

Superior gRaphics in Statistical Reports

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Agenda

- 1 Introduction
- 2 Calling R from SAS
- 3 Features of R Graphics
 - Example 1
 - Example 2
- 4 Limitations
- 5 Conclusion

Introduction

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- Best of two worlds
 - Tables and Listings - SAS
 - Graphs - R
- Sole use of SAS

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 - Call R system in line command mode using SAS X statement - Philip R Holland in his paper SAS2R2SAS

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 - PROC IML 9.22/SAS IML Studio 3.2
 - Call R system in line command mode using SAS X statement - Philip R Holland in his paper SAS2R2SAS
 - Use of two macros - Liang Xie (Conduct R analysis within SAS)



RScript Macro

```
%macro RScript(Rscript);  
    data _null_;  
    file "&Rscript";  
    infile cards;  
    input;  
    put _infile_;  
%mend;
```

CallR Macro

```
%macro CallR(Rscript, Rlog);  
systask command "C:\Progra~1\R\R-2.15.1\bin\R.exe CMD BATCH --vanilla  
                --quiet &Rscript  &Rlog "  
    taskname=rjob1 wait status=rjobstatus1;  
%mend;
```



Writing R code

R from SAS

```
%RScript(c:\rscript.r)
cards4;

<write R code here>

;;;
run;

%CallR(c:/rscript.r, c:/rlog1.txt);

/*Printing R log in the sas log window*/
data _null_;
    infile "c:\rlog1.txt";
    input;
    put _infile_;
run;
```



R log

```

NOTE: Task "rjob1" produced no LOG/Output.
120 %CallR(c:/rscript.r, c:/rlog11.txt);
121
122 data _null_;
123     infile "c:/rlog11.txt";
124     input;
125     put _infile_;
126 run;

NOTE: The infile "c:/rlog11.txt" is:
      File Name=c:/rlog11.txt,
      RECFN=V,LRECL=256

>
> library(rtf)
Loading required package: R.oo
Loading required package: R.methodsS3
R.methodsS3 v1.4.2 (2012-06-22) successfully loaded. See ?R.methodsS3 for help.
R.oo v1.9.8 (2012-06-22) successfully loaded. See ?R.oo for help.

Attaching package: 'R.oo'

The following object(s) are masked from 'package:methods':

    getClasses, getMethods

The following object(s) are masked from 'package:base':

    attach, detach, gc, load, save

Loading required package: gsubfn
Loading required package: proto
Loading required namespace: tcltk
Loading Tcl/Tk interface ... done
> rtf<-RTF("D:/test1.rtf",width=8.5,height=11,font.size=10,oni=c(1,1,1))
> addHeader (rtf,title="Fig1: Histogram for randomly generated values from normal distribution")
> addPlot(rtf,plot.fun=hist,width=6,height=6,res=300,rnorm(100))
>
> addPageBreak(rtf, width=8.5, height=11, oni=c(1, 1, 1))
  
```



Example 1

Multiple Figures in Single Panel

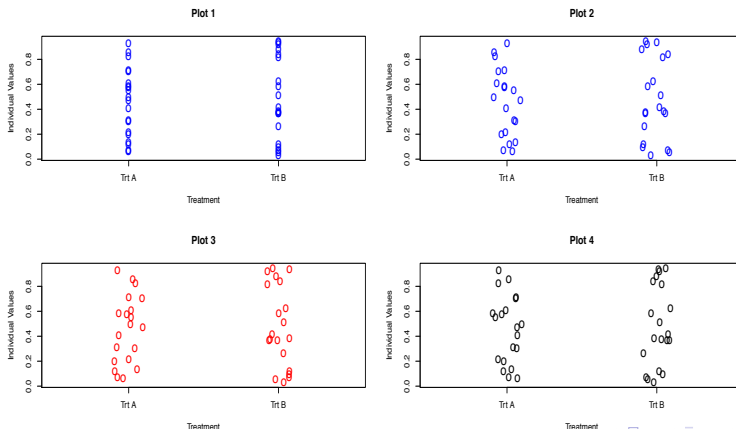
- Requirement - Multiple figures in a single panel



Example 1

Multiple Figures in Single Panel

- Requirement - Multiple figures in a single panel





Example 1

Example 1 Contd...

R Code:

```
pdf("D:/Example1.pdf")
par(mfrow=c(2,2)) # Divide the plotting area

#<Code for Plot 1>
plot(b,a, xaxt = 'n', xlab = 'Treatment',ylab = 'Individual Values',
xlim=c(1,5),main = "Plot 1",cex=1.5,col='blue', pch = 'o')
axis(1,at=c(2,4),labels = c('Trt A', 'Trt B'))
#<Code for Plot 2>
plot(jitter(b,amount=0.2),a, xaxt = 'n', xlab = 'Treatment',ylab =
'Individual Values', xlim=c(1,5),main = "Plot 2", cex=1.5,col='blue',
pch = 'o')
axis(1,at=c(2,4),labels = c('Trt A', 'Trt B'))
# <Code for Plot 3>
# <Code for Plot 4>

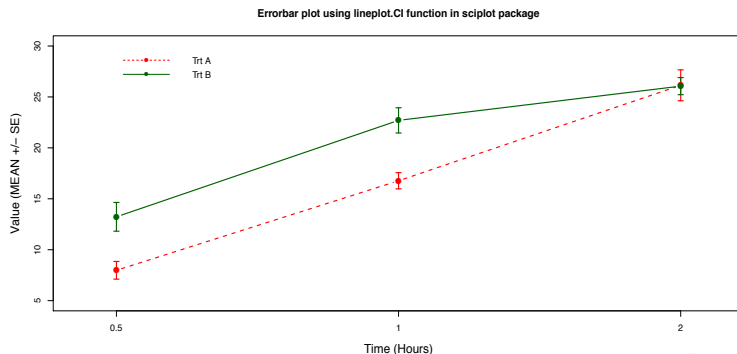
dev.off()
```



Example 2

Errorbar Plot

- Using an inbuilt data in R named ToothGrowth whose variables are renamed as rep, trt and time.
- Errorbar plot using 'lineplot.CI' from 'sciplot' package in R





Example 2

Errorbar plot using sciplot package

R Code

```
lineplot.CI(time, rep, group = trt, data = tg, cex = 1.5,  
  xlab = "Time (Hours)", ylab = "Value (MEAN +/- SE)",  
  cex.lab = 1.3, x.legend = 1, y.legend=30, col = c("red", "dark green"),  
  pch = c(16, 16), ylim=c(5, 30), err.width = 0.05, xaxt = 'n', lwd=2)  
  
axis(1, at=c(1, 2, 3), labels=c(0.5, 1, 2))  
  
title("Errorbar plot using 'lineplot.CI' function in sciplot package")
```

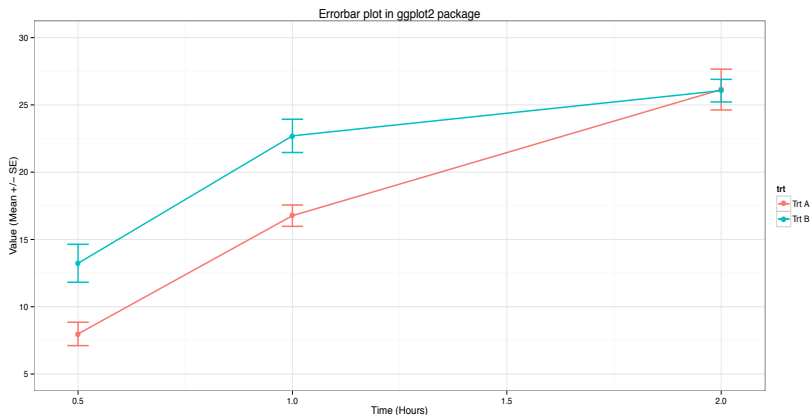
Errorbar plot using ggplot2 package

- Errorbar plot using 'ggplot2' package in R

Example 2

Errorbar plot using ggplot2 package

- Errorbar plot using 'ggplot2' package in R



Errorbar plot using ggplot2 package

R Code

```
ggplot(summary, aes(x=time, y=rep, colour=trt)) +  
  geom_errorbar(aes(ymin=rep-se, ymax=rep+se), width=.05, lwd = 0.8) +  
  geom_line(lwd=0.8) +  
  geom_point(cex=3) + xlab("Time (Hours)") + ylab ("Value (Mean +/- SE)") +  
  ggtitle("Errorbar plot in ggplot2 package") +  
  theme_bw() +  
  scale_y_continuous(limits=c(5,30), breaks=0:30*5)
```

Example 2

Errorbar plot using ggplot2 package

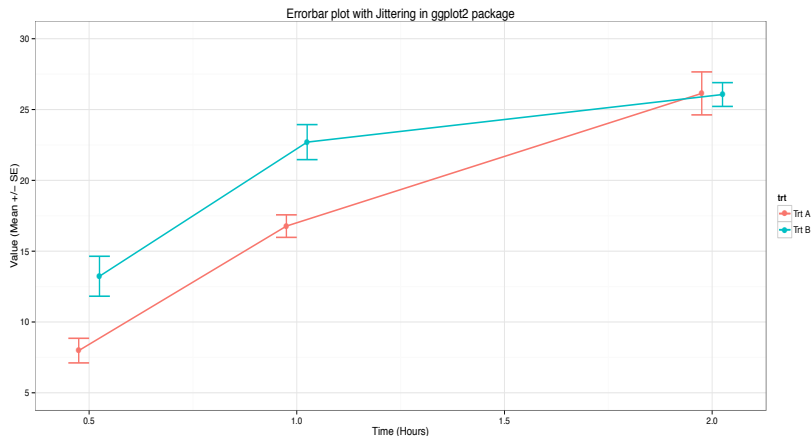
R Code

```
pd <- position_dodge(.1)
ggplot(summary, aes(x=time, y=rep, colour=trt)) +
  geom_errorbar(aes(ymin=rep-se, ymax=rep+se), width=.1, position=pd,
    lwd =0.8) + geom_line(position=pd,lwd =0.8) + geom_point(position=pd,
    cex = 3) + xlab ("Time (Hours)") + ylab ("Value (Mean +/- SE)") + ...
```



Example 2

Errorbar plot using ggplot2 package



What we observe

- 1 Multiple figures in single panel are easily done -

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- 2 Same task by using different packages (sciplot and ggplot2 package) -



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- 1 Multiple figures in single panel are easily done -
- 2 Same task by using different packages (sciplot and ggplot2 package) - Choice to choose the Best and most suited

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- 2 Same task by using different packages (sciplot and ggplot2 package) -
- 3 How easy is to separate overlapping values -



Example 2

What we observe

- 1 Multiple figures in single panel are easily done -
- 2 Same task by using different packages (sciplot and ggplot2 package) -
- 3 How easy is to separate overlapping values - Jittering made easy!!!

Some Points to Mention

Annotation is used to -

- Add text on the graph

Some Points to Mention

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- Add text on the graph
- Axis Break

Some Points to Mention

Annotation is used to -

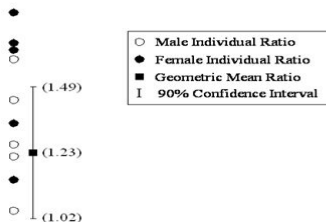
- Add text on the graph
- Axis Break
- Legend at a desired location on the graph

Example 2

Some Points to Mention

Annotation is used to -

- Add text on the graph
- Axis Break
- Legend at a desired location on the graph





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In R functions are available -

- text

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- text
- mtext



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- axis.brake in 'plotrix' library



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In R functions are available -

- text
- mtext
- axis.brake in 'plotrix' library
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Some Points to Mention

- Conventional requirement from most of sponsors - Output in RTF format
- 'rtf' package in R
- Graphical output from R can be saved in various formats - bmp, png, jpeg, gif.
- Best choice - PNG format

Limitations

- Capabilities of SAS 9.2, SAS GTL or SAS 9.3 are not considered.
- Help in R is more technical. It is not well organized as in other software. So first time users may find it difficult.

Conclusion

From examples we have seen, how graphs generated in R have an edge over SAS in terms of appearance, time taken for coding and overall quality of the graph. So, R can be an ideal choice for creating graphs. Since we are calling R from SAS, we are able to create superior figures in SAS itself providing a sense of comfort to SAS users as well.



Questions?

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