(6,4) AS corr FROM
nza_meta_struc_iris_model ORDER BY varxname, varyname;
CALL nza..DROP_MODEL('model=struc_iris');
             TBNET_GROW
-------------------------------------
 Over node no4in TBNet_Grow process
(1 row)

  VARXNAME   |  VARYNAME   |  CORR
             +-------------+---------
 PETALLENGTH | PETALWIDTH  |  0.9628
 PETALLENGTH | SEPALWIDTH  | -0.4205
 SEPALLENGTH | PETALLENGTH |  0.8718
(3 rows)

 DROP_MODEL
------------
 t
(1 row)

CALL nza..TBNET_GROW('model=struc_iris, intable=nza..iris,
incolumn=SEPALLENGTH;SEPALWIDTH;PETALLENGTH;PETALWIDTH,coldefrol
e=ignore,edgelabsort=yes');
SELECT varxname, varyname, corr::numeric(6,4) AS corr FROM
nza_meta_struc_iris_model ORDER BY varxname, varyname;
CALL nza..DROP_MODEL('model=struc_iris');
             TBNET_GROW
-------------------------------------
 Over node no4in TBNet_Grow process
(1 row)

  VARXNAME   |  VARYNAME   |  CORR
-------------+-------------+---------
```

```
 PETALLENGTH | PETALWIDTH  |  0.9628
 PETALLENGTH | SEPALWIDTH  | -0.4205
 PETALLENGTH | SEPALLENGTH |  0.8718
(3 rows)

 DROP_MODEL
------------
 t
(1 row)
```

Related Functions

category Analytics - Regression
TBNET1G
TBNET2G
TBNET_APPLY

TIMESERIES - Predict future values for Time Series

This stored procedure predicts future values of series of timed numeric values

Usage

The TIMESERIES stored procedure has the following syntax:

TIMESERIES(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the Time Series model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

time

the input table column which define an order on the numeric

values Type: NVARCHAR(128)

target
the input table column which contains the numeric

values Type: NVARCHAR(128)

by
the input table column which uniquely identifies a serie of values. If not specified, all numeric values belong to only one time series.

Type: NVARCHAR(128)

Default: <none>

desctable
the optional input table containing the name and descriptions of the time series. The table must contain following columns: <by>, 'NAME' NVARCHAR(ANY), 'DESCRIPTION' NVARCHAR(ANY). If not specified, the series do not have a name or a description.

Type: NVARCHAR(ANY)

Default: <none>

algorithm
the time series algorithm to use. Allowed values are: ExponentialSmoothing, ARIMA, Seasonal-TrendDecomposition, SpectralAnalysis.

Type: VARCHAR(32)

Default: ExponentialSmoothing

interpolationmethod
the interpolation method. Allowed values are: linear, cubicspline, exponentialspline.

Type: NVARCHAR(32)

Default: linear

from
the value of column time to start the analysis from. If not specified, the analysis starts from the first value of the time series in the input table.

Type: same as <time>

Default: <none>

to
the value of column time to stop the analysis at. If not specified, the analysis stops at the last value of the time series in the input table.

Type: same as <time>

Default: <none>

forecasthorizon
the value of column time until which to predict. This parameter is not allowed for algorithm=SpectralAnalysis. If not specified, the algorithm determines itself until which time it predicts values.

Type: NVARCHAR(ANY)

Default: <none>

forecasttimes
list of semi-column separated values of column time to predict at. This parameter is not allowed for algorithm=SpectralAnalysis. If not specified, the times to predict val-ues at is determined by the algorithm.

Type: NVARCHAR(ANY)

Default: <none>

trend
the trend type for algorithm=ExponentialSmoothing. Allowed values are: N (none), A (addditive), DA (damped additive), M (multiplicative), DM (damped multiplicative). If not specified, the trend type is determined by the algorithm.

Type: CHAR(2)

Default: <none>

seasonality
the seasonality type for algorithm=ExponentialSmoothing. Allowed values are: N (none), A (addditive), M (multiplicative). If not specified, the seasonality type is de-termined by the algorithm.

Type: CHAR(1)

Default: <none>

period
the seasonality period. This parameter is not allowed for algorithm=SpectralAnalysis. If not specified, the seasonality period is determined by the algorithm. If set to 0, no seasonality period will be considered by the algorithm.

Type: DOUBLE

Default: <none>

Min: 0

unit
the seasonality period unit. This parameter is not allowed for algorithm=SpectralAnalysis. This parameter must be specified if the parameter period is specified and the <time> column is of type date, time or timestamp. Otherwise, it must not be specified. Allowed values are: ms, s, min, h, d, wk, qtr, q, a, y.

Type: NVARCHAR(ANY)

Default: <none>

p
or p< the parameter p for algorithm=ARIMA, either equal to or below specified value. If not specified, the algorithm will determine its best value automatically.

Type: SMALLINT

Default: <none>

d
or d< the parameter d for algorithm=ARIMA, either equal to or below specified value. If not specified, the algorithm will determine its best value automatically.

Type: SMALLINT

Default: <none>

q
or q< the parameter q for algorithm=ARIMA, either equal to or below specified value. If not specified, the algorithm will determine its best value automatically.

Type: SMALLINT

Default: <none>

SP
or SP< the seasonal parameter SP for algorithm=ARIMA, either equal to or below specified value. If not specified, the algorithm will determine its best value automatically.

Type: SMALLINT

Default: <none>

SD
or SD< the seasonal parameter SD for algorithm=ARIMA, either equal to or below specified value. If not specified, the algorithm will determine its best value automatically.

Type: SMALLINT

Default: <none>

SQ
or SQ< the seasonal parameter SQ for algorithm=ARIMA, either equal to or below specified value. If not specified, the algorithm will determine its best value automatically.

Type: SMALLINT

Default: <none>

outtable
the output table containing predicted future values. This parameter is not allowed for al-gorithm=SpectralAnalysis. If not specified, no output table is written out.

Type: NVARCHAR(256)

Default: <none>

seasadjtable
the output table containing seasonally adjusted values. This parameter is not allowed for al-gorithm=SpectralAnalysis or algorithm=ARIMA. If not specified, no output table is written out. Type: NVARCHAR(256)

Default: <none>

Returns
BIGINT the number of time series processed

Details

A time series model is built by analyzing series of timed numeric values, and is applied immedi-ately for predicting future values. The model itself is stored but not really needed any more (ex-cept for understanding the predicted values).

If specified, a table <outtable> is additionally created with the following columns: <by>, <time>, forecast, standarderror. The table contains the forecast values for future time points of the time series identified by <by>. For each prediction, the standarderror value indicates a confidence inter-val around the forecast value.

If specified, a table <seasadjtable> is additionally created with the following columns: <by>, <time>, adjusted. The values in column <target> of the input table are seasonally adjusted and then copied into this table, with the values of columns <by> and <time>.

Examples

```
CALL nza..TIMESERIES('model=curves_ts,
intable=nza..curves, outtable=curves_out, time=x,
target=y, by=curve, algorithm=exponentialsmoothing');
SELECT * FROM curves_out WHERE curve='quadratic' ORDER
BY x;
CALL nza..DROP_MODEL('model=curves_ts');

CALL nza..DROP_TABLE('curves_out');

 TIMESERIES
------------

          6

(1 row)


   CURVE    | X  |        Y         |  STANDARDERROR
-----------+----+-----------------+-----------------

 quadratic | 51 | 2547.9999996322 | 2.0889322555742

 quadratic | 52 | 2645.9999995728 | 6.2792178687503

 quadratic | 53 | 2743.9999995133 | 12.558435352633

 quadratic | 54 | 2841.9999994539 | 20.976177536159

(4 rows)


 DROP_MODEL
------------
```

```
 t
(1 row)


 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Time Series
PRINT_MODEL

TPR - True Positive Rate from a Confusion Matrix

This stored procedure calculates the True Positive Rate of a class from a confusion matrix

Usage

The TPR stored procedure has the following syntax:

TPR(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

matrixTable
the confusion matrix table

Type: NVARCHAR(256)

class
the class in the confusion matrix table to calculate the True Positive Rate

on Type: NVARCHAR(ANY)

Returns
DOUBLE the True Positive Rate

Details

This stored procedure calculates the True Positive Rate of a class from a confusion matrix. The True positive rate is the ratio of the number of correctly classified records into the given class divided by the number of real values that are in this class.

The confusion matrix table has the following columns: real, prediction, cnt. The column cnt contains the frequency of making a given prediction for the given real value.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,
traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..CONFUSION_MATRIX('intable=nza..iris_test,
resulttable=iris_pred, id=id, resultid=id, target=class,
resulttarget=class, matrixTable=confMatrix');
CALL nza..TPR('matrixTable=confMatrix, class=virginica');
CALL nza..DROP_MODEL('model=iris_c45');
CALL nza..DROP_TABLE('iris_pred');
CALL nza..DROP_TABLE('confMatrix');
```

```
 TRAIN_TEST
------------
   0.918919
(1 row)


 CONFUSION_MATRIX
------------------
                5
(1 row)


 TPR
-----
   1
(1 row)


 DROP_MODEL
------------
 t
(1 row)
```

```
 DROP_TABLE
------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CONFUSION_MATRIX

TRAIN_TEST - Build and evaluate a Classification model on given training and testing sets

This is the simple technique to estimate quality and performance of a predictive model

Usage

The TRAIN_TEST stored procedure has the following syntax:

TRAIN_TEST(NVARCHAR(ANY) paramString)

Parameters

paramString

comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

modelType

the name of the procedure that builds a Classification model (e.g. naivebayes, dectree,

knn) Type: NVARCHAR(ANY)

model

the name of the Classification model to

build Type: NVARCHAR(ANY)

traintable

the input table to build the model

onto Type: NVARCHAR(256)

testtable
the input table to evaluate the model quality

onto Type: NVARCHAR(256)

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing the

class Type: NVARCHAR(128)

outtable
the output table where the predictions will be

stored Type: NVARCHAR(256)

Returns
FLOAT prediction accuracy and -1 if accuracy cannot be calculated

Details

This stored procedure builds a Classification model on <traintable>. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Man-agement functions to further manipulate the model or access the model tables.

The prediction quality of the model is then evaluated on <testtable>.

All parameters specific to a the given Classification stored procedure can be defined too: they will be used when building and testing the model.

A table <outtable> is created with the following columns: id, class. The column id matches the <id> column from intable and class is the predicted class label. The size of this table is the same as the size of <intable>.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree,
traintable=nza..iris_train,
testtable=nza..iris_test, model=iris_c45,
target=class, id=id, outtable=iris_pred');
CALL nza..DROP_MODEL('model=iris_c45');

CALL nza..DROP_TABLE('iris_pred');
```

```
 TRAIN_TEST

------------

   0.918919

(1 row)

 DROP_MODEL
```

```
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Classification
SPLIT_DATA
CROSS_VALIDATION
PERCENTAGE_SPLIT
DECTREE
NAIVEBAYES
KNN

TWOSTEP - Build a TwoStep Clustering model

This stored procedure builds a TwoStep Clustering model that first distributes the input data into a hierarch-ical tree structure according to the distance between the data records, then reduces the tree into k clusters. A second pass over the data associates the input data records to the next cluster.

Usage

The TWOSTEP stored procedure has the following syntax:

TWOSTEP(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

model
the name of the TwoStep Clustering model to

build Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(392)

outtable
the output table where clusters are assigned to each input table record

Type: NVARCHAR(261)

Default: <none>

id
the input table column identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column representing a class or a value to predict, this column is ig-nored by the TwoStep Clustering algorithm.

Type: NVARCHAR(128)

Default: <none>

distance
the distance function. Allowed values are: euclidean, norm_euclidean, loglikelihood.

Type: NVARCHAR(ANY)

Default: loglikelihood

k
the number of clusters. If k is 0 or less, the procedure determines the optimal number of clusters.

Type: INTEGER

Default: 0

maxk
the maximum number of clusters that can be determined automatically. If k is bigger than 0, this parameter is ignored.

Type: INTEGER

Default: 20

Min: 2

incolumn
the input table columns with special properties, separated by a semi-colon

(;). Each column is followed by one or several of the following properties:

its type: ':nom' (for nominal), ':cont' (for continuous). Per default, all numerical types are continuous, other types are nominal.

its role: ':id', ':target', ':input', ':ignore'.

(Remark: ':objweight' is unsupported i.e. ':objweight' same as ':ignore').

- its weight: ':colweight(<wgt>)' where <wgt> is a numeric value of the weight.

If the parameter is undefined, all columns of the input table have default properties.

Type: NVARCHAR(ANY)

Default: <none>

coldeftype
default type of the input table columns. Allowed values are 'nom' and 'cont'.

If the parameter is undefined, all numeric columns are considered continuous, other columns nominal.

Type: NVARCHAR(ANY)

Default: <none>

coldefrole
default role of the input table columns. Allowed values are 'input' and

'ignore'. If the parameter is undefined, all columns are considered 'input'

columns. Type: NVARCHAR(ANY)

Default: <none>

colPropertiesTable
the input table where column properties for the input table columns are stored. The format of this table is the output format of stored procedure nza..COLUMN_PROPERTIES().

If the parameter is undefined, the input table column properties will be detected automatically.

(Remark: colPropertiesTable with "COLROLE" column with value 'objweight' is unsupported, i.e. same as 'ignore')

Type: NVARCHAR(256)

Default: <none>

statistics
flags indicating which statistics to collect. Allowed values are: none, columns, values:n, all.

Regardless of the value of the parameter statistics, all statistics are gathered since they are needed to call PREDICT_TWOSTEP on this model. If statistics=none or statistics=columns, the importance of the attributes is not calculated. If statistics=none, statistics=columns or statistics=all, up to 100 discrete values are gathered.

If statistics=values:n with n a positive number, up to <n> column value statistics are collected:

If a nominal column contains more than <n> values, only the <n> most frequent column stat-istics are kept.

If a numeric column contains more than <n> values, the values will be discretized and the stat-istics will be collected on the discretized values.

Indicating statistics=all is equal to statistics=values:100.

Type: NVARCHAR(ANY)

Default: 'none'

bins
the average number of bins for numerical statistics with more than <n>

values. Type: INTEGER

Default: 10

Min: 2

randseed
the random generator

seed Type: INTEGER

Default: 12345

distancethreshold
the threshold under which 2 data records can be merged into one cluster during the first pass. If not set, the distance threshold is calculated automatically.

Type: DOUBLE

Default: <none>

Min: 0.0

distancethresholdfactor
the factor used to calculate the distance threshold automatically. The distance threshold is then the median distance value minus distancethresholdfactor times the interquartile distance (or the minimum distance if this value is below it). If distan-cethreshold is set, this parameter is ignored.

Type: DOUBLE

Default: 2.0

epsilon
the value to be used as global variance of all continuous fields for the loglikelihood distance. If the value is 0.0 or less, the global variance is calculated for each continuous field. If distance is not loglikelihood, this parameter is ignored.

Type: DOUBLE

Default: 0.0

nodecapacity
the branching factor of the internal tree used in pass 1. Each node can have up to no-decapacity subnodes.

Type: INTEGER

Default: 6

Min: 2

leafcapacity
the number of clusters per leaf node in the internal tree used in pass

1. Type: INTEGER

Default: 8

Min: 2

maxleaves
the maximum number of leaf nodes in the internal tree used in pass 1. When the tree contains maxleaves leaf nodes, the following data records are aggregated into the ex-isting clusters.

Type: INTEGER

Default: 1000

Min: max(10,k)

outlierfraction
the fraction of the records to be considered as outlier in the internal tree used in pass 1. Clusters containing less than outlierfraction times the mean number of data records per cluster are removed.

Type: DOUBLE

Default: 0.0

Min: 0.0

Max: 1.0

Returns
BIGINT the number of generated clusters

Details

This stored procedure builds a TwoStep Clustering model. The model is saved to the database in a set of tables and registered in the database model metadata. Use the Model Management functions to further manipulate the model or access the model tables.

The Clustering model is build in two steps:

The input data records are distributed into a balanced tree according to their distance to the data records already in the tree node. The tree size is limited: outliers are removed and similar tree nodes are merged. Then k clusters are determined out of the tree.

The input data records are assigned again to the nearest of the k clusters.

The output table <outtable> is created with following columns: id, cluster_id, distance. The id column matches the <id> column of the input table. Each input table record is associated with a cluster, where the distance from the record to the cluster is the smallest. The cluster ID and the distance to the cluster are giv-en in the columns cluster_id and distance.

Examples

```
CALL nza..TWOSTEP('model=adult_mdl, intable=nza..adult,
id=id, target=income');
CALL nza..DROP_MODEL('model=adult_mdl');
```

```
 TWOSTEP
---------
        6
(1 row)


 DROP_MODEL
------------
```

```
 t
(1 row)
```

Related Functions

category Analytics - Clustering
LIST_MODELS

UNITABLE - Univariate Frequencies

This stored procedure creates a univariate frequency table for one column of the input table

Usage

The UNITABLE stored procedure has the following syntax:

UNITABLE(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table or view

Type: NVARCHAR(256)

incolumn
the input table column

Type: NVARCHAR(128)

outtable
the output table where the univariate frequencies are written

to Type: NVARCHAR(ANY)

Returns
INTEGER the number of univariate frequencies calculated

Details

This stored procedure counts the frequency of all distinct values for one column of the input table.

The univariate frequencies are stored in the output table with following columns: <incolumn>, count, freq, cum. The column count counts the number of input table records havinf the given value of <incolumn>, the column freq give the relative frequency (percentage) of these records, and the column cum cumulates the frequencies.

Examples

```
CALL
nza..UNITABLE('intable=nza..winequality,incolumn=quality,outtabl
e=gdm_ft');
SELECT * FROM gdm_ft ORDER BY quality;
CALL nza..DROP_TABLE('gdm_ft');
```

```
 UNITABLE
----------
        7
(1 row)


  QUALITY| COUNT |  FREQ |   CUM
---------+-------+-------+--------
        3|     20|   0.41|    0.41
        4|    163|   3.33|    3.74
        5|   1457|  29.75|   33.48
        6|   2198|  44.88|   78.36
        7|    880|  17.97|   96.33
        8|    175|   3.57|   99.90
        9|      5|   0.10| 100.00
 (7 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
BITABLE
HIST

VERIFY_ARULE - Verify if data is prepared to build an Association Rules model

This stored procedure is used to verify whether the given dataset is properly prepared for the ARULE algorithm to run on it.

Usage

The VERIFY_ARULE stored procedure has the following syntax:

VERIFY_ARULE(NVARCHAR(ANY) paramString)

Parameters

paramStringparamString

A comma-separated list of <parameter>=<value> entries using the parameters below. Type: NVARCHAR(ANY)

intable

The name of the table containing the input. Type: NVARCHAR(256)

tid

The column of the input table that identifies transactions. Type: NVARCHAR(128)

Default: tid

item

The column of the input table that identifies items in transactions. Type: NVARCHAR(128)

Default: item

Returns

BOOLEAN TRUE if the dataset is properly prepared; otherwise FALSE.

Details

This procedure checks the data as follows:

no NULL transaction or item values

no duplicate items in a transaction

no negative item values or item values bigger than 100.000.000

Examples

```
CALL nza..VERIFY_ARULE('intable=nza..retail');

 VERIFY_ARULE
--------------
 t
(1 row)
```

Related Functions

category Analytics - Association Rules
Error: Reference source not found
ARULE

WACC - Weighted Classification accuracy

This stored procedure calculates the weighted Classification accuracy, i.e. the weighted ratio of correctly classified predictions

Usage

The WACC stored procedure has the following syntax:

WACC(NVARCHAR(ANY) paramString)

Parameters

paramString
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table containing real

values Type: NVARCHAR(256)

id
the input table column in <intable> identifying a unique instance

id Type: NVARCHAR(128)

target
the input table column in <intable> containing real

values Type: NVARCHAR(128)

resulttable
the input table containing predicted

values Type: NVARCHAR(256)

resultid
the input table column in <resulttable> identifying a unique instance

id Type: NVARCHAR(128)

Default: id

resulttarget
the input table column in <resulttable> containing predicted

values Type: NVARCHAR(128)

Default: class

Returns
DOUBLE the weighted Classification accuracy

Details

This stored procedure calculates the weighted ratio of correctly classified predictions among the total number of predictions. This is done by comparing the predictions made when applying a Clas-sification model onto data, and the real values for this data.

Each class is assigned the same weight in calculating the ratio, independently of the real frequency of the class in the input data. This is useful when classes are not equally frequent.

Examples

```
CALL nza..TRAIN_TEST('modelType=dectree, model=iris_c45,
traintable=nza..iris_train, testtable=nza..iris_test,
target=class, id=id, outtable=iris_pred, minsplit=2');
CALL nza..WACC('intable=nza..iris_test,
resulttable=iris_pred, id=id, target=class');
CALL nza..DROP_MODEL('model=iris_c45');

CALL nza..DROP_TABLE('iris_pred');
```

```
 TRAIN_TEST
------------
   0.918919
(1 row)
   WACC
----------
 0.926496
(1 row)
 DROP_MODEL
------------
 t
(1 row)
 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Diagnostic Measures
CERROR
ACC

WILCOXON_TEST - Wilcoxon paired sample difference test

This procedure executes the Wilcoxon test on paired numeric input columns to evaluate the significance of the difference of their mean values

Usage

The WILCOXON_TEST stored procedure has the following syntax:

WILCOXON_TEST(NVARCHAR(ANY) paramStringtring)

Parameters

paramStringtring
comma-separated list of <parameter>=<value> entries with parameters

below Type: NVARCHAR(ANY)

intable
the input table

Type: NVARCHAR(256)

incolumn
the two numeric input table columns, separated by a semicolon

(;) Type: NVARCHAR(ANY)

by
the input table column which splits the data into groups for which the operation is to be per-formed. If specified, an output table must be specified too.

Type: NVARCHAR(128)

Default: <none>

outtable
the output table to write the Wilcoxon statistics into. This parameter is required if parameter by is specified. Otherwise the parameter is ignored.

Type: NVARCHAR(ANY)

Default: <none>

Returns
NVARCHAR(200) The test results or the number of rows in the output table. The test result can con-tain following results: sStat, wStat, zStat, noItem, pp, lower. See the output table column descrip-tion for more information on them.

Details

This stored procedure executes the Wilcoxon test on two numeric columns, either in the whole in-put table or within the groups defined in the column specified by parameter <by>. The Wilcoxon test compares in non-parametric manner two variables to state if they are different in their mean value. This is indicated by the component of the output called pp.

The output table is created with following columns: n, sstat, wstat, zstat, pp, lower. If the paramet-er by is specified, an additional column <by> is added to indicate for which group the MWW test has been calculated. If pp < 0.05, then one of the two columns tends to have larger values than the other. The class which tends to have lower-ranked values is indicated.

Examples

```
CALL   nza..WILCOXON_TEST('intable=nza..winequality,
incolumn=VOLATILE_ACIDITY;CITRIC_ACID');
                                                WILCOXON_TEST
--------------------------------------------------------------
------------------------------------------------
 sStat= 3285041 wStat= 8524620 zStat= 25.520776487317
noItem= 4898 pp= 0 (lower: "VOLATILE_ACIDITY")
(1 row)
```

```
CALL nza..WILCOXON_TEST('intable=nza..iris,
incolumn=sepalwidth;petalwidth');
                                 WILCOXON_TEST
--------------------------------------------------------------
-------------------
 sStat= 11085 wStat= -1 zStat= -1 noItem= 150 pp=
0 (lower: "SEPALWIDTH")
(1 row)
```

```
CALL   nza..WILCOXON_TEST('intable=nza..winequality,
incolumn=VOLATILE_ACIDITY;CITRIC_ACID,   by=quality,
outtable=Result7');
SELECT quality, pp, lower FROM Result7 ORDER BY
quality; CALL nza..DROP_TABLE('Result7');
 WILCOXON_TEST
 ---------------
    7
(1 row)

 QUALITY |          PP          |        LOWER
---------+----------------------+--------------------
       3 |      0.46282003479431| "VOLATILE_ACIDITY"
       4 |    0.0055011068340939| "CITRIC_ACID"
       5 |  1.1102230246252e-16 | "VOLATILE_ACIDITY"
       6 |                     0| "VOLATILE_ACIDITY"
       7 |                     0| "VOLATILE_ACIDITY"
       8 |  7.4214593837052e-07 | "VOLATILE_ACIDITY"
       9 |               0.15625| "VOLATILE_ACIDITY"
(7 rows)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Analytics - Statistics
MWW_TEST
PWILCOX
T_PMD_TEST

CHAPTER 3
Reference Documentation: Utilities

_sp_utl_aggregateExists - Check if a UDA aggregate function exists

The stored procedure _sp_utl_aggregateExists is deprecated. This stored procedure checks if a UDA aggregate function exists. The aggregate function name must not contain a schema.

Usage

The _sp_utl_aggregateExists stored procedure has the following syntax:

_sp_utl_aggregateExists(NVARCHAR(ANY) aggregateName, BOOLEAN verbose, BOOLEAN in-verse)

Parameters

aggregateName
the aggregate UDA function to look for. It can be qualified by a database name (<database>..<aggregateName>) if not in the current database. Do not specify arguments, this stored procedure does not check the full signature but only the name of the UDA aggreg-ate function.

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise exceptions or

not Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the UDA aggregate function does not exists (inverse=false) or does exist (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified UDA aggregate function exists

Examples

```
CALL
nza.._sp_utl_aggregateExists('nza.._ca_dm_decisiontree_en
tropy', true, false);
 _SP_UTL_AGGREGATEEXISTS
-------------------------
 t
(1 row)
```

```
CALL
nza.._sp_utl_aggregateExists('nza.._ca_dm_decisiontree_en
tropy', true, true);
ERROR:  Aggregate "NZA".."_CA_DM_DECISIONTREE_ENTROPY"
already exists.
```

```
CALL nza.._sp_utl_aggregateExists('does_not_exist',
true, true);
    _SP_UTL_AGGREGATEEXISTS
-------------------------
 f
(1 row)
```

Related Functions

category Utilities - Checking

_sp_utl_columnContainsNulls - Check if a column contains at least one NULL value

The stored procedure _sp_utl_columnContainsNulls is deprecated. This stored procedure checks if a column of a table or view contains at least one NULL value. The table or view name must not contain a schema.

Usage

The _sp_utl_columnContainsNulls stored procedure has the following syntax:

_sp_utl_columnContainsNulls(NVARCHAR(ANY) tableName, NVARCHAR(ANY) columnName, BOOLEAN verbose, BOOLEAN inverse)

Parameters

tableName
the table or view to search the column into. It can be qualified by a database name (<database>..<tableName>) if not in the current database.

Type: NVARCHAR(ANY)

columnName
the column to check

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise an exception or not when the exist-ence of NULL values is not as expected. The stored procedure always raise an exception if the table or view, or the column does not exist.

Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the given column does not contain NULL values (inverse=false) or does contain NULL values (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified column contains at least one NULL value

Examples

```
CALL nza.._sp_utl_columnContainsNulls('nza..adult_test', 'age',
true, true);
  _SP_UTL_COLUMNCONTAINSNULLS
-----------------------------
 f
(1 row)
```

```
CALL nza.._sp_utl_columnContainsNulls('nza..adult_test', 'age',
true, false);
ERROR: Column "AGE" in relation "NZA".."ADULT_TEST" does not
contain null values.
```

Related Functions

category Utilities - Checking

_sp_utl_columnExists - Check if a column exists

The stored procedure _sp_utl_columnExists is deprecated. This stored procedure checks if a column exists in a table or a view. The table or view name must not contain a schema.

Usage

The _sp_utl_columnExists stored procedure has the following syntax:

_sp_utl_columnExists(NVARCHAR(ANY) tableName, NVARCHAR(ANY) columnName, BOOLEAN verbose, BOOLEAN inverse)

Parameters

tableName
the table or view to search a column into. It can be qualified by a database name (<database>..<tableName>) if not in the current database.

Type: NVARCHAR(ANY)

columnName
the column to look for

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise exceptions or

not Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the table, view or column does not exists (inverse=false) or does exist (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified column exists

Examples

```
CALL nza.._sp_utl_columnExists('nza..weather',
'play', true, false);
 _SP_UTL_COLUMNEXISTS
```

```
----------------------
 t
(1 row)
```

```
CALL nza.._sp_utl_columnExists('NZA..weather', 'PLAY',
true, true);
ERROR: Column "PLAY" in relation "NZA".."WEATHER" already
exists.
```

```
CALL nza.._sp_utl_columnExists('NZA..weather',
'wrong_column', true, false);
ERROR: Column "WRONG_COLUMN" in relation "NZA".."WEATHER" does
not exist.
```

```
CALL nza.._sp_utl_columnExists('"NZA".."weather"',
'"PLAY"', false, false);
 _SP_UTL_COLUMNEXISTS
----------------------
 f
(1 row)
```

Related Functions

category Utilities - Checking

_sp_utl_columnIsId - Check if a column contains unique values

The stored procedure _sp_utl_columnIsId is deprecated. This stored procedure checks if a column of a table or view contains only unique values. The table or view name must not contains a schema.

Usage

The _sp_utl_columnIsId stored procedure has the following syntax:

_sp_utl_columnIsId

Parameters

tableName
the table or view to search the column into. It can be qualified by a database name (<database>..<tableName>) if not in the current database.

Type: NVARCHAR(ANY)

columnName
the column to check

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise an exception or not when the existence of unique values is not as expected. The stored procedure always raise an exception if the table or view, or the column does not exist.

Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the given column does not contain unique values (inverse=false) or does contain unique values (inverse=true). This flag is used only when verbose=true. It does not have any influ-ence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified column contains only unique values

Examples

```
CALL nza.._sp_utl_columnIsId('nza..iris',
'wrong_column', false, false);
ERROR:  Column "WRONG_COLUMN" in relation "NZA".."IRIS"
does not exist.
```

```
CALL nza.._sp_utl_columnIsId('nza..iris', 'id',
true, true);
ERROR: Column "ID" in relation "NZA".."IRIS" contains
unique values.
```

```
CALL nza.._sp_utl_columnIsId('nza..iris', 'id',
true, false);
 _SP_UTL_COLUMNISID
```

```
--------------------
 t
(1 row)
```

Related Functions

category Utilities - Checking

_sp_utl_columnIsNumeric - Check if a column is of a numeric data type

The stored procedure _sp_utl_columnIsNumeric is deprecated. This stored procedure checks if a column of a table or view is of a numeric data type: int1, int2, int4, int8, float, double or numeric. Boolean columns, as well as date, interval, time, timetz or timestamp columns are not considered numeric although they can be casted to numeric values. The table or view name must not contains a schema.

Usage

The _sp_utl_columnIsNumeric stored procedure has the following syntax:

_sp_utl_columnIsNumeric(NVARCHAR(ANY) tableName, NVARCHAR(ANY) columnName, BOOLEAN verbose, BOOLEAN inverse)

Parameters

tableName
the table or view to search the column into. It can be qualified by a database name (<database>..<tableName>) if not in the current database.

Type: NVARCHAR(ANY)

columnName
the column to check

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise an exception or not when the data type of the column is not as expected. The stored procedure always raise an exception if the table or view, or the column does not exist.

Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the given column is not numeric (inverse=false) or is numeric (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified column is of a numeric data type

Examples

```
CALL nza.._sp_utl_columnIsNumeric('nza..adult_test',
'age', true, false);
 _SP_UTL_COLUMNISNUMERIC
-------------------------
 t
(1 row)
```

```
CALL nza.._sp_utl_columnIsNumeric('nza..adult_testd',
'age', true, false);
ERROR: Relation "NZA".."ADULT_TESTD" does not exist or
cannot be accessed.
```

```
CALL nza.._sp_utl_columnIsNumeric('nza..adult_test',
'age2', true, false);
ERROR:  Column "AGE2" in relation "NZA".."ADULT_TEST"
does not exist.
```

```
CALL
nza.._sp_utl_columnIsNumeric('nza..adult_test','age',
true, true);
ERROR:  Column "AGE" in relation "NZA".."ADULT_TEST"
contains continuous values.
```

Related Functions

category Utilities - Checking

_sp_utl_columnListExists - Check if a columns exists

The stored procedure _sp_utl_columnListExists is deprecated. This stored procedure checks if a columns exist in a table or a view. Columns are passes as list separated by semicolon. The table or view name must not contain a schema.

Usage

The _sp_utl_columnListExists stored procedure has the following syntax:

_sp_utl_columnListExists(NVARCHAR(ANY) tableName, NVARCHAR(ANY) columnName, BOOLEAN verbose, BOOLEAN inverse)

Parameters

tableName
the table or view to search a column into. It can be qualified by a database name (<database>..<tableName>) if not in the current database.

Type: NVARCHAR(ANY)

columnListName
the columns to look for, list is separated by

semicolons Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise exceptions or

not Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the table, view or column does not exists (inverse=false) or does exist (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified columns exist

Examples

```
CALL nza.._sp_utl_columnListExists('nza..weather',
'play;temperature', true, false);
 _SP_UTL_COLUMNLISTEXISTS
----------------------
  t
(1 row)
```

Related Functions

category Utilities - Checking

_sp_utl_columnsEqualTypes - Check if two columns have the same data type

This stored procedure checks if two columns of tables or views have the same data type. The length or precision of the data types must match too.

Usage

The _sp_utl_columnsEqualTypes stored procedure has the following syntax:

_sp_utl_columnsEqualTypes(NVARCHAR(ANY) tableName1, NVARCHAR(ANY) column-Name1, NVARCHAR(ANY) tableName2, NVARCHAR(ANY) columnName2, BOOLEAN verb-ose, BOOLEAN inverse)

Parameters

tableName1
the table or view to search the first column into. It can be qualified by a database name (<database>..<tableName>) if not in the current database.

Type: NVARCHAR(ANY)

columnName1
the first column to check

Type: NVARCHAR(ANY)

tableName2
the table or view to search the second column into. It can be qualified by a database name (<database>..<tableName>) if not in the current database.

Type: NVARCHAR(ANY)

columnName2
the second column to check

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise an exception or not when the column data types are not as expected. The stored procedure always raise an ex-ception if a table or view, or a column does not exist.

Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the given columns have different data types (inverse=false) or have the same data type (inverse=true). This flag is used only when verbose=true. It does not have any influ-ence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified columns have the same data type

Examples

```
CALL nza.._sp_utl_columnsEqualTypes('nza..adult_test', 'age',
'nza..adult_test', 'age', true, false);
 _SP_UTL_COLUMNSEQUALTYPES
---------------------------
 t
(1 row)
```

```
CALL nza.._sp_utl_columnsEqualTypes('nza..adult_test', 'age',
'nza..adult_test', 'education', true, false);
ERROR:  Columns: "AGE", "EDUCATION" in relations
"NZA".."ADULT_TEST", "NZA".."ADULT_TEST" are not equal type.
type1:integer type2:character varying(12).
```

```
CALL nza.._sp_utl_columnsEqualTypes('nza..adult_test', 'age',
'nza..adult_test', 'capital_gain', true, true);
ERROR: Columns: "AGE", "CAPITAL_GAIN" in relations
"NZA".."ADULT_TEST", "NZA".."ADULT_TEST" are equal type.
type1:integer type2:integer.
```

Related Functions

category Utilities - Checking
_sp_utl_columnExists

_sp_utl_dropAllAggregates - Drop all UDA aggregate functions with the given prefix

This stored procedure drops all UDA aggregate functions whose name matches a given prefix

Usage

The _sp_utl_dropAllAggregates stored procedure has the following syntax:

_sp_utl_dropAllAggregates(NVARCHAR(ANY) inputName)

- ▲ Parameters
  - ► **inputName**

the prefix of the UDA aggregate functions to drop. Only UDA aggregate functions in the current database can be dropped.

Type: NVARCHAR(ANY)

Returns
INT4 the number of UDA aggregate functions that have been dropped

Examples

```
CALL
nza.._sp_utl_dropAllAggregates('uda_does_not_exist');

 _SP_UTL_DROPALLAGGREGATES
---------------------------
                          0
(1 row)
```

```
CALL
nza.._sp_utl_dropAllAggregates('nza..uda_does_not_exist')
;

ERROR:  Cross database access not allowed:
'nza..uda_does_not_exist'.
```

Related Functions

category Utilities - Actions
_sp_utl_dropAllFunctions
_sp_utl_dropAllProcedures
_sp_utl_dropAllUDX

_sp_utl_dropAllFunctions - Drop all UDF functions with the given prefix

This stored procedure drops all UDF functions whose name matches a given prefix

Usage

The _sp_utl_dropAllFunctions stored procedure has the following syntax:

_sp_utl_dropAllFunctions(NVARCHAR(ANY) inputName)

▲ Parameters

inputName
the prefix of the UDF functions to drop. Only UDF functions in the current database can be dropped.

Type: NVARCHAR(ANY)

Returns
INT4 the number of UDF functions that have been dropped

Examples

```
CALL nza.._sp_utl_dropAllFunctions('udf_does_not_exist');

  _SP_UTL_DROPALLFUNCTIONS
--------------------------
                         0

(1 row)
```

```
CALL nza.._sp_utl_dropAllFunctions('nza..udf_does_not_exist');

ERROR:  Cross database access not allowed:
'nza..udf_does_not_exist'.
```

Related Functions

category Utilities - Actions
_sp_utl_dropAllAggregates
_sp_utl_dropAllProcedures
_sp_utl_dropAllUDX

_sp_utl_dropAllLike - Drop all database objects with the given LIKE expression

This stored procedure drops all tables, temporary tables and views whose name matches a given LIKE ex-pression

Usage

The _sp_utl_dropAllLike stored procedure has the following syntax:

_sp_utl_dropAllLike(NVARCHAR(ANY) tableExpr)
Parameters
tableExpr
the LIKE expression of the database objects to

drop Type: NVARCHAR(ANY)

Returns
INT4 number of tables, temporary tables and views that have been dropped

Examples

```
CALL nza.._sp_utl_dropAllLike('nza..object_doest_not
%_exist');
 _SP_UTL_DROPALLLIKE
---------------------
                   0
(1 row)
```

Related Functions

category Utilities - Actions
DROP_TABLE

_sp_utl_dropAllProcedures - Drop all stored procedures with the given prefix

This stored procedure drops all stored procedures whose name matches a given prefix

Usage

The _sp_utl_dropAllProcedures stored procedure has the following syntax:

_sp_utl_dropAllProcedures(NVARCHAR(ANY) inputName)

Parameters

inputName
the prefix of the stored procedures to drop. Only stored procedures in the current database can be dropped.

Type: NVARCHAR(ANY)

Returns
INT4 the number of stored procedures that have been dropped

Examples

```
CALL nza.._sp_utl_dropAllProcedures('sp_does_not_exist');
 _SP_UTL_DROPALLPROCEDURES
---------------------------
```

```
                        0
(1 row)
```

```
CALL nza.._sp_utl_dropAllProcedures('nza..sp_does_not_exist');
```

```
ERROR:  Cross database access not allowed:
'nza..sp_does_not_exist'.
```

Related Functions

category Utilities - Actions
_sp_utl_dropAllAggregates
_sp_utl_dropAllFunctions
_sp_utl_dropAllUDX

_sp_utl_dropAllUDX - Drop all UDx functions with the given prefix

This stored procedure drops all UDA aggregate functions or UDF functions whose name matches a given prefix

Usage

The _sp_utl_dropAllUDX stored procedure has the following syntax:

_sp_utl_dropAllUDX(NVARCHAR(any) inputName);

Parameters

inputName

the prefix of the UDA aggregate functions or UDF functions to drop. Only UDx functions in the current database can be dropped.

Type: NVARCHAR(ANY)

Returns

INT4 the number of UDA aggregate functions and UDF functions that have been dropped

Examples

```
CALL nza.._sp_utl_dropAllUDX('udx_does_not_exist');
```

```
 _SP_UTL_DROPALLUDX
--------------------
                  0
(1 row)
```

```
CALL nza.._sp_utl_dropAllUDX('nza..udx_does_not_exist');

ERROR: Cross Database Access is not supported.
```

Related Functions

category Utilities - Actions
_sp_utl_dropAllAggregates
_sp_utl_dropAllFunctions
_sp_utl_dropAllProcedures

_sp_utl_functionExists - Check if a UDF function exists

The stored procedure _sp_utl_functionExists is deprecated. This stored procedure checks if an UDF function exists. The UDF function name must not contain a schema.

Usage

The _sp_utl_functionExists stored procedure has the following syntax:

_sp_utl_functionExists(NVARCHAR(ANY) functionName, BOOLEAN verbose, BOOLEAN in-verse)

Parameters

functionName
the UDF function to look for. It can be qualified by a database name (<database>..<functionName>) if not in the current database. Do not specify argu-ments, this stored procedure does not check the full signature but only the name of the UDF function.

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise exceptions or

not Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the UDF func-tion does not exists (inverse=false) or does exist (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified UDF function exists

Examples

```
CALL nza.._sp_utl_functionExists('nza..abs', true, false);

 _SP_UTL_FUNCTIONEXISTS
------------------------
 t
(1 row)
```

```
CALL nza.._sp_utl_functionExists('nza..abs', true,

true); ERROR: Function "NZA".."ABS" already exists.
```

Related Functions

category Utilities - Checking

_sp_utl_getColumnType - Column data type

This stored procedure returns the SQL data type of a column of a relation

Usage

The _sp_utl_getColumnType stored procedure has the following syntax:

_sp_utl_getColumnType(NVARCHAR(ANY) threePartName, NVARCHAR(ANY) columnName, BOOLEAN ignoreSize)

Parameters

threePartName
Full string name of a database object in the form database.schema.objectname.

Database and schema are optional (default: current database/default database, current schema).

Type: NVARCHAR(ANY)

columnName
The string name of a column whose SQL data type is returned. The column must

exist. Type: NVARCHAR(ANY)

ignoreSize
If true, the size of character data types and the scale and precision of the numeric data type are removed before the SQL type is returned.

Type: BOOLEAN

Returns
NVARCHAR(ANY) The SQL data type of the column in lower case. If relation or column do not exist, NULL is returned.

Examples

```
CALL nza.._sp_utl_getColumnType('nza..weather',
'INSTANCE', false);
 _SP_UTL_GETCOLUMNTYPE
-----------------------
 integer
(1 row)
```

```
CALL nza.._sp_utl_getColumnType('nza..weather',
'TEMPERATURE', true);
   _SP_UTL_GETCOLUMNTYPE
----------------------------
 national character varying
(1 row)
```

```
CALL
nza.._sp_utl_getColumnType('nza..table_does_not_exist'
, 'id', false);
 _SP_UTL_GETCOLUMNTYPE
-----------------------

(1 row)
```

```
CALL nza.._sp_utl_getColumnType('nza..weather',
'column_does_not_exist', false);
 _SP_UTL_GETCOLUMNTYPE
-----------------------

(1 row)
```

Related Functions

category Utilities - Data Exploration

_sp_utl_getTableSize - Table row count

This stored procedure returns the number or rows of the given table

Usage

The _sp_utl_getTableSize stored procedure has the following syntax:

_sp_utl_getTableSize((NVARCHAR(ANY) tableName)

Parameters

tableName

the table to get the size of

Type: NVARCHAR(ANY)

Returns

INT8 the number of rows in the table

Examples

```
CALL nza.._sp_utl_getTableSize('nza..weather');

 _SP_UTL_GETTABLESIZE
----------------------
                    22
(1 row)
```

Related Functions

category Utilities - Data Exploration

_sp_utl_isTempTable - Check if a table is temporary

The stored procedure _sp_utl_isTempTable is deprecated. This stored procedure checks if a table is tempor-ary. The table name must not contain a schema.

Usage

The _sp_utl_isTempTable stored procedure has the following syntax:

_sp_utl_isTempTable(NVARCHAR(ANY) tableName)

▲ Parameters

tableName
the table to check. It can be qualified by a database name (<database>..<tableName>) if not in the current database.

Type: NVARCHAR(ANY)

Returns
BOOLEAN true if the specified table is temporary

Examples

```
CALL nza.._sp_utl_isTempTable('table_does_not_exist');

  _SP_UTL_ISTEMPTABLE
---------------------
 f
(1 row)
```

```
CREATE TEMPORARY TABLE ttt (id INTEGER);
CALL nza.._sp_utl_isTempTable('ttt');
CALL nza..DROP_TABLE('ttt');

 _SP_UTL_ISTEMPTABLE
---------------------
 t
(1 row)

 DROP_TABLE
------------
 t
(1 row)
```

Related Functions

category Utilities - Checking

_sp_utl_justExecute - Execute a SQL statement

This stored procedure executes a SQL statement

Usage

The _sp_utl_justExecute stored procedure has the following syntax:

_sp_utl_justExecute(NVARCHAR(ANY) commandString)

Parameters

commandString

the SQL command to execute

Type: NVARCHAR(ANY)

Returns

BOOLEAN always true. An exception is raised if the command cannot be executed.

Examples

```
CALL nza.._sp_utl_justExecute('create table mytest(id
INTEGER)');
CALL nza.._sp_utl_justExecute('insert into mytest values(1)');
CALL nza.._sp_utl_justExecute('select id from mytest');
CALL nza.._sp_utl_justExecute('drop table mytest');
CALL nza.._sp_utl_justExecute('drop table mytest');
```

```
  _SP_UTL_JUSTEXECUTE
---------------------
 t
(1 row)

  _SP_UTL_JUSTEXECUTE
---------------------
 t
(1 row)

  _SP_UTL_JUSTEXECUTE
---------------------
 t
(1 row)
```

```
  _SP_UTL_JUSTEXECUTE
---------------------
 t
(1 row)

ERROR:  Table 'MYTEST' does not exist
```

Related Functions

category Utilities - Actions

_sp_utl_procedureExists - Check if a stored procedure exists

The stored procedure _sp_utl_procedureExists is deprecated. This stored procedure checks if a stored procedure exists. The stored procedure name must not contain a schema.

Usage

The _sp_utl_procedureExists stored procedure has the following syntax:

_sp_utl_procedureExists(NVARCHAR(ANY) procedureName, BOOLEAN verbose, BOOLEAN inverse)

Parameters

procedureName
the stored procedure to look for. It can be qualified by a database name (<database>..<procedureName>) if not in the current database. Do not specify argu-ments, this stored procedure does not check the full signature but only the name of the stored procedure.

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise exceptions or

not Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the stored pro-cedure does not exists (inverse=false) or does exist (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns

BOOLEAN true if the specified stored procedure exists

Examples

```
CALL nza.._sp_utl_procedureExists('nza..dectreee', true, false);

ERROR: Procedure "NZA".."DECTREEE" does not exist.


CALL nza.._sp_utl_procedureExists('nza..dectree', true, false);
 _SP_UTL_PROCEDUREEXISTS
-------------------------
 t
(1 row)


CALL nza.._sp_utl_procedureExists('nza..dectree', true,

true); ERROR: Procedure "NZA".."DECTREE" already exists.


CALL nza.._sp_utl_procedureExists('nza..dectreee', true, true);
 _SP_UTL_PROCEDUREEXISTS
-------------------------
 f
(1 row)
```

Related Functions

category Utilities - Checking

_sp_utl_relationExists - Check if a table or a view exists

The stored procedure _sp_utl_relationExists is deprecated. This stored procedure checks if a table or a view exists. The table or view name must not contain a schema.

Usage

The _sp_utl_relationExists stored procedure has the following syntax:

_sp_utl_relationExists(NVARCHAR(ANY) objectName, BOOLEAN verbose, BOOLEAN in-verse)

Parameters

objectName
the table or view to look for. It can be qualified by a database name (<database>..<ob-jectName>) if not in the current database.

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise exceptions or

not Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the table or view does not exists (inverse=false) or does exist (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified table or view exists

Examples

```
CALL nza.._sp_utl_relationExists('nza..weather',
true, false);
 _SP_UTL_RELATIONEXISTS
------------------------
 t
(1 row)
```

```
CALL nza.._sp_utl_relationExists('nza..weather',
true, true);
ERROR:  Relation "NZA".."WEATHER" already exists.
```

```
CALL nza.._sp_utl_relationExists('table_does_not_exist',
true, false);
ERROR: Relation "TABLE_DOES_NOT_EXIST" does not exist or
cannot be accessed.
```

Related Functions

category Utilities - Checking

_sp_utl_sequenceExists - Check if a sequence exists

The stored procedure _sp_utl_sequenceExists is deprecated. This stored procedure checks if a sequence ex-ists. The sequence name must not contain a schema.

Usage

The _sp_utl_sequenceExists stored procedure has the following syntax:

_sp_utl_sequenceExists(NVARCHAR(ANY) sequenceName, BOOLEAN verbose, BOOLEAN inverse)

Parameters

sequenceName
the sequence to look for. It can be qualified by a database

name (<database>..<sequenceName>) if not in the current

database. Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise exceptions or

not Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the sequence does not exists (inverse=false) or does exist (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified sequence exists

Examples

```
CREATE SEQUENCE testnzaseq;
CALL nza.._sp_utl_sequenceExists('testnzaseq', true, false);
CALL nza.._sp_utl_sequenceExists('testnzaseq', true, true);
DROP SEQUENCE testnzaseq;
```

```
 _SP_UTL_SEQUENCEEXISTS
------------------------
 t
(1 row)
```

```
ERROR:  Sequence "TESTNZASEQ" already exists.
```

Related Functions

category Utilities - Checking

_sp_utl_tableExists - Check if a table exists

The stored procedure _sp_utl_tableExists is deprecated. This stored procedure checks if a table ex-ists. The table name must not contain a schema.

Usage

The _sp_utl_tableExists stored procedure has the following syntax:

_sp_utl_tableExists(NVARCHAR(ANY) tableName, BOOLEAN verbose, BOOLEAN inverse)

Parameters

tableName
the table to look for. It can be qualified by a database

name (<database>..<tableName>) if not in the current

database. Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise exceptions or

not Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the table does not exists (inverse=false) or does exist (inverse=true). This flag is used only when verb-ose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified table exists

Examples

```
CALL nza.._sp_utl_tableExists('nza..weather',
true, false);
 _SP_UTL_TABLEEXISTS
---------------------
 t
```

```
(1 row)
```

```
CALL nza.._sp_utl_tableExists('nza..weather', true, true);
ERROR: Table "NZA".."WEATHER" already exists.
```

```
CALL nza.._sp_utl_tableExists('nza..weatherrr', true, false);
ERROR: Table "NZA".."WEATHERRR" does not exist.
```

Related Functions

category Utilities - Checking

_sp_utl_viewExists - Check if a view exists

The stored procedure _sp_utl_viewExists is deprecated. This stored procedure checks if a view exists. The view name must not contain a schema.

Usage

The _sp_utl_viewExists stored procedure has the following syntax:

_sp_utl_viewExists(NVARCHAR(ANY) viewName, BOOLEAN verbose, BOOLEAN inverse)

Parameters

viewName
the view to look for. It can be qualified by a database name (<database>..<viewName>) if not in the current database.

Type: NVARCHAR(ANY)

verbose
flag indicating whether the stored procedure should raise exceptions or

not Type: BOOLEAN

inverse
flag indicating whether the stored procedure raises an exception when the view does not exists (inverse=false) or does exist (inverse=true). This flag is used only when verbose=true. It does not have any influence on the return value.

Type: BOOLEAN

Returns
BOOLEAN true if the specified view exists

Examples

```
CALL nza.._sp_utl_viewExists('V_NZA_MODELS',
true, false);
 _SP_UTL_VIEWEXISTS
--------------------
 t
(1 row)
```

```
CALL nza.._sp_utl_viewExists('V_NZA_MODELS', true,
true); ERROR: View "V_NZA_MODELS" already exists.
```

```
CALL nza.._sp_utl_viewExists('view_does_not_exist',
true, false);
ERROR:  View "VIEW_DOES_NOT_EXIST" does not exist.
```

Related Functions

category Utilities - Checking

drand64 - 64 bits pseudo-random number generator

This function returns a random number using a data-slice independent 64 bits pseudo-random number generator.

Usage

The drand64 function has the following syntax:

drand64(INT8 randomSeed)

Parameters

randomSeed

random seed

Type: INT8

Returns

DOUBLE random number between 0.0 and 1.0

Details

This function delivers a random double value between 0.0 and 1.0. The 64 bits pseudo-random number gen-erator is based on different prime numbers per data slice, ensuring the independence of the sequences of numbers producted on any pair of data slices.

Examples

```
SELECT nza..drand64(123);

     DRAND64

------------------

 0.35831899940968

(1 row)
```

Related Functions

category Utilities - Preprocessing

DROP_TABLE - Drop a table

This stored procedure drops a table if it exists

Usage

The DROP_TABLE stored procedure has the following syntax:

DROP_TABLE(NVARCHAR(ANY) tableName)

Parameters

tableName

the table to drop. The table name can be indicated directly or prefixed with 'intable='. Type: NVARCHAR(ANY)

Returns

BOOLEAN true if the table was dropped, false if the table does not exist or cannot be dropped

Examples

```
CREATE TABLE mytest (id INTEGER);

CALL nza..DROP_TABLE('mytest');

  DROP_TABLE

------------

 t

(1 row)
```

```
CREATE TABLE mytest (id INTEGER);
CALL nza..DROP_TABLE('intable=mytest');
  DROP_TABLE
------------
 t
(1 row)
```

```
CALL nza..DROP_TABLE('nza..table_does_not_exist');
  DROP_TABLE
------------
 f
(1 row)
```

Related Functions

category Utilities - Actions
_sp_utl_dropAllLike

ISDATE_TINY - Check if a string has the compact date format YYYYMMDD

This function checks that the input string represents a valid date with format YYYYMMDD

Usage

The ISDATE_TINY function has the following syntax:

ISDATE_TINY(VARCHAR(100) date)

Parameters

date

the date string to check

Type: VARCHAR(100)

Returns

INT4 1 if the string is a valid date with format YYYYMMDD, NULL if the string is NULL, or 0 otherwise

Details

This function checks that the input string represents a valid date with format YYYYMMDD. A valid date con-sist of exactly 8 characters, each character must be between '0' and '9'. The month part must be between 01 and 12, the days between 01 and the number of days in the month. Leap years are taken into account.

Note that it is possible to pass date as INT. However, when INT is automatically converted to VARCHAR, its leading zeros are truncated: e.g. 00010522 gets '10522' and is finally not recognized as a valid date.

Examples

```
CREATE TABLE DateAsString(date VARCHAR(50));
INSERT INTO DateAsString VALUES ('2009010');
INSERT INTO DateAsString VALUES ('200901222');
INSERT INTO DateAsString VALUES ('200');
INSERT INTO DateAsString VALUES ('-20091101');
INSERT INTO DateAsString VALUES ('20090001');
INSERT INTO DateAsString VALUES ('20091301');
INSERT INTO DateAsString VALUES ('20090400');
INSERT INTO DateAsString VALUES ('20090431');
INSERT INTO DateAsString VALUES ('20080229');
INSERT INTO DateAsString VALUES ('20090229');
INSERT INTO DateAsString VALUES ('21000229');
INSERT INTO DateAsString VALUES ('19991919');
INSERT INTO DateAsString VALUES ('20040429');
INSERT INTO DateAsString VALUES ('yyyymmdd');
INSERT INTO DateAsString VALUES ('abcd0101');
INSERT INTO DateAsString VALUES ('Date');
INSERT INTO DateAsString VALUES (NULL);
SELECT nza..ISDATE_TINY(date), date FROM DateAsString ORDER
BY isdate_tiny, date;
CALL nza..DROP_TABLE('DateAsString');
```

```
 ISDATE_TINY |   DATE
-------------+-----------
             |
            0| -20091101
            0| 19991919
```

```
                  0 |  200
                  0 |  20090001
                  0 |  2009010
                  0 |  200901222
                  0 |  20090229
                  0 |  20090400
                  0 |  20090431
                  0 |  20091301
                  0 |  21000229
                  0 |  Date
                  0 |  abcd0101
                  0 |  yyyymmdd
                  1 |  20040429
                  1 |  20080229
(17 rows)

 DROP_TABLE
------------
t
(1 row)
```

Related Functions

category Utilities - Checking

msghelp - Show information related to a message number in the correct language of the locale.

This stored procedure provides detailed information on a specific message (by number) in the lan-guage of the locale

Usage

The msghelp stored procedure has the following syntax:

msghelp(varchar(11) message_num);

Parameters

message_number

message number with 3-character product prefix + 2-character component prefix (e.g. 'NZAMT-0045')

Type: VARCHAR(11)

Returns

boolean Always returns TRUE

Examples

```
call nza..msghelp('NZAMT-0045');
```

```
call nza..msghelp('NZAMT-0045E');
```

Appears on the screen as a notice (TODO: An actual example of output needs to go here when we've settled on a message format)

Related Functions

category Utilities - Checking

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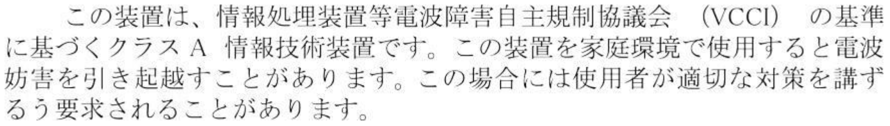

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