

# Package ‘SmartEDA’

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**Type** Package

**Title** Summarize and Explore the Data

**Version** 0.3.9

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**Depends** R (>= 3.3.0)

**Imports** ggplot2, sampling, scales, rmarkdown, ISLR(>= 1.0),  
data.table, gridExtra, GGally, qpdf

**Description** Exploratory analysis on any input data describing the structure and the relationships present in the data. The package automatically select the variable and does related descriptive statistics. Analyzing information value, weight of evidence, custom tables, summary statistics, graphical techniques will be performed for both numeric and categorical predictors.

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**Suggests** testthat, knitr, covr, psych

**Encoding** UTF-8

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ExpCatStat	<i>Function provides summary statistics for all character or categorical columns in the dataframe</i>
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**Description**

This function combines results from weight of evidence, information value and summary statistics.

**Usage**

```
ExpCatStat(
  data,
  Target = NULL,
  result = "Stat",
  clim = 10,
  nlim = 10,
  bins = 10,
  Pclass = NULL,
  plot = FALSE,
  top = 20,
  Round = 2
)
```

**Arguments**

data	dataframe or matrix
Target	target variable
result	"Stat" - summary statistics, "IV" - information value
clim	maximum unique levles for categorical variable. Variables will be dropped if unique levels is higher than clim for class factor/character variable
nlim	maximum unique values for numeric variable.
bins	number of bins (default is 10)
Pclass	reference category of target variable
plot	Information value barplot (default FALSE)
top	for plotting top information values (default value is 20)
Round	round of value

**Details**

Criteria used for categorical variable predictive power classification are

- If information value is  $< 0.03$  then predictive power = "Not Predictive"
- If information value is  $0.3$  to  $0.1$  then predictive power = "Somewhat Predictive"
- If information value is  $0.1$  to  $0.3$  then predictive power = "Meidum Predictive"
- If information value is  $>0.3$  then predictive power = "Highly Predictive"

**Value**

This function provides summary statistics for categorical variable

- Stat - Summary statistics includes Chi square test scores, p value, Information values, Cramers V and Degree if association
- IV - Weight of evidence and Information values

Columns description:

- Variable variable name
- Target - Target variable
- class - name of bin (variable value otherwise)
- out0 - number of good observations
- out1 - number of bad observations
- Total - Total values for each category
- pct1 - good observations / total good observations
- pct0 - bad observations / total bad observations
- odds - Odds ratio  $[(a/b)/(c/d)]$
- woe - Weight of Evidence – calculated as  $\ln(\text{odds})$
- iv - Information Value -  $\ln(\text{odds}) * (\text{pct0} - \text{pct1})$

**Author(s)**

dubrangala

**Examples**

```

# Example 1
## Read mtcars data
# Target variable "am" - Transmission (0 = automatic, 1 = manual)
# Summary statistics
ExpCatStat(mtcars,Target="am",result = "Stat",clim=10,nlim=10,bins=10,
Pclass=1,plot=FALSE,top=20,Round=2)
# Information value plot
ExpCatStat(mtcars,Target="am",result = "Stat",clim=10,nlim=10,bins=10,
Pclass=1,plot=TRUE,top=20,Round=2)
# Information value for categorical Independent variables
ExpCatStat(mtcars,Target="am",result = "IV",clim=10,nlim=10,bins=10,
Pclass=1,plot=FALSE,top=20,Round=2)

```

ExpCatViz

*Distributions of categorical variables***Description**

This function automatically scans through each variable and creates bar plot for categorical variable.

**Usage**

```

ExpCatViz(
  data,
  target = NULL,
  fname = NULL,
  clim = 10,
  col = NULL,
  margin = 1,
  Page = NULL,
  Flip = F,
  sample = NULL,
  rdata = FALSE,
  value = NULL,
  gtitle = NULL,
  theme = "Default"
)

```

**Arguments**

data	dataframe or matrix
target	target variable. This is not a mandatory field

fname	output file name. Output will be generated in PDF format
clim	maximum categories to be considered to include in bar graphs
col	define the colors to fill the bars, default it will take sample colours
margin	index, 1 for row based proportions and 2 for column based proportions
Page	output pattern. if Page=c(3,2), It will generate 6 plots with 3 rows and 2 columns
Flip	default vertical bars. It will be used to flip the axis vertical to horizontal
sample	random selection of categorical variable
rdata	to plot bar graph for frequency/aggregated table
value	value column name. This is mandatory if 'rdata' is TRUE
gtitle	graph title
theme	adding extra themes, geoms, and scales for 'ggplot2' (eg: themes options from ggthemes package)

### Value

This function returns collated graphs in grid format in PDF or JPEG format. All the files will be stored in the working directory

- Bar graph for raw data(this function will dynamically pick all the categorical variable and plot the bar chart)
- Bar graph for aggregated data
- Bar graph is a Stacked Bar graph by target variable

### See Also

[geom\\_bar](#)

### Examples

```
## Bar graph for specified variable
mtdata = mtcars
mtdata$carname = rownames(mtcars)
ExpCatViz(data=mtdata, target="carname", col="blue", rdata=TRUE, value="mpg")
n=nrow(mtdata)
ExpCatViz(data=mtdata, target="carname", col=rainbow(n), rdata=TRUE, value="mpg") ## Ranibow colour
# Stacked bar chart
ExpCatViz(data=mtdata, target = "gear", col=hcl.colors(3, "Set 2"))
ExpCatViz(data=mtdata, target = "gear", col=c("red", "green", "blue"))
# Bar chart
ExpCatViz(data=mtdata)
ExpCatViz(data=mtdata, col="blue", gtitle = "Barplot")
```

---

 ExpCTable

*Function to create frequency and custom tables*


---

### Description

this function will automatically select categorical variables and generate frequency or cross tables based on the user inputs. Output includes counts, percentages, row total and column total.

### Usage

```
ExpCTable(
  data,
  Target = NULL,
  margin = 1,
  clim = 10,
  nlim = 10,
  round = 2,
  bin = 3,
  per = FALSE,
  weight = NULL
)
```

### Arguments

data	dataframe or matrix
Target	target variable (dependent variable) if any. Default NULL
margin	margin of index, 1 for row based proportions and 2 for column based proportions
clim	maximum categories to be considered for frequency/custom table. Variables will be dropped if unique levels are higher than 'clim' for class factor/character variable. Default value is 10.
nlim	numeric variable unique limits. Default 'nlim' values is 3, table excludes the numeric variables which is having greater than 'nlim' unique values
round	round off
bin	number of cuts for continuous target variable
per	percentage values. Default table will give counts
weight	a vector of weights, it must be equal to the length of data

### Details

this function provides both frequency and custom tables for all categorical features. And ouput will be generated in data frame

**Value**

Frequency tables, Cross tables

Columns description for frequency tables:

- Variable is Variable name
- Valid is Variable values
- Frequency is Frequency
- Percent is Relative frequency
- CumPercent is Cumulative sum of relative frequency

Columns description for custom tables:

- Variable is Variable name
- Category is Variable values
- Count is Number of counts
- Per is Percentages
- Total is Total count

**Examples**

```
# Frequency table
ExpCTable(mtcars, Target = NULL, margin = 1, clim = 10, nlim = 3, bin = NULL, per = FALSE)
# Crosstbale for Mtcars data
ExpCTable(mtcars, Target = "gear", margin = 1, clim = 10, nlim = 3, bin = NULL, per = FALSE)
# Weighted frequeency for Mtcars data
ExpCTable(mtcars, margin = 1, clim = 10, nlim = 3, bin = NULL, per = FALSE, weight = "wt")
```

---

ExpCustomStat	<i>Customized summary statistics</i>
---------------	--------------------------------------

---

**Description**

Table of descriptive statistics. Output returns matrix object containing descriptive information on all input variables for each level or combination of levels in categorical/group variable. Also while running the analysis user can filter out the data by individual variable level or across data level.

**Usage**

```
ExpCustomStat(
  data,
  Cvar = NULL,
  Nvar = NULL,
  stat = NULL,
  gby = TRUE,
```

```

    filt = NULL,
    dcast = FALSE,
    value = NULL
  )

```

### Arguments

data	dataframe or Matrix
Cvar	qualitative variables on which to stratify / subgroup or run categorical summaries
Nvar	quantitative variables on which to run summary statistics for.
stat	descriptive statistics. Sepecify which summary statistics required (Included all base stat functions like 'mean', 'medain', 'max', 'min', 'sum', 'IQR', 'sd', 'var', quantile like P0.1, P0.2 etc'). Also added two more stat here are 'PS' is percentage of shares and 'Prop' is column percentage
gpsy	default value is True. Group level summary will be created based on list of categorical variable. If summary required at each categorical variable level then keep this option as FALSE
filt	filter out data while running the summary statistics. Filter can apply accross data or individual variable level using filt option. If there are multiple filters, seperate the conditons by using '^'. Ex: Nvar = c("X1", "X2", "X3", "X4"), let say we need to exclude data X1>900 for X1 variable, X2==10 for X2 variable, Gender !='Male' for X3 variable and all data for X4 then filt should be, filt = c("X1>900" ^ "X2==10" ^ "Gender !='Male'" ^ all) or c("X1>900" ^ "X2==10" ^ "Gender !='Male'" ^ ^). in case if you want to keep all data for some of the variable listed in Nvar, then specify inside the filt like ^all^ or ^^(single space)
dcast	fast dcast from data.table
value	If dcast is TRUE, pass the variable name which needs to come on column

### Details

Filter unique value from all the numeric variables

Case1: Excluding unique values or outliers values like '999' or '9999' or '888' etc from each selected variables.

Eg: dat = data.frame(x = c(23,24,34,999,12,12,23,999,45), y = c(1,3,4,999,0,999,0,8,999,0))

Exclude 999:

x = c(23,24,34,12,12,23,45)

y = c(1,3,4,0,0,8,0)

Case2: Summarise the data with selected descriptive statistics like 'mean' and 'median' or 'sum' and 'variance' etc..

Case3: Aggregate the data with different statistics using group by statement

Case4: Reshape the summary statistics.. etc

The complete functionality of 'ExpCustomStat' function is detailed in vignette help page with example code.

**Value**

summary statistics as dataframe. Usage of this function is detailed in user guide vignettes document.

**Examples**

```
## Selected summary statistics 'Count,sum, percentage of shares' for
## disp and mpg variables by vs, am and gear
ExpCustomStat(mtcars, Cvar=c("vs","am","gear"), Nvar = c("disp","mpg"),
              stat = c("Count","sum","PS"), gpsy = TRUE, filt = NULL)

ExpCustomStat(mtcars, Cvar=c("gear"), Nvar = c("disp","mpg"),
              stat = c("Count","sum","var"), gpsy = TRUE, filt = "am==1")

ExpCustomStat(mtcars, Cvar = c("gear"), Nvar = c("disp","mpg"),
              stat = c("Count","sum","mean","median"), gpsy = TRUE, filt = "am==1")

## Selected summary statistics 'Count and fivenum stat for disp and mpg
## variables by gear
ExpCustomStat(mtcars, Cvar = c("gear"), Nvar = c("disp", "mpg"),
              stat = c("Count",'min','p0.25','median','p0.75','max'), gpsy = TRUE)
```

ExpData

*Function to generate data dictionary of a data frame***Description**

This function used to produce the metadata information and data summary

**Usage**

```
ExpData(data, type = 1, fun = NULL)
```

**Arguments**

data	a data frame
type	Type 1 is overall data summary; Type 2 is variable level summary
fun	to add any additional statistics into metadata type 2 output, for example: mean, sum, etc..

**Details**

This function provides overall and variable level data summary like percentage of missing, variable types etc..

- Type = 1, overall data summary (column names are "Descriptions Value")
- Type = 2, variable level summary (column names are "Index Variable\_Name Variable\_Type Sample\_n Missing\_count Per\_of\_Missing No\_of\_distinct\_values" and other statistics)

**Examples**

```
# Overall data summary
ExpData(data=mtcars, type=1)
# Variable level data summary
ExpData(data=mtcars, type=2)
```

---

ExpInfoValue

*Information value*


---

**Description**

Provides information value for each categorical variable (X) against target variable (Y)

**Usage**

```
ExpInfoValue(X, Y, valueOfGood = NULL)
```

**Arguments**

X	Independent categorical variable.
Y	Binary response variable, it can take values of either 1 or 0.
valueOfGood	Value of Y that is used as reference category.

**Details**

Information value is one of the most useful technique to select important variables in a predictive model. It helps to rank variables on the basis of their importance. The IV is calculated using the following formula

- $IV = (\text{Percentage of Good event} - \text{Percentage of Bad event}) * WOE$ , where WOE is weight of evidence
- $WOE = \log(\text{Percentage of Good event} - \text{Percentage of Bad event})$

Here is what the values of IV mean according to Siddiqi (2006)

- If information value is  $< 0.03$  then predictive power = "Not Predictive"
- If information value is  $0.03$  to  $0.1$  then predictive power = "Somewhat Predictive"
- If information value is  $0.1$  to  $0.3$  then predictive power = "Medium Predictive"
- If information value is  $> 0.3$  then predictive power = "Highly Predictive"

**Value**

Information value (iv) and Predictive power class

- information value
- predictive class

**See Also**[IV](#)**Examples**

```
X = mtcars$gear
Y = mtcars$am
ExpInfoValue(X,Y,valueOfGood = 1)
```

---

ExpKurtosis

*Measures of Shape - Kurtosis*

---

**Description**

Measures of shape to give a detailed evaluation of data. Explains the amount and direction of skew. Kurtosis explains how tall and sharp the central peak is. Skewness has no units: but a number, like a z score

**Usage**

```
ExpKurtosis(x, type)
```

**Arguments**

x	A numeric object or data.frame
type	a character which specifies the method of computation. Options are "moment" or "excess"

**Value**

ExpKurtosis returns Kurtosis values

**Author(s)**

dubrangala

**Examples**

```
ExpKurtosis(mtcars$hp, type="excess")
ExpKurtosis(mtcars$carb, type="moment")
ExpKurtosis(mtcars, type="excess")
```

ExpNumStat

*Summary statistics for numerical variables***Description**

Function provides summary statistics for all numerical variable. This function automatically scans through each variable and select only numeric/integer variables. Also if we know the target variable, function will generate relationship between target variable and each independent variable.

**Usage**

```
ExpNumStat(
  data,
  by = "A",
  gp = NULL,
  Qnt = NULL,
  Nlim = 10,
  MesofShape = 2,
  Outlier = FALSE,
  round = 3,
  weight = NULL,
  dcast = FALSE,
  val = NULL
)
```

**Arguments**

data	dataframe or matrix
by	group by A (summary statistics by All), G (summary statistics by group), GA (summary statistics by group and Overall)
gp	target variable if any, default NULL
Qnt	default NULL. Specified quantile is c(.25,0.75) will find 25th and 75th percentiles
Nlim	numeric variable limit (default value is 3 which means it will only consider those variable having more than 3 unique values and variable type is numeric/integer)
MesofShape	Measures of shapes (Skewness and kurtosis).
Outlier	Calculate the lower hinge, upper hinge and number of outlier
round	round off
weight	a vector of weights, it must be equal to the length of data
dcast	fast dcast from data.table
val	Name of the column whose values will be filled to cast (see Details sections for list of column names)

**Details**

column descriptions

- Vname is Variable name
- Group is Target variable
- TN is Total sample (included NA observations)
- nNeg is Total negative observations
- nPos is Total positive observations
- nZero is Total zero observations
- NegInf is Negative infinite count
- PosInf is Positive infinite count
- NA\_value is Not Applicable count
- Per\_of\_Missing is Percentage of missing
- Min is minimum value
- Max is maximum value
- Mean is average value
- Median is median value
- SD is Standard deviation
- CV is coefficient of variations  $(SD/mean)*100$
- IQR is Inter quartile range
- Qnt is quantile values
- MesofShape is Skewness and Kurtosis
- Outlier is Number of outlier
- Cor is Correlation b/w target and independent variables

**Value**

summary statistics for numeric independent variables

Summary by:

- Only overall level
- Only group level
- Both overall and group level

**See Also**

[describe.by](#)

**Examples**

```

# Descriptive summary of numeric variables is Summary by Target variables
ExpNumStat(mtcars,by="G",gp="gear",Qnt=c(0.1,0.2),MesofShape=2,
           Outlier=TRUE,round=3)
# Descriptive summary of numeric variables is Summary by Overall
ExpNumStat(mtcars,by="A",gp="gear",Qnt=c(0.1,0.2),MesofShape=2,
           Outlier=TRUE,round=3)
# Descriptive summary of numeric variables is Summary by Overall and Group
ExpNumStat(mtcars,by="GA",gp="gear",Qnt=seq(0,1,.1),MesofShape=1,
           Outlier=TRUE,round=2)
# Summary by specific statistics for all numeric variables
ExpNumStat(mtcars,by="GA",gp="gear",Qnt=c(0.1,0.2),MesofShape=2,
           Outlier=FALSE,round=2,dcast = TRUE, val = "IQR")
# Weighted summary statistics
ExpNumStat(mtcars,by="GA",gp="gear",Qnt=c(0.1,0.2),MesofShape=2,
           Outlier=FALSE,round=2,dcast = TRUE, val = "IQR", weight = "wt")

```

---

ExpNumViz

*Distributions of numeric variables*


---

**Description**

This function automatically scans through each variable and creates density plot, scatter plot and box plot for continuous variable using ggplot2 functions.

**Usage**

```

ExpNumViz(
  data,
  target = NULL,
  type = 1,
  nlim = 3,
  fname = NULL,
  col = NULL,
  Page = NULL,
  sample = NULL,
  scatter = FALSE,
  gtitle = NULL,
  theme = "Default"
)

```

**Arguments**

data	dataframe or matrix
target	target variable
type	1 (boxplot by category and overall), 2 (boxplot by category only), 3 (boxplot for overall)

nlim	numeric variable unique limit. Default nlim is 3, graph will exclude the numeric variable which is having less than 'nlim' unique value
fname	output file name
col	define the fill color for box plot. Number of color should be equal to number of categories in target variable
Page	output pattern. if Page=c(3,2), It will generate 6 plots with 3 rows and 2 columns
sample	random selection of plots
scatter	option to run scatter plot between all the numerical variables (default scatter=FALSE)
gtitle	chart title
theme	adding extra themes, geoms, and scales for 'ggplot2' (eg: themes options from ggthemes package)

### Details

This function automatically scan each variables and generate a graph based on the user inputs. Graphical representation includes scatter plot, box plot and density plots.

All the plots are generated using ggplot2 pacakge function (geom\_boxplot, geom\_density, geom\_point)

The plots are combined using gridExtra pacakge functions

- target is continuous then output is scatter plots
- target is categorical then output is box plot
- target is NULL then density plot for all numeric features
- scatter = TRUE generate multiple scatter plot between all the independent contionuos variables with or without group argument

### Value

returns collated graphs in PDF or JPEG format

- Univariate plot density plot for all the numeric data with the value of shape of the distribution (Skewness & Kurtosis)
- Bivariate plot correlatin plot for all the numeric data
- Bivariate plot scatter plot between continuous dependent variable and Independent variables
- Box plot by overall sample
- Box plot by stratified sample

### See Also

[geom\\_boxplot](#) [ggthemes](#) [geom\\_density](#) [geom\\_point](#)

## Examples

```
## Generate Boxplot by category
ExpNumViz(iris,target = "Species", type = 2, nlim = 2,
          col = c("red", "green", "blue", "pink"), Page = NULL, sample = 2, scatter = FALSE,
          gtitle = "Box plot: ")
## Generate Density plot
ExpNumViz(iris, nlim = 2,
          col = NULL,Page = NULL, sample = 2, scatter = FALSE,
          gtitle = "Density plot: ")
## Generate Scatter plot by Dependent variable
ExpNumViz(iris,target = "Sepal.Length", type = 1, nlim = 2,
          col = "red", Page = NULL, sample = NULL, scatter = FALSE,
          gtitle = "Scatter plot: ", theme = "Default")
## Generate Scatter plot for all the numerical variables
ExpNumViz(iris,target = "Species", type = 1, nlim = 2,
          col = c("red", "green", "blue"), Page = NULL, sample = NULL, scatter = TRUE,
          gtitle = "Scatter plot: ", theme = "Default")
```

---

 ExpOutliers

*Univariate outlier analysis*


---

## Description

this function will run univariate outlier analysis based on boxplot or SD method. The function returns the summary of outlier for selected numeric features and adding new features if there is any outliers

## Usage

```
ExpOutliers(
  data,
  varlist = NULL,
  method = "boxplot",
  treatment = NULL,
  capping = c(0.05, 0.95),
  outflag = FALSE
)
```

## Arguments

data	dataframe or matrix
varlist	list of numeric variable to perform the univariate outlier analysis
method	detect outlier method boxplot or NxStDev (where N is 1 or 2 or 3 std deviations, like 1xStDev or 2xStDev or 3xStDev)
treatment	treating outlier value by mean or median. default NULL

capping	default LL = 0.05 & UL = 0.95 cap the outlier value by replacing those observations outside the lower limit with the value of 5th percentile and above the upper limit, with the value of 95th percentile value
outflag	add extreme value flag variable into output data

### Details

this function provides both summary of the outlier variable and data

Univariate outlier analysis method

- boxplot is If a data value are below (Q1 minus 1.5x IQR) or boxplot lower whisker or above (Q3 plus 1.5x IQR) or boxplot upper whisker then those points are flagged as outlier value
- Standard Deviation is If a data distribution is approximately normal then about 68 percent of the data values lie within one standard deviation of the mean and about 95 percent are within two standard deviations, and about 99.7 percent lie within three standard deviations. If any data point that is more than 3 times the standard deviation, then those points are flagged as outlier value

### Value

Outlier summary includes

- Num of outliers is Number of outlier in each variable
- Lower bound is Q1 minus 1.5x IQR for boxplot; Mean minus 3x StdDev for Standard Deviation method
- Upper bound is Q3 plus 1.5x IQR for boxplot; Mean plus 3x StdDev for Standard Deviation method
- Lower cap is Lower percentile capping value
- Upper cap is Upper percentile capping value

### Examples

```
ExpOutliers(mtcars, varlist = c("mpg", "disp", "wt", "qsec"), method = 'BoxPlot',
capping = c(0.1, 0.9), outflag = TRUE)
```

```
ExpOutliers(mtcars, varlist = c("mpg", "disp", "wt", "qsec"), method = '2xStdDev',
capping = c(0.1, 0.9), outflag = TRUE)
```

```
# Mean imputation or 5th percentile or 95th percentile value capping
ExpOutliers(mtcars, varlist = c("mpg", "disp", "wt", "qsec"), method = 'BoxPlot',
treatment = "mean", capping = c(0.05, 0.95), outflag = TRUE)
```

ExpOutQQ

*Quantile Quantile Plots*

---

**Description**

This function automatically scans through each variable and creates normal QQ plot also adds a line to a normal quantile quantile plot.

**Usage**

```
ExpOutQQ(data, nlim = 3, fname = NULL, Page = NULL, sample = NULL)
```

**Arguments**

data	Input dataframe or data.table
nlim	numeric variable limit
fname	output file name. Output will be generated in PDF format
Page	output pattern. if Page=c(3,2), It will generate 6 plots with 3 rows and 2 columns
sample	random number of plots

**Value**

Normal quantile quantile plot

**See Also**

[geom\\_qq](#)

**Examples**

```
CData = ISLR::Carseats  
ExpOutQQ(CData, nlim=10, fname=NULL, Page=c(2, 2), sample=4)
```

---

ExpParcoord*Parallel Co ordinate plots*

---

**Description**

This function creates parallel Co ordinate plots

**Usage**

```
ExpParcoord(
  data,
  Group = NULL,
  Stsize = NULL,
  Nvar = NULL,
  Cvar = NULL,
  scale = NULL
)
```

**Arguments**

data	Input dataframe or data.table
Group	stratification variables
Stsize	vector of startum sample sizes
Nvar	vector of numerice variables, default it will consider all the numeric variable from data
Cvar	vector of categorical variables, default it will consider all the categorical variable
scale	scale the variables in the parallel coordinate plot (Default normailized with minimum of the variable is zero and maximum of the variable is one) (see ggparcoord details for more scale options)

**Details**

The Parallel Co ordinate plots having the functionalities of visulization for sample rows if data size large. Also data can be stratified basis of Target or group variables. It will normalize all numeric variables between 0 and 1 also having other standardization options. It will automatically make dummy (1,0) variables for categorical variables

**Value**

Parallel Co ordinate plots

**See Also**

[ggparcoord](#)

**Examples**

```
CData = ISLR::Carseats
# Defualt ExpParcoord funciton
ExpParcoord(CData,Group=NULL,Stsize=NULL,
  Nvar=c("Price","Income","Advertising","Population","Age","Education"))
# With Stratified rows and selected columns only
ExpParcoord(CData,Group="ShelveLoc",Stsize=c(10,15,20),
  Nvar=c("Price","Income"),Cvar=c("Urban","US"))
# Without stratification
ExpParcoord(CData,Group="ShelveLoc",Nvar=c("Price","Income"),
```

```

    Cvar=c("Urban","US"),scale=NULL)
# Scale changed std: univariately, subtract mean and divide by standard deviation
ExpParcoord(CData,Group="US",Nvar=c("Price","Income"),
    Cvar=c("ShelveLoc"),scale="std")
# Selected numeric variables
ExpParcoord(CData,Group="ShelveLoc",Stsize=c(10,15,20),
    Nvar=c("Price","Income","Advertising","Population","Age","Education"))

```

---

ExpReport

*Function to create HTML EDA report*


---

## Description

Create a exploratory data analysis report in HTML format

## Usage

```

ExpReport(
  data,
  Template = NULL,
  Target = NULL,
  label = NULL,
  theme = "Default",
  op_file = NULL,
  op_dir = getwd(),
  sc = NULL,
  sn = NULL,
  Rc = NULL
)

```

## Arguments

data	a data frame
Template	R markdown template (.rmd file)
Target	dependent variable. If there is no defined target variable then keep as it is NULL.
label	target variable descriptions, not a mandatory field
theme	customized ggplot theme (default SmartEDA theme) (for Some extra themes use Package: ggthemes)
op_file	output file name (.html)
op_dir	output path
sc	sample number of plots for categorical variable. User can decide how many number of plots to depict in html report.
sn	sample number of plots for numerical variable. User can decide how many number of plots to depict in html report.
Rc	reference category of target variable. If Target is categorical then Pclass value is mandatory and which should not be NULL

## Details

The "ExpReport" function will generate a HTML report for any R data frames.

## Note

If the markdown template is ready, you can use that template to generate the HTML report

ExpReport will generate three different types of HTML report based on the Target field

- IF Target = NULL, means there is no defined dependent variable then it will generate general EDA report at overall level
- IF Target = continuous, then it will generate EDA report including univariate and multivariate summary statistics with correlation.
- IF Target = categorical, then it will generate EDA report including univariate and multivariate summary statistics with chi square, Information values.

## See Also

[create\\_report](#)

## Examples

```
## Creating HTML report
## Not run:
library (ggthemes)
# Create report where target variable is categorical
ExpReport(mtcars,Target="gear",label="car",theme=theme_economist(),op_file="Samp1.html",Rc=3)
# Create report where target variable is continuous
ExpReport(mtcars,Target="wt",label="car",theme="Default",op_file="Samp2.html")
# Create report where no target variable defined
ExpReport(mtcars,Target=NULL,label="car",theme=theme_foundation(),op_file="Samp3.html")

## End(Not run)
```

---

ExpSkew

*Measures of Shape - Skewness*

---

## Description

Measures of shape to give a detailed evaluation of data. Explains the amount and direction of skew. Kurtosis explains how tall and sharp the central peak is. Skewness has no units: but a number, like a z score

## Usage

```
ExpSkew(x, type)
```

**Arguments**

x	A numeric object or data.frame
type	a character which specifies the method of computation. Options are "moment" or "sample"

**Value**

ExpSkew returns Skewness values

**Author(s)**

dubrangala

**Examples**

```
ExpSkew(mtcars, type="moment")
ExpSkew(mtcars, type="sample")
```

---

ExpStat	<i>Function provides summary statistics for individual categorical predictors</i>
---------	---

---

**Description**

Provides bivariate summary statistics for all the categorical predictors against target variables. Output includes chi - square value, degrees of freedom, information value, p-value

**Usage**

```
ExpStat(X, Y, valueOfGood = NULL)
```

**Arguments**

X	Independent categorical variable.
Y	Binary response variable, it can take values of either 1 or 0.
valueOfGood	Value of Y that is used as reference category.

**Details**

Summary statistics included Pearson's Chi-squared Test for Count Data, "chisq.test" which performs chi-squared contingency table tests and goodness-of-fit tests. If any NA value present in X or Y variable, which will be considered as NA as in category while computing the contingency table.

Also added unique levels for each X categorical variables and degrees of freedom

**Value**

The function provides summary statistics like

- Unique number of levels
- Chi square statistics
- P value
- df Degrees of freedom
- IV Information value
- Predictive class

**See Also**

[chisq.test](#)

**Examples**

```
X = mtcars$carb
Y = mtcars$am
ExpStat(X,Y,valueOfGood = 1)
```

---

ExpTwoPlots	<i>Function to create two independent plots side by side for the same variable</i>
-------------	--

---

**Description**

To plot graph from same variable when Target=NULL vs. when Target = categorical variable (binary or multi-class variable)

**Usage**

```
ExpTwoPlots(
  data,
  plot_type = "numeric",
  iv_variables = NULL,
  target = NULL,
  lp_geom_type = "boxplot",
  lp_arg_list = list(),
  rp_geom_type = "boxplot",
  rp_arg_list = list(),
  fname = NULL,
  page = NULL,
  theme = "Default"
)
```

**Arguments**

data	dataframe
plot_type	the plot type ("numeric", "categorical").
iv_variables	list of independent variables. this input will be based off plot_type. List of numeric variables / List of categorical variables
target	binary or multi-class dependent variable
lp_geom_type	left side geom plot. this option is for univariate data. Options for numeric are "boxplot", "histogram", "density", "violin", "qqplot" and for categorical "bar", "pie", "donut"
lp_arg_list	arguments to be passed to lp_geom_type. Default is list()
rp_geom_type	right side geom plot. Options for numeric are "boxplot", "histogram", "density", "violin" "qqplot" and for categorical "bar", "pie", "donut"
rp_arg_list	arguments to be passed to rp_geom_type. Default is list()
fname	output file name. Output will be generated in PDF format
page	output pattern. if Page=c(3,2), It will generate 6 plots with 3 rows and 2 columns
theme	adding extra themes, geoms, and scales for 'ggplot2' (eg: themes options from gthemes package)

**Value**

This function returns same variable in two different views of ggplot in one graph. And there is a option to save the graph into PDF or JPEG format.

**Examples**

```
## Bar graph for specified variable
# Let's consider mtcars data set, it has several numerical and binary columns
target = "gear"
categorical_features <- c("vs", "am", "carb")
numeircal_features <- c("mpg", "cyl", "disp", "hp", "drat", "wt", "qsec")

# plot numerical data two independent plots:
# Left side histogram chart wihtout target and Right side boxplot chart with target
num_1 <- ExpTwoPlots(mtcars, plot_type = "numeric",
  iv_variables = numeircal_features, target = "gear",
  lp_arg_list = list(alpha=0.5, color = "red", fill= "white",
  binwidth=1),lp_geom_type = 'histogram',
  rp_arg_list = list(fill = c("red", "green", "blue")),
  rp_geom_type = 'boxplot', page = c(2,1),theme = "Default")

# plot categorical data with two independent plots:
# Left side Donut chart wihtout target and Right side Stacked bar chart with target
cat_1 <- ExpTwoPlots(mtcars,plot_type = "categorical",
  iv_variables = categorical_features,
  target = "gear",lp_arg_list = list(),lp_geom_type = 'donut',
  rp_arg_list = list(stat = 'identity', ),
  rp_geom_type = 'bar',page = c(2,1),theme = "Default")
```

---

ExpWoeTable

*Function provides summary statistics with weight of evidence*


---

**Description**

Weight of evidence for categorical(X-independent) variable against Target variable (Y)

**Usage**

```
ExpWoeTable(X, Y, valueOfGood = NULL, print = FALSE, Round = 2)
```

**Arguments**

X	Independent categorical variable.
Y	Binary response variable, it can take values of either 1 or 0.
valueOfGood	Value of Y that is used as reference category.
print	print results
Round	rounds the values

**Details**

The weight of evidence tells the predictive power of an independent variable in relation to the dependent variable

**Value**

Weight of evidence summary table

**See Also**

[WOETable](#)

**Examples**

```
X = mtcars$gear
Y = mtcars$am
Woe = ExpWoeTable(X,Y,valueOfGood = 1)
```

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