Personality Project

Big Five Test PMC Lab Psychometric Theory psych package

A short list of the most useful R commands

A summary of the most important commands with minimal examples. See the relevant part of the guide for better examples. For all of these commands, using the help(function) or ? function is the most useful source of information. Unfortunately, knowing what to ask for help about is the hardest problem.

See the R-reference card by Tom Short for a much more complete list.

Input and display

```
#read files with labels in first row
read.table(filename,header=TRUE)            #read a tab or space delimited file
read.table(filename,header=TRUE,sep=',')    #read csv files

x <- c(1,2,4,8,16 )                            #create a data vector with specified elements
y <- c(1:10)                                   #create a data vector with elements 1-10
n <- 10
x1 <- c(rnorm(n))                              #create a n item vector of random normal deviates
y1 <- c(runif(n))+n                            #create another n item vector that has n added to each random uniform distribution
z <- rbinom(n,size,prob)                       #create n samples of size "size" with probability prob from the binomial
vect <- c(x,y)                                 #combine them into one vector of length 2n
mat <- cbind(x,y)                              #combine them into a n x 2 matrix
mat[4,2]                                    #display the 4th row and the 2nd column
mat[3,]                                     #display the 3rd row
mat[,2]                                     #display the 2nd column
subset(dataset,logical)                     #those objects meeting a logical criterion
subset(data.df,select=variables,logical)    #get those objects from a data frame that meet a criterion
data.df[data.df=logical]                    #yet another way to get a subset
x[order(x$B),]                              #sort a dataframe by the order of the elements in B
x[rev(order(x$B)),]                         #sort the dataframe in reverse order

browse.workspace                            #a Mac menu command that creates a window with information about all variables in the workspace
```

Moving around

```
ls()                                        #list the variables in the workspace
rm(x)                                       #remove x from the workspace
rm(list=ls())                               #remove all the variables from the workspace
attach(mat)                                 #make the names of the variables in the matrix or data frame available in the workspace
detach(mat)                                 #releases the names (remember to do this each time you attach something)
with(mat, .... )                            #a preferred alternative to attach ... detach
new <- old[,-n]                                #drop the nth column
new <- old[-n,]                                #drop the nth row
new <- old[,-c(i,j)]                        #drop the ith and jth column
new <- subset(old,logical)                     #select those cases that meet the logical condition
complete  <-  subset(data.df,complete.cases(data.df)) #find those cases with no missing values
new <- old[n1:n2,n3:n4]                        #select the n1 through n2 rows of variables n3 through n4)
```

Distributions

```
beta(a, b)
gamma(x)
choose(n, k)
factorial(x)

dnorm(x, mean=0, sd=1, log = FALSE)      #normal distribution
pnorm(q, mean=0, sd=1, lower.tail = TRUE, log.p = FALSE)
qnorm(p, mean=0, sd=1, lower.tail = TRUE, log.p = FALSE)
rnorm(n, mean=0, sd=1)


dunif(x, min=0, max=1, log = FALSE)      #uniform distribution
punif(q, min=0, max=1, lower.tail = TRUE, log.p = FALSE)
qunif(p, min=0, max=1, lower.tail = TRUE, log.p = FALSE)
runif(n, min=0, max=1)
```

Data manipulation

```
replace(x, list, values)                #remember to assign this to some object i.e., x <- replace(x,x==-9,NA)
                                        #similar to the operation x[x==-9] <- NA
scrub(x, where, min, max, isvalue,newvalue)  #a convenient way to change particular values (in psych package)

cut(x, breaks, labels = NULL,
    include.lowest = FALSE, right = TRUE, dig.lab = 3, ...)

x.df <- data.frame(x1,x2,x3 ...)           #combine different kinds of data into a data frame
```

```
            as.data.frame()
             is.data.frame()
x <- as.matrix()
scale()                                  #converts a data frame to standardized scores

round(x,n)                               #rounds the values of x to n decimal places
ceiling(x)                               #vector x of smallest integers > x
floor(x)                                 #vector x of largest interger < x
as.integer(x)                            #truncates real x to integers (compare to round(x,0)
as.integer(x < cutpoint)                 #vector x of 0 if less than cutpoint, 1 if greater than cutpoint)
factor(ifelse(a < cutpoint, "Neg", "Pos"))  #is another way to dichotomize and to make a factor for analysis
transform(data.df,variable names = some operation) #can be part of a set up for a data set

x%in%y                     #tests each element of x for membership in y
y%in%x                     #tests each element of y for membership in x
all(x%in%y)                #true if x is a proper subset of y
all(x)                     # for a vector of logical values, are they all true?
any(x)                     #for a vector of logical values, is at least one true?
```

Statistics and transformations

```
max(x, na.rm=TRUE)      #Find the maximum value in the vector x, exclude missing values
min(x, na.rm=TRUE)
mean(x, na.rm=TRUE)
median(x, na.rm=TRUE)
sum(x, na.rm=TRUE)
var(x, na.rm=TRUE)      #produces the variance covariance matrix
sd(x, na.rm=TRUE)       #standard deviation
mad(x, na.rm=TRUE)     #(median absolute deviation)
fivenum(x, na.rm=TRUE) #Tukey fivenumbers min, lowerhinge, median, upper hinge, max
table(x)    #frequency counts of entries, ideally the entries are factors(although it works with integers or even reals)
scale(data,scale=FALSE)   #centers around the mean but does not scale by the sd)
cumsum(x,na=rm=TRUE)     #cumulative sum, etc.
cumprod(x)
cummax(x)
cummin(x)
rev(x)       #reverse the order of values in x

cor(x,y,use="pair")   #correlation matrix for pairwise complete data, use="complete" for complete cases

aov(x~y,data=datafile)  #where x and y can be matrices
aov.ex1 = aov(DV~IV,data=data.ex1)  #do the analysis of variance or
aov.ex2 = aov(DV~IV1*IV21,data=data.ex2)          #do a two way analysis of variance
summary(aov.ex1)                                     #show the summary table
print(model.tables(aov.ex1,"means"),digits=3)       #report the means and the number of subjects/cell
boxplot(DV~IV,data=data.ex1)        #graphical summary appears in graphics window

lm(x~y,data=dataset)                       #basic linear model where x and y can be matrices  (see plot.lm for plotting options)
t.test(x,g)
pairwise.t.test(x,g)
power.anova.test(groups = NULL, n = NULL, between.var = NULL,
                 within.var = NULL, sig.level = 0.05, power = NULL)
power.t.test(n = NULL, delta = NULL, sd = 1, sig.level = 0.05,
             power = NULL, type = c("two.sample", "one.sample", "paired"),
             alternative = c("two.sided", "one.sided"),strict = FALSE)
```

More statistics: Regression, the linear model, factor analysis and principal components analysis (PCA)

```
matrices
t(X)                                    #transpose of X
X %*% Y                                 #matrix multiply X by Y
solve(A)                                #inverse of A
solve(A,B)                              #inverse of A * B    (may be used for linear regression)

data frames are needed for regression
lm(Y~X1+X2)
lm(Y~X|W)


factanal()    (see also fa in the psych package)
princomp()     (see principal in the psych package)
```

Useful additional commands

```
colSums (x, na.rm = FALSE, dims = 1)
rowSums (x, na.rm = FALSE, dims = 1)
colMeans(x, na.rm = FALSE, dims = 1)
rowMeans(x, na.rm = FALSE, dims = 1)
rowsum(x, group, reorder = TRUE, ...)          #finds row sums for each level of a grouping variable
apply(X, MARGIN, FUN, ...)                     #applies the function (FUN) to either rows (1) or columns (2) on object X
apply(x,1,min)                               #finds the minimum for each row
apply(x,2,max)                              #finds the maximum for each column
col.max(x)                                     #another way to find which column has the maximum value for each row
which.min(x)
which.max(x)
z=apply(x,1,which.min)               #tells the row with the minimum value for every column
```

Graphics

```
par(mfrow=c(nrow,mcol))                    #number of rows and columns to graph
par(ask=TRUE)                              #ask for user input before drawing a new graph
par(omi=c(0,0,1,0) )                       #set the size of the outer margins
mtext("some global title",3,outer=TRUE,line=1,cex=1.5)    #note that we seem to need to add the global title last
                    #cex = character expansion factor

boxplot(x,main="title")                   #boxplot (box and whiskers)


title( "some title")                           #add a title to the first graph


hist()                                    #histogram
plot()
        plot(x,y,xlim=range(-1,1),ylim=range(-1,1),main=title)
        par(mfrow=c(1,1))     #change the graph window back to one figure
        symb=c(19,25,3,23)
        colors=c("black","red","green","blue")
        charact=c("S","T","N","H")
        plot(PA,NAF,pch=symb[group],col=colors[group],bg=colors[condit],cex=1.5,main="Postive vs. Negative Affect by Film condition")
        points(mPA,mNA,pch=symb[condit],cex=4.5,col=colors[condit],bg=colors[condit])

curve()
abline(a,b)
         abline(a, b, untf = FALSE, ...)
     abline(h=, untf = FALSE, ...)
     abline(v=, untf = FALSE, ...)
     abline(coef=, untf = FALSE, ...)
     abline(reg=, untf = FALSE, ...)

identify()
        plot(eatar,eanta,xlim=range(-1,1),ylim=range(-1,1),main=title)
        identify(eatar,eanta,labels=labels(energysR[,1])  )       #dynamically puts names on the plots
locate()

legend()
pairs()                                   #SPLOM (scatter plot Matrix)
pairs.panels ()    #SPLOM on lower off diagonal, histograms on diagonal, correlations on diagonal
                   #not standard R, but in the psych package
matplot ()
biplot ())
plot(table(x))                            #plot the frequencies of levels in x

x= recordPlot()                     #save the current plot device output in the object x
replayPlot(x)                       #replot object x
dev.control                         #various control functions for printing/saving graphic files
pdf(height=6, width=6)              #create a pdf file for output
dev.of()                            #close the pdf file created with pdf
layout(mat)                         #specify where multiple graphs go on the page
                                    #experiment with the magic code from Paul Murrell to do fancy graphic location
layout(rbind(c(1, 1, 2, 2, 3, 3),
             c(0, 4, 4, 5, 5, 0)))
for (i in 1:5) {
  plot(i, type="n")
  text(1, i, paste("Plot", i), cex=4)
}
```

Distributions

To generate random samples from a variety of distributions

```
rnorm(n,mean,sd)
rbinom(n,size,p)
sample(x, size, replace = FALSE, prob = NULL)      #samples with or without replacement
```

Working with Dates

```
date <-strptime(as.character(date), "%m/%d/%y")    #change the date field to a internal form for time
                                                   #see ?formats and ?POSIXlt
 as.Date
 month= months(date)                #see also weekdays, Julian
```

And more...

The psych package includes about 350 additional functions that I have created in the last 9 years. These were created because my students and I needed some specific operation. Some functions were added following requests from other users. Follow the instructions for installing the psych package.

These functions include:

```
#alpha.scale     #find coefficient alpha for a scale and a dataframe of items
#describe        give means, sd, skew, n, and se
#summ.stats      #basic summary statistics by a grouping variable
#error.crosses   #(error bars in two space)
#skew            find skew
#panel.cor       taken from the examples for pairs
#pairs.panels    adapted from panel.cor  --   gives a splom, histogram, and correlation matrix
#multi.hist  #plot multiple histograms
#correct.cor    #given a correlation matrix and a vector of reliabilities, correct for reliability
#fisherz        #convert pearson r to fisher z
#paired.r       #test for difference of dependent correlations
#count.pairwise  #count the number of good cases when doing pairwise analysis
#eigen.loadings  #convert eigen vector vectors to factor loadings by unnormalizing them
#principal       #yet another way to do a principal components analysis -- brute force eignvalue decomp
#factor.congruence #find the factor congruence coeffiecints
#factor.model    #given a factor model, find the correlation matrix
#factor.residuals #how well does it fit?
#factor.rotate    # rotate two columns of a factor matrix by theta (in degrees)
#phi2poly       #convert a matrix of phi coefficients to polychoric correlations
```

Useful R links

- Readings and software:
- Comprehensive R Archive Network (CRAN)
- An introduction to R
- R Studio

- Structural Equation modelling:
- sem
- lavaan
- psych for sem
- EFA and factor extension (fa)

- Multilevel modeling:
- Multilevel
- Linear and Non Linear Mixed Effects nlme
- statsBy

- Item Response Models:
- Latent Trait Model (ltm)
- mirt
- mokken
- irt by factor analysis (irt.fa)

More on the psych package

The psych package is a work in progress. The current released version is 1.5.1 Updates are added sporadically, but usually at least once a quarter. The development version is always available at the pmc repository.

If you want to help us develop our understanding of personality, please take our test at SAPA Project.

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