

# Package ‘YaleToolkit’

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**Title** Data exploration tools from Yale University.

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**Depends** grid, lattice, vcd, MASS, colorspace, barcode, gpairs

**Description** This collection of data exploration tools was developed at Yale University for the graphical exploration of complex multivariate data; barcode and gpairs now have their own packages.

**License** GPL (>= 2)

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YaleToolkit-package     *Data exploration tools from the Department of Statistics at Yale University*

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## Description

This collection of data exploration tools was developed at Yale University for the graphical exploration of complex multivariate data. The main functions provided are `barcode()`, `gpairs()`, `whatis()`, and `sparkmat()`, although `barcode()` and `gpairs()` are now provided by packages of the same names, respectively.

## Details

Package: YaleToolkit  
Type: Package  
Version: 4.1  
Date: 2012-02-19  
License: GPL version 2 or newer

See individual help files for more information about the functions.

The package also includes several data sets. For more information, please see the help files for `nasa` and `YaleEnergy`. Please get in touch with us if you note any problems.

## Author(s)

John W. Emerson, Walton Green

Maintainer: John W. Emerson <[john.emerson@yale.edu](mailto:john.emerson@yale.edu)>

## References

Chambers, J.M., Cleveland, W.S., Kleiner, B., and Tukey, P.A. (1983), *Graphical Methods for Data Analysis*, Belmont, CA: Wadsworth.

Friendly, M. (2002) 'Corrgrams: Exploratory displays for correlation matrices' *American Statistician* 56(4), 316–324.

Tufte, Edward R. (2006) *Beautiful Evidence* The Graphics Press, Cheshire, Connecticut. See <http://www.edwardtufte.com> for this and other references.

## See Also

[barcode](#), [gpairs](#), [sparkmat](#), [sparklines](#), [sparkline](#), [whatis](#), [corrgram](#).

## Examples

```
# See individual function documentation for examples.
```

---

`nasa`*Pressure and High Cloud Cover Spatially Distributed Time Series*

---

**Description**

Six years of monthly pressure and high cloud cover measurements over a regular grid of the Americas, from NASA's poster competition at the 2006 Joint Statistical Meeting (JSM).

**Usage**

```
data(nasa)
```

**Format**

This NASA data set is stored as a list of 3 components: `data` (containing the pressure and high cloud cover measurements), `elev` (the elevation data), and `coast` (the coastline data). To see the structure, type `str(nasa)`, and see `Details` and `Source` for more information, below.

**Details**

The data are a subset of some geographic and atmospheric measurements on a coarse 24 by 24 grid covering Central America. The variables included are elevation, air pressure, and high cloud cover. With the exception of elevation, the variables are monthly averages, with observations for Jan., 1995 to Dec., 2000. These data were obtained from the NASA Langley Research Center Atmospheric Sciences Data Center.

**Source**

NASA Langley Research Center Atmospheric Sciences Data Center, with permission. The JSM poster competition was announced at:

<http://www.amstat-online.org/sections/graphics/dataexpo/2006.php>

**Examples**

```
# See sparkmat().
```

---

`sparkline`*Draws a sparkline*

---

**Description**

Draws a times series or 'sparkline' in a compact iconic fashion suitable for inclusion in more complex graphics or text.

**Usage**

```
sparkline(s, times = NULL, ylim = NULL, buffer = unit(0, "lines"),
          margins = NULL, IQR = NULL, yaxis = FALSE, xaxis = FALSE,
          ptopts = list(points = NULL, labels = NULL, labels.ch = NULL,
                        gp = NULL, just = NULL, pch = NULL), margin.pars = NULL,
          buffer.pars = NULL, frame.pars = NULL, line.pars = gpar(lwd = 1),
          main = NULL, sub = NULL, xlab = NULL, ylab = NULL, new = TRUE)
```

**Arguments**

<code>s</code>	a vector or time series (class "ts" or "zoo") giving the data to be plotted. If <code>s</code> is a time series, the <code>start</code> , <code>end</code> , and <code>frequency</code> found in <code>attributes(s)\$tsp</code> are automatically converted into an argument to <code>times</code> .
<code>times</code>	the times at which to plot the data; if <code>NULL</code> (the default), equal spacing is assumed, equivalent to setting <code>times = 1:length(s)</code> .
<code>ylim</code>	the maximum and minimum value on the y-axis; if <code>NULL</code> , defaults to the actual maximum and minimum of the data.
<code>buffer</code>	a buffer above the maximum and below the minimum values attained by the sparkline. Defaults to <code>unit(0, 'lines')</code> .
<code>margins</code>	margins around the sparkline-plus-buffer area. <code>NULL</code> (the default) provides no margins; the value passed must be a 4-vector of units giving the bottom, left, top and right margins in that order.
<code>IQR</code>	a list of graphics parameters to shade or otherwise delineate the interquartile range of the sparkline. <code>NULL</code> (the default), does not show the IQR. See <a href="#">Details</a> for more information.
<code>yaxis</code>	draws a vertical axis if <code>TRUE</code> ; defaults to <code>FALSE</code> in which case no axis is drawn.
<code>xaxis</code>	'interior' draws a horizontal axis inside the plotting frame; 'exterior' outside the plotting frame (in the margins); defaults to <code>FALSE</code> , in which case no axis is drawn.
<code>ptopts</code>	a list of graphics parameters describing the points on the sparkline that are plotted and labelled. In particular the first and last or minimum and maximum points are labeled if <code>ptopts\$labels</code> is 'first.last' or 'min.max'. In addition to labels, other relevant parameters from <a href="#">gpar</a> should be valid. See <a href="#">Details</a> for more information.
<code>margin.pars</code>	a list of graphics parameters describing the margin area. See <a href="#">Details</a> for more information.
<code>buffer.pars</code>	a list of graphics parameters describing the buffer area. See <a href="#">Details</a> for more information.
<code>frame.pars</code>	a list of graphics parameters describing the exact area taken up by the plotted sparkline. See <a href="#">Details</a> for more information.
<code>line.pars</code>	a list of graphics parameters describing the sparkline. See <a href="#">Details</a> for more information.
<code>main</code>	a main title, above the sparkline.
<code>sub</code>	a subtitle, to the right of the sparkline.

xlab	a string to label the x-axis.
ylab	a string to label the y-axis.
new	defaults to TRUE, which creates a new, empty page; otherwise adds the sparkline to an existing plot.

### Details

In all the cases where a list of graphics parameters is needed, the valid parameter names are the same as would be valid when passed to `gpar` in the appropriate call. That is, passing `list(fill = 'blue', col = 'red')` to `margin` gives a margin that is blue with a red border; but adding `fontface = 'bold'` will have no effect, just as it would have no effect in a call to `grid.rect()`. In particular, note that `ptopts` takes the following non-standard parameters: `labels`, a vector indexing the points to label or the string `'min.max'` or `'first.last'`; `labels.ch`, a vector of strings giving the labels; and `points`, a vector indexing the points at which points should be plotted. Passing `'min.max'` or `'first.last'` to `ptopts$labels` overrides any values of `ptopts$labels.ch`.

### Note

This is primarily intended to be called by other functions (`sparklines()` and `sparkmat()`), but it can also be used as an alternative to `ts.plot()`. Thanks to Gabor Grothendieck for suggesting the generalization that provides support of "zoo" objects.

### Author(s)

John W. Emerson, Walton Green

### References

Tufte, E. R. (2006) *Beautiful Evidence* Cheshire, Connecticut: Graphics Press.

### See Also

[ts.plot](#), [sparklines](#), [sparkmat](#)

### Examples

```
### sparkline examples
data(nhtemp)

## The default behaviour of sparkline

sparkline(nhtemp)

## Creating stand-alone plots

sparkline(rnorm(10),
          buffer = unit(1, "lines"),
          ptopts = 'first.last',
          margins = unit(c(1,1,1,1), 'inches'),
```

```

        yaxis = TRUE, xaxis=TRUE,
        IQR = gpar(fill = 'grey', col = 'grey'),
        main = "Ten Random Standard Normal Numbers",
        sub = '...plotted here')

data(YaleEnergy)
y <- YaleEnergy[YaleEnergy$name==YaleEnergy$name[2],]
sparkline(y$ELSQFT, times=y$year+y$month/12,
          xaxis=TRUE, yaxis=TRUE, main="Branford College Electrical Consumption",
          buffer=unit(1, "lines"), margins = unit(c(1, 1, 1, 1), 'inches'))

sparkline(Nile,
          buffer = unit(1, "lines"),
          ptopts = list(labels = 'min.max'),
          margin.pars = gpar(fill = 'lightblue'),
          buffer.pars = gpar(fill = 'lightgreen'),
          frame.pars = gpar(fill = 'lightyellow'),
          yaxis = TRUE, xaxis=TRUE,
          IQR = gpar(fill = 'grey', col = 'grey'),
          main="Nile Discharge between 1871 and 1970",
          sub='In what units?')

## Adding a sparkline to an existing plot

grid.newpage()
pushViewport(viewport(w = 0.8, h = 0.8))
sparkline(rnorm(10),
          buffer = unit(1, "lines"),
          margins = unit(c(4,4,4,4), 'points'),
          ptopts = list(labels = 'min.max'),
          margin.pars = gpar(fill = 'lightblue'),
          buffer.pars = gpar(fill = 'lightgreen'),
          frame.pars = gpar(fill = 'lightyellow'),
          yaxis = TRUE, xaxis=TRUE,
          IQR = gpar(fill = 'grey', col = 'grey'),
          main="Title (plotted OUTSIDE the viewport)", new = FALSE)
popViewport()

```

---

sparklines

*Draws a panel of vertically stacked sparklines*

---

### Description

Draws a panel of vertically stacked, aligned sparklines, or time series.

### Usage

```

sparklines(ss, times = NULL, overlap = FALSE, yscale = NULL,
           buffer = unit(0, "lines"), buffer.pars = NULL, IQR = NULL,

```

```

ptopts = NULL, yaxis = TRUE, xaxis = "exterior",
labeled.points = NULL, point.labels = NULL,
label.just = c(1.2, 0.5), frame.pars = NULL,
line.pars = gpar(lwd = 1),
outer.margin = unit(c(5, 4, 4, 2), "lines"),
outer.margin.pars = NULL, main = NULL, sub = NULL,
xlab = NULL, ylab = NULL, lcol = NULL, new = TRUE)

```

## Arguments

<code>ss</code>	a data frame whose columns give the time series to be plotted
<code>overlap</code>	FALSE for stacked sparklines; TRUE for all plotted on the same y-axis.
<code>times</code>	the times at which to plot the data; if NULL (the default), equal spacing is assumed. All the sparklines must share the same <code>times</code> argument. If unaligned time series must be plotted, multiple calls to <code>sparklines()</code> are required.
<code>yscale</code>	either a vector of length 2 giving the y-limits for all sparklines, or a list having the same length as the number of columns in <code>ss</code> (each component of which is a 2-vector giving the associated sparkline scales). Defaults to NULL, in which case the scales for each sparkline are set to the sparkline's minimum and maximum values.
<code>buffer</code>	a buffer above the maximum and below the minimum values attained by the sparkline. Defaults to <code>unit(0, 'lines')</code> .
<code>buffer.pars</code>	a list of graphics parameters describing the buffer area. See <a href="#">Details</a> for more information.
<code>IQR</code>	a list of graphics parameters to shade or otherwise delineate the interquartile range of the sparkline. Defaults to NULL, in which case the IQR is not shown. See <a href="#">Details</a> for more information.
<code>ptopts</code>	a list of graphics parameters describing the points on the sparkline that are plotted and labelled. In particular the first and last or minimum and maximum points are labeled if <code>ptopts\$labels</code> is <code>'first.last'</code> or <code>'min.max'</code> .
<code>yaxis</code>	draws a vertical axis if TRUE; defaults to FALSE, in which case no axis is drawn.
<code>xaxis</code>	<code>'interior'</code> draws horizontal axes inside the plotting frame (for each sparkline); <code>'exterior'</code> draws the common axis for all the sparklines outside the plotting frame; defaults to FALSE (no axis).
<code>labeled.points</code>	not implemented. See <code>ptopts</code> .
<code>point.labels</code>	not implemented. See <code>ptopts</code> .
<code>label.just</code>	not implemented. See <code>ptopts</code> .
<code>frame.pars</code>	a list of graphics parameters describing the exact area taken up by the plotted sparkline. See <a href="#">Details</a> for more information.
<code>line.pars</code>	a list of graphics parameters describing the sparkline. See <a href="#">Details</a> for more information.
<code>outer.margin</code>	a vector of 4 units (bottom, left, top, right) giving the outer margin sizes in order (around the entire panel of sparklines). Defaults to <code>unit(c(0,0,0,0), 'lines')</code> .

<code>outer.margin.pars</code>	a list of graphics parameters describing the outer margin. See <code>Details</code> for more information.
<code>main</code>	a main title, above the stack of sparklines.
<code>sub</code>	a character vector the length of <code>length(ss)</code> providing titles for the individual sparklines, printed to the right of the sparklines.
<code>xlab</code>	a string providing the label for the common x-axis or (probably a useless feature) a character vector the length of <code>length(ss)</code> providing x-axis labels for the individual sparklines.
<code>ylab</code>	a character vector the length of <code>length(ss)</code> providing y-axis labels for the individual sparklines.
<code>lcol</code>	a vector of colors the same length as the number of columns in <code>ss</code> to color the line. As in base graphics, can be either a vector of strings giving the color names, a numeric vector referring to the current palette, or the output of functions like <code>hsv</code> or <code>rgb</code>
<code>new</code>	defaults to <code>TRUE</code> , which creates a new, empty page; otherwise adds the sparkline to the existing plot.

### Details

In all the cases where a list of graphics parameters is needed, the valid parameter names are the same as would be valid when passed to `gpar` in the appropriate call. That is, passing `list(fill = 'blue', col = 'red')` to `margin` gives a margin that is blue with a red border; but adding `fontface = 'bold'` will have no effect, just as it would have no effect in a call to `grid.rect`.

### Note

We do not support non-aligned time series plots such as `ts.plot(airmiles, Nile, nhtemp)`.

### Author(s)

John W. Emerson, Walton Green

### References

Tufte, E. R. (2006) *Beautiful Evidence* Cheshire, Connecticut: Graphics Press.

### See Also

[ts.plot](#), [sparkline](#), [sparkmat](#)

### Examples

```
### sparkline examples
data(beaver1)

## The default behaviour of sparklines
sparklines(beaver1)
```

```

sparklines(beaver1,
           outer.margin = unit(c(2,4,4,5), 'lines'),
           outer.margin.pars = gpar(fill = 'lightblue'),
           buffer = unit(1, "lines"),
           frame.pars = gpar(fill = 'lightyellow'),
           buffer.pars = gpar(fill = 'lightgreen'),
           yaxis = TRUE, xaxis=FALSE,
           IQR = gpar(fill = 'grey', col = 'grey'),
           main = 'Beaver 1')

data(YaleEnergy)
y <- YaleEnergy[YaleEnergy$name==YaleEnergy$name[2],]
sparklines(y[,c("ELSQFT", "STEAM")], times=y$year+y$month/12,
           main="Branford Electric and Steam Consumption")

## Adding a pair of sparklines to an existing plot

grid.newpage()
pushViewport(viewport(w = 0.8, h = 0.8))
sparklines(data.frame(x = rnorm(10), y = rnorm(10, mean=5)), new = FALSE)
popViewport()

grid.newpage()
pushViewport(viewport(w = 0.8, h = 0.8))
sparklines(data.frame(x = rnorm(10), y = rnorm(10, mean=2)),
           buffer = unit(1, "lines"),
           frame.pars = gpar(fill = 'lightyellow'),
           yaxis = TRUE, xaxis=FALSE,
           IQR = gpar(fill = 'grey', col = 'grey'), new = FALSE)
popViewport()

```

---

sparkmat

*Draws a sparkmat*

---

## Description

Draws multiple time series (or sparklines) at given locations.

## Usage

```

sparkmat(x, locs = NULL, w = NULL, h = NULL, lcol = NULL,
         yscales = NULL, tile.shading = NULL,
         tile.margin = unit(c(0, 0, 0, 0), "points"),
         tile.pars = NULL, just = c("right", "top"),
         new = TRUE, ...)

```

**Arguments**

<code>x</code>	a list of data frames, all with the same dimensions, one for each panel of vertically aligned sparklines.
<code>locs</code>	a data frame with x-coordinates in the first variable and y-coordinates in the second variable, giving locations of each of the <code>length(x)</code> sparkline panels.
<code>w</code>	vector of unit widths (or native widths if not specified as units).
<code>h</code>	vector of unit heights (or native heights if not specified as units).
<code>lcol</code>	vector of <code>ncol(x[[1]])</code> line colors, one for each sparkline in each panel.
<code>yscales</code>	either a vector of length 2 giving the y-limits for all sparklines, or a list having the same length as the number of columns in <code>ss</code> (each component of which is a 2-vector giving scales for the individual sparklines). Defaults to <code>NULL</code> , in which case the scales for each sparkline are set to its minimum and maximum value within the panel.
<code>tile.shading</code>	vector of background shadings for the panels.
<code>tile.margin</code>	an outer margin around each tile (panel of sparklines). A 4-vector of units giving the bottom, left, top and right margins; defaults to <code>unit(c(0,0,0,0), 'points')</code> .
<code>tile.pars</code>	a list of graphics parameters describing the buffer area. See <code>Details</code> for more information.
<code>just</code>	default is <code>c("right", "top")</code> ; controls the justification of the sparklines relative to the provided location coordinates.
<code>new</code>	defaults to <code>TRUE</code> , which creates a new, empty page; otherwise adds the sparkline to the existing plot.
<code>...</code>	for arguments to be passed through to <code>sparklines()</code> .

**Details**

In all the cases where a list of graphics parameters is needed, the valid parameter names are the same as would be valid when passed to `gpar` in the appropriate call. That is, passing `list(fill = 'blue', col = 'red')` to `margin` gives a margin that is blue with a red border; but adding `fontface = 'bold'` will have no effect, just as it would have no effect in a call to `grid.rect()`.

**Author(s)**

John W. Emerson, Walton Green

**References**

Tufte, E. R. (2006) *Beautiful Evidence* Cheshire, Connecticut: Graphics Press.

**See Also**

[ts.plot](#), [sparkline](#), [sparklines](#)

**Examples**

```

# An example with a time series of energy consumption at Yale colleges.
data(YaleEnergy)
y <- YaleEnergy

# Need list of 12 data frames, each with one time series.

z <- list(data.frame(y[y$name==y$name[1], "ELSQFT"]),
          data.frame(y[y$name==y$name[2], "ELSQFT"]),
          data.frame(y[y$name==y$name[3], "ELSQFT"]),
          data.frame(y[y$name==y$name[4], "ELSQFT"]),
          data.frame(y[y$name==y$name[5], "ELSQFT"]),
          data.frame(y[y$name==y$name[6], "ELSQFT"]),
          data.frame(y[y$name==y$name[7], "ELSQFT"]),
          data.frame(y[y$name==y$name[8], "ELSQFT"]),
          data.frame(y[y$name==y$name[9], "ELSQFT"]),
          data.frame(y[y$name==y$name[10], "ELSQFT"]),
          data.frame(y[y$name==y$name[11], "ELSQFT"]),
          data.frame(y[y$name==y$name[12], "ELSQFT"]))

sparkmat(z, locs=data.frame(y$lon, y$lat), new=TRUE,
         w=0.002, h=0.0002, just=c("left", "top"))
grid.text(y[1:12,1], unit(y$lon[1:12]+0.001, "native"),
          unit(y$lat[1:12]+0.00003, "native"),
          just=c("center", "bottom"), gp=gpar(cex=0.7))
grid.text("Degrees Longitude", 0.5, unit(-2.5, "lines"))
grid.text("Degrees Latitude", unit(-4.5, "lines"), 0.5, rot=90)
grid.text("Monthly Electrical Consumption (KwH/SqFt)",
          0.5, 0.82, gp=gpar(cex=1, font=2))
grid.text("of Yale Residential Colleges",
          0.5, 0.77, gp=gpar(cex=1, font=2))
grid.text("July 1999 - July 2006",
          0.5, 0.72, gp=gpar(cex=1, font=2))

# An example with pressure and high cloud cover over a regular grid of the
# Americas, provided by NASA ().

runexample <- FALSE
if (runexample) {

data(nasa)

grid.newpage()
pushViewport(viewport(w = unit(1, "npc")-unit(2, "inches"),
                      h = unit(1, "npc")-unit(2, "inches")))
v <- viewport(xscale = c(-115, -55),
              yscale = c(-22.5, 37.5))
pushViewport(v)

y <- vector(mode="list", length=24*24)
locs <- as.data.frame(matrix(0, 24*24, 2))

```

```

tile.shading <- rep(0, 24*24)
for(i in 1:24) { # Latitudes
  for(j in 1:24) { # Longitudes
    y[[i-1]*24+j]] <- as.data.frame(t(nasa$data[,i,j]))
    locs[(i-1)*24+j,] <- c(as.numeric(dimnames(nasa$data)$lon[j]),
                          as.numeric(dimnames(nasa$data)$lat[i]))
    tile.shading[(i-1)*24+j] <- gray( 1-.5*(nasa$elev[i,j]/max(nasa$elev)) )
  }
}

yscales <- list(quantile(nasa$data["pressure",,,], c(0.01, 0.99), na.rm=TRUE),
               quantile(nasa$data["cloudhigh",,,], c(0.01, 0.99), na.rm=TRUE))

sparkmat(y, locs=locs, just='center', w=2.5, h=2.5,
         tile.shading=tile.shading, lcol=c(6,3), yscales=yscales,
         tile.margin = unit(c(2,2,2,2), 'points'), new=FALSE)

grid.xaxis(gp=gpar(fontface=2, fontsize=14))
grid.yaxis(gp=gpar(fontface=2, fontsize=14))
grid.rect()

grid.text("Degrees Latitude", x=unit(-0.75, "inches"), y=0.5, rot=90,
         gp=gpar(fontface=2, fontsize=14))
grid.text("Degrees Longitude", x=0.5, y=unit(-0.75, "inches"), rot=0,
         gp=gpar(fontface=2, fontsize=14))
grid.text("Grayscale shading reflects",
         x=unit(1, "npc")+unit(0.6, "inches"), y=0.5, rot=270,
         gp=gpar(fontface=2, fontsize=14))
grid.text("average elevation above sea level",
         x=unit(1, "npc")+unit(0.3, "inches"), y=0.5, rot=270,
         gp=gpar(fontface=2, fontsize=14))

grid.lines(nasa$coast[,1], nasa$coast[,2], default.units = 'native',
         gp = gpar(col = 'black', lwd = 1))

grid.text("Pressure",
         x=0.25, y=unit(1, "npc")+unit(1.25, "lines"),
         gp=gpar(fontface=2, fontsize=14))
grid.rect(x=0.25, y=unit(1, "npc") + unit(0.5, "lines"),
         width=0.4, height=unit(0.05, "inches"), gp=gpar(col=6, fill=6))
grid.text("High Cloud",
         x=0.75, y=unit(1, "npc")+unit(1.25, "lines"),
         gp=gpar(fontface=2, fontsize=14))
grid.rect(x=0.75, y=unit(1, "npc") + unit(0.5, "lines"),
         width=0.4, height=unit(0.05, "inches"), gp=gpar(col=3, fill=3))
}

```

**Description**

Summarize the characteristics of variables (columns) in a data frame.

**Usage**

```
whatis(x, var.name.truncate = 20, type.truncate = 14)
```

**Arguments**

<code>x</code>	a data frame
<code>var.name.truncate</code>	maximum length (in characters) for truncation of variable names. The default is 20; anything less than 12 is less than the column label in the resulting data frame and is a waste of information.
<code>type.truncate</code>	maximum length (in characters) for truncation of variable type; 14 is the full width, but 4 works well if space is at a premium.

**Details**

The function `whatis()` provides a basic examination of some characteristics of each variable (column) in a data frame.

**Value**

A list of characteristics describing the variables in the data frame, `x`. Each component of the list has `length(x)` values, one for each variable in the data frame `x`.

<code>variable.name</code>	from the <code>names(x)</code> attribute, possibly truncated to <code>var.name.truncate</code> characters in length.
<code>type</code>	the possibilities include "pure factor", "mixed factor", "ordered factor", "character", and "numeric"; <code>whatis()</code> considers the possibility that a factor or a vector could contain character and/or numeric values. If both character and numeric values are present, and if the variable is a factor, then it is called a mixed factor. If the levels of a factor are purely character or numeric (but not both), it is a pure factor. Non-factors must then be either character or numeric.
<code>missing</code>	the number of NAs in the variable.
<code>distinct.values</code>	the number of distinct values in the variable, equal to <code>length(table(variable))</code> .
<code>precision</code>	the number of decimal places of precision.
<code>min</code>	the minimum value (if numeric) or first value (alphabetically) as appropriate.
<code>max</code>	the maximum value (if numeric) or the last value (alphabetically) as appropriate.

**Author(s)**

John W. Emerson, Walton Green

**References**

Special thanks to John Hartigan and the students of 'Statistical Case Studies' of 2004 for their help troubleshooting and developing the function `whatis()`.

**See Also**

See also [str](#).

**Examples**

```
mydf <- data.frame(a=rnorm(100),
                  b=sample(c("Cat", "Dog"), 100, replace=TRUE),
                  c=sample(c("Apple", "Orange", "8"), 100, replace=TRUE),
                  d=sample(c("Blue", "Red"), 100, replace=TRUE))
mydf$d <- as.character(mydf$d)
whatis(mydf)

data(iris)
whatis(iris)

data(NewHavenResidential)
whatis(NewHavenResidential)
```

---

YaleEnergy

*Monthly energy consumption of Yale residential colleges.*

---

**Description**

The data set contains monthly energy time series for Yale residential college, from July 1999 through July 2006

**Usage**

```
data(YaleEnergy)
```

**Format**

A data frame with 1020 observations on the following 18 variables.

`name` a factor with levels BERKELEY BRANFORD CALHOUN DAVENPORT EZRA STILES JONATHAN EDWARDS MORSE PIERSON SAYBROOK SILLIMAN TIMOTHY DWIGHT TRUMBULL

`address` a factor with levels 189 ELM ST. 205 ELM ST. 241 ELM ST. 242 ELM ST. 248 YORK ST. 261 PARK ST. 302 YORK ST. 345 TEMPLE ST. 505 COLLEGE ST. 70 HIGH ST. 74 HIGH ST.

`gsf` gross square footage of the college

`EL` electrical consumption in kilowatt hours

ELSQFT electrical consumption per square foot  
 CHW chilled water consumption in tons  
 SQFTCHW square feet per ton of chilled water  
 STEAM steam consumption in pounds  
 STEAMSQFT steam per square foot  
 MBTU million British Thermal Units (BTU) from chilled water and steam  
 MBTUSQFT million BTUs per square foot  
 year year of the record  
 month month of the record  
 lon degrees longitude of the college  
 lat degrees latitude

### Source

John W. Emerson, Yale University

### Examples

```

data(YaleEnergy)
whatis(YaleEnergy)

y <- YaleEnergy          # This is just for convenience.
esqft <- list(data.frame(y[y$name==y$name[1], "ELSQFT"]),
              data.frame(y[y$name==y$name[2], "ELSQFT"]),
              data.frame(y[y$name==y$name[3], "ELSQFT"]),
              data.frame(y[y$name==y$name[4], "ELSQFT"]),
              data.frame(y[y$name==y$name[5], "ELSQFT"]),
              data.frame(y[y$name==y$name[6], "ELSQFT"]),
              data.frame(y[y$name==y$name[7], "ELSQFT"]),
              data.frame(y[y$name==y$name[8], "ELSQFT"]),
              data.frame(y[y$name==y$name[9], "ELSQFT"]),
              data.frame(y[y$name==y$name[10], "ELSQFT"]),
              data.frame(y[y$name==y$name[11], "ELSQFT"]),
              data.frame(y[y$name==y$name[12], "ELSQFT"]))

# The sparkmat() command does most of the work:
sparkmat(esqft, locs=data.frame(y$lon, y$lat), new=TRUE,
         w=0.002, h=0.0002, just=c("left", "top"))

# We'll add some text for a nice finished product:
grid.text(y[1:12,1], unit(y$lon[1:12]+0.001, "native"),
          unit(y$lat[1:12]+0.00003, "native"),
          just=c("center", "bottom"), gp=gpar(cex=0.7))
grid.text("Degrees Longitude", 0.5, unit(-2.5, "lines"))
grid.text("Degrees Latitude", unit(-4.5, "lines"), 0.5, rot=90)
grid.text("Monthly Electrical Consumption (KwH/SqFt) of Yale Colleges",
          0.5, 0.8, gp=gpar(cex=1, font=2))
grid.text("July 1999 - July 2006",
          0.5, 0.74, gp=gpar(cex=1, font=2))

```

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