3. R Graphics

Overviews of R Graphics

- Overviews of R Graphics
  - Graphical Functions
    - High Level Graphical Functions

Function	Meaning
plot()	Scatter plot
hist()	Histogram
boxplot()	box plot
qqplot()	QQ plot
pairs ()	pairwise scatter plot
barplot ()	bar plot
pie ()	pie chart
curve ()	draw a function curve
contour ()	contour plot
persp ()	3-d surface plot

    - Low Level Graphical Functions

Function	Meaning
points ()	Add points to a figure
lines ()	Add lines to a figure
text ()	Insert text in the plot region
abline ()	Add horizontal and vertical lines or a single line
title ()	Add figure title or outer title
legend ()	Insert legend
axis ()	Customize axes

Graphical Parameters

- Graphical Parameters
  - Setting Graphical Parameters

    you can customize graphs (line style, symbols, color, etc) by specifying graphical parameters in the function par() or in the high-level function call.

    - By par() functions
      - It can set general parameters & lay-out parameters
      - It is applied globally to the current graphics device
      - To set a graphic parameter, par(tag=value).
      - To extract a graphic parameter, par("tag")

    - By High-Level Graphical functions
      - It can set general parameters & high-level graphical parameters
      - It is applied locally. Changes are only in effect for the function call.

Graphical Parameters

- General Parameters
  - Color for lines, points or texts : col =<“COLOR_NAME”>
    - colors by numbers

    0=white, 1=black, 2=red, 3=green, 4=blue, 5=cyan, 6=magenta, 7=yellow, 8=grey.

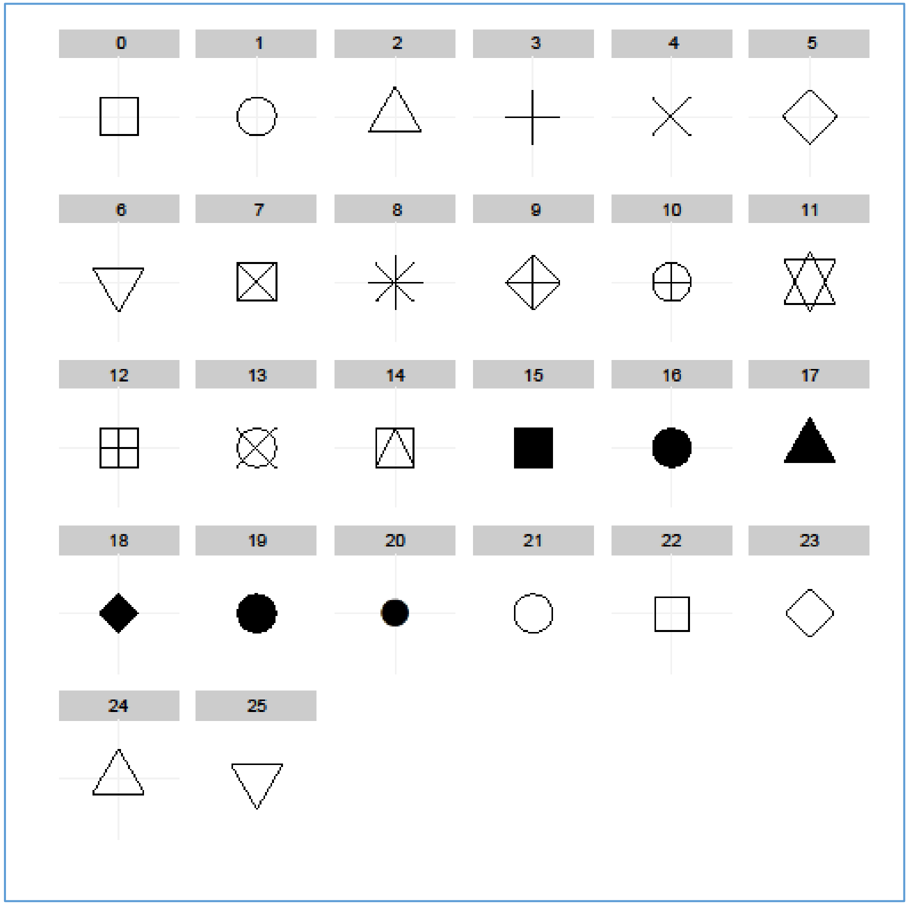
    - colors by names

    There are 657 named colors in R

    http://www.stat.columbia.edu/~tzheng/files/Rcolor.pdf

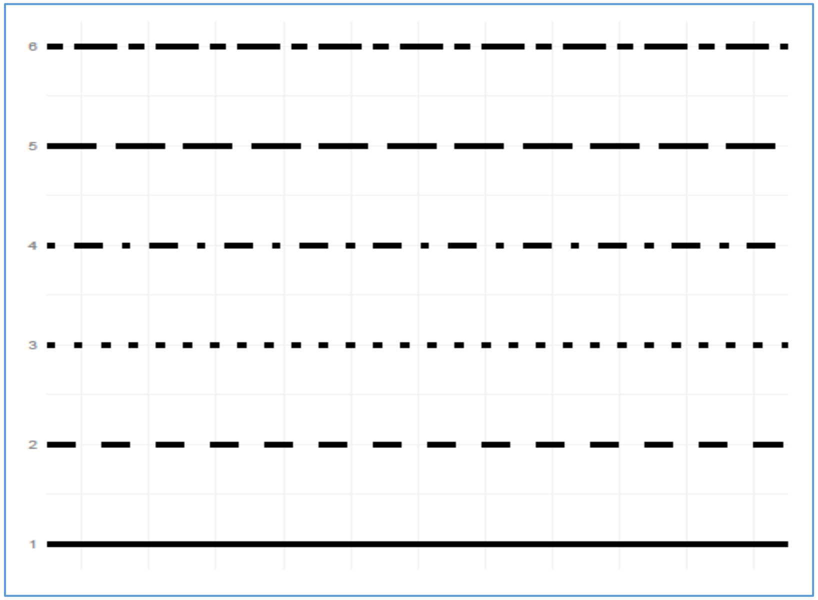
Graphical Parameters

- point symbols : pch=<PCHCODE> or <“CHAR”>



Graphical Parameters

- Size of points or tests: cex=<NUM>
- Line width : lwd=<NUM>
- Line Type : lty=<LINECODE>



Graphical Parameters

- Layout Parameters
  - parameters that affect the page layout, can be changed only using par().

  - Multiple graphs per page
    - To create a n by m grid of figures use par() with either the mfcol or mfrow settings.
    - mfcol=c(n, m) : adds figures by column
    - mfrow=c(n, m) : adds figures by row

  - Margin size
    - mar sets figure margins and oma sets outer margins for each plot.
    - Both are defined by a numeric vector with elements :

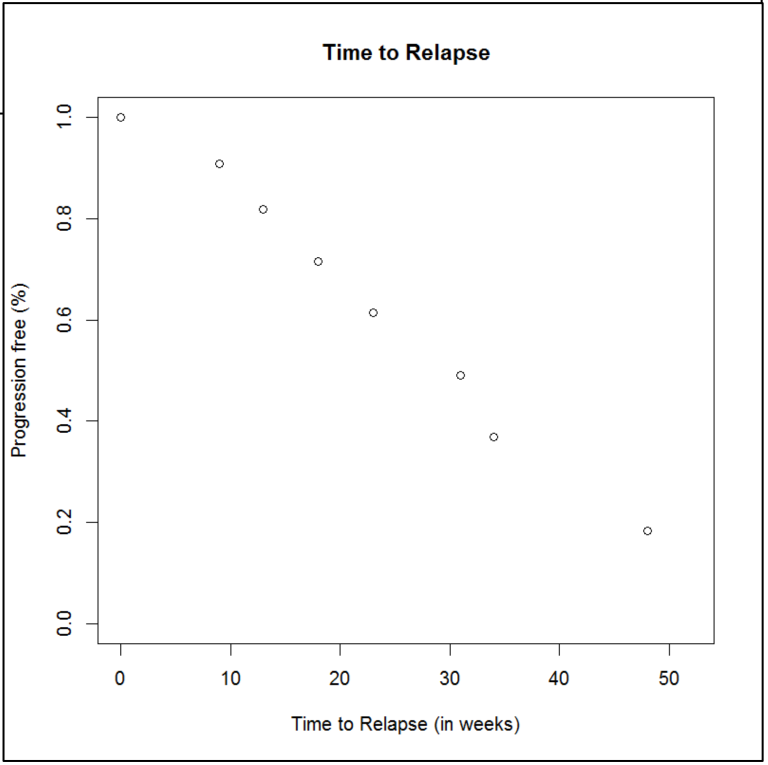
      mar=c(bottom, left, top, right)

Graphical Parameters

- High-Level Graphical Parameters
  - There are some other graphical parameters that is used only in high-level graphical functions, never inside par().
  - the plot type : type=<TYPE_CODE>
    - "p" : points (the default)
    - "l" : lines
    - "b" : both lines and points (isolated points)
    - "o" : both lines and points (overstruck points)
    - "n" : empty plot (axis and labels only)
  - Limits of the axis : xlim or ylim = c(<MIN>, <MAX>)
  - Main or Sub title for the plot : main or sub = <“TEXT”>
  - Axis label: xlab or ylab = <“TEXT”>

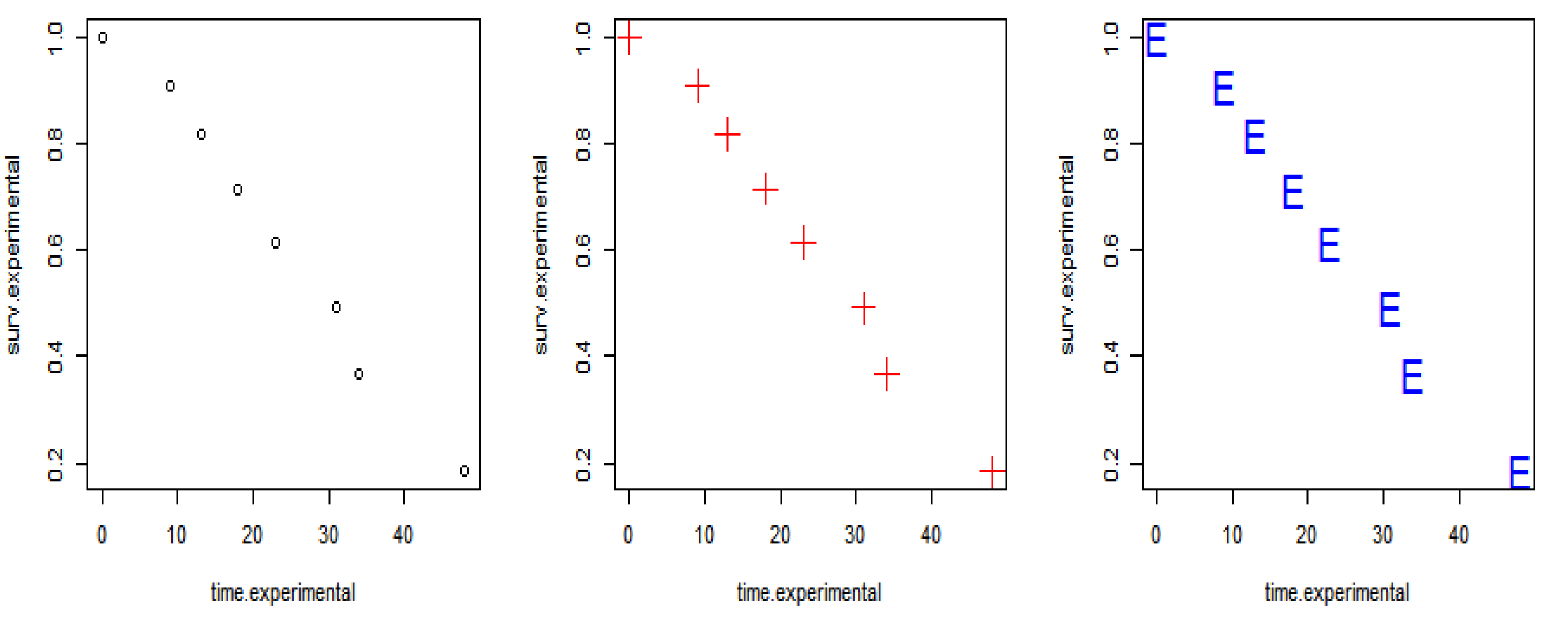
High-Level Graphical Functions

```
> time.experimental<-c(0, 9, 13, 18, 23, 31, 34, 48)
> surv.experimental<-c(1, 0.909, 0.818, 0.716, 0.614, 0.491,
+ 0.368, 0.184)
> plot(time.experimental, surv.experimental,
+ main="Time to Relapse",
+ xlab="Time to Relapse (in weeks)",
+ ylab="Progression free (%)",
+ ylim=c(0, 1), xlim=c(0, 52))
```



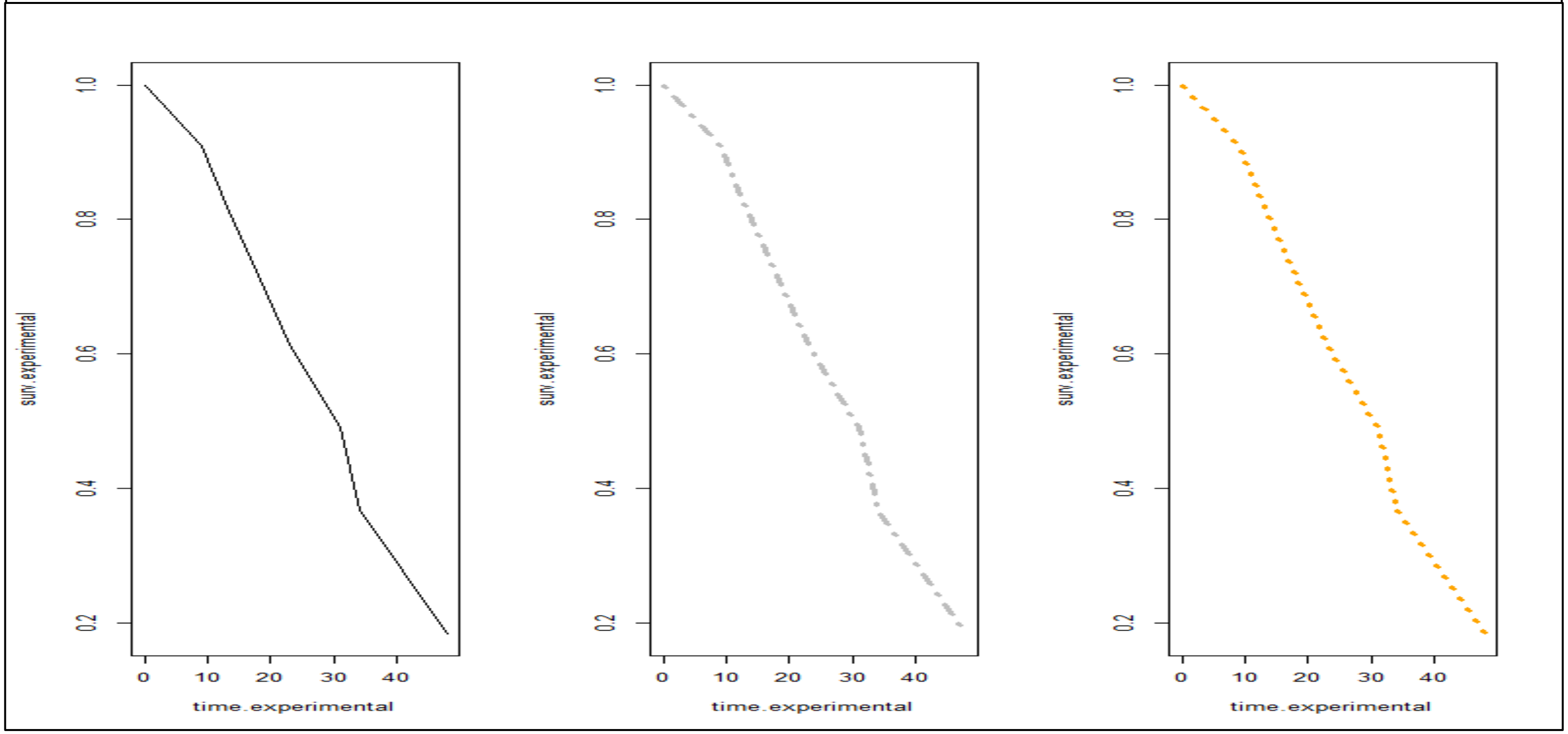
High-Level Graphical Functions

```
> par( mfrow=c(1,3) )
> plot(time.experimental, surv.experimental, type="p")
> plot(time.experimental, surv.experimental, type="p", col="red",
+ pch=3, cex=2)
> plot(time.experimental, surv.experimental, type="p", col="blue",
+ pch="E", cex=2)
```



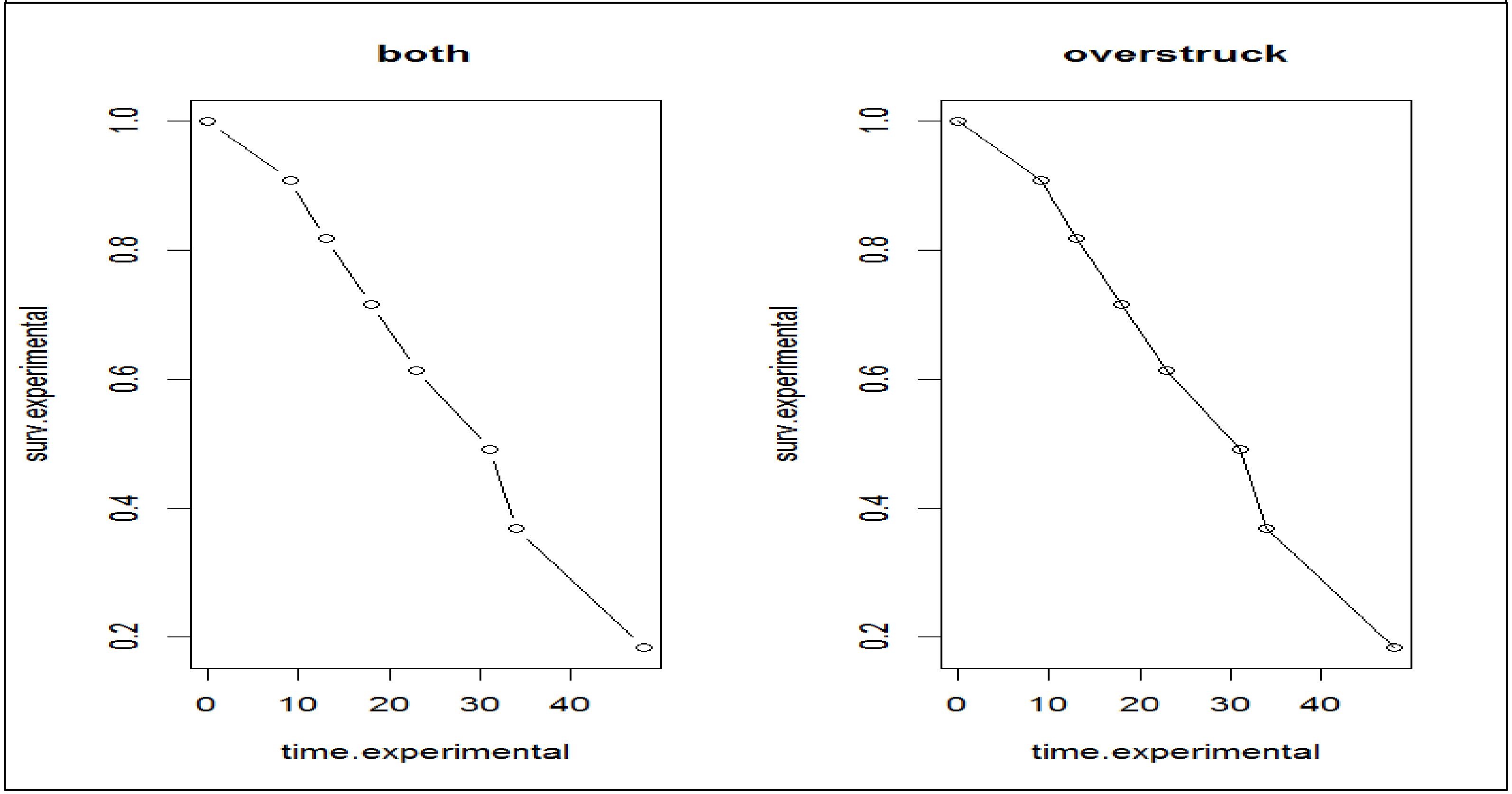
High-Level Graphical Functions

```
> par( mfrow=c(1,3) )
> plot(time.experimental, surv.experimental, type="l")
> plot(time.experimental, surv.experimental, type="l", lwd=3, lty=4,
col="grey")
> plot(time.experimental, surv.experimental, type="l", lwd=3, lty=3,
col="orange")
```



High-Level Graphical Functions

```
> par( mfrow=c(1,2) )
> plot(time.experimental, surv.experimental, type="b", main="both")
> plot(time.experimental, surv.experimental, type="o",
main="overstruck")
```



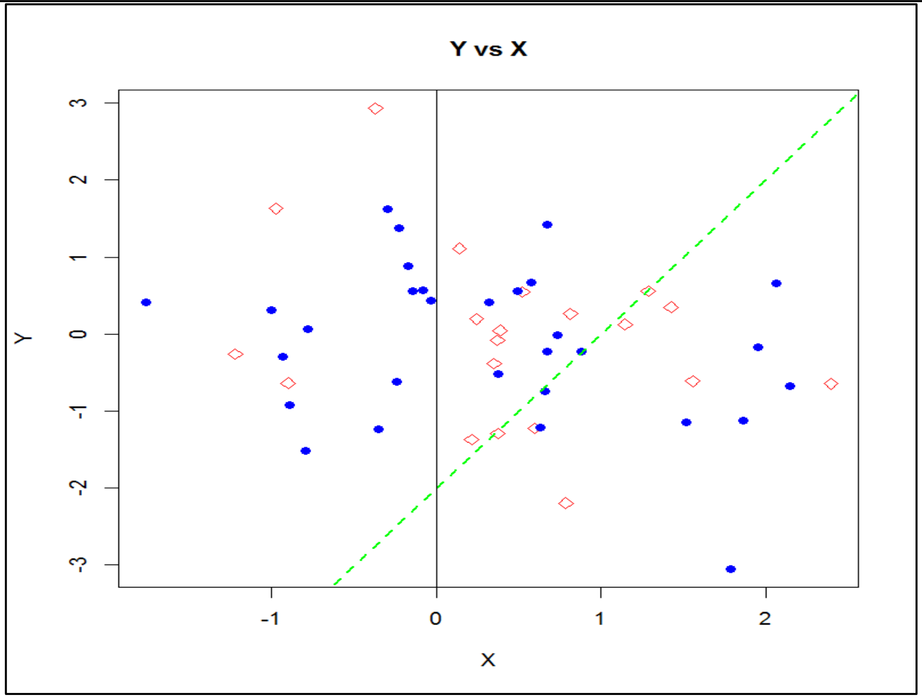
Low-Level Graphical Functions

- points/lines : add points or connected lines to the current plot.
  - points (<X>, <Y>, <PARAS>)
  - lines (<X>, <Y>, <PARAS>)
  - points and lines function can use type option (type = “p”, “l”, “b”,…, “n”) like plot function to create different types of graphs.

- abline : to add reference lines to a graph.
  - abline(a=<INTERCEPT>, b=<SLOPE>, <PARA>)
  - abline(h=<VALUE>, <PARA>)
  - abline (v=<XVALUE>, <PARA>)

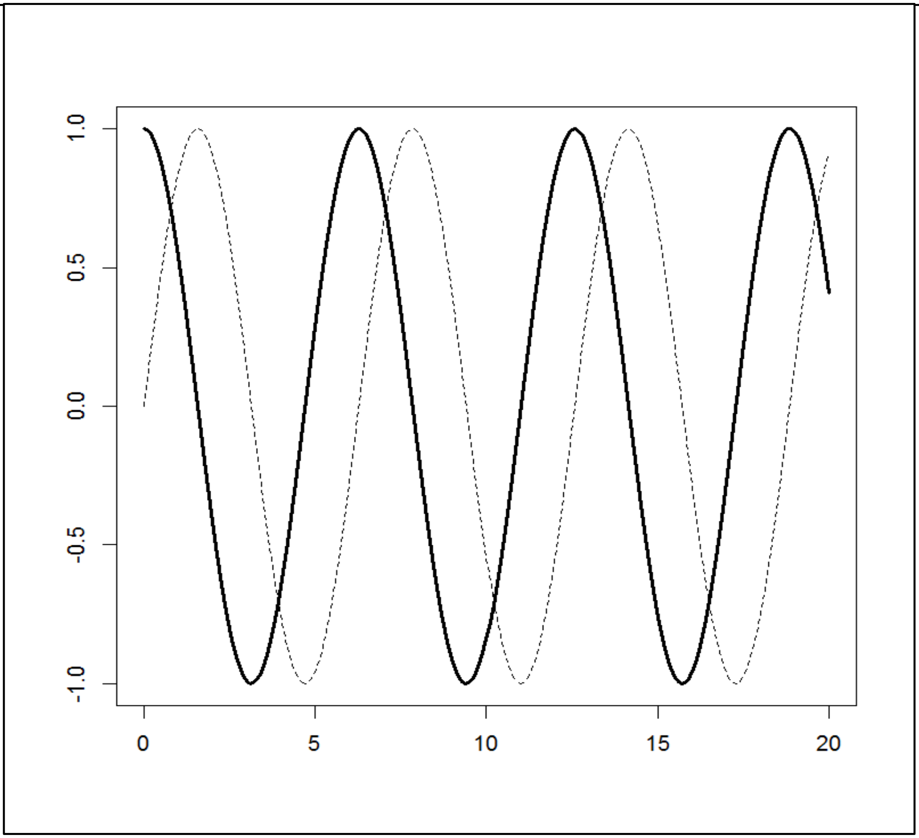
Low-Level Graphical Functions

```
> x <- rnorm(50); y <- rnorm(50)
> group <- c( rep(0,25), rep(1,25) )
> plot(x, y, xlab="X", ylab="Y", main="Y vs X", type="n")
> points(x[group==1], y[group==1], pch=5, col="red")
> points(x[group==0], y[group==0], pch=19, col="blue")
> abline(a=-2,b=2, lty=2, lwd=2, col="green" )
> abline(v=0)
```



Low-Level Graphical Functions

```
> x<-seq(0, 20, by=0.1)
> plot(x, sin(x), type="n", ylab="", xlab="")
> lines(x, sin(x), type="l", lty=2)
> lines(x, cos(x), type="l", lwd=3)
```



Low-Level Graphical Functions

- text : to add texts
  - text (<X>, <Y>, <TEXTS>)

- legend : to add legends to a figure.
  - legend (<LOCATION>, legend=<CHAR_VEC>, <OTHER_PARAS>)
    - to indicate the location of the legend.
      - an x, y coordinate for the upper left corner of the legend.
      - use the keywords "bottom", "bottomleft", "left", "topleft", "top", "topright", "right", "bottomright", or "center".
    - You are responsible for matching plotting symbols, sizes or colors with the those in the legend.

Low-Level Graphical Functions

```
> set.seed(789)
> x1 <- rnorm(10); x2 <- rnorm(10, mean=2)
> y1 <- rnorm(10); y2 <- rnorm(10, mean=2)
> plot(c(x1, x2), c(y1, y2), main="Figure 1", type="n", xlab="X",
ylab="Y")
> points(x1, y1, col="red", pch=19)
> points(x2, y2, col="blue", pch=0)
> legend("topleft", legend=c("Group 1","Group 2"), pch=c(19, 0),
col=c("red","blue"))
> text( -1, 2, "text here!")
```

Low-Level Graphical Functions

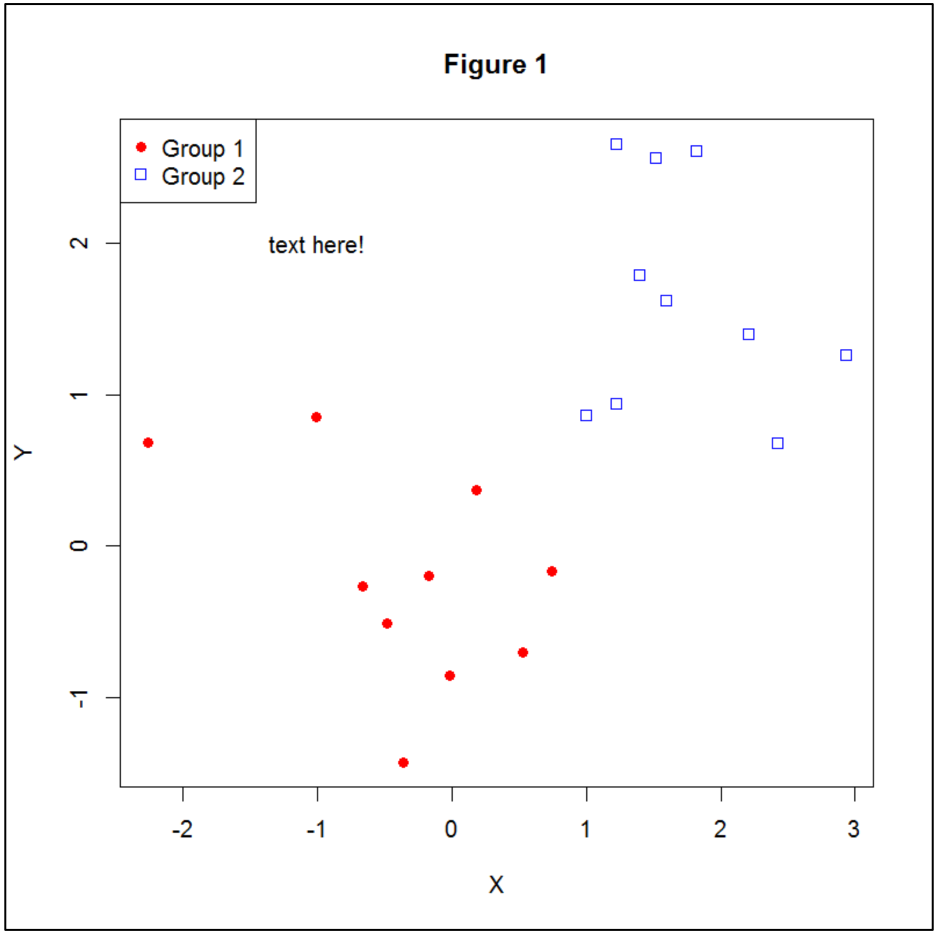


Figure 1
● Group 1
□ Group 2
text here!
Y
X