


Using for statistical analyses

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Day 7 - Agenda:

- ▶  Graph Gallery
- ▶ wind rose plots
- ▶ matrices and arrays
- ▶ image plots

Graph Gallery







Graph Gallery - Enhance your data visualization with R

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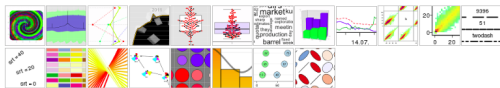
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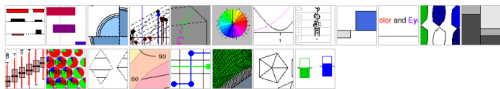
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► Last entries ...




► Random entries







R Project

R is a system for statistical computation and graphics. It consists of a language plus a run-time environment with graphics, a debugger, access to certain system functions, and the ability to run programs stored in script files.





R Graphic Engine

One of R's strengths is the ease with which well-designed publication-quality plots can be produced, including mathematical symbols and formulae where needed. Great care has been taken over the defaults for the minor design choices in graphics, but the user retains full control.

 131
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168) Chartjunk with R by Ben Bolker, Baptiste Augle.

A question on StackOverflow asked for "Excel-like" features: a gradient background, shadowed points or lines, and a box with rounded corners. Always eager to please, Baptiste Augle and I collaborated to create this marvelous demonstration that R can produce any plot you want, even if it is de ...



165) Profile Plot by Patrick R. Schmid.

Not unlike the stars() plot, a profile plot allows one to generate a profile of several items and how they compare on various axes. Using this plot one can quickly see how items stack up on multiple dimensions. For example, when attempting to compare three brands of cars, one might want to compare t ...



164) Beeswarm boxplot (with ggplot2) by Denis Haine.

This is another implementation of the Beeswarm Boxplot, using ggplot2. From Denis Haine's blog ...



162) word cloud by Ian Fellows.

A tag cloud (word cloud, or weighted list in visual design) is a visual representation for text data, typically used to depict keyword metadata (tags) on websites, or to visualize free form text. "Tags" are usually single words, normally listed alphabetically, and the importance of each tag is shown ...



160) multiple time series by René Locher.

Plots one or more regular time series in multiple figures on one or more screens (pages). In this example, O₃, NO_x and temperature 30-minutes means at Aitdorf from 2004-07-13 to 2004-07-22 are shown. ...



158) Image lag plot matrix by René Locher.

Produces an image lag plot matrix of large timeseries where the colors encode the density of the points in the lag plots. In this example, the auto correlations with lag 1-4 of O₃ concentrations in Aitdorf (Switzerland) in 2004 can be compared. ...



167) box-and-whisker plot of FFT power spectrum by frequency/period by Christian Gunning.

This is a visualization of a boxplot with a continuous X axis, where the "categories" of the X-axis have natural but non-linear spacing. In this case, the distribution of power spectrum coefficients of a number of time series generated by the logistic plot are shown. For more details, see this ...



165) Evolution of Rcpp code size by Romain Francois.

This graph uses the png package to import a png file used in the background. It also shows the use of transparency. ...



163) Beeswarm Boxplot by Tal Galili.

This Scatter Dot Beeswarm Box Violin - plot (in the lack of an agreed upon term) is a one-dimensional scatter plot which is like stripchart, but with closely packed, non-overlapping points; the positions of the points are corresponding to the frequency in a similar way as the violin-plot. The plot i ...



161) Presentation style 3D barplot by Michel J. Figurski.

3D bar-plot, similar to one produced by Excel or Calc, but with many customizable features, such as transparency, bar size, size of the gaps between bars, etc. The function has no error protection, so it may be hard to troubleshoot if the parameters are set incorrectly. Most importantly, "heights" p ...



159) Image scatter plot matrix by René Locher.

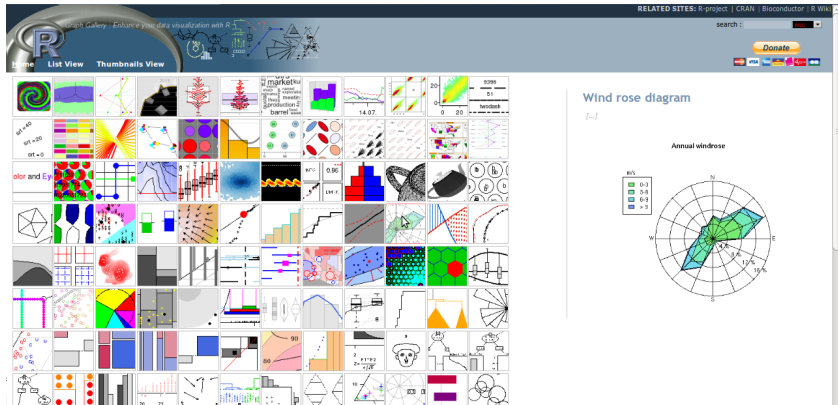
The 'pairs' function produces an image scatter plot matrix of large datasets where the colors encode the density of the points in the scatter plots. In this example, correlations of O_x concentrations between three different sites (Aitdorf, Lucerne and Schwyz) are demonstrated. ...



157) graphical parameter settings by Biecek Przemyslaw.

Examples for different settings of: the type and width for lines and the type and size for points ...

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Graph Gallery - Enhance your data visualization with R

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Annual windrose

Wind rose diagram

Description



Requirements

source code

Download or view  

packages



The following packages will be needed to produce that graph



climatol    




Author(s)


Jose A. Guizar

Social


  3

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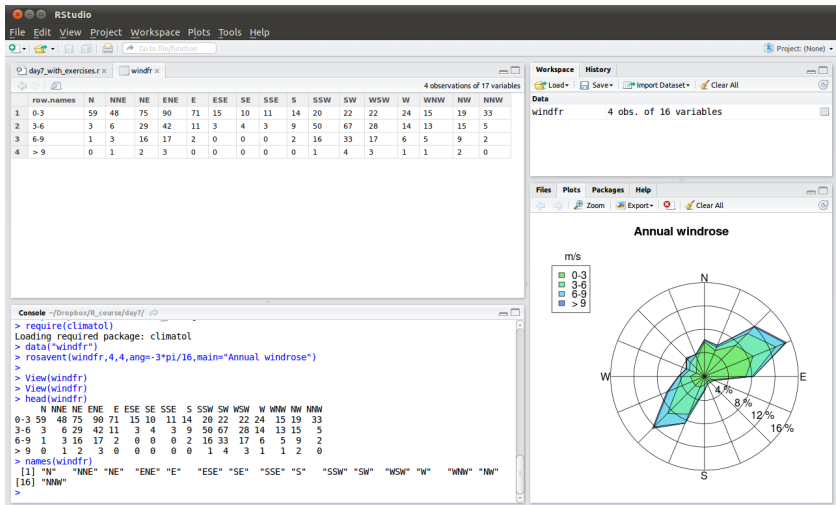
 Facebook social plugin

wind roses

```
require(climatol)
data(windfreq.dat)
rosavent(windfreq.dat,4,4,ang=-3*pi/16,main="Annual windrose")
```

```
install.packages("climatol")
require(climatol)
data("windfr")
rosavent(windfr,4,4,ang=-3*pi/16,main="Annual windrose")
```

wind roses



wind roses

```
u <- windfr
names(u) <- 1:16 # seq(0,360-22.5, length.out=16)
rosavent(windfr,4,4,ang=-3*pi/16,main="Annual windrose")
```

Exercise

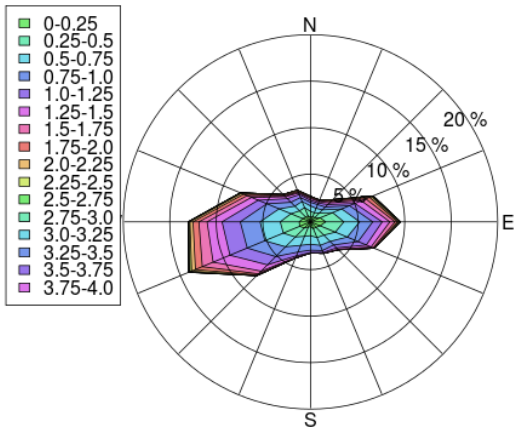
1. Import data from “wave_height_frequencies.xls”
2. create wind rose from data
3. rename legend (hint: use the help command)

Exercise

```
data <- read.table('wave_height_frequencies.csv')
rosavent(data, uni="wave height [m]")
?rosavent
```

Exercise

wave height [m]



Exercise

```
data <- read.table('wave_height_frequencies.csv')
rosavent(data, uni="wave height [m]")
?rosavent
```

defining matrices

```
matrix(1:10,nrow=5,ncol=2) # matrix(data,rows,columns)
matrix(1:10,5,2)           # option 2
matrix(1:10,5)              # option 3
dim(m)                      # checking matrix dimensions
```

defining matrices

```
matrix(1:10,nrow=5,ncol=2) # matrix(data,rows,columns)
matrix(1:10,5,2)           # option 2
matrix(1:10,5)              # option 3
dim(m)                      # checking matrix dimensions
```

```
matrix(0,5,2)               # 5x2 matrix of zeros
matrix(1,5,2)               # 5x2 matrix of ones
matrix(NA,5,2)              # 5x2 matrix of NAs
```

defining matrices

```
matrix(1:10,nrow=5,ncol=2) # matrix(data,rows,columns)
matrix(1:10,5,2)           # option 2
matrix(1:10,5)              # option 3
dim(m)                      # checking matrix dimensions
```

```
# matrices with uniform values
matrix(0,5,2)               # 5x2 matrix of zeros
matrix(1,5,2)               # 5x2 matrix of ones
matrix(NA,5,2)              # 5x2 matrix of NAs
```

```
matrix(0,5)                 # single column matrix

matrix(1:10,ncol=5,nrow=2) # changing arguments order
matrix(1:10,5,2,byrow=T)   # fill matrix by rows; default:
  byrow=F
```


defining matrices

```
matrix(1:10,nrow=5,ncol=2) # matrix(data,rows,columns)
```

```
## other options:
```

```
## a) aligning vectors
```

```
cbind(rep(0,5),rep(0,5)) # 5x2 matrix of zeros
```

```
## b) converting vectors
```

```
m <- 1:10
```

```
dim(m) <- c(5,2)
```

```
## c) arrays
```

```
array(1:10,dim=c(5,2)) # arrays
```

```
array(0, dim=c(5,2)) # 5x2 matrix of zeros
```

```
array(1:10, dim=c(5,2,3)) # multiple dimensions
```

matrix operations

```
m <- matrix(1:10,5,2)      # matrix(data,rows,columns)
m

## 1) changing values
## a) accessing specific elements
i <- c(2,4,8,10)
m[i]
m[i] <- 0
m

m[3,2] <- NA
m
m[8]
m[8] <- 100
m
```

matrix operations

```
## b) matrix wide operations
m <- matrix(rnorm(10),5,2) # matrix(data,rows,columns)
m
m <- round(m)
m

m*2
m*m # element by element product
```

matrix operations

```
## applying functions
# apply(matrix, margin, fun, ...)
# margin = 1; --> apply functions per row
# margin = 2; --> apply functions per column
# margin = c(1,2); --> apply functions per row & column
apply(m, 2, mean)
apply(m, 2, max)
apply(m, 2, sort) # sorting values

## 2) transpose matrix (changing rows and columns)
t(m)

## 3) extend matrix
cbind(m, 1:5)
n <- 1:5
cbind(m, n)
```

matrix operations

```
## 4) naming columns and vectors
colnames(m) <- paste("col",1:2, sep="")
rownames(m) <- paste("row",1:5, sep="")
m

# caution when accessing data!
m$col1 # works only on data frames
m[,1]
m <- data.frame(m)
m
str(m) # check structure
m$col1 # works only on data frames

# converting dataframes
m <- as.matrix(m)
str(m) # check structure
```

matrix operations

```
## 4) plotting matrices  
m  
dim(m) # 5x2 matrix  
image(m)
```

matrix operations

```
## 4) plotting matrices
m
dim(m) # 5x2 matrix
image(m)

image(1:5,1:2,m) # change axes tick marks
# attention:
# plot from the lower left margin
# rows and columns are switched!
```

matrix operations

```
## 4) plotting matrices
m
dim(m) # 5x2 matrix
image(m)

image(1:5,1:2,m) # change axes tick marks
# attention:
# plot from the lower left margin
# rows and columns are switched!

# show indices
text(c(row(m)), c(col(m))-.25,
     paste("[",c(row(m)), ",",c(col(m)),"] ", sep=""))
```


matrix operations

```
## 4) plotting matrices
m
dim(m) # 5x2 matrix
image(m)

image(1:5,1:2,m) # change axes tick marks
# attention:
# plot from the lower left margin
# rows and columns are switched!

# show indices
text(c(row(m)), c(col(m))-.25,
     paste("[",c(row(m)), ",",c(col(m)),"]", sep=""))

# show values
text(c(row(m)), c(col(m)), m)
```

how to plot a matrix

```
# set figure margins
par(mar=c(10,5,5,6)) # mar=c(bottom, left, top, right);
                        default:c(5, 4, 4, 2) + 0.1.

# start plotting procedure
image(1:5,1:2,m, axes=FALSE) # plot know axes!

# add axes & box
axis(1,at=1:5,lab=2:6)
axis(2,at=1:2,lab=6:5)
box()
```

```
# show indices
text(c(row(m)), c(col(m))-.25,
     paste("[",c(row(m)), ",",c(col(m)),"]", sep=""))

# show values
text(c(row(m)), c(col(m)), m)
```

```
# add colorbar
# install.packages("fields")
library(fields)
image.plot(m, legend.only=TRUE, col = heat.colors(12))
```

how to plot a matrix

```
datasheet <- read.table('SST_data.csv', header=F, sep=',',  
  dec=".")  
head(datasheet)  
z <- t(as.matrix(datasheet))  
x <- 1:dim(z)[1]  
y <- 1:dim(z)[2]  
colorbar.colors <- tim.colors(64)  
  
# set figure margins  
par(mar=c(10,5,5,6)) # mar=c(bottom, left, top, right);  
  default:c(5, 4, 4, 2) + 0.1.  
  
# start plotting procedure  
image(x, y, z[,180:1], col=colorbar.colors,  
  xlab='time', ylab='latitude', main="average monthly  
  SST from 2000-2010 at 335°E", axes=F)  
  
dates <- paste(7, '/', 2000:2010, sep="")  
axis(1,seq(7,length(x),12),dates)  
axis(2,seq(1,180,44.5),c(-90,45,0,45,90))  
box()  
image.plot(zlim=range(z), legend.only=TRUE, col=colorbar.  
  colors)
```

Exercise

1. Calculate the min, mean, median, max SST of each latitude
2. create an image plot from the wind rose data of Exercise 1
 - 2.1 add a colorbar and contour lines

Exercises

```
# 1. Calculate the min, mean, median, max SST of each
    latitude
apply(z,2,min)
apply(z,2,mean)
apply(z,2,median)
apply(z,2,max)
apply(z,2,range)

colMeans(z)
apply(z,2,quantile, probs = c(0.25, 0.5, 0.75))
```