



Beyond Statistics

Namrata Deshpande, Cytel

Barcelona, PhUSE 2016

- R – strengths & challenges
- GUI with gWidgets
- Automation with ReporteRs
- Motivation
- Concluding remarks

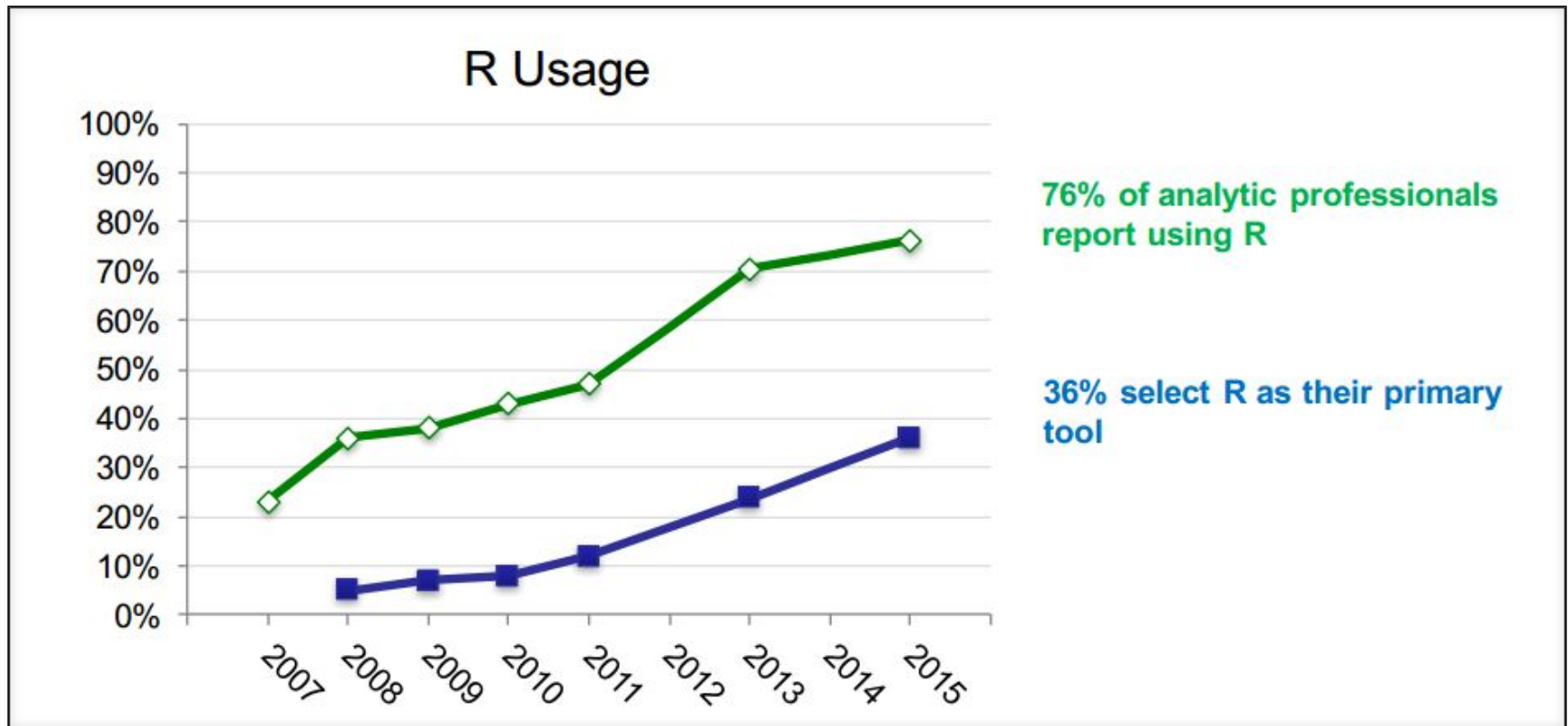


The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again.

Why R?

- Statistical packages for the latest developments in the field
- Strong graphical packages like ggplot2
- Supports Unix, Windows, Mac OS
- No licensing cost
- Widely acceptable

Popularity of R



Source: Rexer Data Science Survey April - 2016

Traditional Approach... a bit complex!

```
#A program to analyze raw data comparing two treatments #
```

```
#Inputs
```

```
Study_name
```

```
data_raw
```

```
Treatment_var
```

```
Response_var
```

```
#Extracting variables from data
```

```
Treatment <- data_raw[,Treatment_var]
```

```
Response <- data_raw[,Response_var]
```

```
#Bar plot for mean response
```

```
library(ggplot2)
```

```
Mean_resp <- aggregate(Response, Treatment,
```

```
  FUN = "mean")
```

```
plot1 <- ggplot(Mean_resp,
```

```
  aes(x=factor(Treatment), y=Response,
      fill=factor(Treatment), width = 0.5)) +
```

```
  geom_bar(stat="identity", position= "dodge") +
```

```
  xlab("Treatment") + ylab("Mean Response") +
```

```
  ggtitle("Comparison of Treatments") +
```

```
  scale_fill_discrete(name="Treatment") +
```

```
  theme(axis.text.x = element_text(size = 11),
```

```
        axis.text.y = element_text(size = 11))
```

```
#Comparison of two treatments
```

```
tout <- t.test(Response~Treatment)
```

Execution through R console

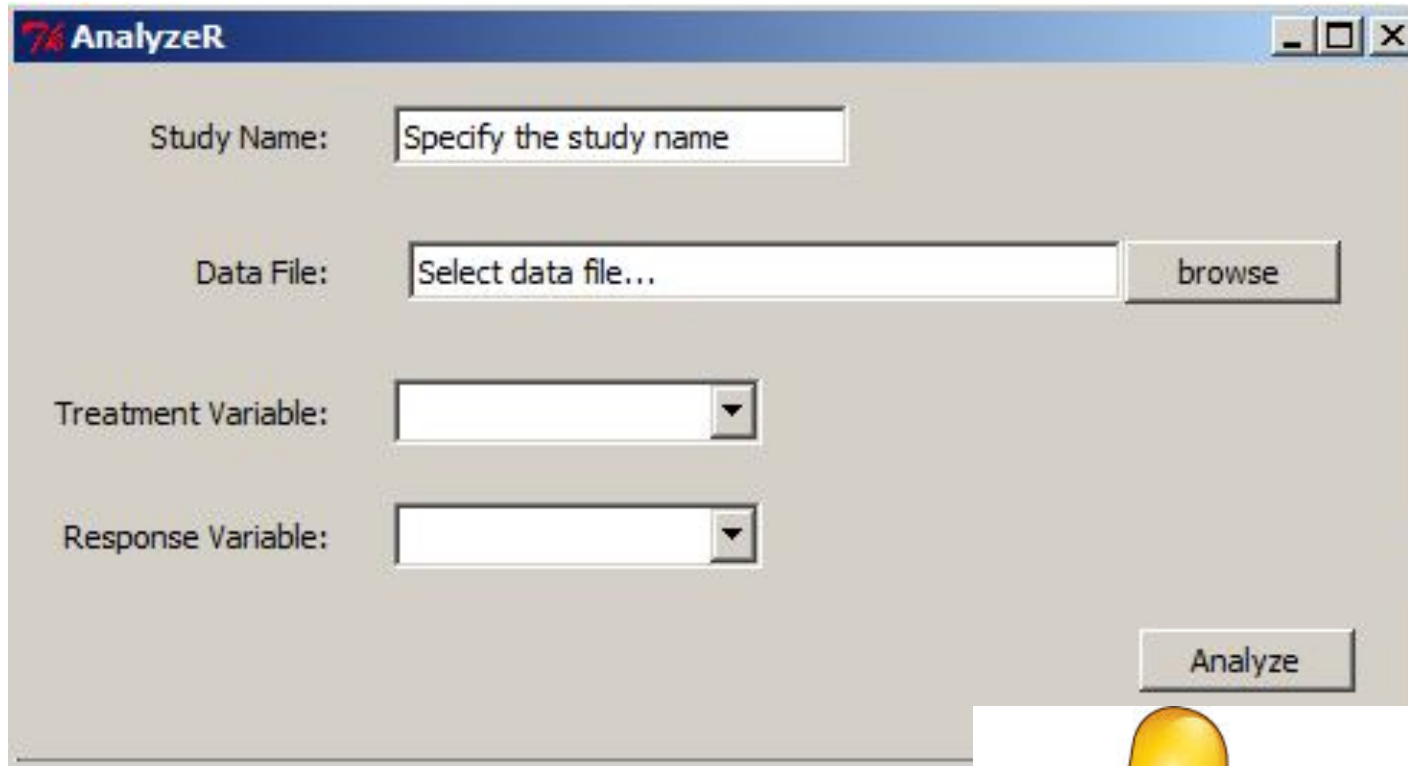
Inputs – part of the actual code

Sound R programming needed

```
#Load library 'ggplot2'  
#Treatment wise mean  
#response  
#Bar plot
```



Better R Experience



The image shows a screenshot of a software window titled "74 AnalyzerR". The window has a standard Windows-style title bar with minimize, maximize, and close buttons. The main area of the window is light gray and contains four input fields with labels to their left: "Study Name:" followed by a text box containing "Specify the study name"; "Data File:" followed by a text box containing "Select data file..." and a "browse" button to its right; "Treatment Variable:" followed by a dropdown menu; and "Response Variable:" followed by another dropdown menu. At the bottom right of the window is a large "Analyze" button. A thin white line extends from the bottom left corner of the window frame towards the bottom right of the slide.



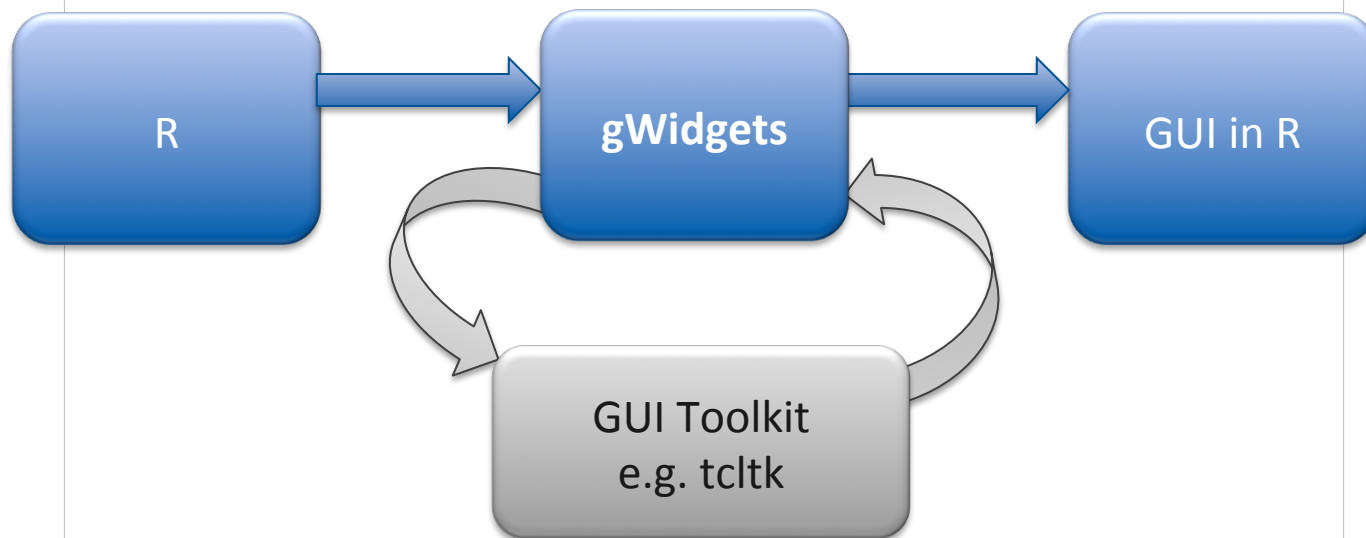
An R package authored by John Verzani

“Widget” – Interactive controls on a GUI



The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again.

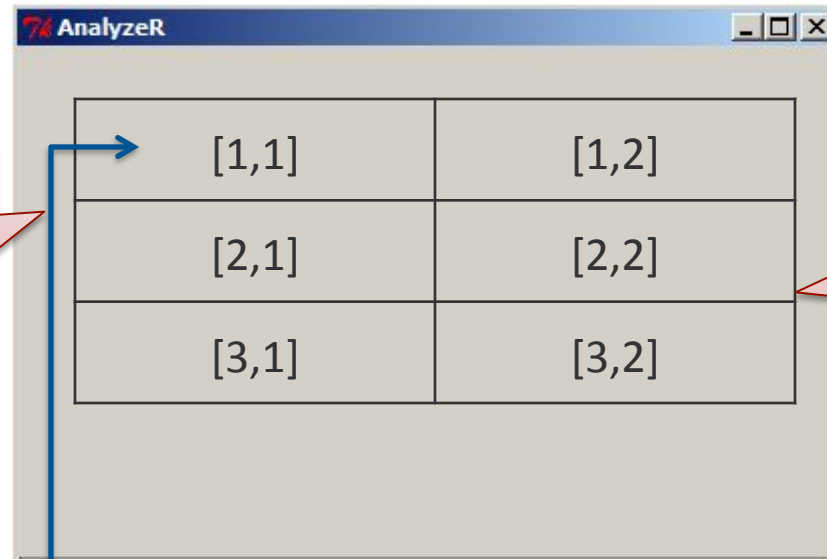
How does gWidgets work?



Window and Layout

 The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again.

Base container
using 'gwindow'

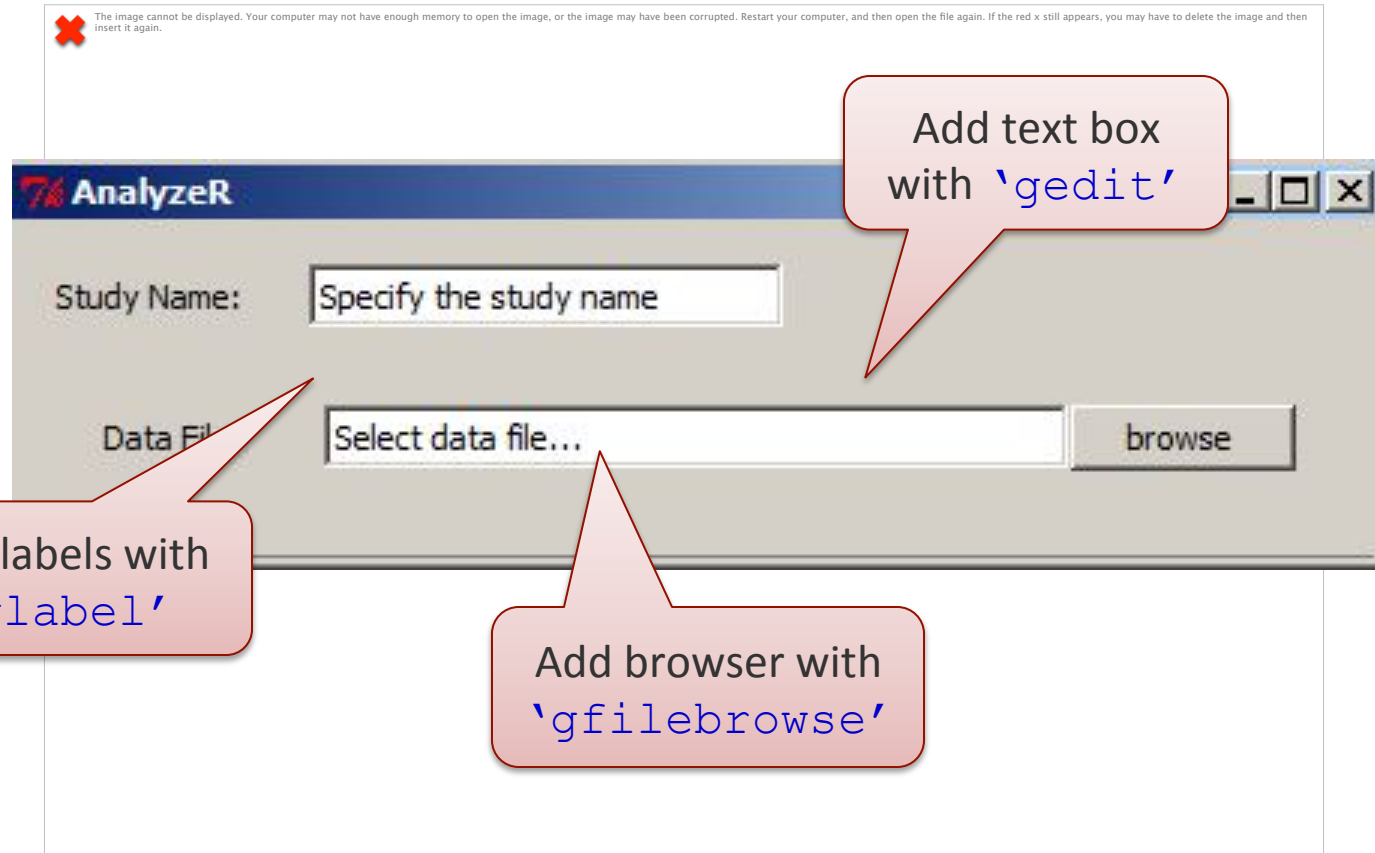


[1,1]	[1,2]
[2,1]	[2,2]
[3,1]	[3,2]

Tabular layout using
'glayout'

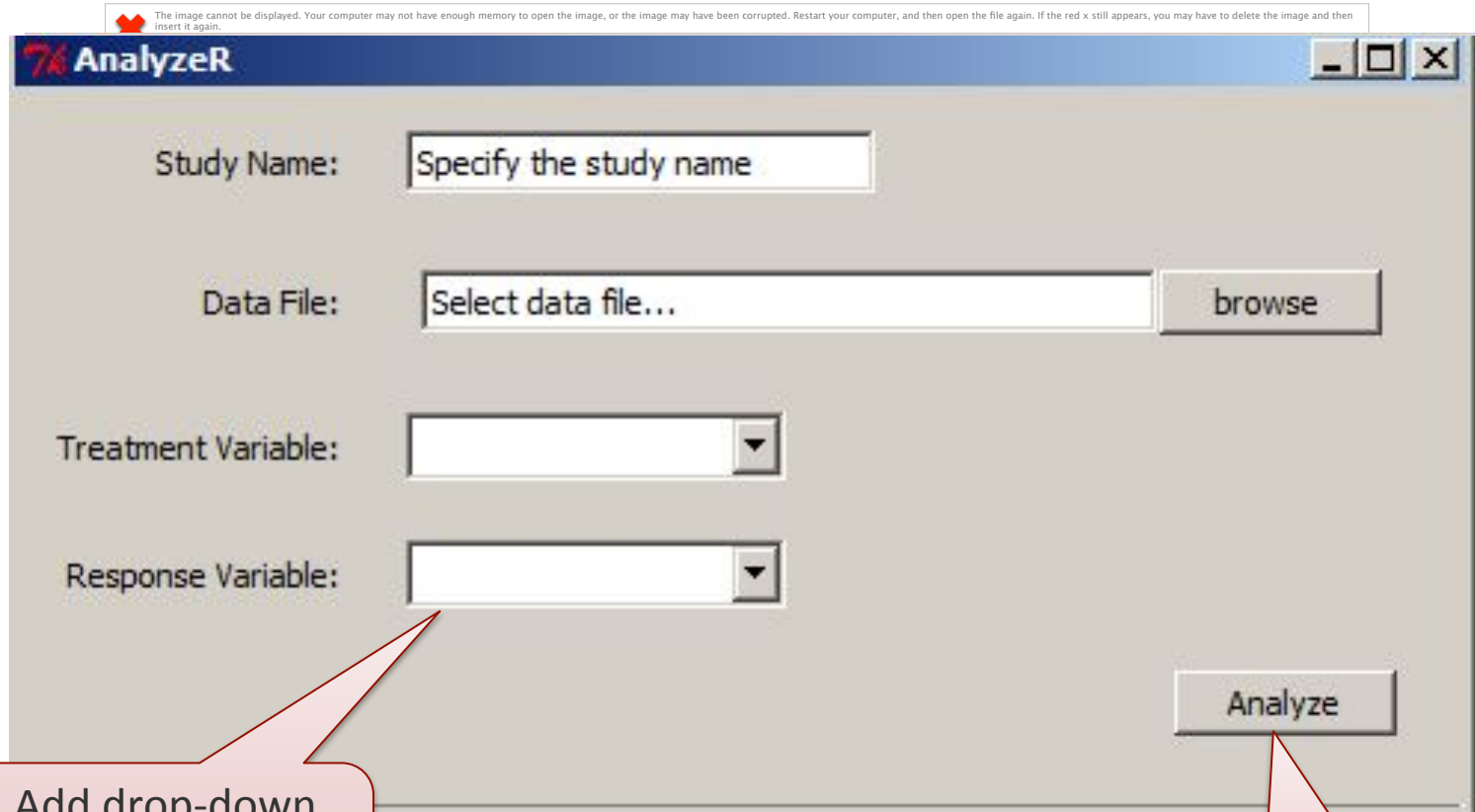
```
layout[1,1,anchor = c(0,0)] <- widget
```

Text box and File Browser



Combo-box and Button

 The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again.



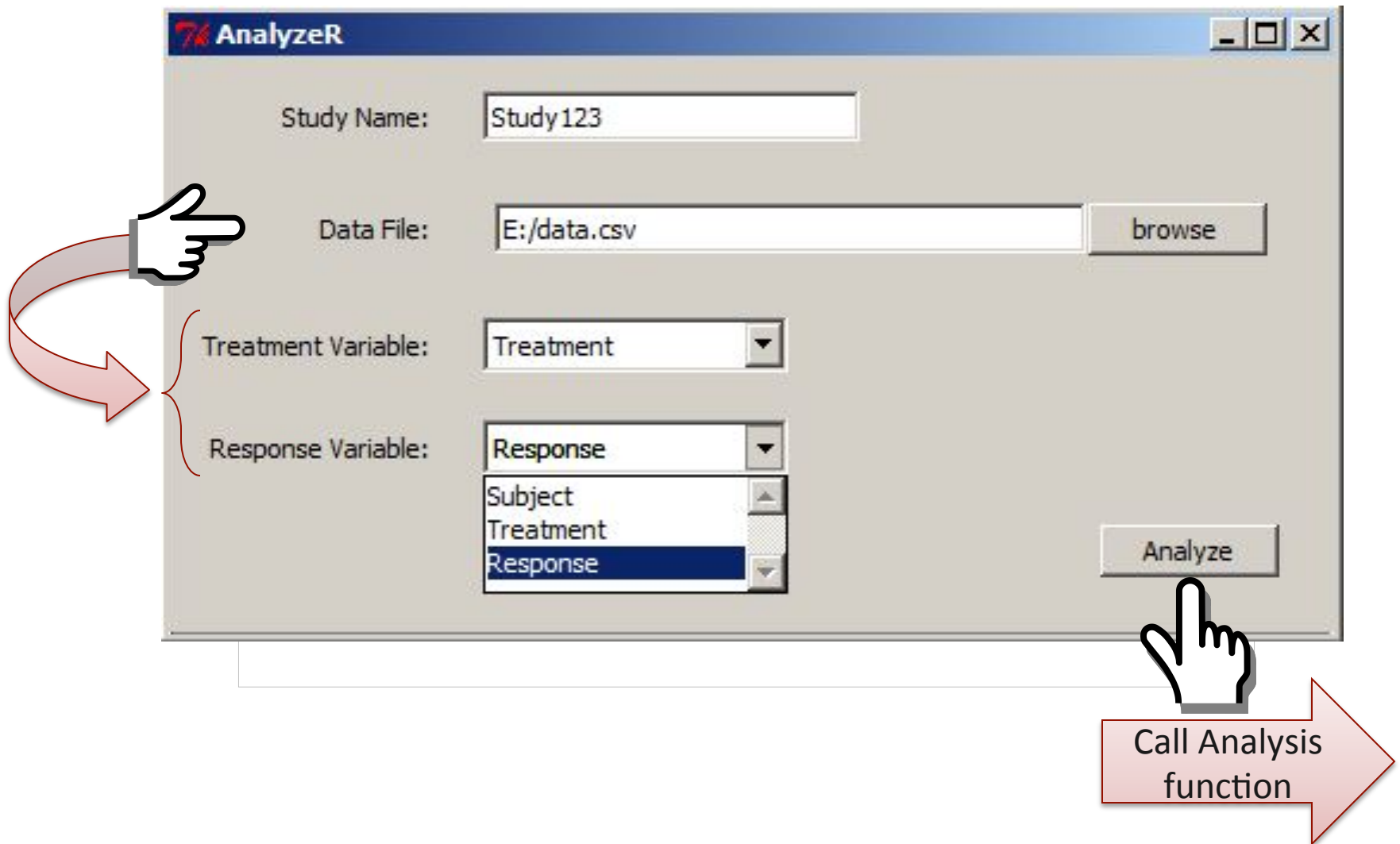
The screenshot shows a window titled "76 Analyzer". It contains four input fields: "Study Name:" with a text box containing "Specify the study name"; "Data File:" with a text box containing "Select data file..." and a "browse" button to its right; "Treatment Variable:" with a drop-down menu; and "Response Variable:" with a drop-down menu. At the bottom right is an "Analyze" button.

Add drop-down
list with
'gcombobox'

Add buttons with
'gbutton'

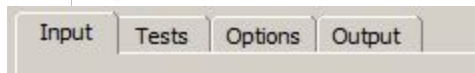
GUI with gWidgets (cont.)

Handler functions: Handle interdependent actions on the GUI



- Many more GUI functional as well as cosmetic features –

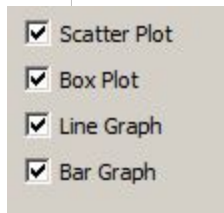
➤ multiple tabs



➤ radio buttons



➤ check boxes



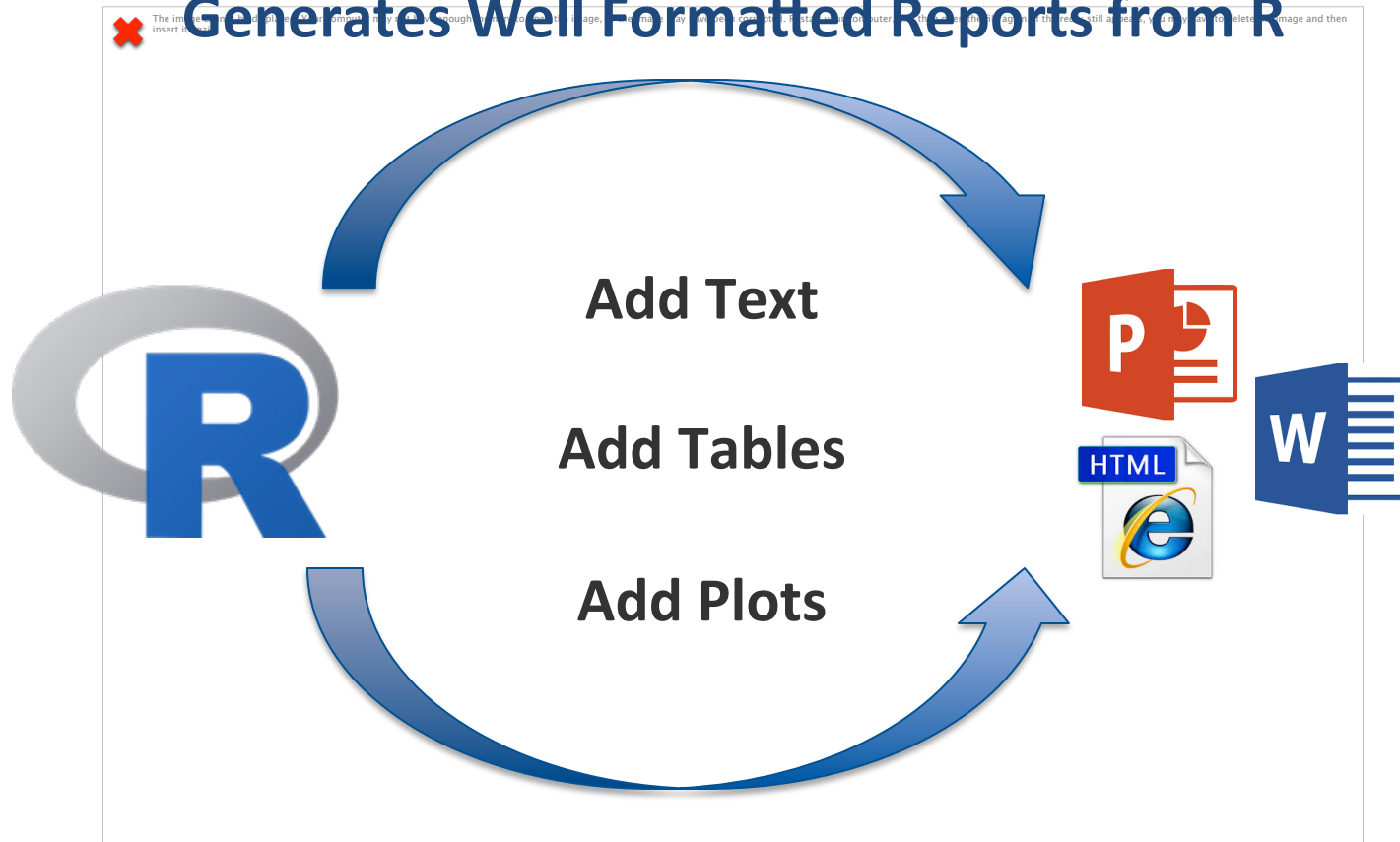
➤ add images



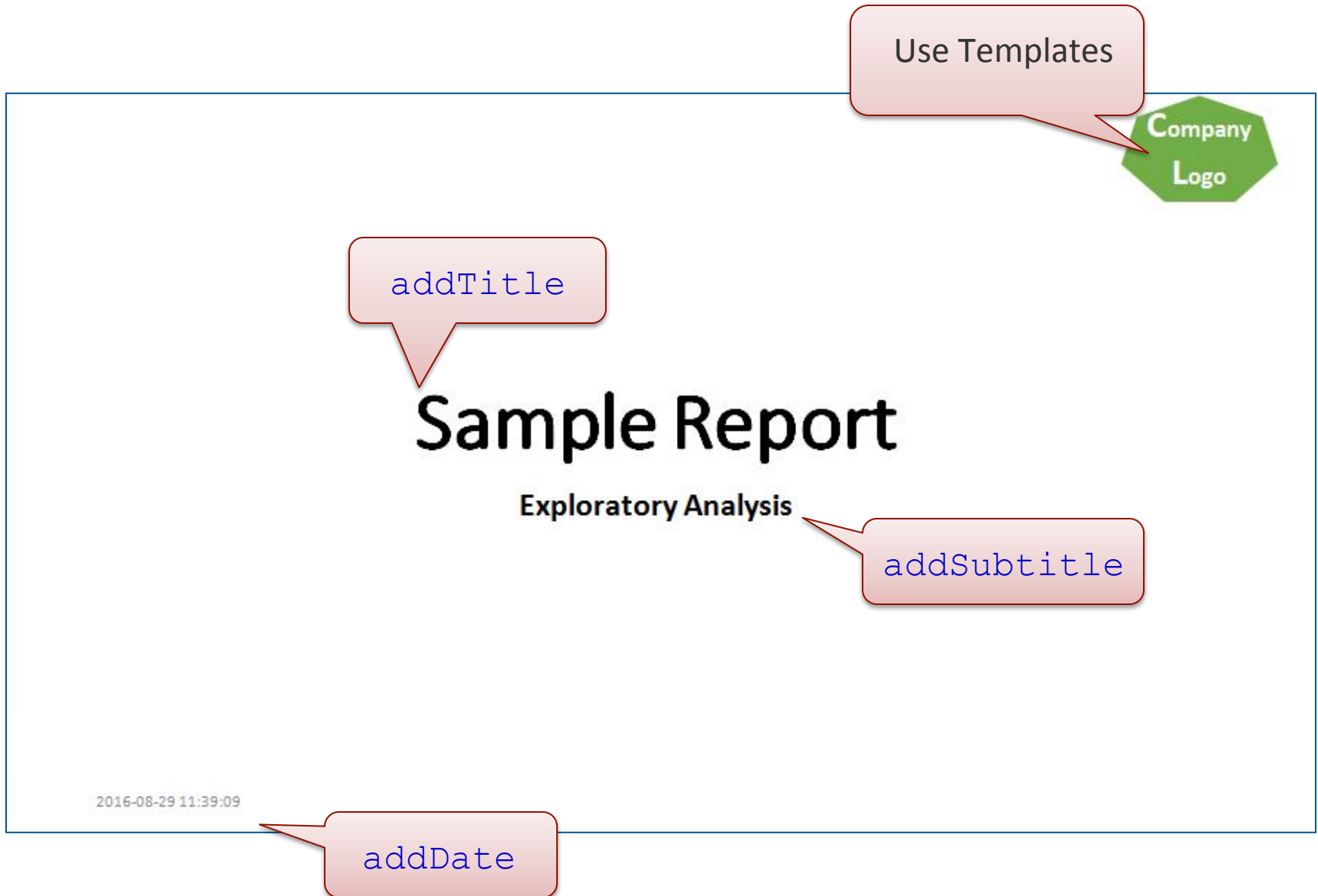
- Simple intuitive functions
- Enables tool development

Package authored by David Gohel et al.

Generates Well Formatted Reports from R



Reporting with ReporteRs



Reporting with ReporteRs (cont.)

Add text using
'addParagraph'

 The image cannot be displayed. Your computer may not have enough memory to open the image, and then open the file again. If the red x still appears, you may have to delete the image and then

Input Information



Evaluation Method: Descriptive Analysis

- Study: ABC123
- Sample size: 158
- Number of Treatments: 3
- Control: C
- Primary Attributes: Attr1, Attr2, Attr3, Attr4, Attr5
- Secondary Attributes: Attr6, Attr7, Attr8, Attr9

'pot' for
multiple formats

Bullet points using
'set_of_paragraphs'

Reporting with Reporters (cont.)

Results

Well formatted tables
with 'FlexTable'

Attribute Means

Primary Attributes			
Attribute	A	B	C
Attr1	4.52 A	4.57 A	3.60 B
Attr2	5.91 A	5.76 A	4.76 B
Attr3	0.71 C	1.12 B	2.19 A
Attr4	2.76 A	2.71 A	2.90 A
Attr5	2.00 A	1.81 A	1.81 A
Different letters represent significant differences			

'addFooterRow'

'addHeaderRow'



Secondary Attributes			
Attribute	A	B	C
Attr6	5.31 A	5.05 A	4.21 B
Attr7	4.69 A	4.43 B	3.43 C
Attr8	4.64 B	4.29 C	5.29 A
Attr9	0.60 A	0.69 A	0.76 A
Different letters represent significant differences			

Set column wise
width, alignment, etc.

Reporting with ReporteRs (cont.)

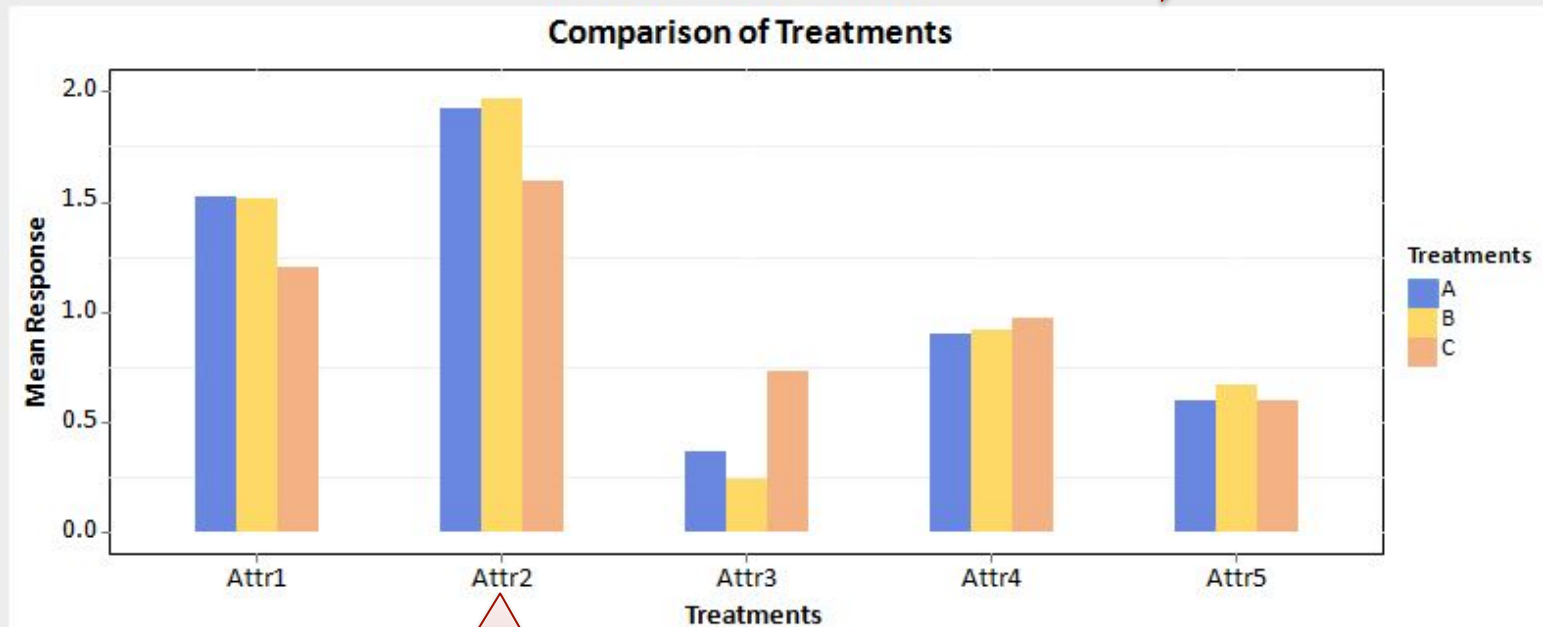
Add graph objects
using `'addPlot'`



The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again.



Bar Chart – Treatment Comparison



Editable title,
labels, legend

- Ability to generate reports from R instantly.
- Editable graphs and tables
- Customized formatting
- Enables end to end automation

Tools for Clinical Trials

The

Group

Routine

Issues

Aut

tion

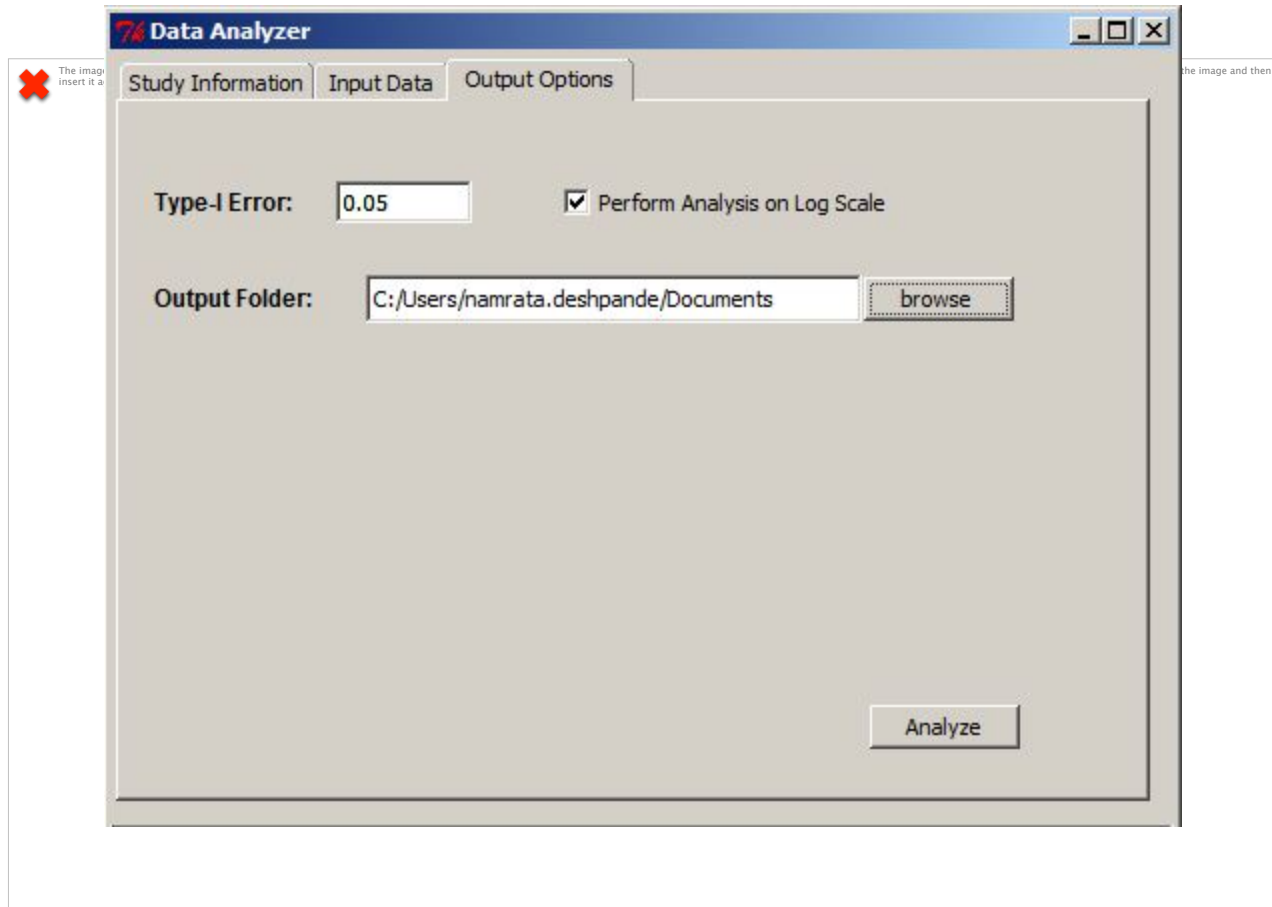
ol

JI with
ets

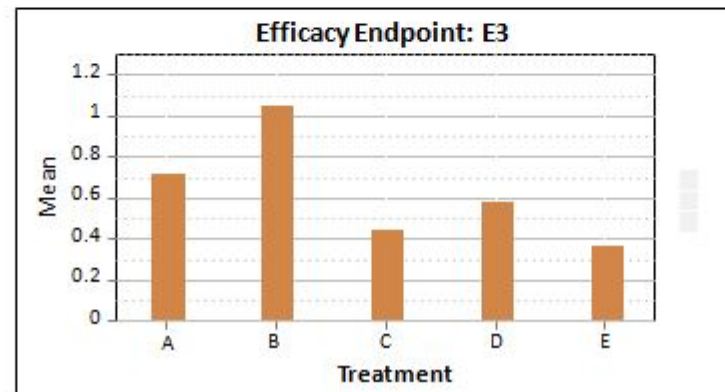
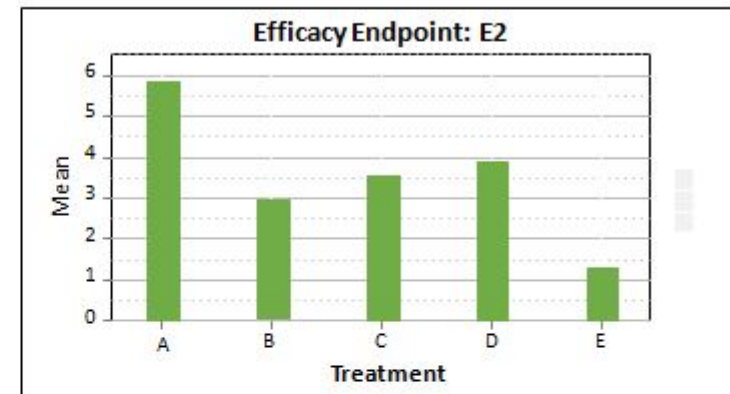
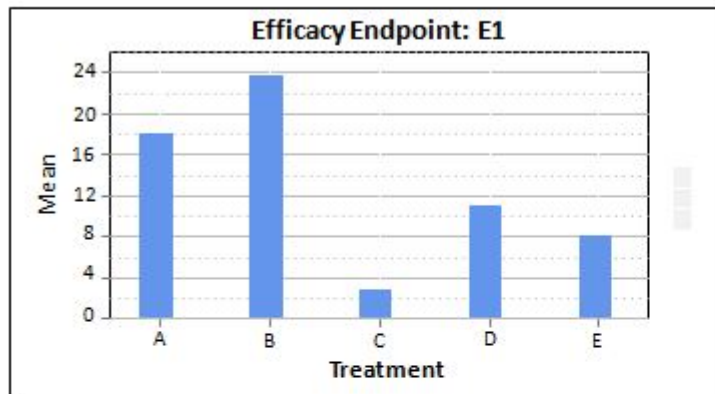
on with
eRs

	A	B	C	D	E	F	G
1	Subject	Treatment	E1	E2	E3	S1	S2
2	1	A	15	5.63	0.55	3	15
3	2	A	15	6.94	0.90	3	16
4	3	A	14.5	7.22	0.60	3.5	13
5	4	A	15	6.19	0.88	3	21.5
6	5	A	14.5	5.63	0.17	3	17
7	6	A	15.5	7.43	0.14	4.5	15.5
8	7	A	14	5.59	0.36	3	12
9	8	A	13	5.68	0.78	3	15
10	9	A	14.5	6.98	0.50	3	12
11	10	A	15	6.64	0.63	3	22.5
12	11	A	14	6.27	0.24	2	21.5
13	12	A	15	7.39	0.06	3	18
14	13	A	15	6.61	0.62	3.5	12.5
15	14	A	15	5.83	0.46	2	11
16	15	A	14.5	6.30	0.95	0	17
17	16	A	14.5	5.62	0.78	2.5	13
18	17	A	14	6.62	0.23	3	19
19	18	A	14	6.98	0.86	2	14

The GUI



Comparison of Treatments

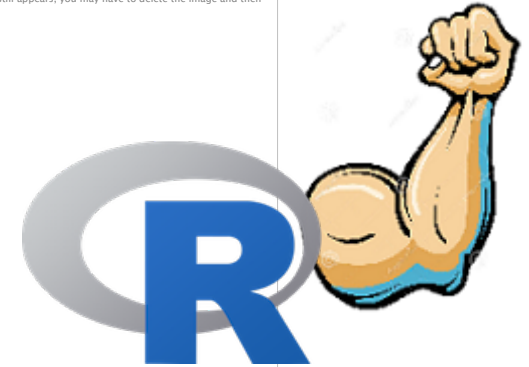


Comparison of Treatments with Control

Treatment vs. Control	Significant Efficacy Endpoints
A vs. C	E1, E2
B vs. C	E1, E3
D vs. C	-
E vs. C	E1, E2
Format: [Treatment > Control] & [Treatment < Control]	
Statistical analysis based on ANOVA model.	

gWidgets, ReporteRs – Powerful non-statistical R packages

- ✓ Leverage the strength of statistical & graphical R packages
- ✓ Extend R usage to non-programmers
- ✓ Save time with automation
- ✓ Add sophistication to R's user experience





Thank you!

namrata.deshpande@cytel.com