



LondonR Workshop
March 30th 2015

WiFi

- UCLGuest Wireless Network
- Navigate to a page outside of UCL
- Click on the link to the self service page
- Enter your details and event code (CDRC)
- Click Generate Account
- Make a note of the username and password
- Click on the link to login

Workshop Aim

Be able to develop a simple Shiny App with standard inputs and outputs

A subset of Mango's forthcoming Shiny training course!

Outline

- A Basic Shiny app
- Defining the User Interface
- Displaying Outputs
- Reactivity
- Beyond the Basics

Workshop resources

- R (version 3.1.2)
- RStudio
- Shiny (version 0.11)

Workshop structure

- 2 hours
- Presentation format
- Worked examples of creating apps
- Exercises during the workshop

What is Shiny?

- R Package for Interactive Web Apps developed by RStudio
- Gives the power of R in a convenient user interface
- Can be written entirely in R

A Basic Shiny App

- A basic app requires:
 - A user interface script
 - A "Server" script
- Runs using the `runApp` function

The User Interface Script

- Defines the components of the user interface
 - Page titles
 - Input options
 - Outputs
- Defines what the user will see and interact with

The Server Script

- Contains the information to build the app
- Requires a call to the function `shinyServer`
 - Contains a function with parameter input and output
- Defines what happens in R

Worked Example 1

My First Shiny App!

Enter text here:

You entered the text: Welcome to LondonR!

Worked Example 1 - UI

```
shinyUI(fluidPage(  
  titlePanel("My First Shiny App!"),  
  sidebarLayout(  
    sidebarPanel(  
      textInput("myText", "Enter text here:")  
    ),  
    mainPanel(  
      textOutput("niceTextOutput")  
    )  
  )  
))
```

Worked Example 1 - Server

```
shinyServer(function(input, output) {  
  
  output$niceTextOutput <-  
  renderText(paste("You entered the text:\n",  
input$myText))  
  
})
```

Layouts

- Example 1 used a sidebarLayout
- There are a number of possible layouts
- In this workshop we will only use the sidebarLayout

Sidebar Panel

- Define the contents of the sidebar using the `sidebarPanel` function
- Accepts `*Input` functions that specify the app inputs

Input Controls

Input	Description
textInput	Text string input
numericInput	Numeric value input
selectInput	Select single or multiple values from drop down list
sliderInput	Numeric range “slider” input
radioButtons	Set of radio button inputs
fileInput	File upload control

Worked Example 2

My First Shiny App!

Enter text here:

Select a number:



Select from the dropdown:



Worked Example 2 - UI

```
sidebarPanel (  
  textInput ("myTextInput", "Enter text  
here:"),  
  numericInput ("myNumberInput", "Select a  
number:", value = 50, min = 0, max =  
100, step = 1),  
  selectInput ("mySelectInput", "Select from  
the dropdown:", choices = LETTERS[1:10])  
)
```

Main Panel

- Define the contents of the main panel using the function `mainPanel` function
- Can contain outputs using the `*Output` functions
- Can include HTML using a series of functions that replicate the HTML tags

HTML Formatting

- We don't need to use HTML tags
- Shiny includes a series of equivalent functions

Function	Usage
p	A paragraph of text
h*	A level * (1, 2, 3,...) header
code	A block of code
img	An image
strong	Bold text
em	Italic text

Worked Example 2

My First Shiny App!

Enter text here:

Select a number:

Select from the dropdown:

Using HTML in Shiny

This is a paragraph of text that is included in our main panel. **This text will be in bold.**

You entered the text: Welcome to LondonR!

You selected the number: 50

You selected option: A

Worked Example 2 - UI

```
mainPanel (  
  h4("Using HTML in Shiny"),  
  p("This is a paragraph of text that is  
    included in our main panel."),  
  strong("This text will be in bold.")),  
  textOutput("niceTextOutput"),  
  textOutput("niceNumberOutput"),  
  textOutput("niceSelectOutput")  
)
```

Exercise 1

Build a simple Shiny application that takes a date string input (e.g. “30-03-2015”) and returns the following text:

- What day of the week is it (e.g. “Wednesday”)
- What month it is (e.g. “December”)
- What year it is

Hint: try using the `dateInput` and `format` functions

Exercise 1 - UI

```
require(shiny)

shinyUI(fluidPage(

  # Define the header for the page
  titlePanel("Exercise 1"),

  # Set up the page to have a sidebar
  sidebarLayout(
    # Define the contents of the sidebar
    sidebarPanel(
      dateInput("dateInput", "Select date")
    ),

    # Define the contents of the main panel
    mainPanel(
      textOutput("dateOutput")
    )
  )
))
```


Exercise 1 - Sever

```
require(shiny)

shinyServer(function(input, output){

  output$dateOutput <- renderText(
    format(input$dateInput, format = "A %A in %B. The year is %Y")
  )

})
```

Defining Outputs

- So far we have just output text
- Shiny also allows us to output graphics, data and images
- We have to define the output in the UI and the Server scripts using different functions

Rendering Outputs

Output Type	server.R Function	ui.R Function
Text	renderPrint	textOutput
Data	renderDataTable	dataTableOutput
Plot	renderPlot	plotOutput
Image	renderImage	imageOutput

Worked Example 3 - Render Data

- From the user interface select a dataset from a dropdown menu
- Display the data in a dataTable

Worked Example 3 - Render Data

Render Data in a Shiny App

Select from the dropdown:

airquality ▼

Show 25 entries

Search:

	Ozone	Solar.R	Wind	Temp	Month	Day
41	190		7.4	67	5	1
36	118		8	72	5	2
12	149		12.6	74	5	3
18	313		11.5	62	5	4
			14.3	56	5	5
28			14.9	66	5	6
23	299		8.6	65	5	7
19	99		13.8	59	5	8
8	19		20.1	61	5	9
	194		8.6	69	5	10
7			6.9	74	5	11

Worked Example 3 - UI

```
sidebarLayout (  
  sidebarPanel (  
    selectInput("selectInput", "Select from the  
    dropdown:", choices = c("airquality", "iris",  
    "mtcars"))  
  ),  
  mainPanel (  
    dataTableOutput("dataOutput")  
  )  
)
```

Worked Example 3 - Server

```
output$dataOutput <-  
  renderDataTable (switch (input$selectInput,  
    "airquality" = airquality,  
    "iris" = iris,  
    "mtcars" = mtcars)  
  )
```

Worked Example 4 - Render Plots

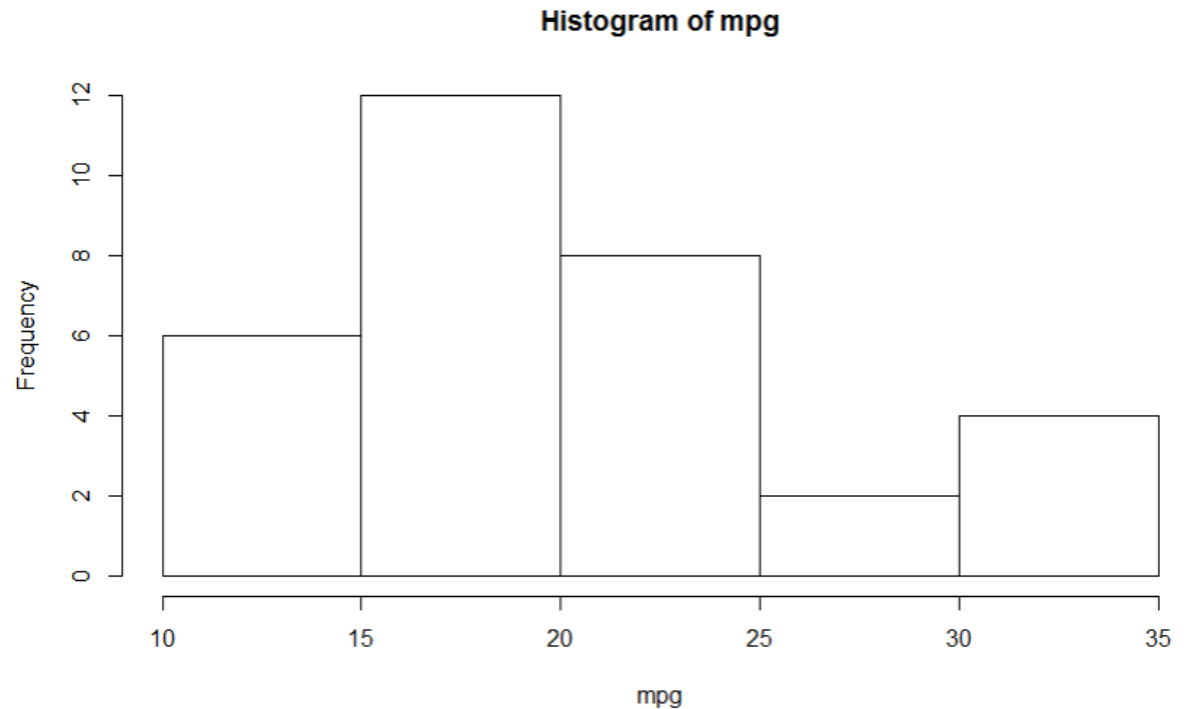
- Select a column of the data from a drop down menu
- Plot a histogram of the data

Worked Example 4 - Render Plots

Render Plot in a Shiny App

Select column:

mpg



Worked Example 4 - UI

```
sidebarLayout (  
  sidebarPanel (  
    selectInput ("selectInput", "Select  
column:", choices = colnames (mtcars))  
  ),  
  mainPanel (  
    plotOutput ("plotOutput")  
  )  
)
```

Worked Example 4 - Server

```
output$plotOutput <- renderPlot(  
  hist(mtcars[,input$selectInput],  
       main = paste("Histogram  
of", input$selectInput),  
       xlab = input$selectInput)  
)
```

Exercise 2

Create a Shiny application that takes:

- A numeric value between 1 and 500
- A colour
- A main title

Use these inputs to create an output histogram of random data from any distribution where n is the numeric input

Exercise 2 - UI

```
require(shiny)

shinyUI(fluidPage(

  # Define the header for the page
  titlePanel("Render Plot in a Shiny App"),

  # Set up the page to have a sidebar
  sidebarLayout(
    # Define the contents of the sidebar
    sidebarPanel(
      numericInput("numberInput", "Select size of data:", min = 0, max = 500, value = 100),
      selectInput("colInput", "Select a colour", choices = c("red", "yellow", "blue", "green"))
    ),

    # Define the contents of the main panel
    mainPanel(
      plotOutput("plotOutput")
    )
  )
))
```

Exercise 2 - Server

```
require(shiny)

shinyServer(function(input, output){

  output$plotOutput <- renderPlot(
    hist(rnorm(input$numberInput), col = input$colInput)
  )

})
```

Reactivity

- Consider the last exercise...
 - Suppose we want to change the colour of the plot, what happens to the data?

Reactivity

- Each time we change an option the data is simulated again
- Suppose this was reading in a large dataset, connecting to a database etc.

The reactive Function

- This lets us create a reactive function
- The function is only called when the relevant inputs are updated
- Our data is only updated when the number of simulations is changed

Worked Example 5

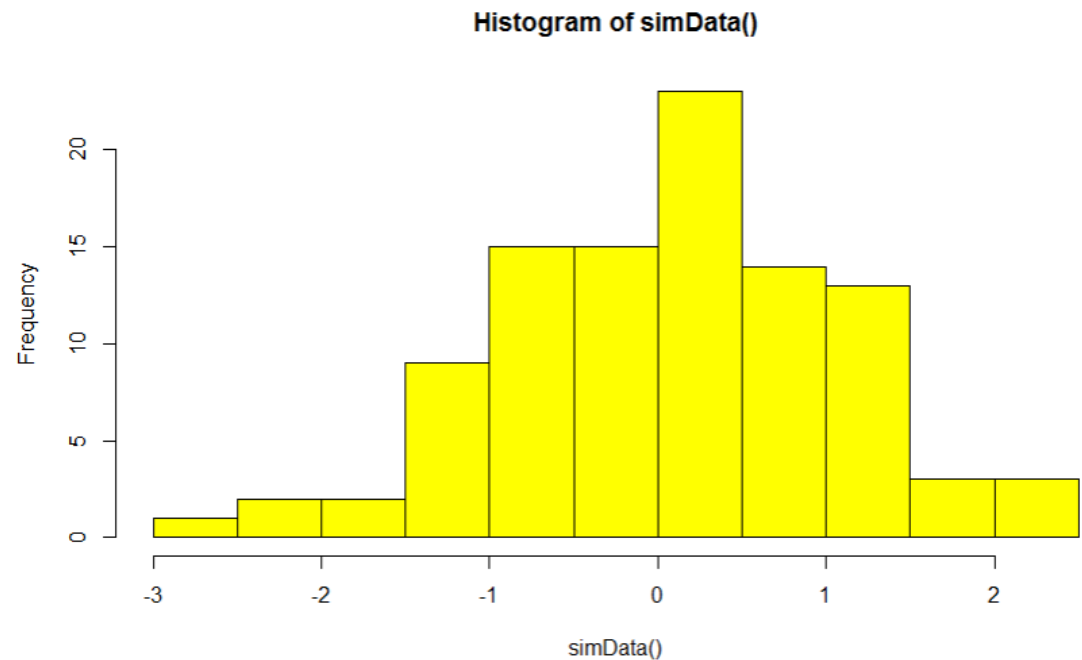
Render Plot in a Shiny App

Select size of data:

Select a colour:

yellow

- red
- yellow
- blue
- green



Worked Example 5 - Server

```
simData <- reactive({  
  rnorm(input$numberInput)  
})  
  
output$plotOutput <- renderPlot(  
  hist(simData(), col =  
    input$colInput)  
)
```

Beyond the basics

- Changes to layouts
- Including tabbed pages
- Include CSS to style the page
- Incorporate Shiny and Markdown
- Share your app
- ...

All covered on our 1 day Getting Started with Shiny course

Shiny Themes

- A new package that allows us to change the bootstrap theme
- Requires Shiny v0.11
- Available on CRAN

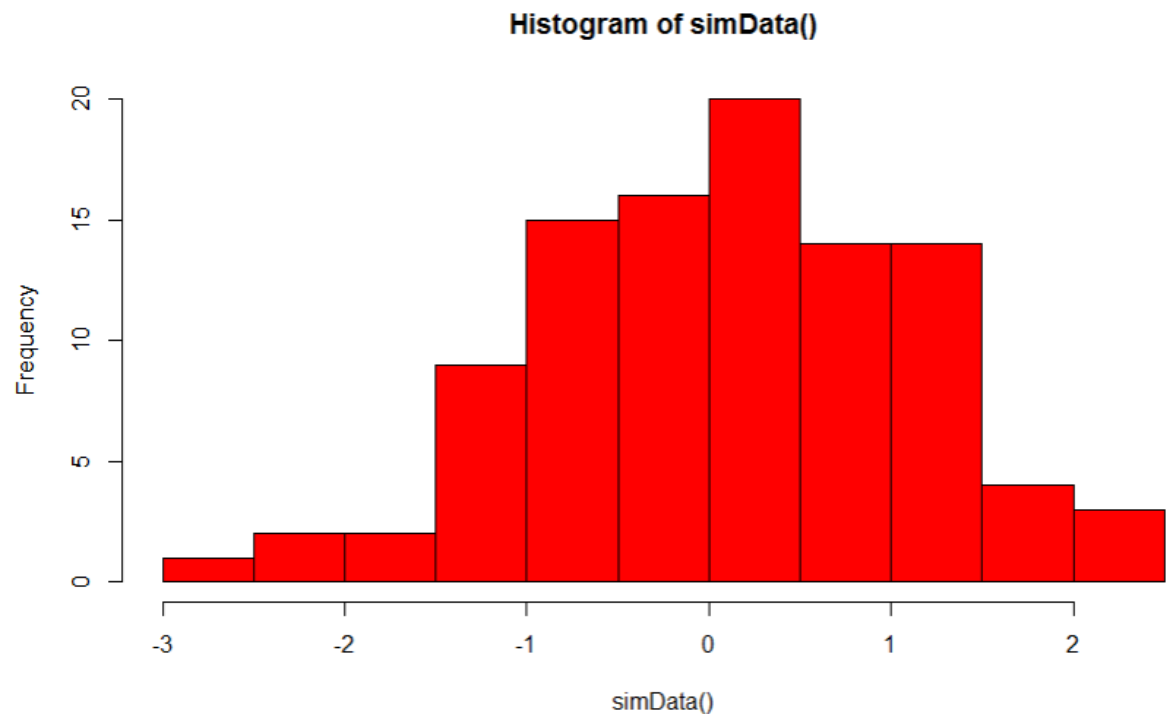
<http://rstudio.github.io/shinythemes/>

Worked Example 6

Render Plot in a Shiny App

Select size of data:

Select a colour



Worked Example 6 - UI

```
require(shinythemes)
```

```
shinyUI(fluidPage(  
  theme = shinytheme("cerulean"),  
  ...  
))
```

Shiny Dashboard

- Package under development by RStudio for developing Dashboards with Shiny
- Available on github

What Next?

- This evenings LondonR meeting!
- Getting Started with Shiny training course
- Data Visualisation in R training course

- EARL 2015

LondonR tonight

- **SAS to R Migration** – Rich Pugh, Mango Solutions
- **The Coder and the Designer: Using R for Visualising London's Data** – James Cheshire, UCL (and Co-Author of The Information Capital)
- **How to build a mid-sized analytical application with Shiny** – Enzo Martoglio, Sopra Steria

Getting Started with Shiny - May 27th

- 1 Day Training Course
 - Covers this content in more depth + more!
 - Including CSS
 - Shiny + Rmarkdown
- To be held in central London
- See the Mango team for more details!

Data Visualisation in R - May 28th

- 1 Day Training Course
 - The Principles of Data Visualisation
 - Implementing these principles in ggplot2
- To be held in central London
- See the Mango team for more details!

EARL 2015

LONDON 14 - 16 SEPTEMBER

- Tower Hotel
- 2 day conference
- 1 day of workshops prior to conference
- Capacity for 400+
- Conference evening event in Tower Bridge
- Earlybird deadline ends tomorrow
- Abstract deadline extended to 17th April

EARL 2015

LONDON 14 - 16 SEPTEMBER

- **Alex Bellos** (Author of Alex's Adventures in Numberland)
- **Joe Cheng** (Creator of Shiny!)
- **Dirk Eddelbuettel** (Author of Rcpp)
- **Hannah Fry** (Lecturer in Mathematics at the Centre for Advanced Spatial Analysis)

Speak to the Mango team to know more or visit the webpage

<http://www.earl-conference.com/>

EARL Workshops

- 10.00 – 13.00
 - **Integrating R and Python** (Chris Musselle)
 - **Current Best Practices in Formal Package Development** (Aimee Gott, Gregoire Gauriot)
- 14.00 – 17.00
 - **Introduction to Rcpp** (Dirk Eddelbuettel)
 - **Interactive reporting with R Markdown and Shiny** (Joe Cheng)

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