



Northeastern University
College of Engineering



IE6600 Computation and Visualization for Analytics

R-Shiny Application

Zhenyuan Lu

Class Schedule

Contents

- UI widgets
- Widgets input values
- Reactive output
- Render functions
- Three small exercises (each exercise roughly ~10mins)
- Two medium exercise
- One **large** exercise (if we have time)

4.UI Widgets

ui

R-Shiny *Basic widgets*

The standard Shiny widgets are:

function	widget
<code>actionButton</code>	Action Button
<code>checkboxGroupInput</code>	A group of check boxes
<code>checkboxInput</code>	A single check box
<code>dateInput</code>	A calendar to aid date selection
<code>dateRangeInput</code>	A pair of calendars for selecting a date range
<code>fileInput</code>	A file upload control wizard
<code>helpText</code>	Help text that can be added to an input form
<code>numericInput</code>	A field to enter numbers
<code>radioButtons</code>	A set of radio buttons
<code>selectInput</code>	A box with choices to select from
<code>sliderInput</code>	A slider bar
<code>submitButton</code>	A submit button
<code>textInput</code>	A field to enter text

actionButton()

Action

Submit

dateRangeInput()

2019-03-25 to 2019-03-25

radioButtons()

- Choice 1
- Choice 2
- Choice 3

checkboxInput()

Choice A

fileInput()

Browse... No file selected

selectInput()

Choice 1

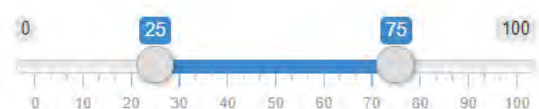
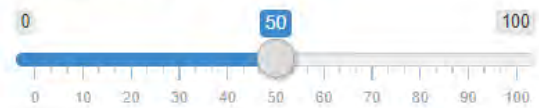
checkboxGroupInput()

- Choice 1
- Choice 2
- Choice 3

helpText()

Note: help text isn't a true widget, but it provides an easy way to add text to accompany other widgets.

sliderInput()



dateInput()

2014-01-01

numericInput()

1

textInput()

Enter text...

actionBttn()



dateRangeInput()

 to

radioGroupButtons()

Label



awesomeCheckbox()

 A single checkbox

fileInput()

pickerInput()

Live search

awesomeCheckboxGroup()

Checkboxes

-
- A
-
-
- B
-
-
- C

helpText()

Note: help text isn't a true widget, but it provides an easy way to add text to accompany other widgets.

sliderTextInput()

Choose a range:



Jan Apr Aug Dec

R-Shiny *Excercise*

UI Widgets Basic widgets shinyWidgets package

actionButton()

Action

Submit

dateRangeInput()

2019-03-25 to 2019-03-25

radioButtons()

- Choice 1
- Choice 2
- Choice 3

checkboxInput()

Choice A

fileInput()

Browse... No file selected

selectInput()

Choice 1

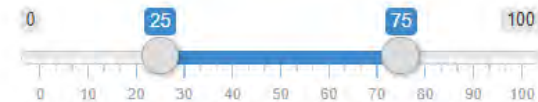
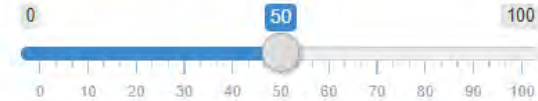
checkboxGroupInput()

- Choice 1
- Choice 2
- Choice 3

helpText()

Note: help text isn't a true widget, but it provides an easy way to add text to accompany other widgets.

sliderInput()



dateInput()

2014-01-01

numericInput()

1

textInput()

Enter text...



uiWidget2.R

See [uiWidget2.R](#) on Canvas

ui

output values

```
uiOutput()  
verbatimTextOutput()  
tableOutput()  
plotlyOutput()  
plotOutput()  
.  
.  
.
```

5.Reactive Output, functions and data

server

R-Shiny *Display reactive output*

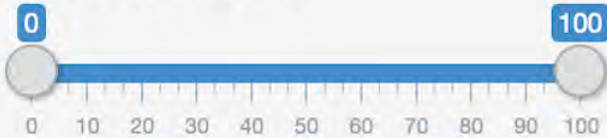
censusVis

Create demographic maps with information from the 2010 US Census.

Choose a variable to display

Percent White ▼

Range of interest:



You have selected Percent White

You have chosen a range that goes from 0 to 100

Two steps

You can create reactive output with a two step process:

1. Add an **R object** to your user interface.
2. Tell Shiny **how to build the object in the server function**. The object will be reactive if the code that builds it **calls a widget value**.

R-Shiny *Step1: Add an R object to the UI*

Shiny provides a family of functions that turn R objects into output for your user interface. Each function creates a specific type of output, which included but not limited to the following objects:

Output function	Creates
<code>dataTableOutput</code>	DataTable
<code>htmlOutput</code>	raw HTML
<code>imageOutput</code>	image
<code>plotOutput</code>	plot
<code>tableOutput</code>	table
<code>textOutput</code>	text
<code>uiOutput</code>	raw HTML
<code>verbatimTextOutput</code>	text

R-Shiny *For example*

```
ui <- fluidPage(  
  titlePanel("censusVis"),  
  
  sidebarLayout(  
    sidebarPanel(  
      helpText("Create demographic maps with  
        information from the 2010 US Census."),  
  
      selectInput("var",  
        label = "Choose a variable to display",  
        choices = c("Percent White",  
                    "Percent Black",  
                    "Percent Hispanic",  
                    "Percent Asian"),  
        selected = "Percent White"),  
  
      sliderInput("range",  
        label = "Range of interest:",  
        min = 0, max = 100, value = c(0, 100))  
    ),  
  
    mainPanel(  
      textOutput("selected_var")  
    )  
  )  
)
```

For example, the ui object on the left uses textOutput to add a reactive line of text to the main panel of the Shiny app pictured above.

Notice that textOutput takes an argument, the character string "selected_var". Each of the *Output functions require a single argument: a character string that Shiny will use as the name of your reactive element. Your users will not see this name, but you will use it later.

R-Shiny *Step2: Provide R code to build the object*

Placing a function in ui tells Shiny where to display your object. Next, you need to tell Shiny how to build the object. We do this by providing the R code that builds the object in the server function.

```
server <- function(input, output) {  
  
  output$selected_var <- renderText({  
    "You have selected this"  
  })  
  
}
```

R-Shiny *Render function for each output*

Each entry to output should contain the output of one of Shiny's render* functions. These functions capture an R expression and do some light pre-processing on the expression. Use the render* function that corresponds to the type of reactive object you are making.

render function

`renderDataTable`

`renderImage`

`renderPlot`

`renderPrint`

`renderTable`

`renderText`

`renderUI`

creates

DataTable

images (saved as a link to a source file)

plots

any printed output

data frame, matrix, other table like structures

character strings

a Shiny tag object or HTML

ui

output values

Output function

`dataTableOutput`

`htmlOutput`

`imageOutput`

`plotOutput`

`tableOutput`

`textOutput`

`uiOutput`

`verbatimTextOutput`

Creates

DataTable

raw HTML

image

plot

table

text

raw HTML

text

server

associated render

render function

`renderDataTable`

`renderImage`

`renderPlot`

`renderPrint`

`renderTable`

`renderText`

`renderUI`

creates

DataTable

images

plots

any printed output

data frame, matrix

character strings

a Shiny tag object or HTML

R-Shiny *Use widget(input) values*

Shiny will automatically make an object reactive if the object uses an input value. For example, the server function below creates a reactive line of text by calling the value of the select box widget to build the text.

```
server <- function(input, output) {  
  
  output$selected_var <- renderText({  
    paste("You have selected", input$var)  
  })  
  
}
```

Exercise 1

R-Shiny Exercise(5min)

exercise 1

Create demographic maps with information from the 2010 US Census.

Choose a variable to display

Percent White

Range of interest:

0 100

You have selected Percent White
You have chosen a range that goes from 0 to 100

exercise 1

Create demographic maps with information from the 2010 US Census.

Choose a variable to display

Percent White

Percent White
Percent Black
Percent Hispanic
Percent Asian

You have selected Percent White
You have chosen a range that goes from 0 to 100

Exercise 2


R-Shiny Exercise(10min)

exercise 2

Name

Characteristics
Score:

0 10



The teacher Zhenyuan . (Score: 10)

Name

Characteristics

- is handsome
- is smart
- is awesome

0 1 2 3 4 5 6 7 8 9 10

The instructor Zhenyuan Lu is handsome . (Score: 10)

Exercise 3

R-Shiny Exercise(10min)

exercise 3

Name

Characteristics

True/False

The teacher Zhenyuan is handsome

Are you kidding me?

exercise 3

Name

Characteristics

True/False

The teacher Zhenyuan is awesome

He's lame!

exercise 3

Name

Characteristics

True/False

The teacher Zhenyuan is smart

Uh?!

server
functions

```
# Set up a trigger for dynamically  
action ----  
observeEvent({ })  
# Store a reactive value into shiny  
server ----  
reactiveValues({ })
```

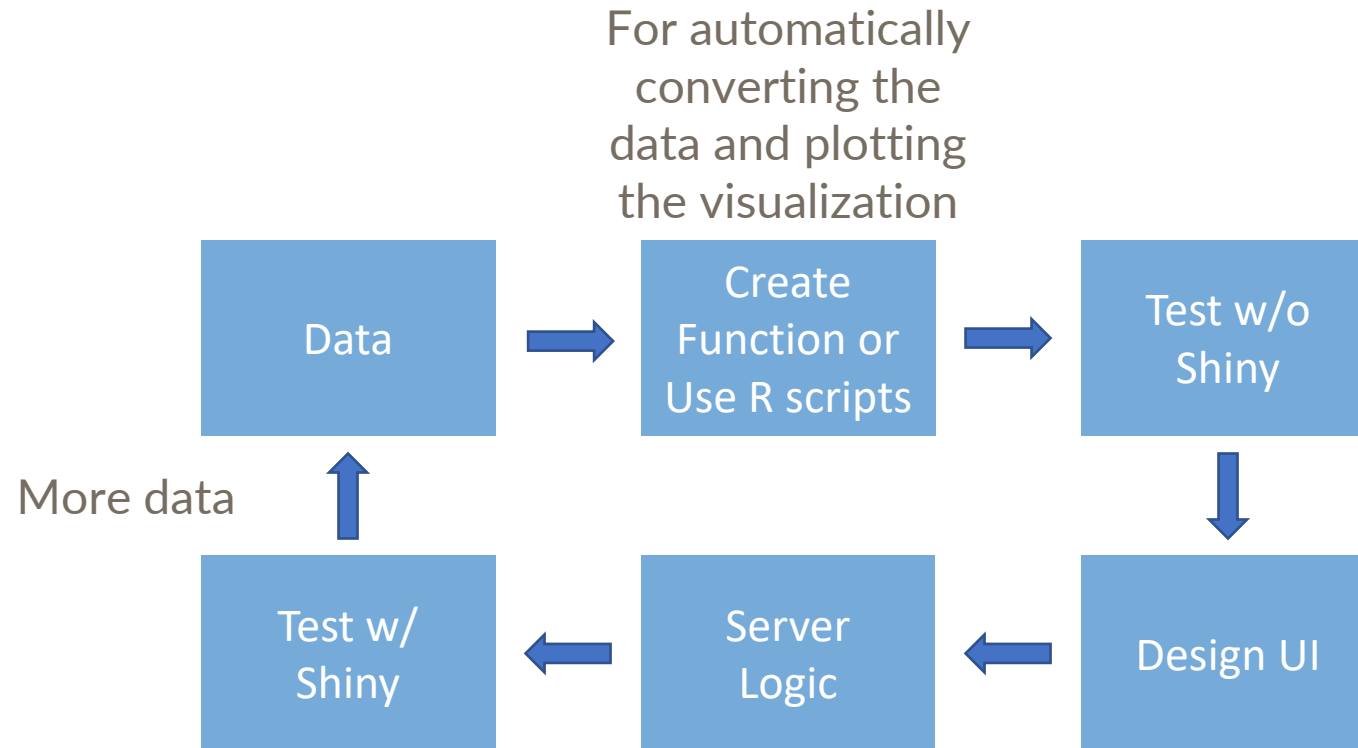
global

global
settings

```
Library()  
Global settings  
Global dataset
```

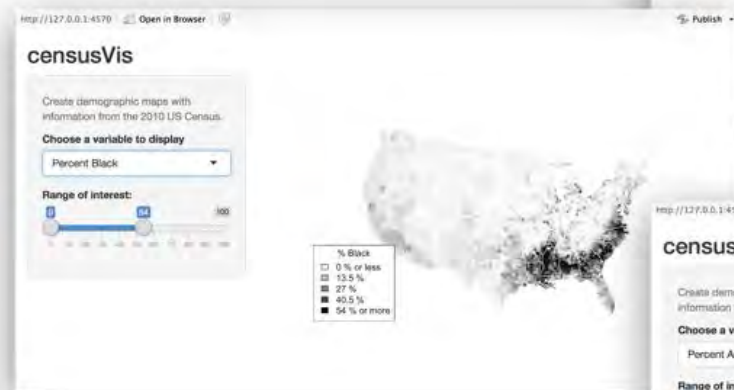
A simple workflow

R-Shiny Work Flow

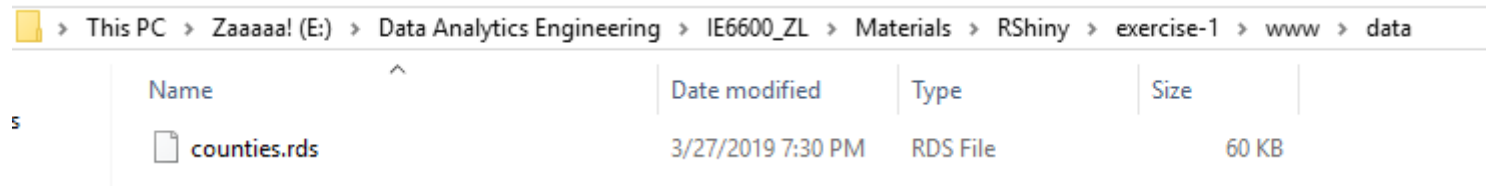


Exercise 4

R-Shiny *This is what we want to create*



R-Shiny *Find the data - counties.RDS*



Name	Date modified	Type	Size
counties.rds	3/27/2019 7:30 PM	RDS File	60 KB

Please download the .RDS file from Canvas
Then create a ShinyApp folder -> www -> data

R-Shiny *Create a function for plot map based on countries.RDS*

```
# Note: percent map is designed to work with the counties data set
# It may not work correctly with other data sets if their row order does
# not exactly match the order in which the maps package plots counties
percent_map <- function(var, color, legend.title, min = 0, max = 100) {

  # generate vector of fill colors for map
  shades <- colorRampPalette(c("white", color))(100)

  # constrain gradient to percents that occur between min and max
  var <- pmax(var, min)
  var <- pmin(var, max)
  percents <- as.integer(cut(var, 100,
    include.lowest = TRUE, ordered = TRUE))
  fills <- shades[percents]

  # plot choropleth map
  map("county", fill = TRUE, col = fills,
    resolution = 0, lty = 0, projection = "polyconic",
    myborder = 0, mar = c(0,0,0,0))

  # overlay state borders
  map("state", col = "white", fill = FALSE, add = TRUE,
    lty = 1, lwd = 1, projection = "polyconic",
    myborder = 0, mar = c(0,0,0,0))

  # add a legend
  inc <- (max - min) / 4
  legend.text <- c(paste0(min, " % or less"),
    paste0(min + inc, " %"),
    paste0(min + 2 * inc, " %"),
    paste0(min + 3 * inc, " %"),
    paste0(max, " % or more"))


  legend("bottomleft",
    legend = legend.text,
    fill = shades[c(1, 25, 50, 75, 100)],
    title = legend.title)
}
```

This is just an example how to make a plot function:

`percent_map()`

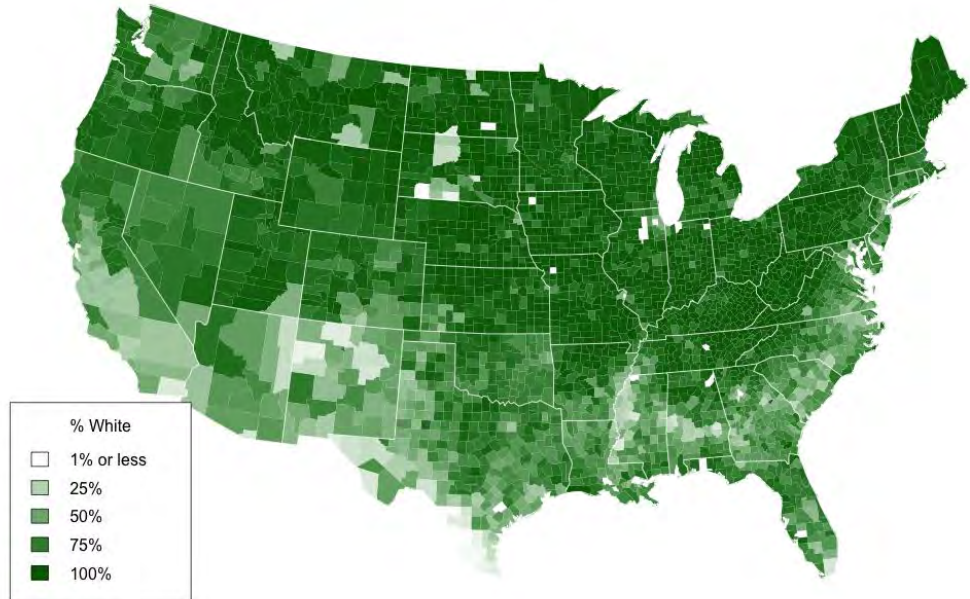
You don't have to understand the code syntax
Copy and paste the left code chunk into a new
.R file named percentMap, then place it into
your ShinyApp folder -> www -> functions

Zaaaaa! (E) > Data Analytics Engineering > IE6600_ZL > Materials > RShiny > exercise-1 > www > functions

Name	Date modified	Type	Size
 percentMap.R	3/27/2019 8:19 PM	R File	2 KB

R-Shiny *Test without Shiny*

```
library(maps)
library(mapproj)
source(yourFunctionPath)
counties <- readRDS(YourDataPath)
percent_map(counties$white, "darkgreen",
"% White")
```



BAAM!

exercise-1-rds

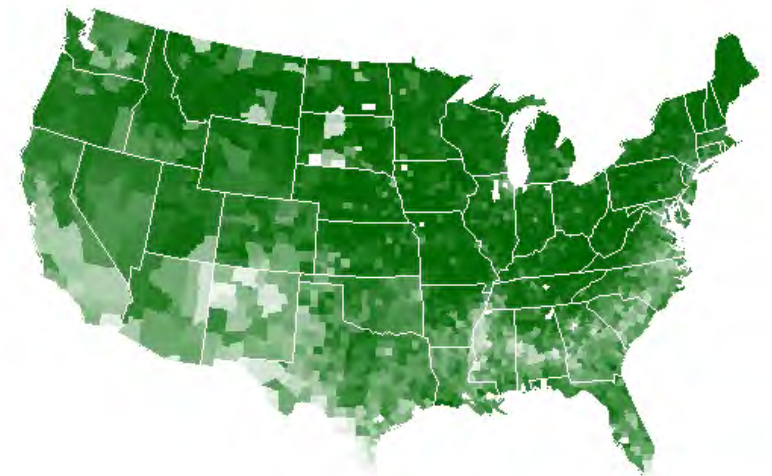
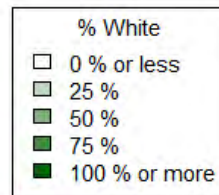
Create demographic maps with information from the 2010 US Census.

Choose a variable to display

Percent White

Range of interest:

0 100



R-Shiny *Design UI*

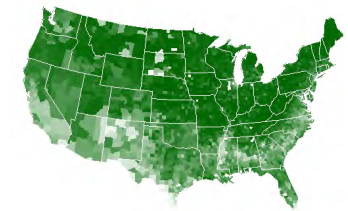
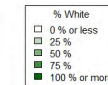
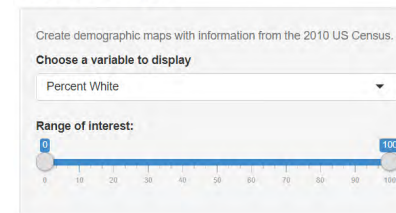
```
ui <- fluidPage(titlePanel("exercise-1-rds"),
  sidebarLayout(
    sidebarPanel(
      helpText("Create demographic maps with
        information from the 2010 US Census."),

      selectInput(
        "var",
        label = "Choose a variable to display",
        choices = c(
          "Percent White",
          "Percent Black",
          "Percent Hispanic",
          "Percent Asian"
        ),
        selected = "Percent White"
      ),

      sliderInput(
        "range",
        label = "Range of interest:",
        min = 0,
        max = 100,
        value = c(0, 100)
      )
    ),

    mainPanel()
  ))
```

exercise-1-rds



Which part did we miss?

```
# Server logic ----  
server <- function(input, output) {  
  # some arguments  
}
```

What do we need for
the arguments?

exercise-1-rds

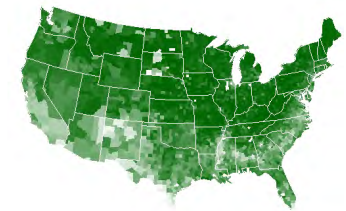
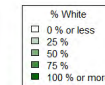
Create demographic maps with information from the 2010 US Census.

Choose a variable to display

Percent White

Range of interest:

0 100



Let's get back to the following scripts.

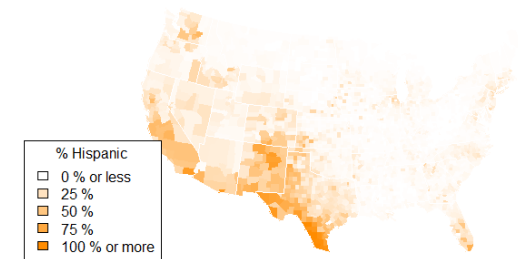
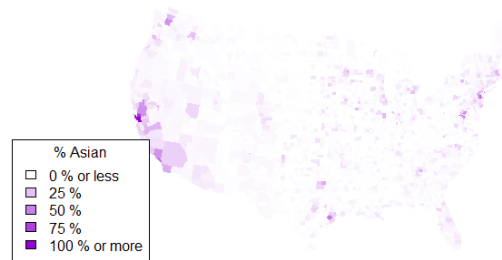
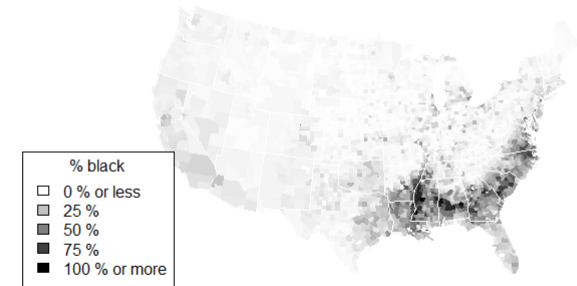
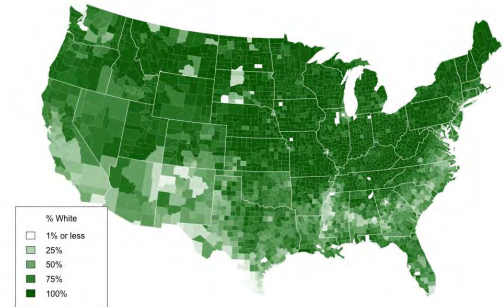
```
percent_map(counties$white, "darkgreen", "% White")
```

```
percent_map(counties$black, "black", "% Black")
```

```
percent_map(counties$hispanic, "darkorange", "% Hispanic")
```

```
percent_map(counties$asian, "darkviolet", "% Asian")
```

We have three arguments/variables: var, color, and legend.title



We have another two arguments: **max** →
and **min**

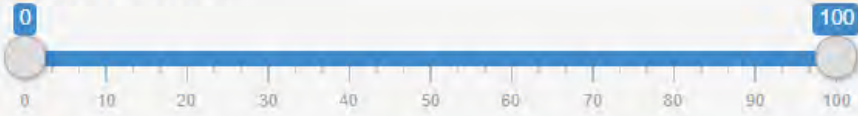
exercise-1-rds

Create demographic maps with information from the 2010 US Census.

Choose a variable to display

Percent White

Range of interest:



The range slider is a horizontal blue bar with tick marks every 10 units from 0 to 100. Two circular handles are positioned at the 0 and 100 marks, with blue boxes containing the numbers '0' and '100' above them respectively.

R-Shiny Design Server

```
ui <- fluidPage(titlePanel("exercise-1-rds"),
  sidebarLayout(
    sidebarPanel(
      helpText("Create demographic maps with
        information from the 2010 US Census."),

      selectInput(
        "var",
        label = "Choose a variable to display",
        choices = c(
          "Percent White",
          "Percent Black",
          "Percent Hispanic",
          "Percent Asian"
        ),
        selected = "Percent White"
      ),

      sliderInput(
        "range",
        label = "Range of interest:",
        min = 0,
        max = 100,
        value = c(0, 100)
      )
    ),

    mainPanel()
  )
))
```


exercise-1-rds

Create demographic maps with information from the 2010 US Census.

Choose a variable to display

Percent White

Range of interest:



```
server <- function(input, output) {
  output$map <- renderPlot({
    data <- switch(input$var,
      "Percent White" = counties$white,
      "Percent Black" = counties$black,
      "Percent Hispanic" = counties$hispanic,
      "Percent Asian" = counties$asian)

    percent_map(var = data, color = ?, legend.title = ?, max = ?,
      min = ?)
  })
}
```

Finish the rest four arguments

Rep ("Exercise 4", 1)

One more time

Exercise 5

server
functions

```
# Set up a trigger for dynamically  
action ----  
observeEvent({ })  
# Store a reactive value into shiny  
server ----  
reactiveValues({ })
```

R-Shiny Titanic data

exercise-titanic

Create GLM based on titanic dataset.

Choose CSV File

Browse... titanic.csv

Upload complete

Choose a x variable

age

Choose a color variable

sex

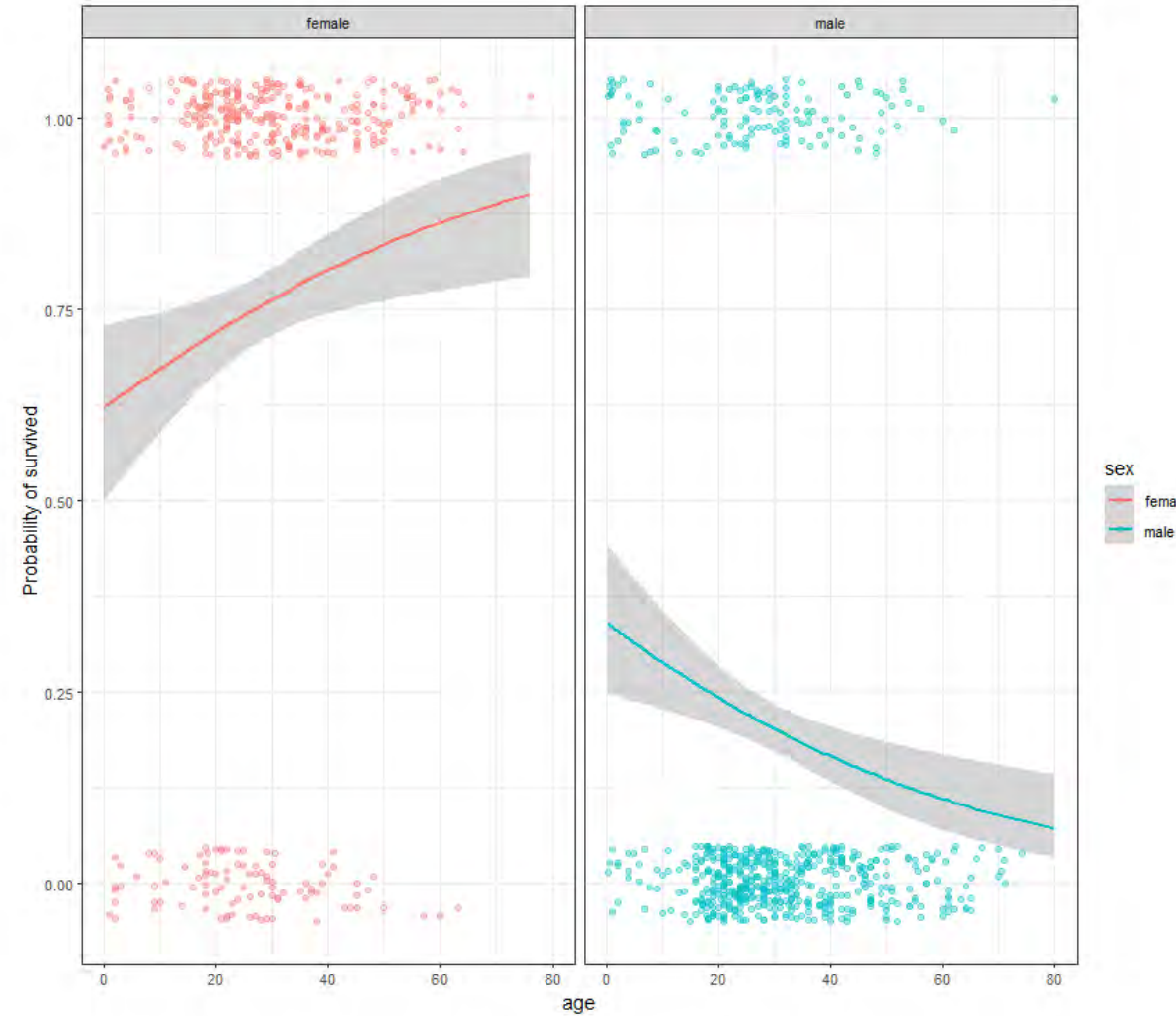
Choose a facet variable

sex

Search:

	X1	pclass	survived	name
1	1	1	1	Allen, Miss. Elisabeth Walt
2	2	1	1	Allison, Master. Hudson Tre
3	3	1	0	Allison, Miss. Helen Loraine
4	4	1	0	Allison, Mr. Hudson Joshua
5	5	1	0	Allison, Mrs. Hudson J C (E
6	6	1	1	Anderson, Mr. Harry
7	7	1	1	Andrews, Miss. Kornelia Th
8	8	1	0	Andrews, Mr. Thomas Jr
9	9	1	1	Appleton, Mrs. Edward Dal
10	10	1	0	Artagaveytia, Mr. Ramon

Showing 1 to 11 of 1,309 entries



Exercise 6

Exercise 6: 107 lines

2nd Example

Title:

Course:

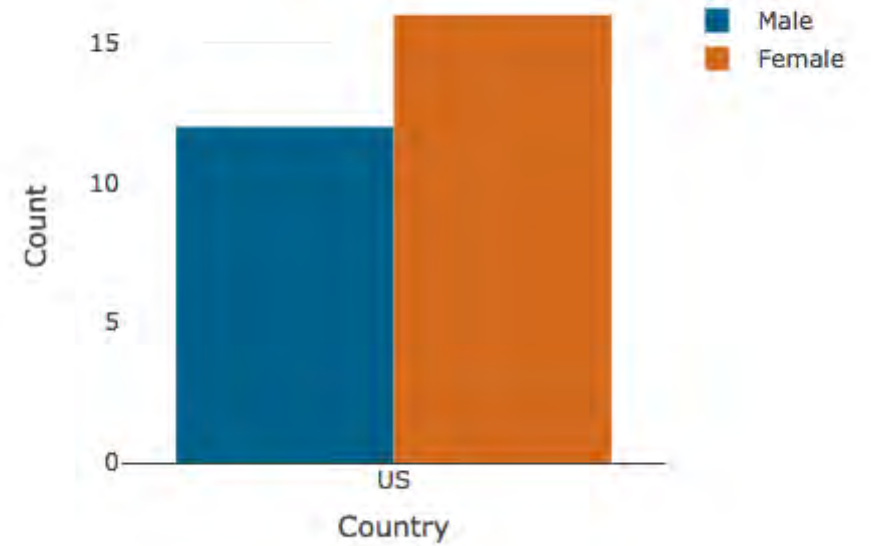
Country:

Numbers:

Gender:

Fall2018

Course	Country	Numbers	Gender
IE6600	US	12	Male
IE6600	US	16	Female



Answers

Lu, Zhenyuan. Data Visualization Tutorial in R.. zhenyuanlu.github.io, 2022.

R-Shiny *Answer for Exercise 1*

```
ui <- fluidPage(  
  titlePanel("exercise 1"),  
  
  sidebarLayout(  
    sidebarPanel(  
      helpText("Create demographic maps with  
        information from the 2010 US Census."),  
  
      selectInput("var",  
        label = "Choose a variable to display",  
        choices = c("Percent White",  
                    "Percent Black",  
                    "Percent Hispanic",  
                    "Percent Asian"),  
        selected = "Percent White"),  
  
      sliderInput("range",  
        label = "Range of interest:",  
        min = 0, max = 100, value = c(0, 100))  
    ),  
  
    mainPanel(  
      textOutput("selected_var"),  
      textOutput("selected_num")  
    )  
  )  
)
```

```
server <- function(input, output) {  
  
  output$selected_var <- renderText({  
    paste("You have selected", input$var)  
  })  
  output$selected_num <- renderText({  
    paste("You have chosen a range that goes from ",  
input$range[1], "to", input$range[2])  
  })  
  
}  
  
shinyApp(ui, server)
```

R-Shiny *Answer for Exercise 2*

```
library(shiny)

ui <- fluidPage(
  titlePanel("exercise 2"),

  sidebarLayout(
    sidebarPanel(
      textInput("text", "Name", value="The teacher Zhenyuan"),

      selectInput("variable",
                  label = "Characteristics",
                  choices = list(choose="", "is handsome",
                                "is smart",
                                "is awesome")),

      sliderInput("range", "Score:", min=0, max=10, value=10)
    ),

    mainPanel(fluidPage(
      fluidRow(
        verbatimTextOutput("textoutput")
      )
    ))
  )
)

server <- function(input ,output){
  output$textoutput <- renderText({
    paste(input$text, input$variable, ".",
          "(Score: ", input$range, ") ", sep=" ")
  })
}

shinyApp(ui, server)
```

R-Shiny *Answer for Exercise 3*

```
library(shiny)

ui <- fluidPage(
  titlePanel("exercise 3"),

  sidebarLayout(
    sidebarPanel(
      textInput("text", "Name", value="The teacher Zhenyuan"),

      selectInput("variable",
                  label = "Characteristics",
                  choices = list(choose="", "is handsome",
                                "is smart",
                                "is awesome")),

      actionButton("evaluation", "True/False")
    ),

    mainPanel(fluidPage(
      fluidRow(
        verbatimTextOutput("textoutput"),
        br(),
        uiOutput("truth")
      )
    ))
  )
)
```

```
server <- function(input ,output){
  values <- reactiveValues()

  output$textoutput <- renderText({
    paste(input$text, input$variable, sep=" ")
  })

  observeEvent(input$evaluation, {
    if(input$variable=="is handsome"){
      output$truth <- renderUI({
        h3(helpText(paste("Are you kidding me?"), style="color:red"))
      })}else{
      if(input$variable=="is smart"){
        output$truth <- renderUI({h3(helpText(paste("Uh?!"),
        style="color:red"))})}
      }else{if(input$variable=="is awesome"){
        output$truth <- renderUI({h3(helpText(paste("He's lame!"),
        style="color:red"))})}
      }
    }
  })

  shinyApp(ui, server)
```

R-Shiny Answer for Exercise 4

```
# Load packages ----
library(shiny)
library(maps)
library(mapproj)

# Load data ----
counties <- readRDS("www/data/counties.RDS")

# Source helper functions -----
source("www/functions/percentMap.R")

# User interface ----
ui <- fluidPage(titlePanel("exercise-4-rds"),

  sidebarLayout(
    sidebarPanel(
      helpText("Create demographic maps with
        information from the 2010 US Census."),

      selectInput(
        "var",
        label = "Choose a variable to display",
        choices = c(
          "Percent White",
          "Percent Black",
          "Percent Hispanic",
          "Percent Asian"
        ),
        selected = "Percent White"
      ),

      sliderInput(
        "range",
        label = "Range of interest:",
        min = 0,
        max = 100,
        value = c(0, 100)
      )
    ),

    mainPanel(plotOutput("map"))
  ))
```

```
# Server logic ----
server <- function(input, output) {
  output$map <- renderPlot({
    data <- switch(
      input$var,
      "Percent White" = counties$white,
      "Percent Black" = counties$black,
      "Percent Hispanic" = counties$hispanic,
      "Percent Asian" = counties$asian
    )

    color <- switch(
      input$var,
      "Percent White" = "darkgreen",
      "Percent Black" = "black",
      "Percent Hispanic" = "darkorange",
      "Percent Asian" = "darkviolet"
    )

    legend <- switch(
      input$var,
      "Percent White" = "% White",
      "Percent Black" = "% Black",
      "Percent Hispanic" = "% Hispanic",
      "Percent Asian" = "% Asian"
    )

    percent_map(data, color, legend, input$range[1], input$range[2])
  })
}

shinyApp(ui, server)
```

R-Shiny Answer for Exercise 4

```
# Server logic ----
server <- function(input, output) {
  output$map <- renderPlot({
    data <- switch(
      input$var,
      "Percent White" = counties$white,
      "Percent Black" = counties$black,
      "Percent Hispanic" = counties$hispanic,
      "Percent Asian" = counties$asian
    )

    color <- switch(
      input$var,
      "Percent White" = "darkgreen",
      "Percent Black" = "black",
      "Percent Hispanic" = "darkorange",
      "Percent Asian" = "darkviolet"
    )

    legend <- switch(
      input$var,
      "Percent White" = "% White",
      "Percent Black" = "% Black",
      "Percent Hispanic" = "% Hispanic",
      "Percent Asian" = "% Asian"
    )

    percent_map(data, color, legend, input$range[1], input$range[2])
  })
}
```



```
# More brief ----
server <- function(input, output) {
  output$map <- renderPlot({
    args <- switch(input$var,
      "Percent White" = list(counties$white, "darkgreen", "% White"),
      "Percent Black" = list(counties$black, "black", "% Black"),
      "Percent Hispanic" = list(counties$hispanic, "darkorange", "% Hispanic"),
      "Percent Asian" = list(counties$asian, "darkviolet", "% Asian"))

    args$min <- input$range[1]
    args$max <- input$range[2]

    do.call(percent_map, args)
  })
}
```

R-Shiny Answer for Exercise 5

```
# Load packages ----
library(shiny)
library(tidyverse)
library(plotly)
library(DT)
library(shinyWidgets)

# Source helper functions -----
source("www/functions/titanicGlm.R")

xis <- c("age", "fare")
color <- c(
  "pclass",
  "survived",
  "name",
  "sex",
  "age",
  "sibsp",
  "parch",
  "ticket",
  "fare",
  "cabin",
  "embarked",
  "boat",
  "body",
  "home.dest"
)
facet.l <- c("pclass", "survived", "sex", "age")
```

```
# User interface ----
ui <- fluidPage(titlePanel("exercise-titanic"),
  sidebarLayout(
    sidebarPanel(
      width = 2,
      helpText("Create GLM based on titanic dataset. "),

      # Input: Select a file ----
      fileInput(
        "titanic",
        "Choose CSV File",
        multiple = FALSE,
        accept = c("text/csv",
                  "text/comma-separated-values,text/plain",
                  ".csv")
      ),

      selectInput(
        "xv",
        label = "Choose a x variable",
        choices = xis,
        selected = "age"
      ),

      selectInput(
        "colr",
        label = "Choose a color variable",
        choices = color,
        selected = "sex"
      ),

      selectInput(
        "fac",
        label = "Choose a facet variable",
        choices = facet.l,
        selected = "sex"
      )
    ),

    mainPanel(fluidPage(fluidRow(
      column(6,
        DT::dataTableOutput("dataSet")),
      column(6,
        plotOutput(
          "glm", width = "700px", height = "600px"
        ))
    )))
  ))
```


R-Shiny *Answer for Exercise 5*

```
# Server logic ----
server <- function(input, output) {
  values <- reactiveValues(tbl=NULL)

  observeEvent(input$titanic, {
    # Store the uploaded file ----
    values$tbl <- read_csv(input$titanic$datapath)
    output$dataSet <- DT::renderDataTable({
      tryCatch({
        df <- values$tbl
      },
      error = function(e) {
        stop(safeError(e))
      })
    },
    extensions = c('Scroller', 'FixedColumns'),
    options = list(
      deferRender = TRUE,
      scrollX = TRUE,
      scrollY = 400,
      scroller = TRUE,
      dom = 'Bfrtip',
      fixedColumns = TRUE
    ))
  })

  output$glm <- renderPlot({

    titanicGlm(values$tbl, input$xv, input$colr, facet = input$fac)
  })

}

# Run app ----
shinyApp(ui, server)
```

R-Shiny Answer for Exercise 6

```
library(shiny)
library(plotly)

df.path <- file.path("www/data/students.csv")
ui <- fluidPage(#theme = shinytheme("paper"),
  titlePanel("2nd Example-Zhenyuan Lu"),
  sidebarLayout(
    sidebarPanel(
      width=2,
      textInput(
        width = "100%",
        inputId = "title",
        label = "Title:",
        value = NA
      ),
      textInput(
        width="100%",
        inputId = "course",
        label="Course:",
        value = NA
      ),
      textInput(
        width = "100%",
        inputId = "country",
        label = "Country:",
        value = NA
      ),
      selectInput(
        width="100%",
        inputId = "gender",
        label="Gender:",
        choices = c(choose='', "Male", "Female", "Others")
      ),
```

```
        numericInput(
          width="100%",
          inputId="numbers",
          label="Numbers:",
          value = NA
        ),
        actionButton(
          inputId = "update",
          label = "Submit/Update",
          icon = icon("database"),
          width = "100%"
        ),
        actionButton(
          inputId="recall",
          label="recall",
          icon=icon("refresh"),
          width="100%"
        )
      )
    #verbatimTextOutput("testTxt")
  ),

  mainPanel(fluidPage(fluidRow(
    column(6,
      h3(textOutput("title",container = span)),
      tableOutput("dataSet")),
    column(6,
      plotlyOutput(
        "barchart", width = "100%", height = "300px"
      )
    )
  )))
))
```

R-Shiny *Answer for Exercise 6*

```
server <- function(input, output) {
  values <- reactiveValues()

  observeEvent(input$update, {
    values$dataInput <- data.frame(
      Course=input$course,
      Country=input$country,
      Numbers=input$numbers,
      Gender=input$gender
    )
    values$df <- as.data.frame(read.csv(df.path)[-1])
    if(!"TRUE"%in%is.na(values$dataInput)){
      values$newStudent <- na.omit(unique(rbind(values$df, values$dataInput)))
      write.csv(values$newStudent, df.path)}
  })

  output$dataSet <- renderTable(
    values$newStudent
  )

  output$testTxt <- renderPrint({
    values$newStudent
  })

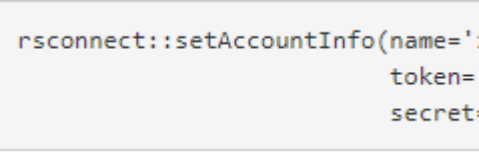
  output$title <- renderText({
    input$title
  })

  observeEvent(input$recall, {
    values$newStudent <- values$newStudent[-dim(values$newStudent)[1],]
    write.csv(values$newStudent, df.path)
  })

  output$barchart <- renderPlotly({
    shiny::validate(need(values$newStudent, ""))
    plot_ly(values$newStudent, x = ~Country, y = ~Numbers, type = 'bar', color=~Gender, colors =
c("#1F618D", "#cc6900")) %>%
      layout(yaxis = list(title = 'Count'), barmode = 'group')
  })
}

shinyApp(ui, server)
```

R-Shiny *Deploy your web app on server*

```
# 1st step, register an account ----  
https://www.shinyapps.io/  
# 2nd step ----  
install.packages('rsconnect')  
# 3rd step, go to your account page ----  
Copy the following code to your Rstudio commend  


```
rsconnect::setAccountInfo(name='
 token=
 secret=
)
```

  
# 3rd step, go to your account page ----  
rsconnect::deployApp('yourAppDirectory')
```

References: Lu, Zhenyuan (2022). Data Visualization Tutorial in R.
zhenyuanlu.github.io,