

Introduction to R Software

Introduction to Statistical Functions

:::

Bivariate and Three Dimensional Plots

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Bivariate plots:

Provide first hand visual information about the nature and degree of relationship between two variables.

Relationship can be linear or nonlinear.

We discuss several types of plots through examples.

Scatter plot

Plot command:

x, y: Two data vectors

```
plot(x, y)
```

```
plot(x, y, type)
```

type	
"p" for p oints	"l" for l ines
"b" for b oth	"c" for the lines part alone of " b "
"o" for both ' o verplotted'	"s" for stair s teps.
"h" for ' h istogram' like (or 'high-density') vertical lines	

Scatter plot

Plot command:

x, y: Two data vectors

```
plot(x, y)
```

```
plot(x, y, type)
```

Get more details from help: `help("type")`

Other options:

main an overall title for the plot.

suba sub title for the plot.

xlaba title for the x axis.

ylaba title for the y axis.

aspthe y/x aspect ratio.

Example:

Daily water demand in a city depends upon weather temperature.

We know from experience that water consumption increases as weather temperature increases.

Data on 27 days is collected as follows:

Daily water demand (in million litres)

```
water <- c(33710,31666,33495,32758,34067,36069,  
37497,33044,35216, 35383,37066,38037,38495,  
39895,41311,42849,43038,43873,43923, 45078,  
46935,47951,46085,48003,45050,42924,46061)
```

Temperature (in centigrade)

```
temp <- c(23,25,25,26,27,28,30,26,29,32,33,34,  
35,38,39,42,43,44, 45,45.5,45,46,44,44,41,37,40)
```

Scatter plot

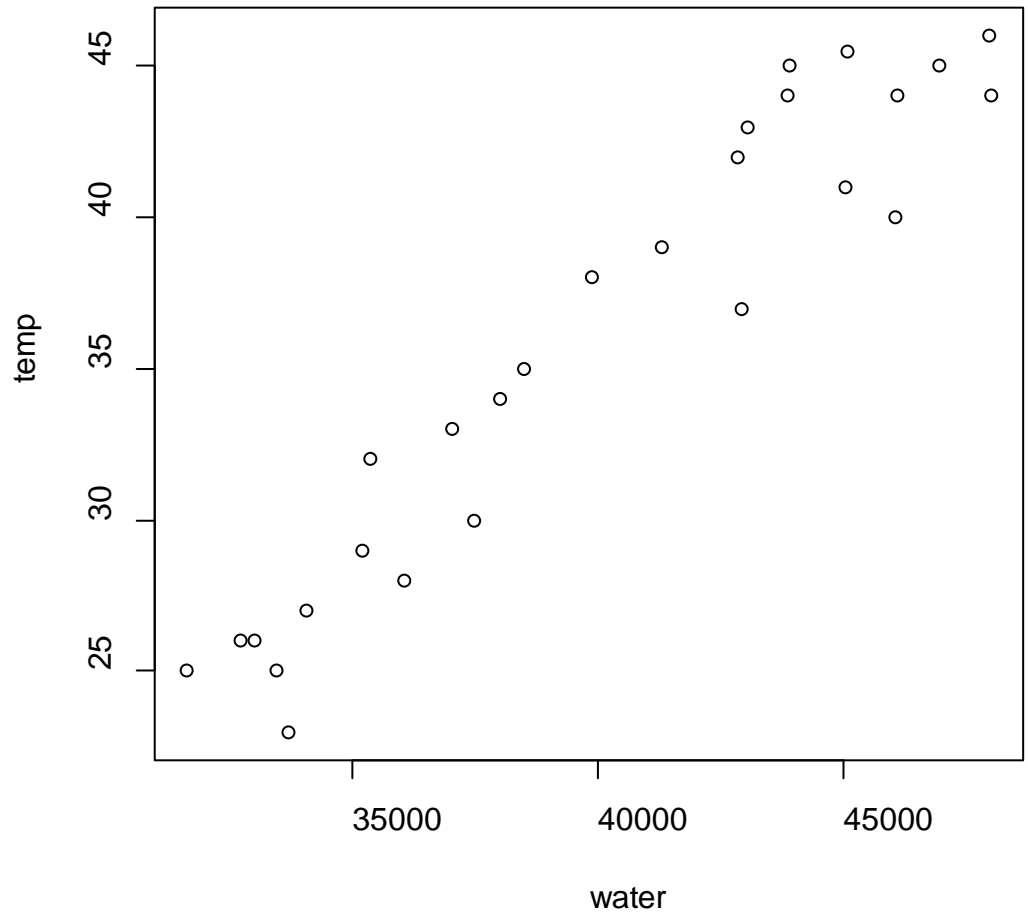
Plot command:

x, y: Two data vectors

Various type of plots are possible to draw.

plot(x, y)

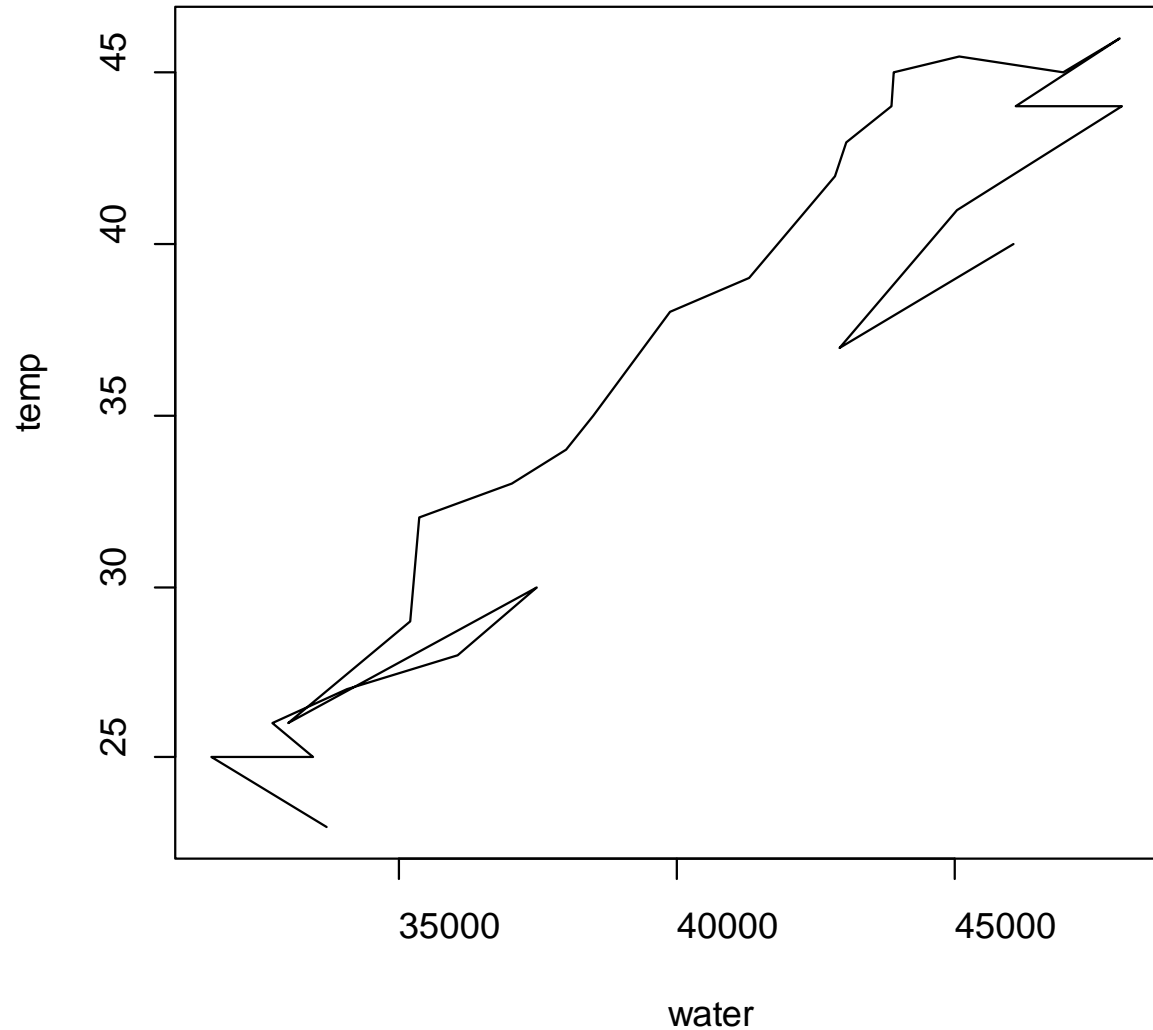
plot(water, temp)



Scatter plot

`plot(water, temp, "l")`

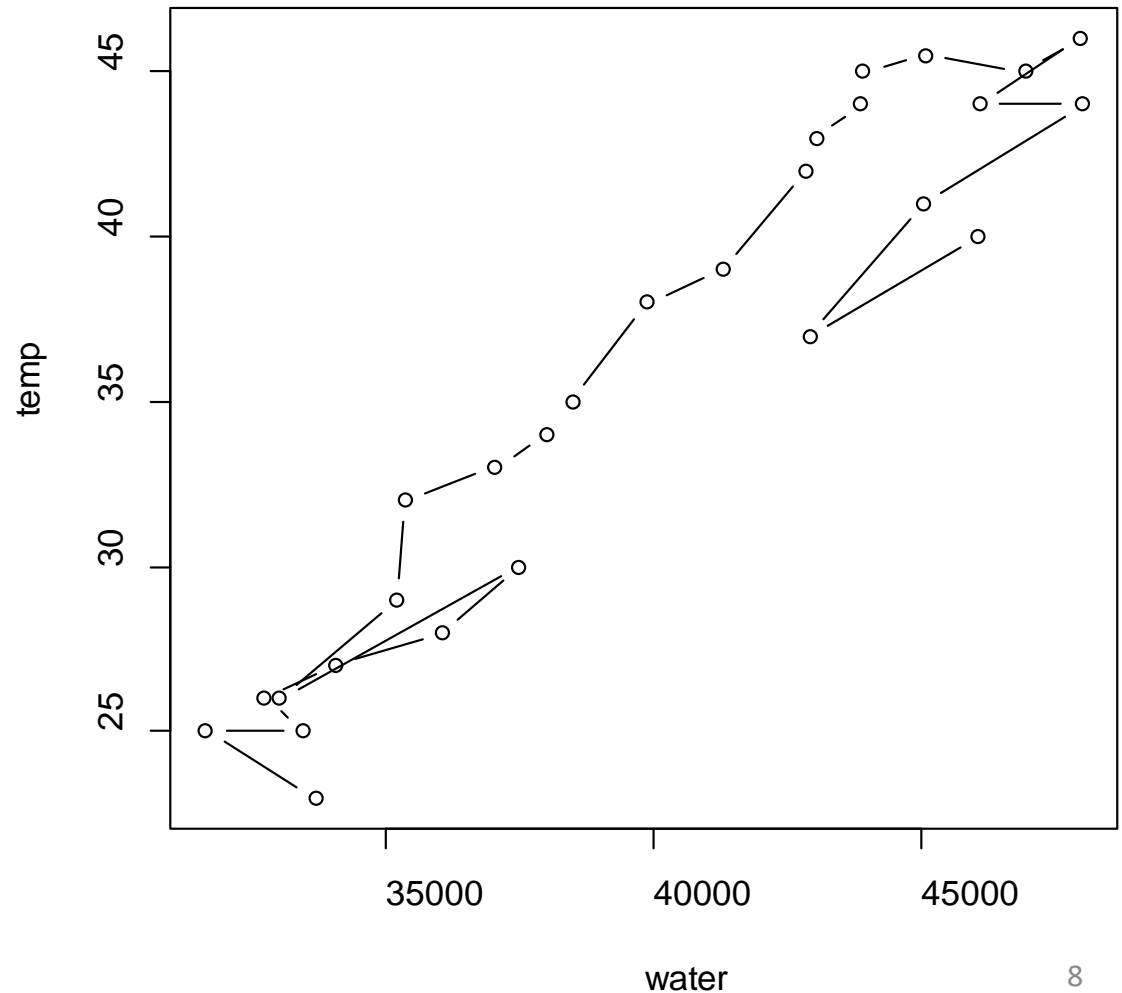
"l" for lines,



Scatter plot

```
plot(water, temp, "b")
```

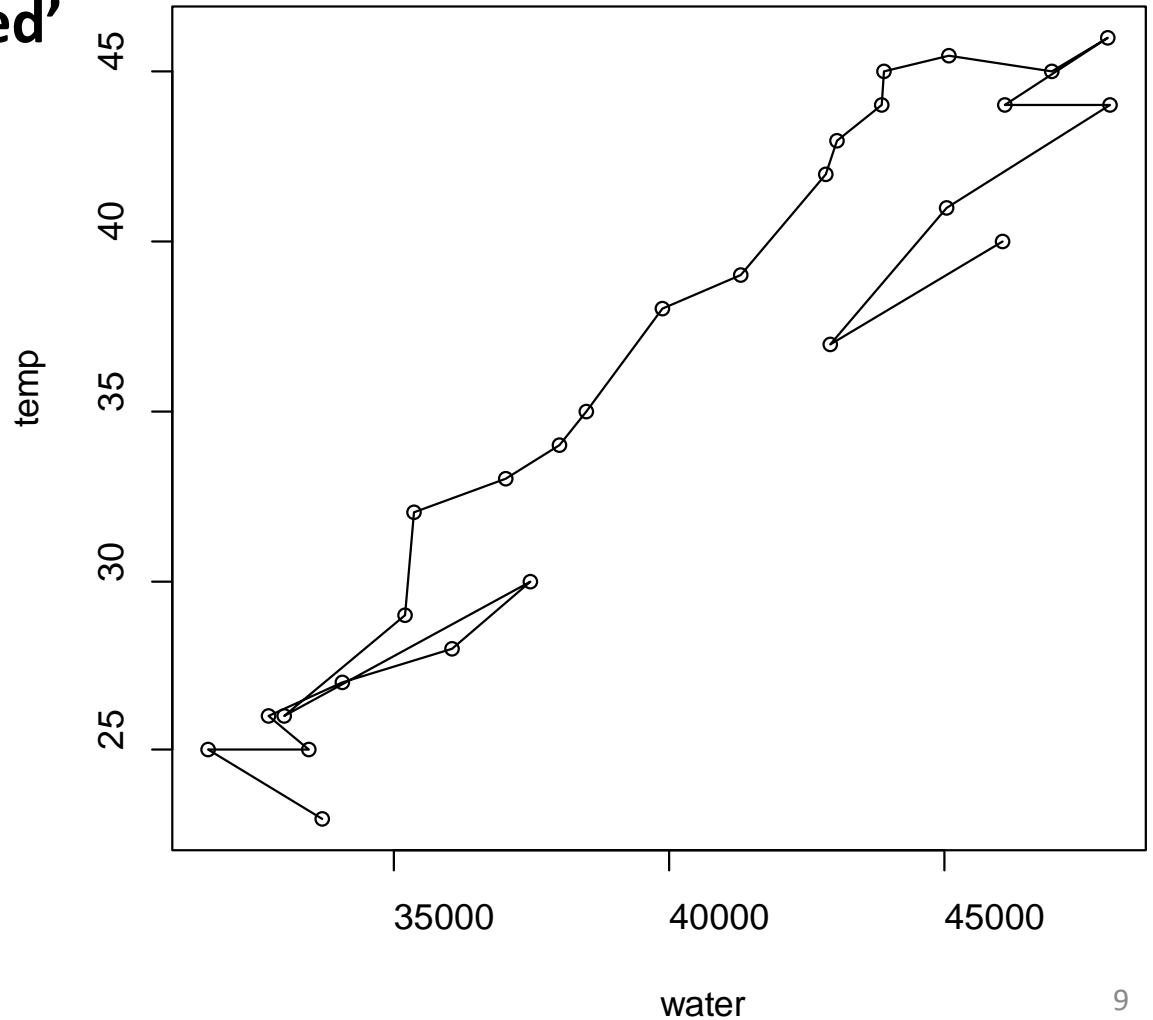
"b" for both – line and point



Scatter plot

```
plot(water, temp, "o")
```

“o” for both ‘overplotted’



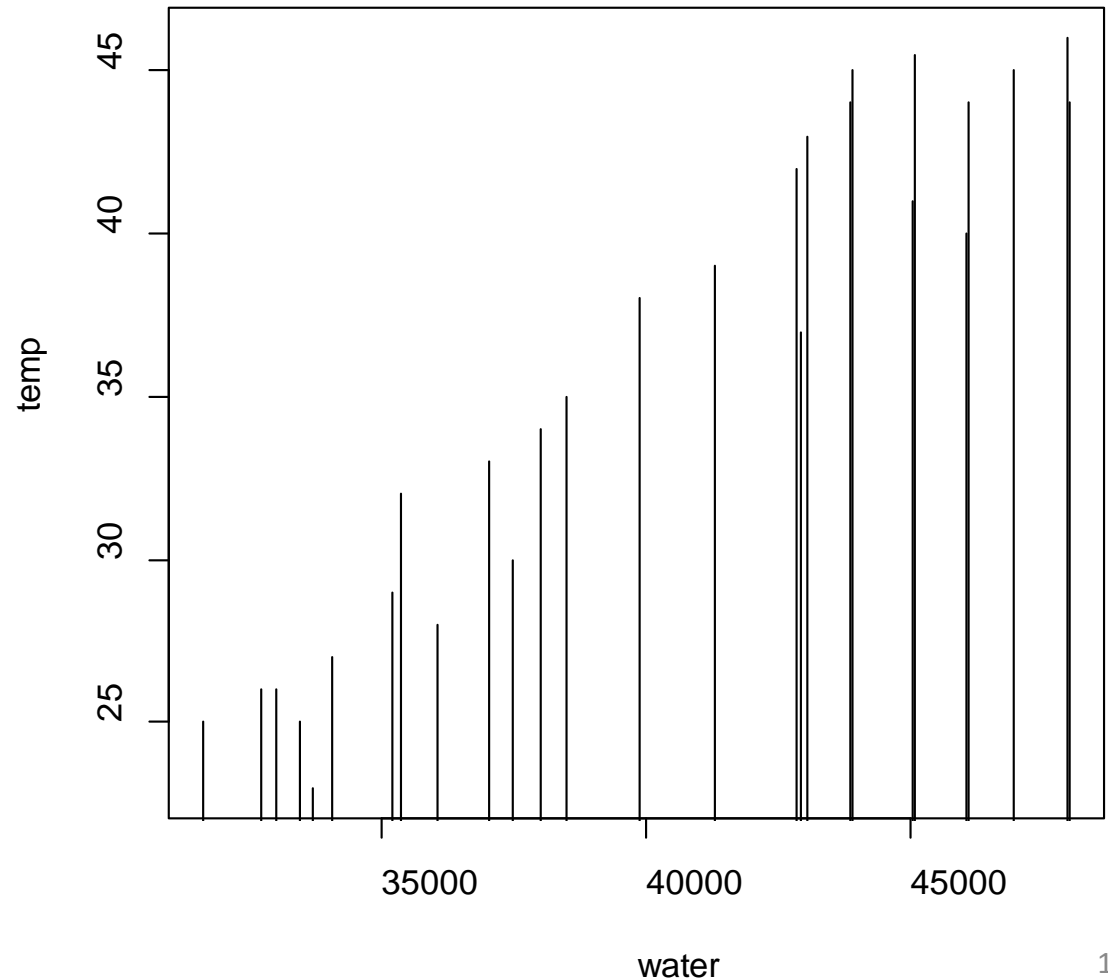
Scatter plot

```
plot(water, temp, "h")
```

“h” for ‘histogram’

like (or ‘high-density’)

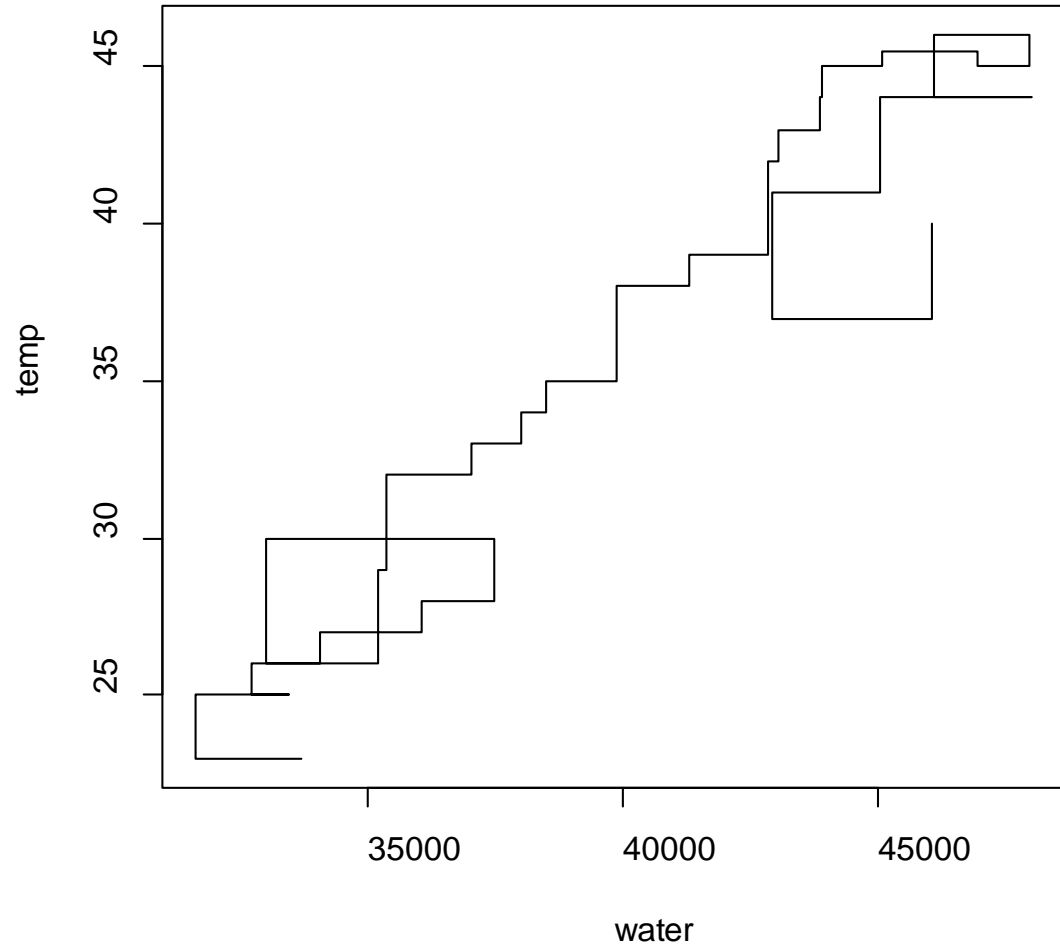
vertical lines



Scatter plot

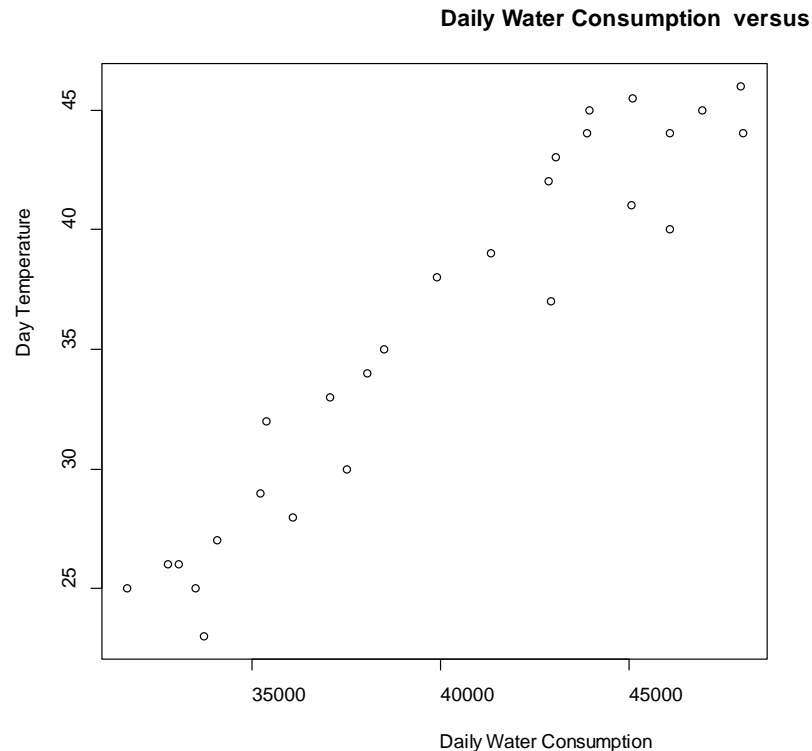
```
plot(water, temp, "s")
```

“s” for stair steps.



Scatter plot

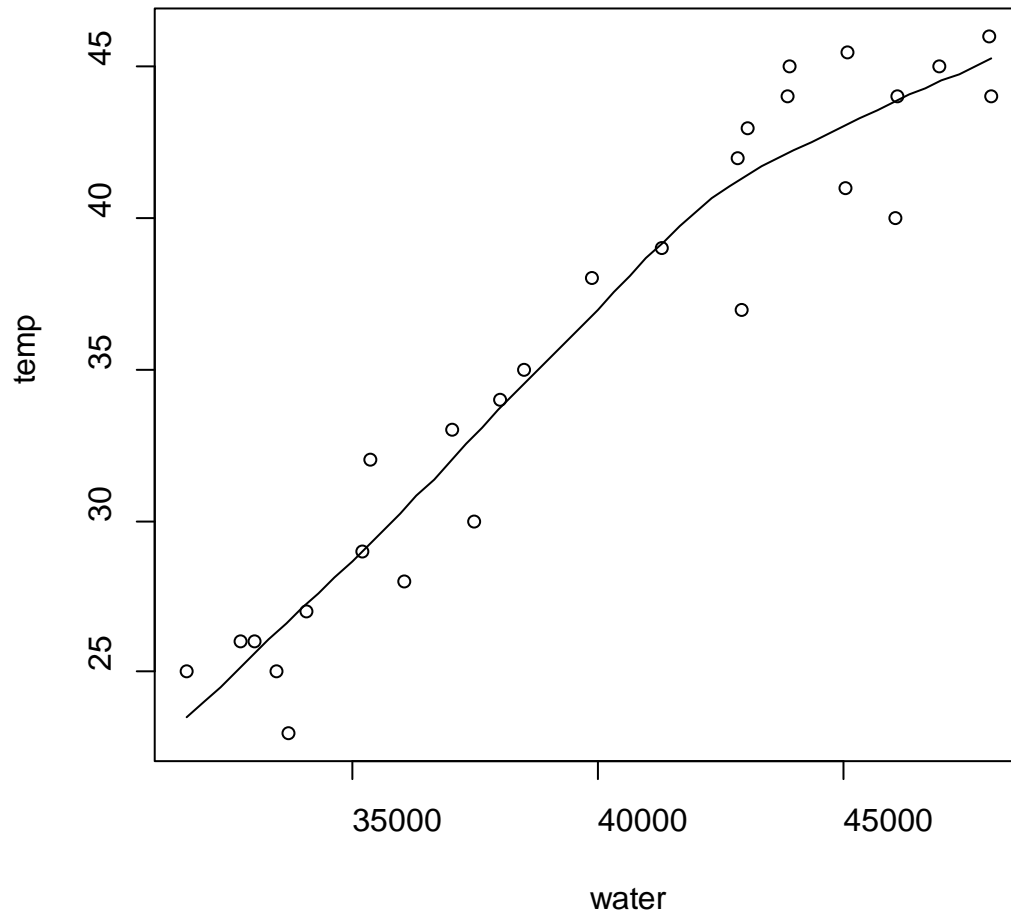
```
> plot(water, temp, xlab=" Daily Water  
Consumption ", ylab=" Day Temperature ", main="  
Daily Water Consumption versus Day  
Temperature")
```



Smooth Scatter plot

`scatter.smooth(x,y)` provides scatter plot with smooth curve

Example: `scatter.smooth(water,temp)`



Smooth Scatter plot

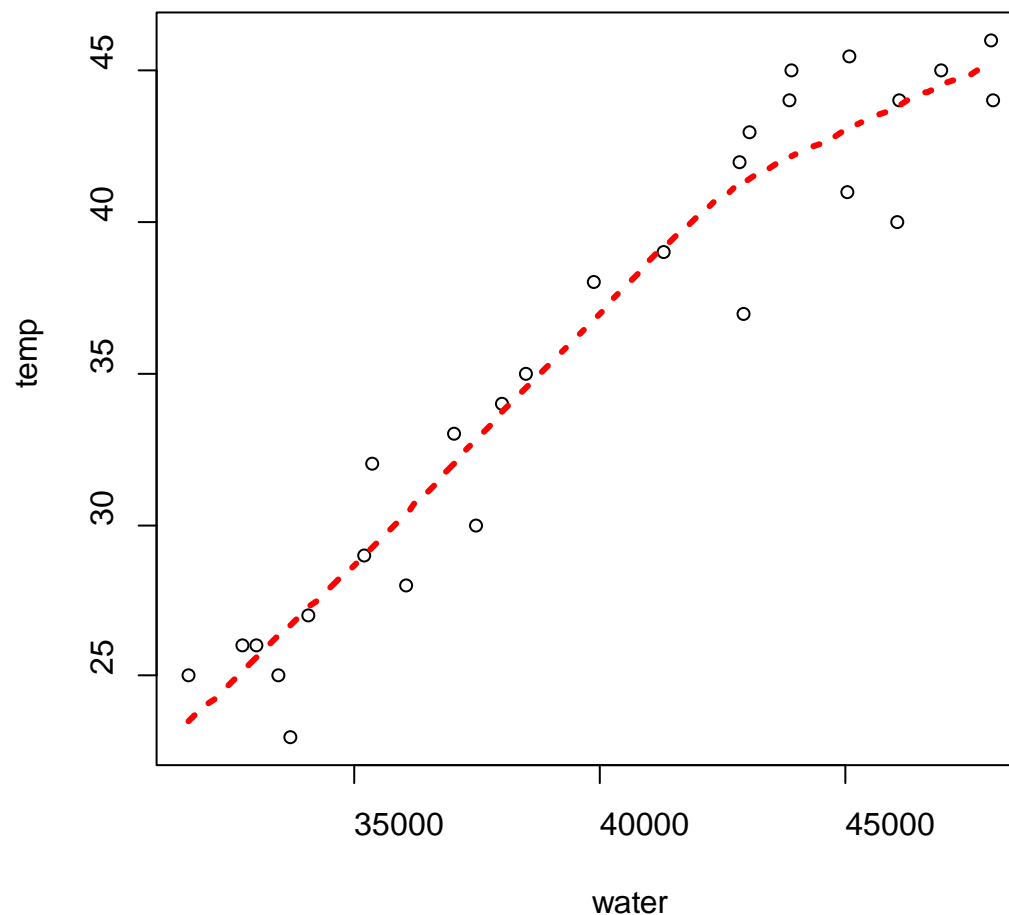
Other options are available.

```
scatter.smooth(x, y = NULL, span = 2/3, degree =  
1, family = c("symmetric", "gaussian"), xlab =  
NULL, ylab = NULL, ylim = range(y, pred$y, na.rm  
= TRUE), evaluation = 50, ..., lpars = list())
```

Smooth Scatter plot

Example:

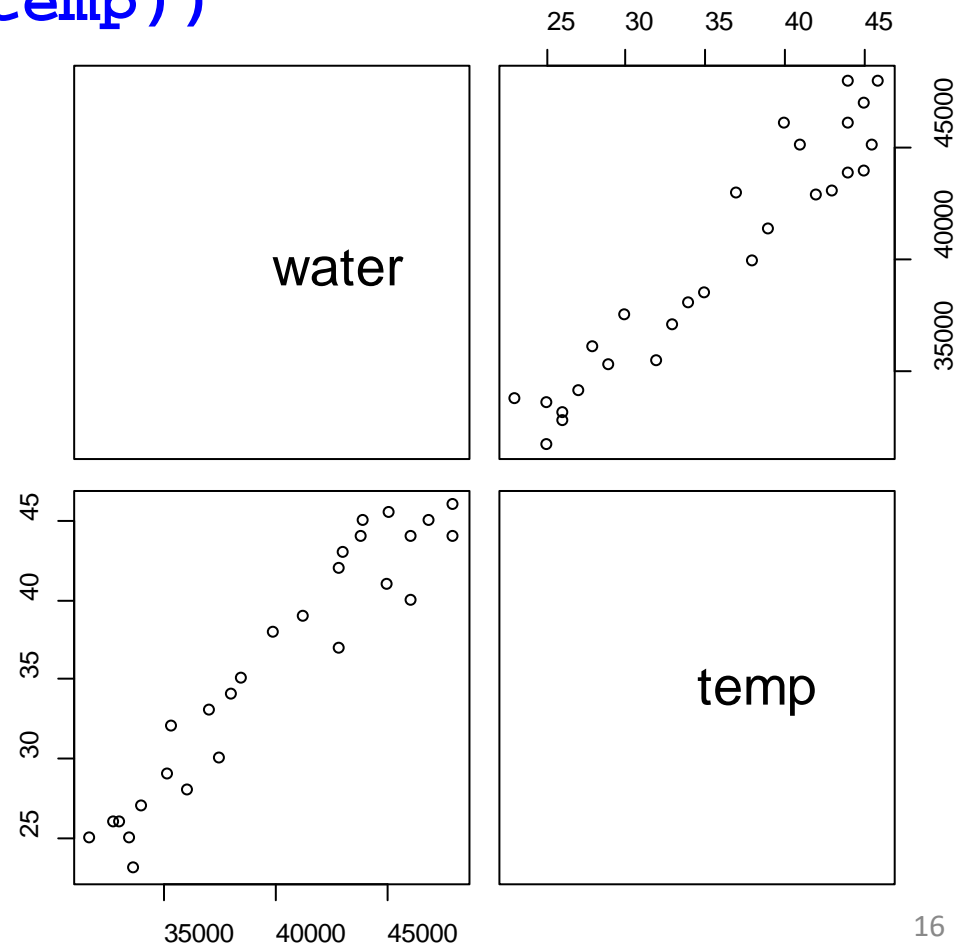
```
> scatter.smooth(water, temp, lpars = list(col =  
"red", lwd = 3, lty = 3))
```



Matrix Scatter plot

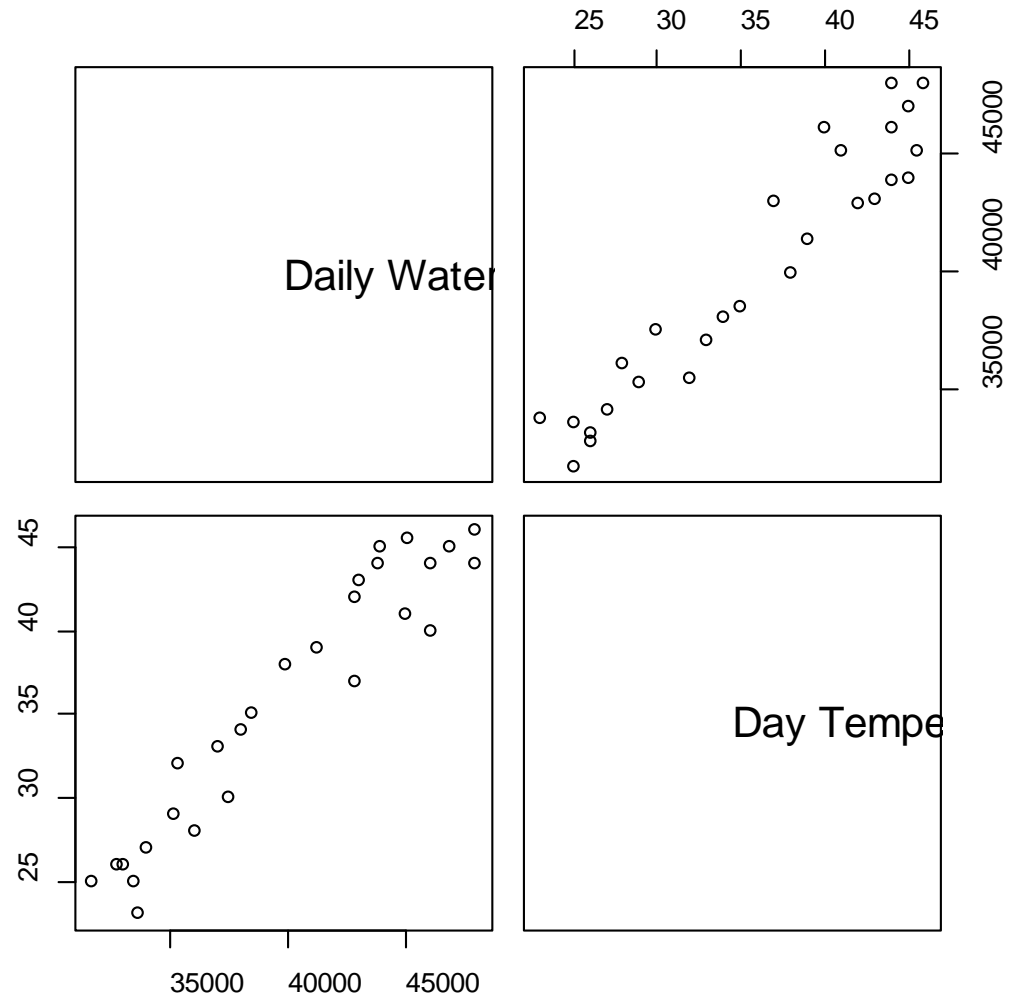
The command `pairs()` allows the simple creation of a matrix of scatter plots.

```
> pairs( cbind(water,temp) )
```



Matrix Scatter plot

```
> pairs( cbind(water,temp), labels=c("Daily  
Water Demand", "Day Temperature") )
```



3 Dimensional Scatter Plot:

`scatterplot3d()` Plots a three dimensional (3D) point cloud

```
> install.packages("scatterplot3d")
```

```
> library(scatterplot3d)
```

```
> setwd("C:/RCourse/")
```

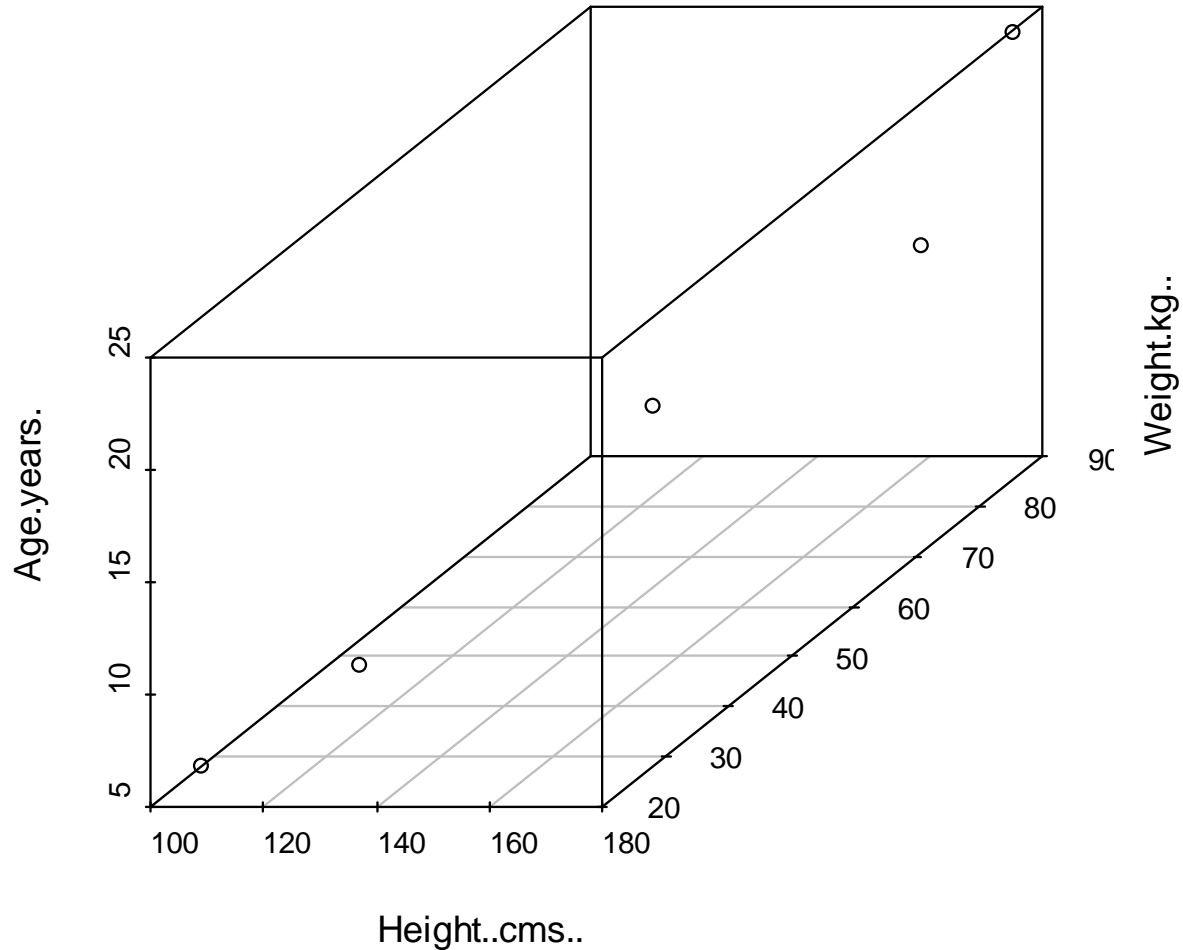
```
> data3d <- read.csv("data-age-height-weight.csv")
```

```
> data3d
```

	Height..cms..	Weight.kg..	Age.years.
1	100	28	5
2	120	35	8
3	150	55	15
4	176	74	18
5	180	85	25

3 Dimensional Scatter Plot:

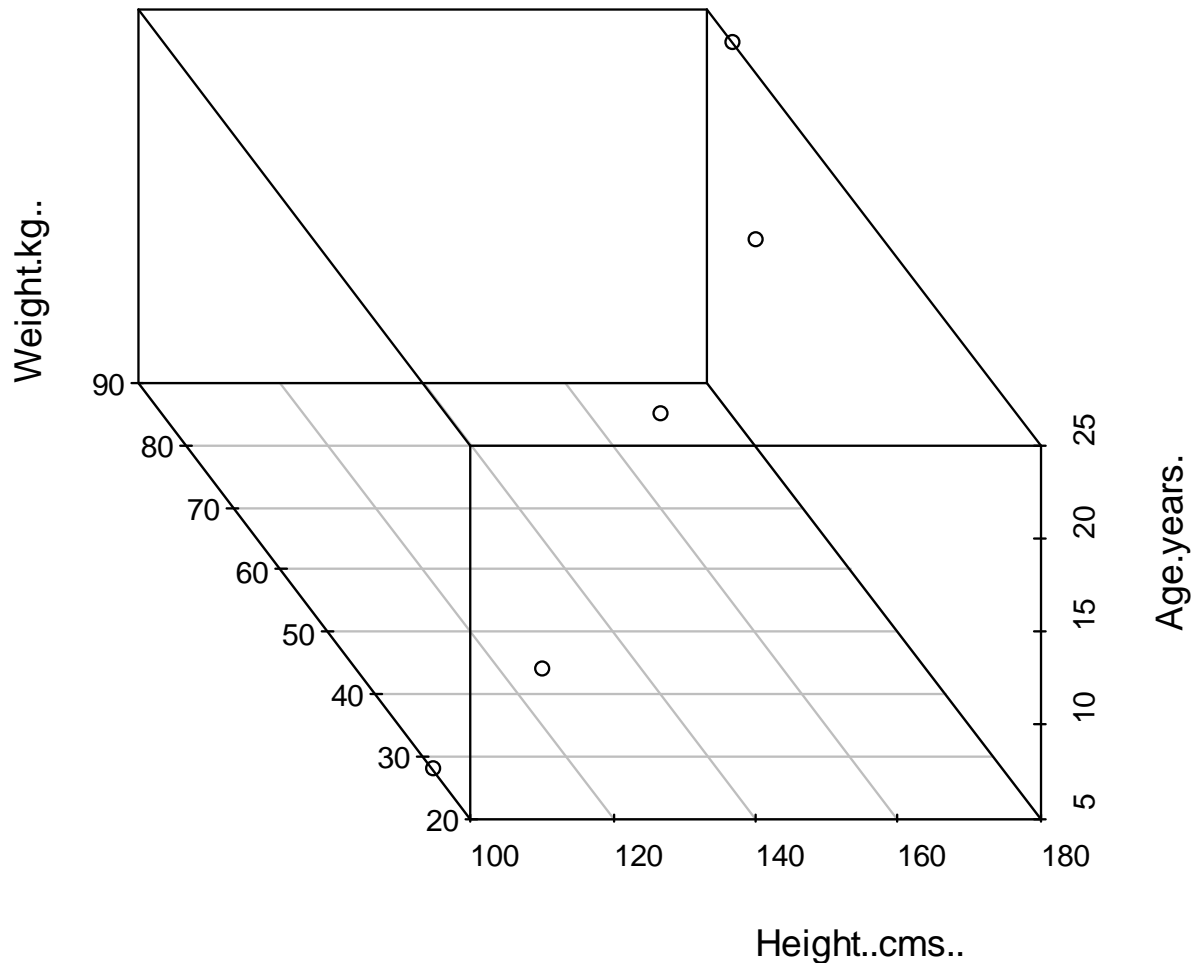
```
> scatterplot3d(data3d[,1:3])
```



3 Dimensional Scatter Plot:

Direction of the figure can be changed.

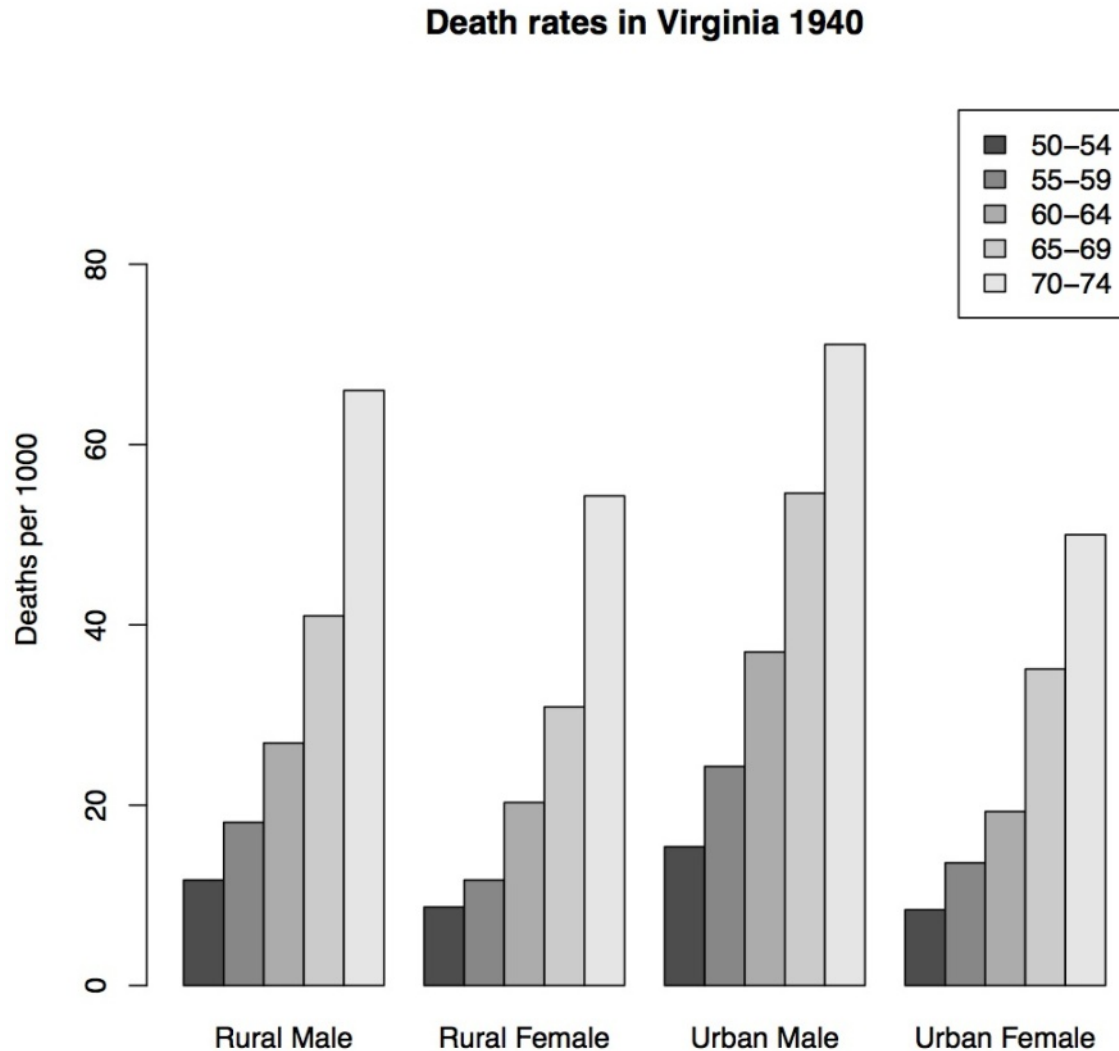
```
> scatterplot3d(data3d[,1:3], angle = 120)
```



More functions

- `contour()` for contour lines
- `dotchart()` for dot charts (replacement for bar charts)
- `image()` pictures with colors as third dimension
- `mosaicplot()` mosaic plot for (multidimensional) diagrams of categorical variables (contingency tables)
- `persp()` perspective surfaces over the x–y plane

Multiple Bar plots are possible



Grouped box plots are possible

