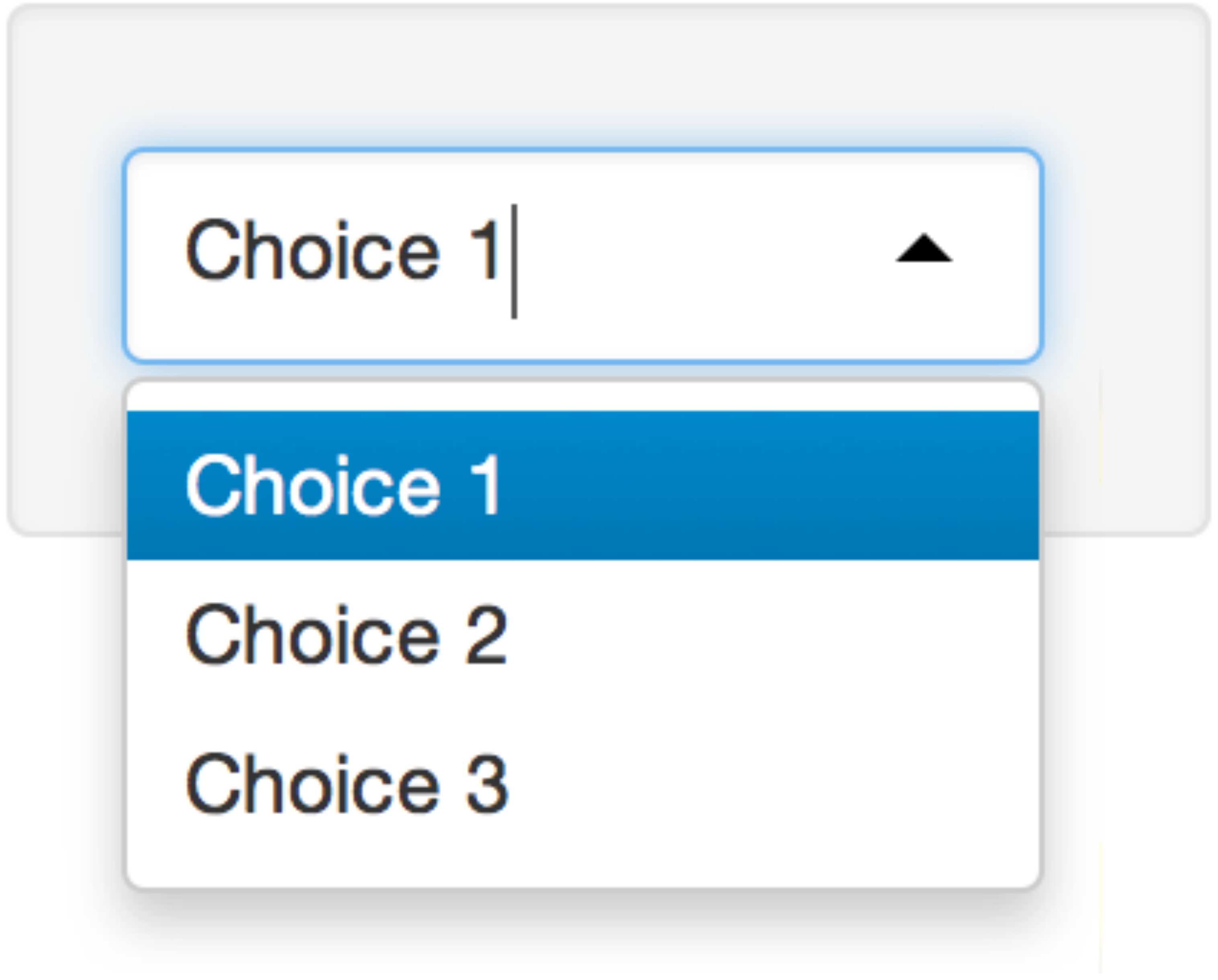
Shiny Interactive Data Analysis

How to build a Shiny App



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Slides available at http://tinyurl.com/shinyslides

Learn R

R basics

```
# Assignment of values to objects
num_rows <- 10
name <- “Chester”
temp <- c(0, 10, 52, 100)
vec <- rnorm(100)

# Simple function call
mean(temp)
[1] 40.5
```

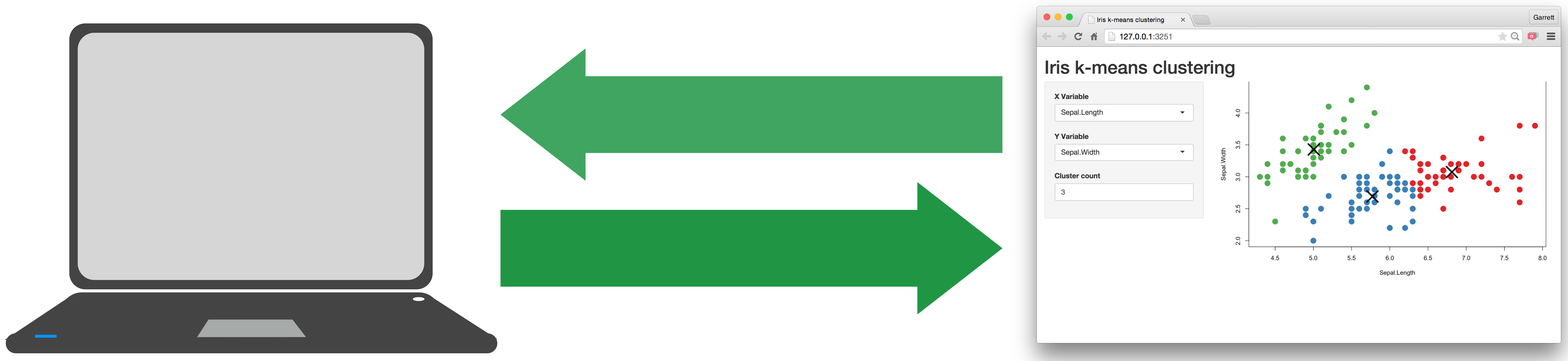
Writing functions

```
# Function definition
cube.it <- function(x) {
    cube <- x * x * x
    return(cube)
}

# Function call
cube.it(7)
[1] 343
```

Understand the architecture

Every Shiny app is maintained by a computer running R



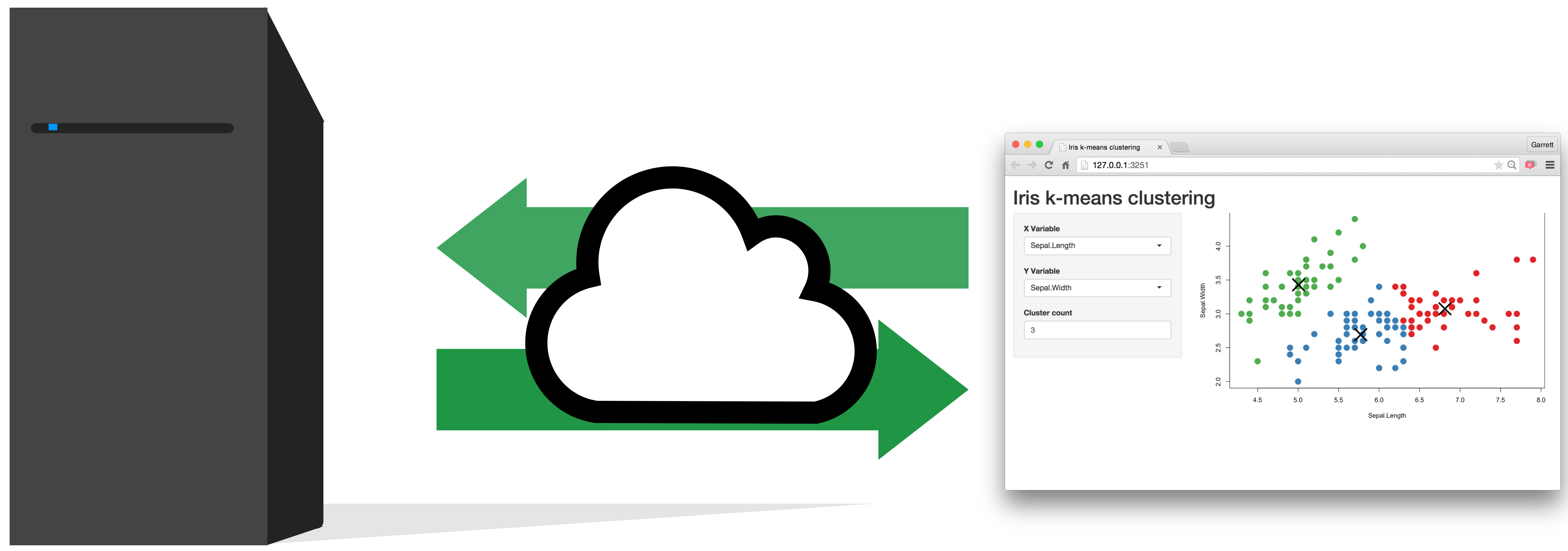
Iris k-means clustering

X Variable: Sepal.Length

Y Variable: Sepal.Width

Cluster count: 3

Every Shiny app is maintained by a computer running R



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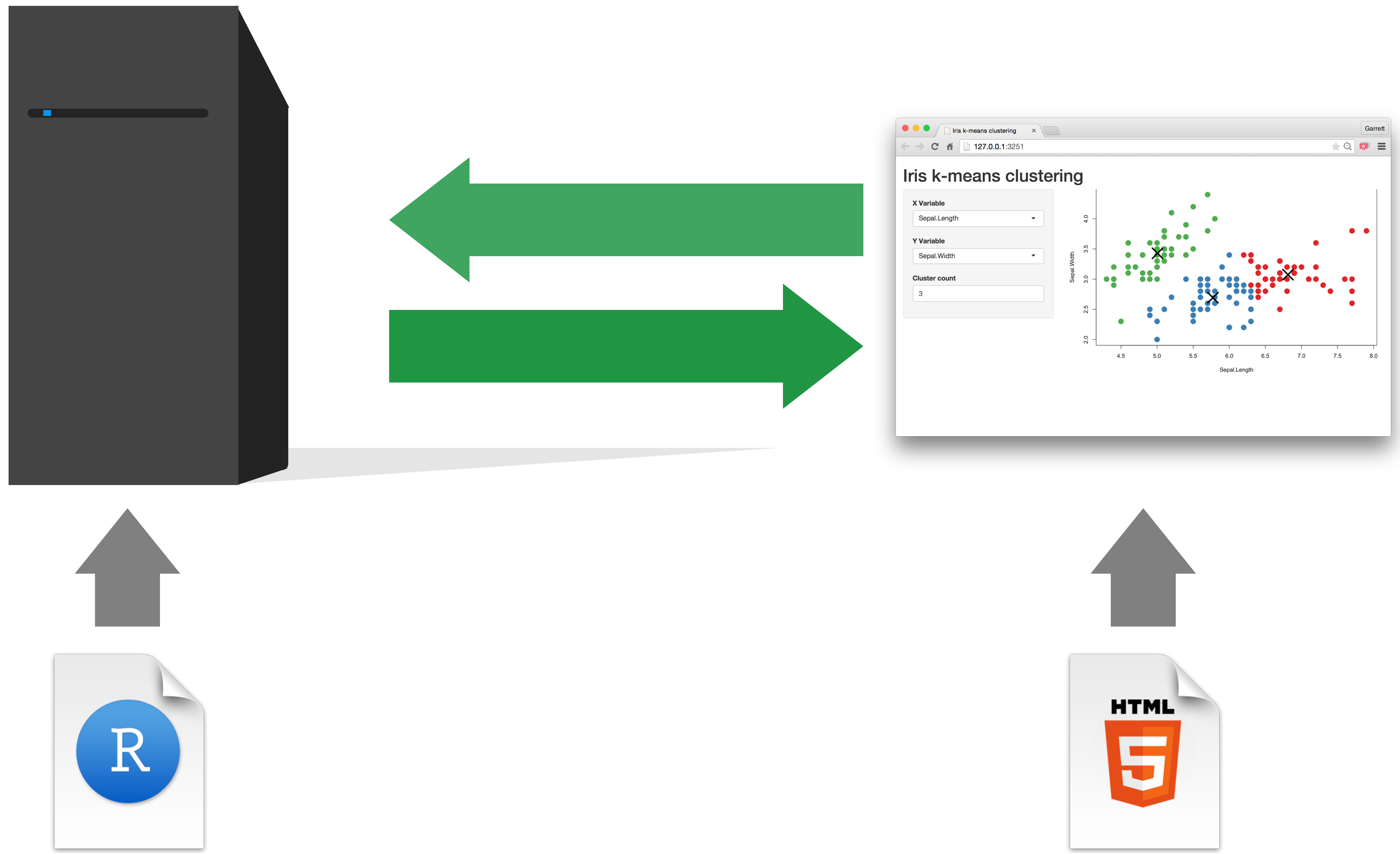

Iris k-means clustering

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Server Instructions

User Interface (UI)

Use the template

RStudio

App template

The shortest viable shiny app

```
library(shiny)
ui <- fluidPage()

server <- function(input, output) {}

shinyApp(ui = ui, server = server)
```

Add elements to your app as arguments to `fluidPage()`

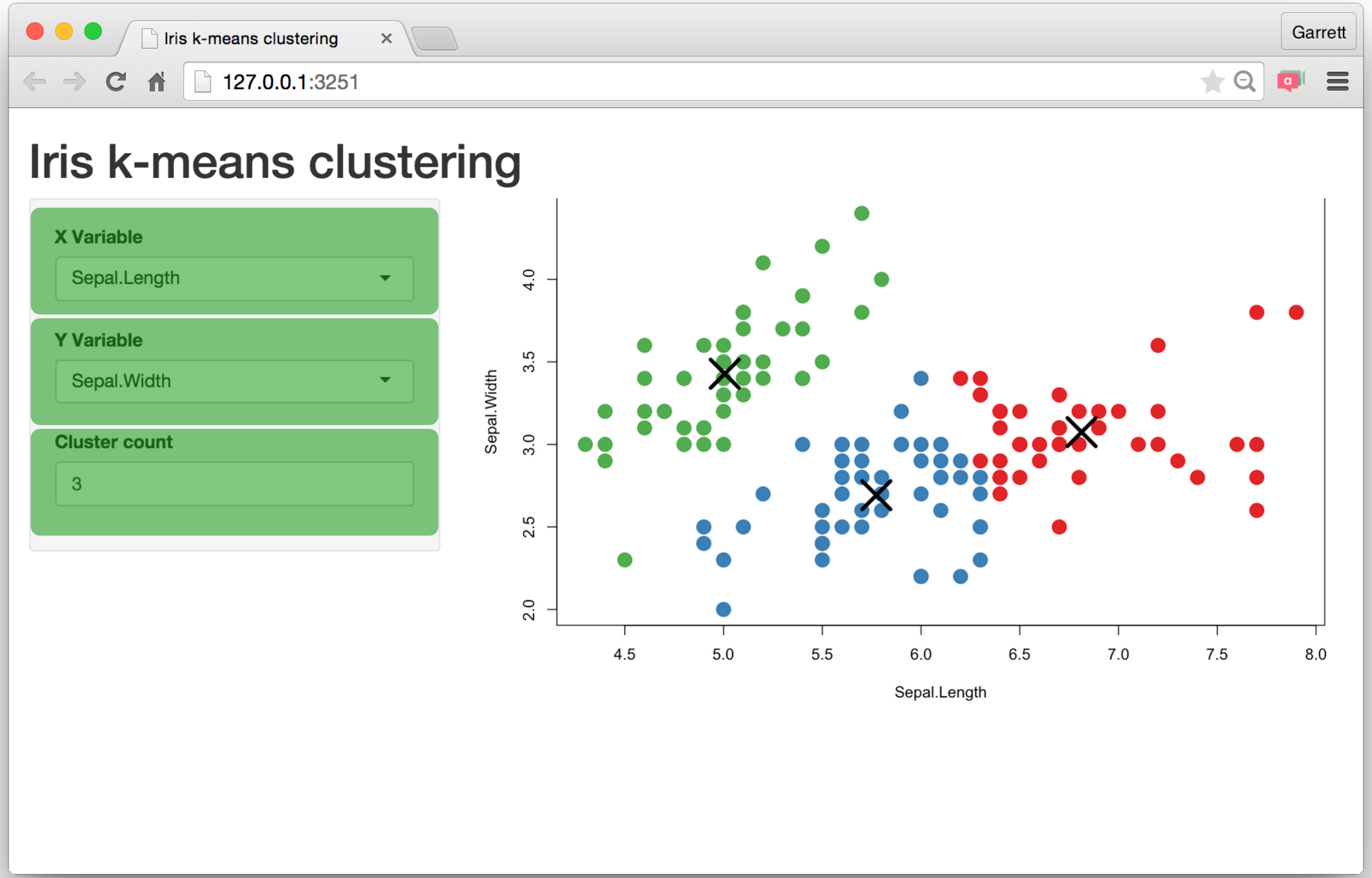
```
library(shiny)
ui <- fluidPage("Hello World")

server <- function(input, output) {}

shinyApp(ui = ui, server = server)
```

Inputs and Outputs

Build your app around **inputs** and **outputs**



Iris k-means clustering

X Variable

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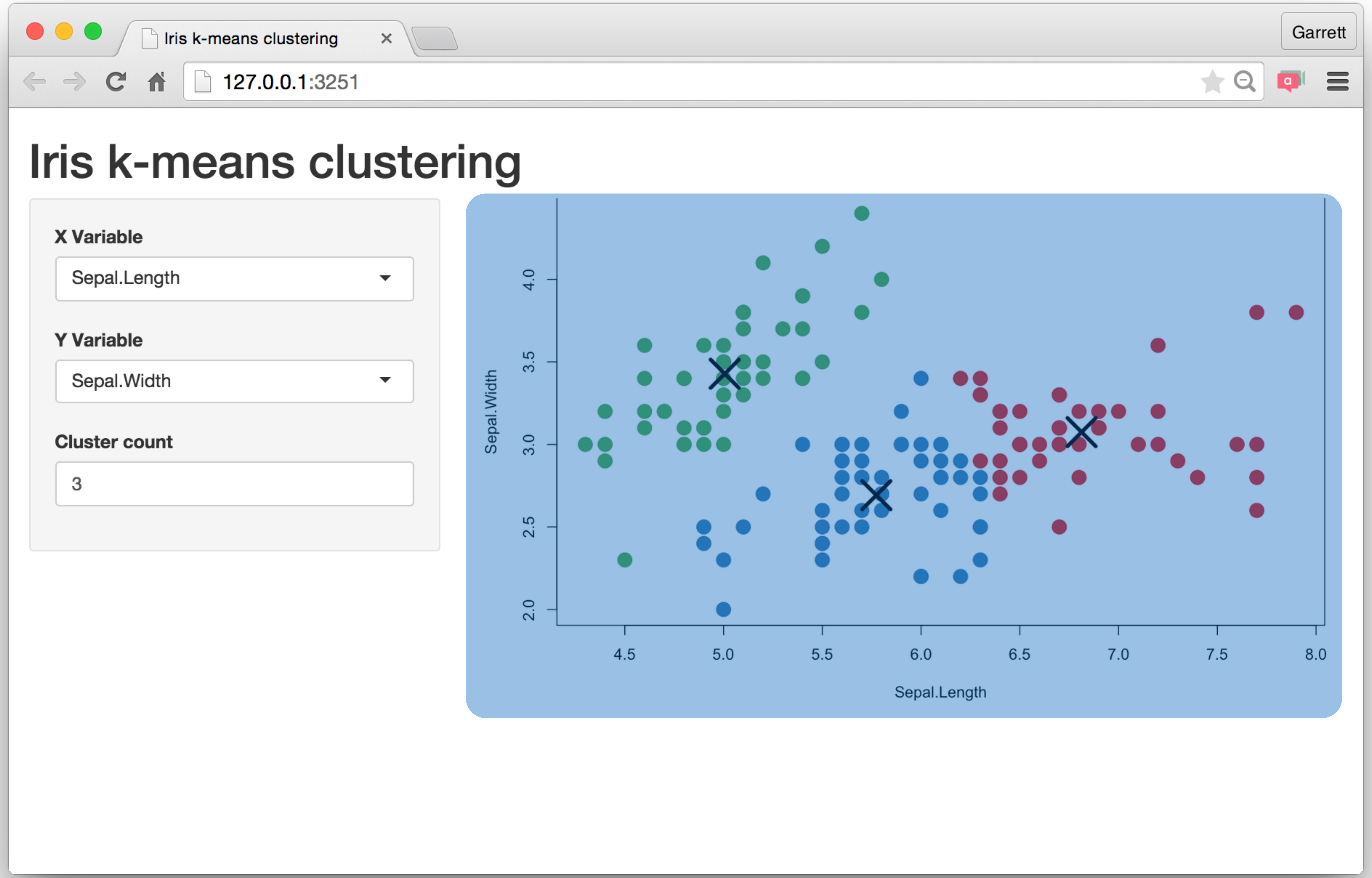
RStudio

Build your app around inputs and outputs


Iris k-means clustering

127.0.0.1:3251

Garrett

Iris k-means clustering

X Variable
Sepal.Length

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Sepal.Width

Cluster count
3

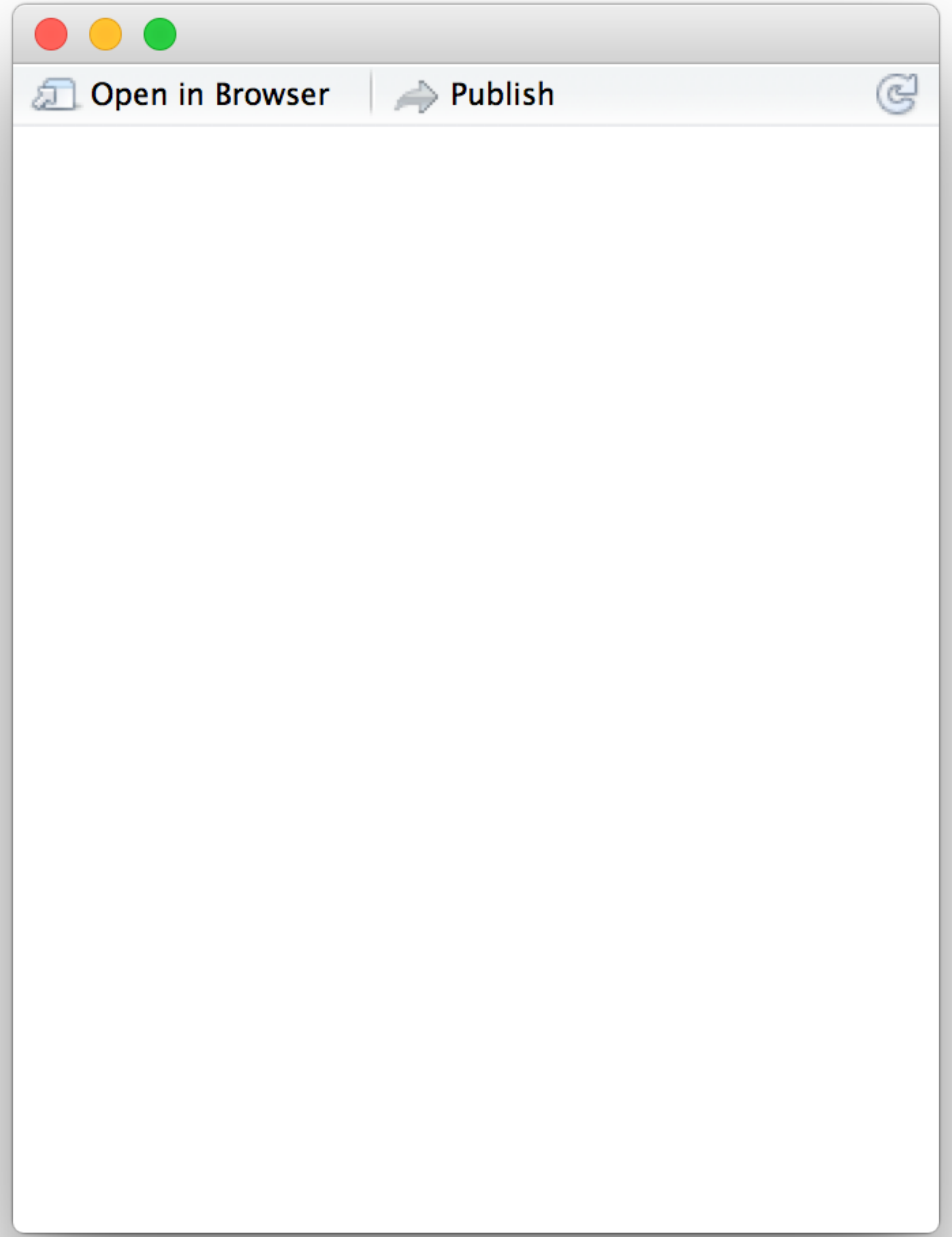
Add elements to your app as arguments to `fluidPage()`

```
ui <- fluidPage(
  # *Input() functions,
  # *Output() functions
)
```

Inputs

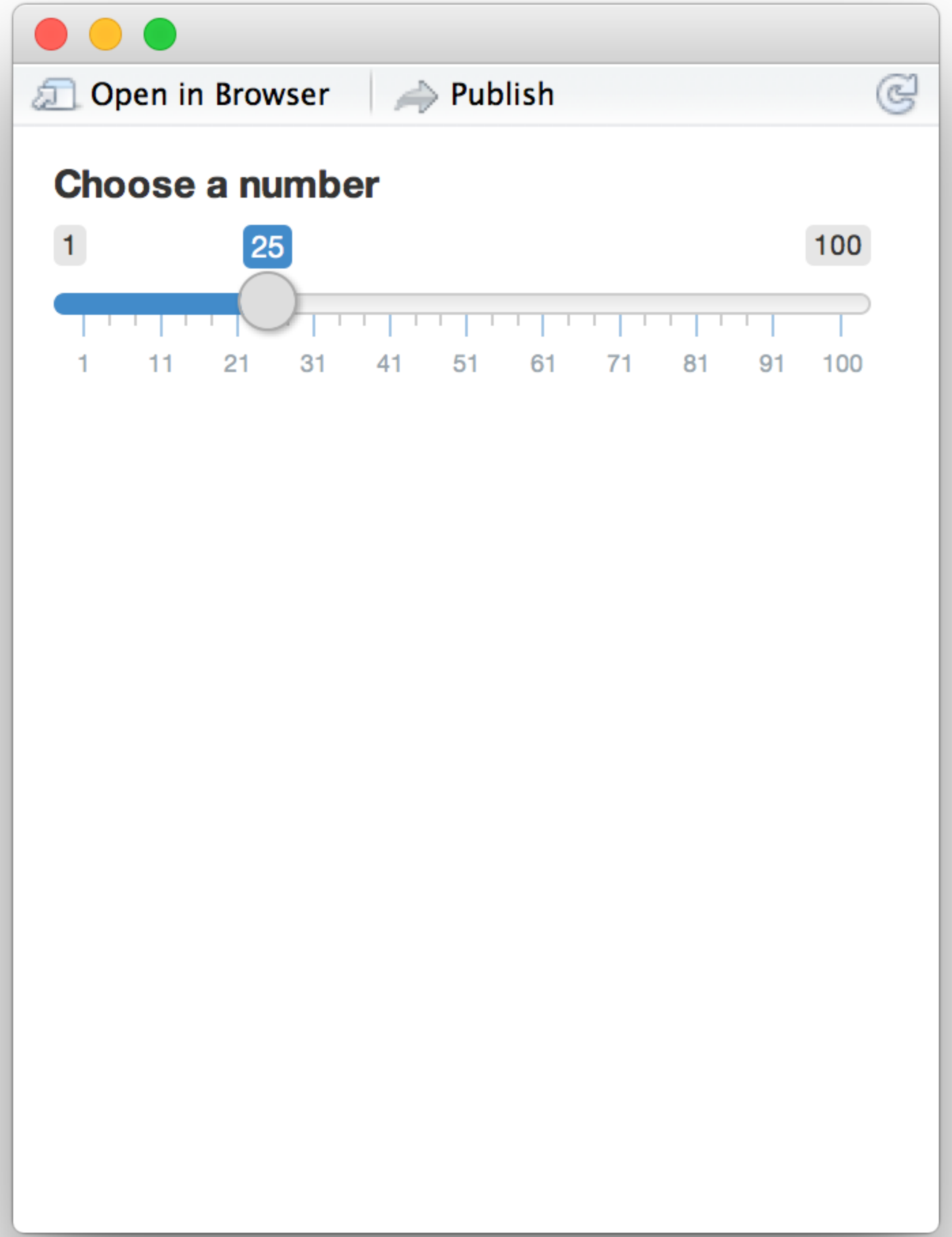
Create an input with an input function.

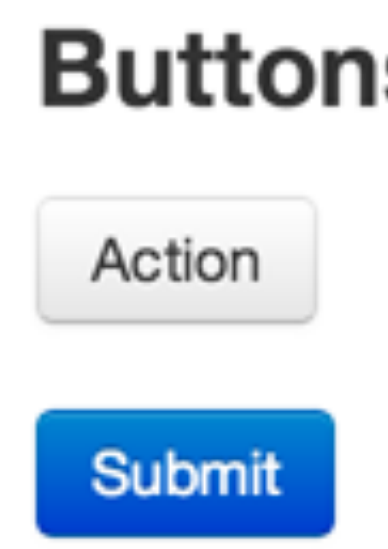
```
library(shiny)
ui <- fluidPage(



)

server <- function(input, output) {}

shinyApp(server = server, ui = ui)
```



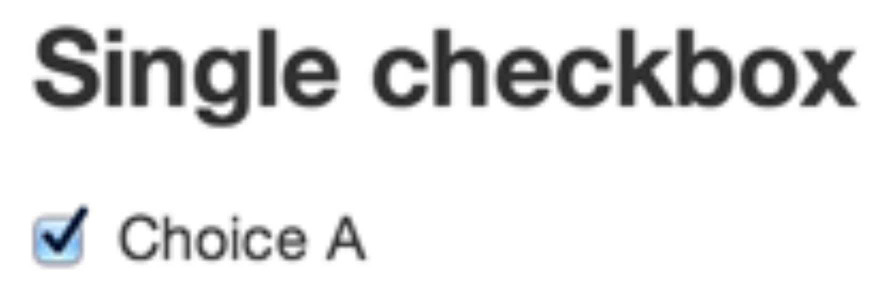
Create an input with an input function.

```
library(shiny)
ui <- fluidPage(
  sliderInput(inputId = "num",
    label = "Choose a number",
    value = 25, min = 1, max = 100)
)

server <- function(input, output) {}

shinyApp(server = server, ui = ui)
```

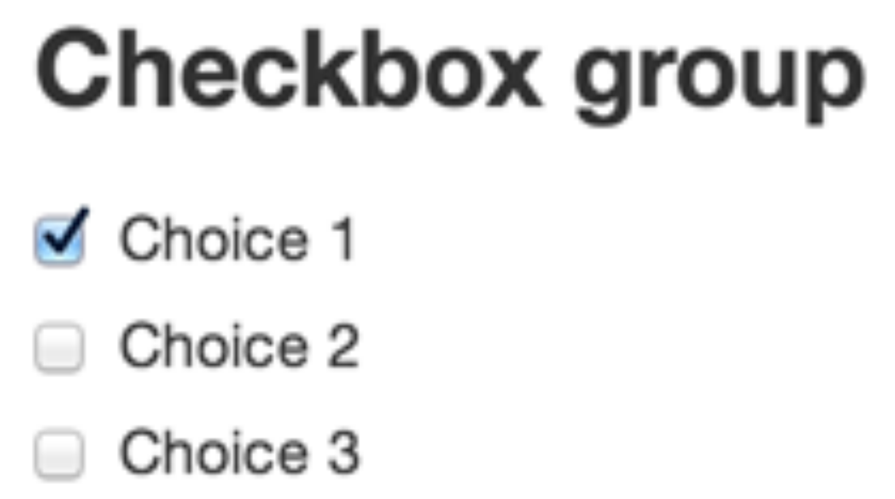




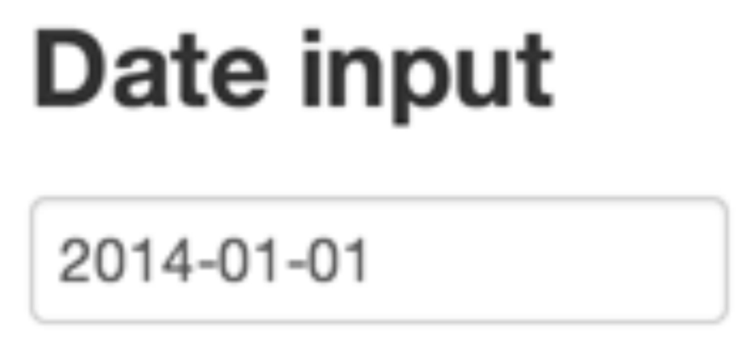
`actionButton()`
`submitButton()`



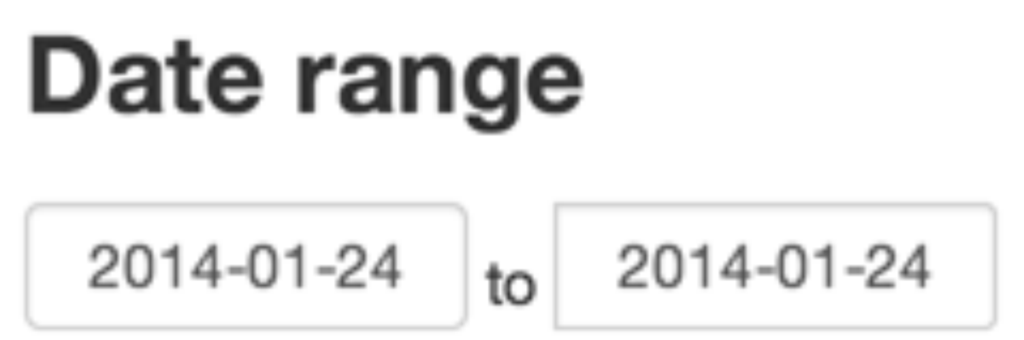
`checkboxInput()`



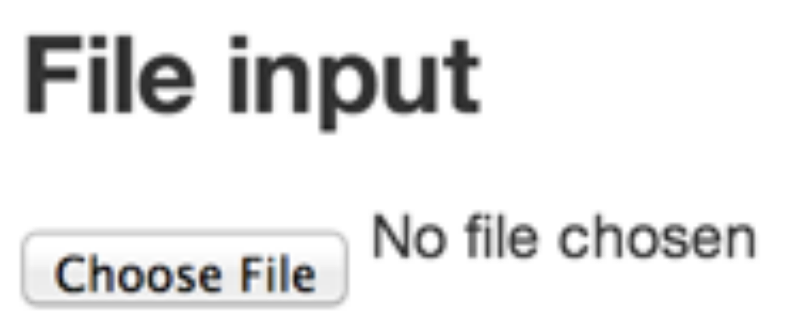
`checkboxGroupInput()`



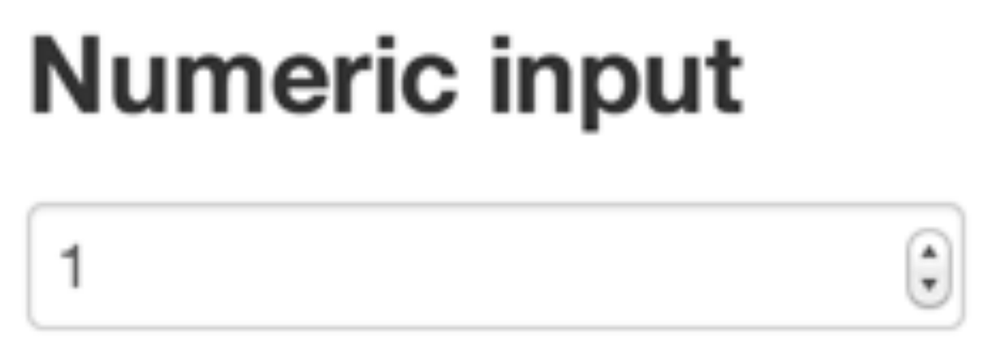
`dateInput()`



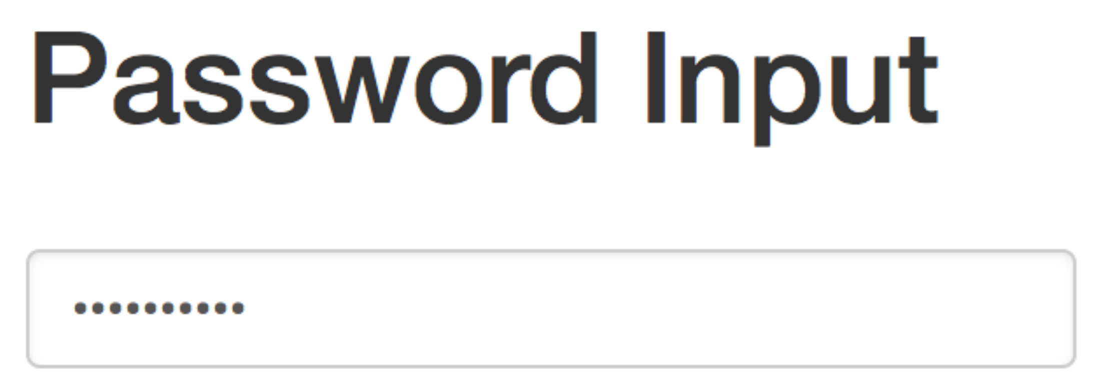
`dateRangeInput()`



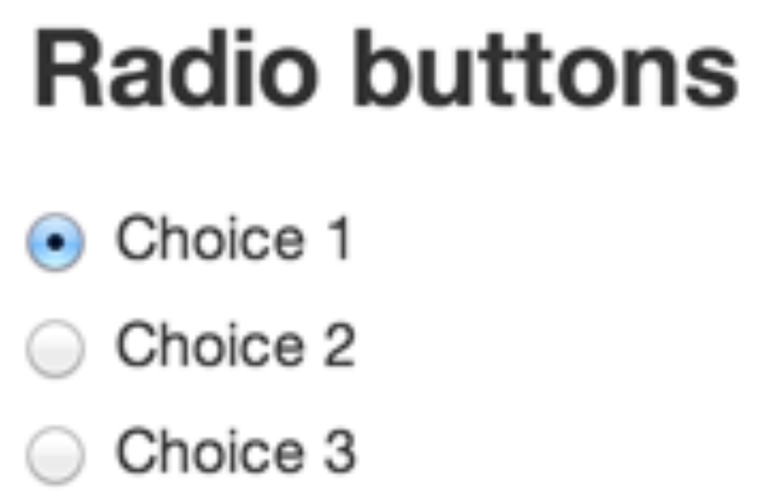
`fileInput()`



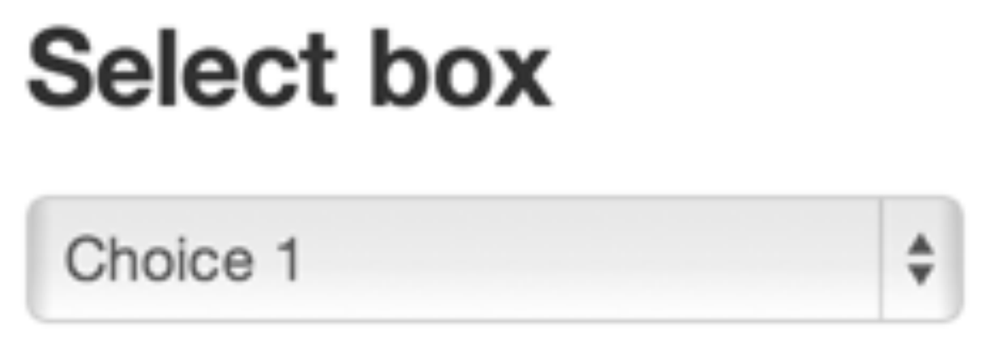
`numericInput()`



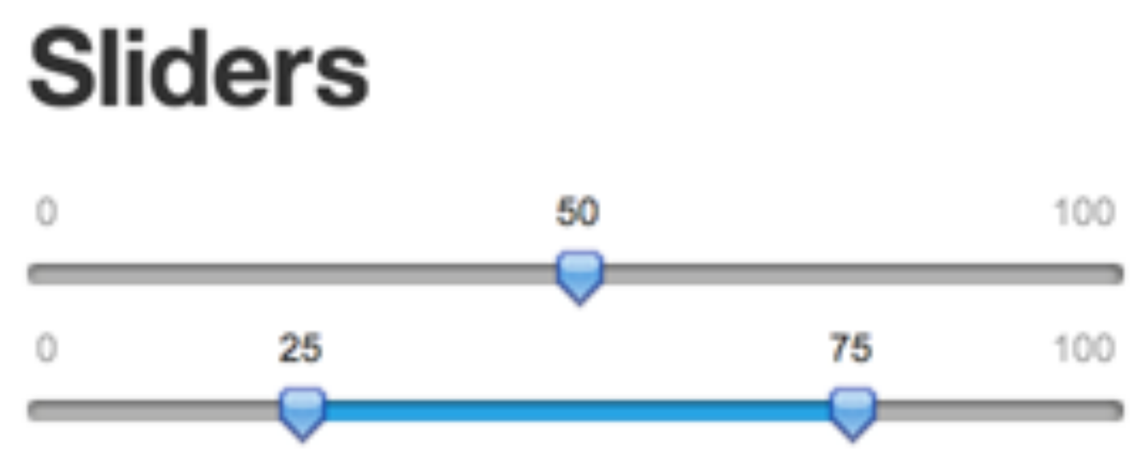
`passwordInput()`



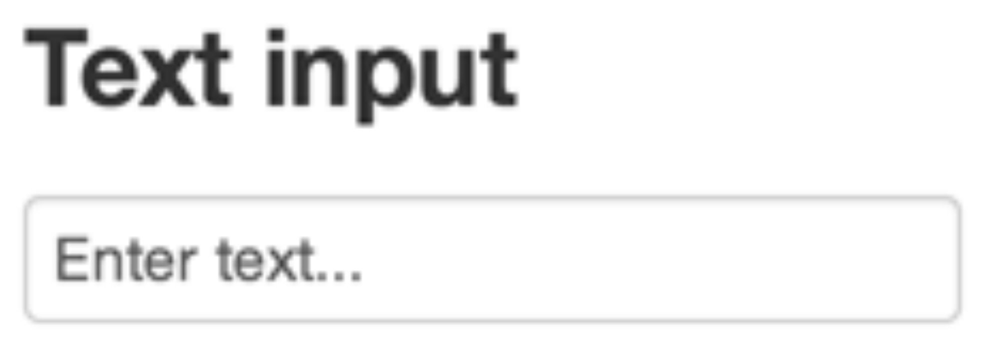
`radioButtons()`



`selectInput()`

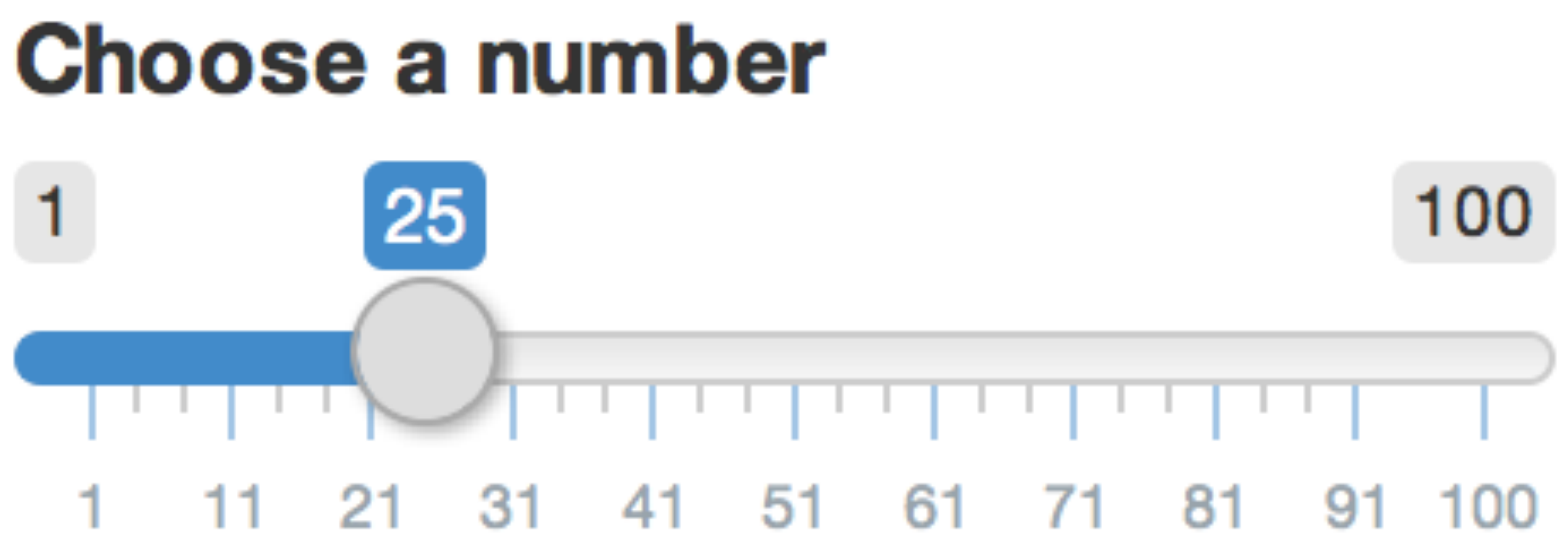


`sliderInput()`



`textInput()`

Syntax



```
sliderInput(inputId = "num", label = "Choose a number", …)
```

input name (for internal use)

Notice: Id not ID

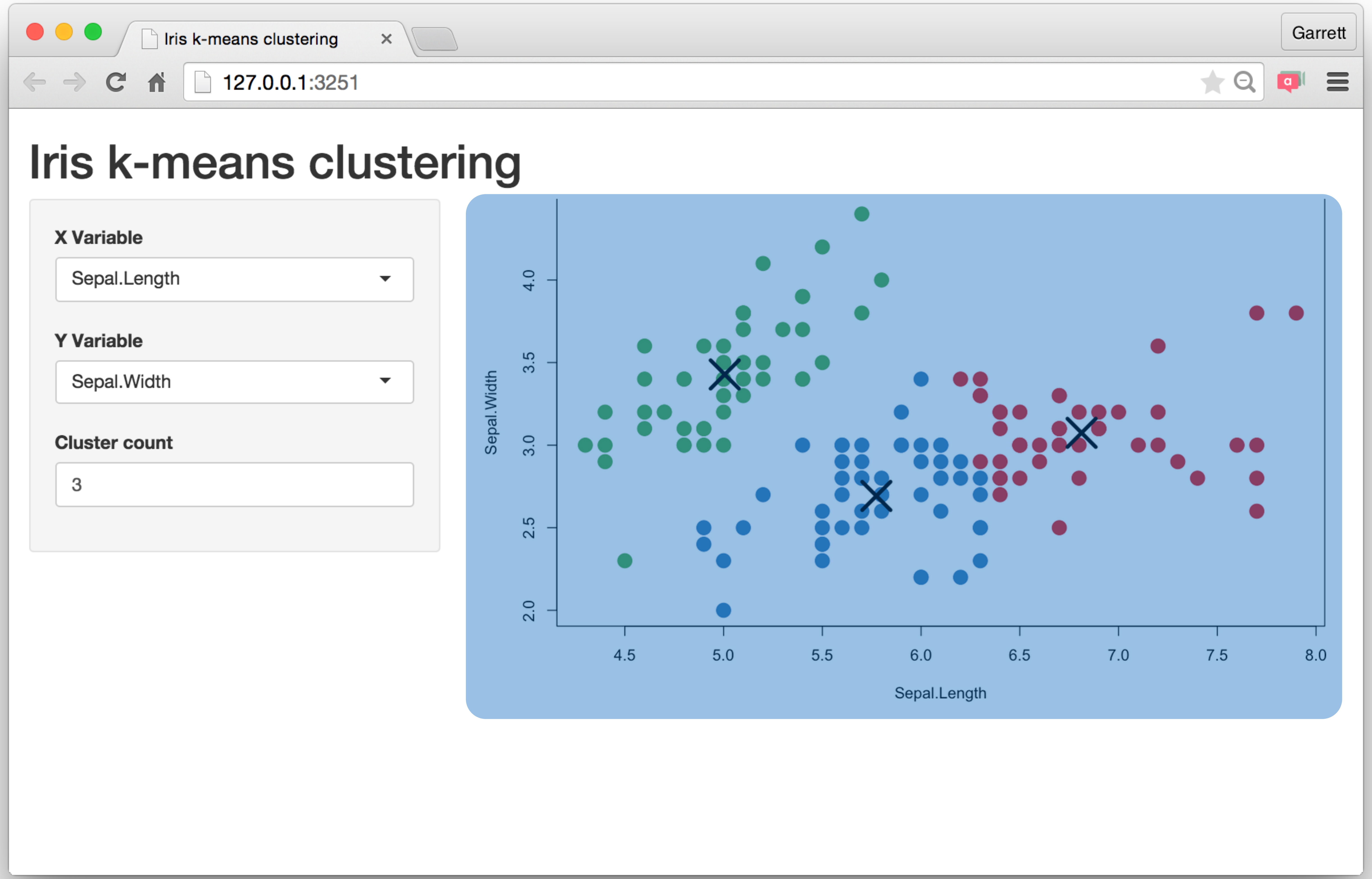
label to display

input specific arguments

`?sliderInput`

Outputs

Build your app around inputs and outputs



Iris k-means clustering

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Iris k-means clustering

X Variable: Sepal.Length

Y Variable: Sepal.Width

Cluster count: 3

RStudio

Function	Inserts
`dataTableOutput()`	an interactive table
`htmlOutput()`	raw HTML
`imageOutput()`	image
`plotOutput()`	plot
`tableOutput()`	table
`textOutput()`	text
`uiOutput()`	a Shiny UI element
`verbatimTextOutput()`	text

*Output()

To display output, add it to `fluidPage()` with an `*Output()` function

```
plotOutput(outputId = "hist")
```

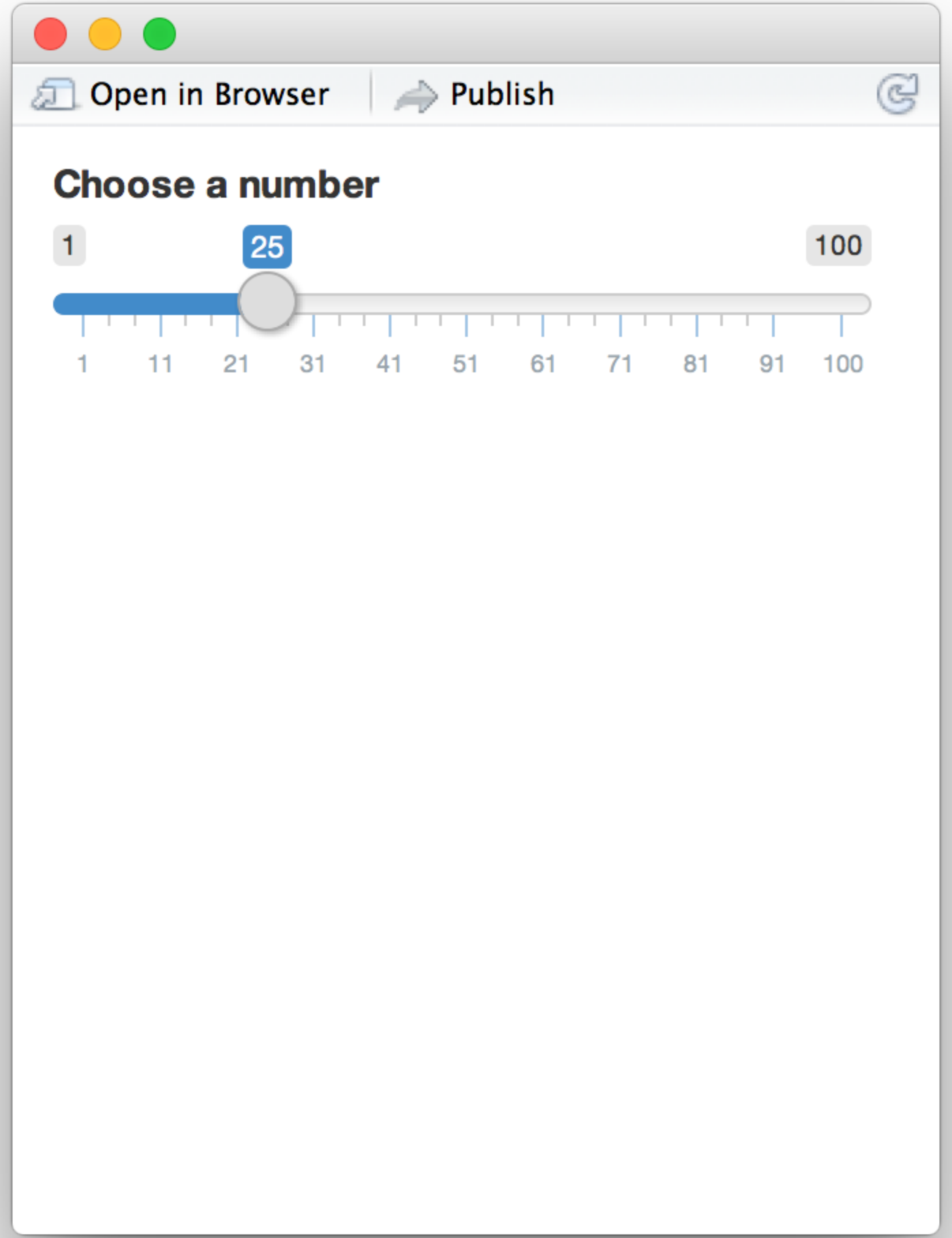
the type of output to display

name to give to the output object

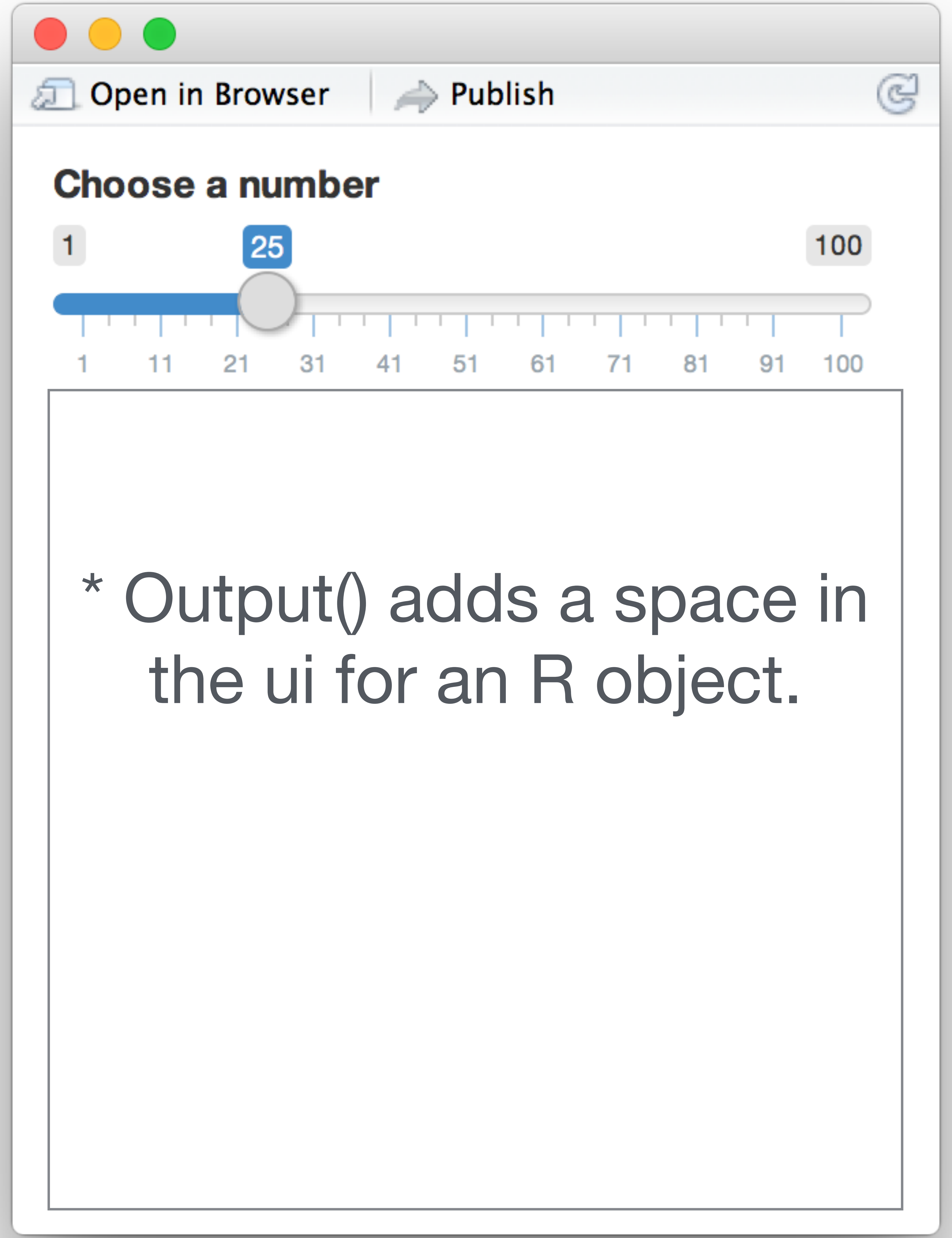
```r
library(shiny)

ui <- fluidPage(
  sliderInput(inputId = "num",
    label = "Choose a number",
    value = 25, min = 1, max = 100),
  plotOutput("hist")
)

server <- function(input, output) {}

shinyApp(ui = ui, server = server)
```

Comma between arguments

```r
library(shiny)

ui <- fluidPage(
  sliderInput(inputId = "num",
    label = "Choose a number",
    value = 25, min = 1, max = 100),
  plotOutput("hist")
)

server <- function(input, output) {}

shinyApp(ui = ui, server = server)
```

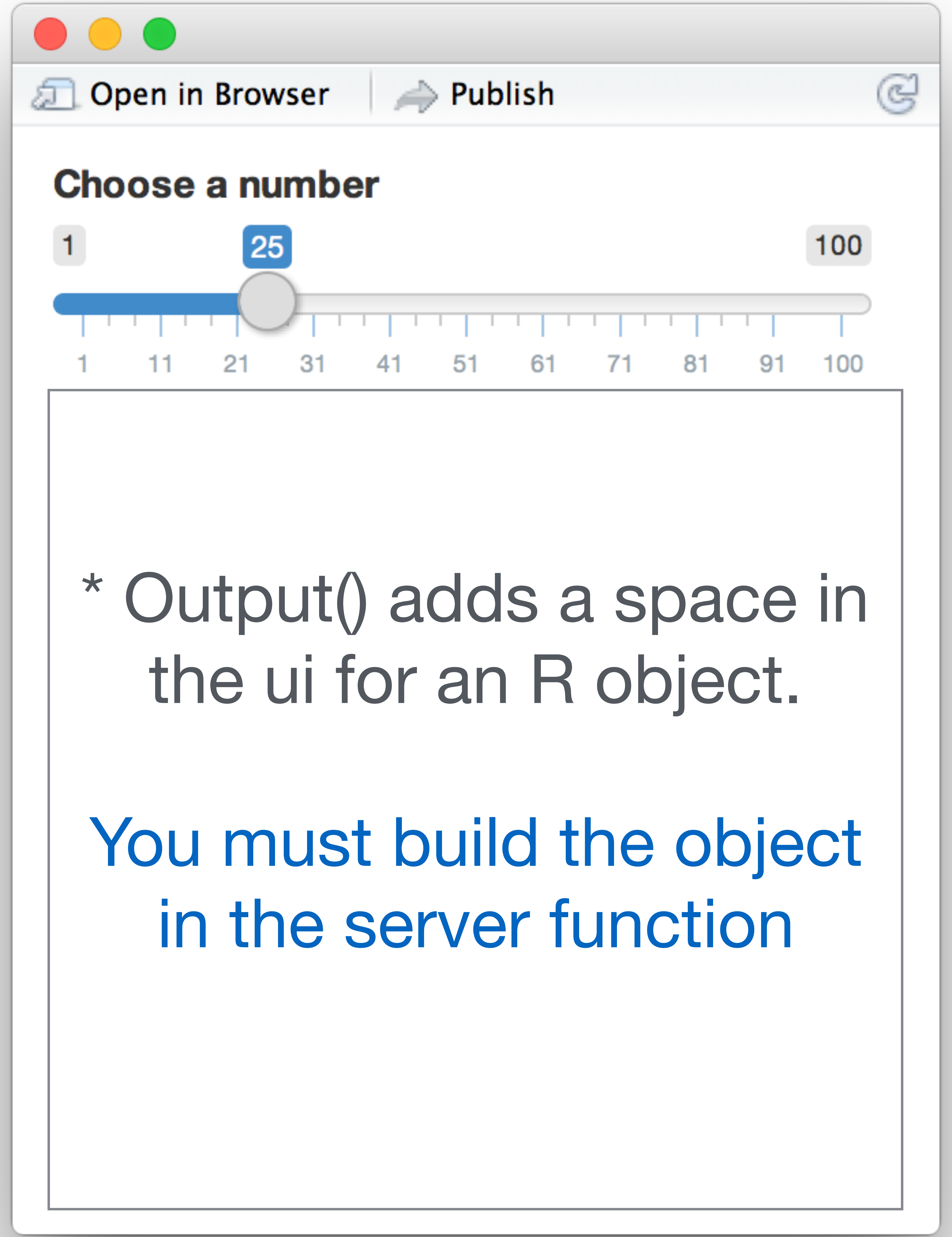


```r
library(shiny)

ui <- fluidPage(
  sliderInput(inputId = "num",
    label = "Choose a number",
    value = 25, min = 1, max = 100),
  plotOutput("hist")
)

server <- function(input, output) {}

shinyApp(ui = ui, server = server)
```



* Output() adds a space in the ui for an R object.

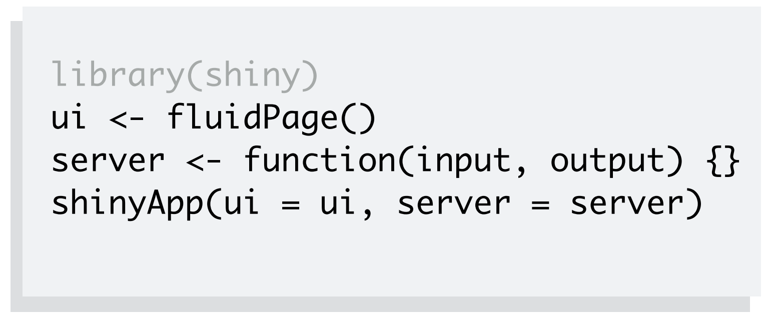
```r
library(shiny)

ui <- fluidPage(
  sliderInput(inputId = "num",
    label = "Choose a number",
    value = 25, min = 1, max = 100),
  plotOutput("hist")
)

server <- function(input, output) {}

shinyApp(ui = ui, server = server)
```



* Output() adds a space in the ui for an R object.

You must build the object in the server function

Recap

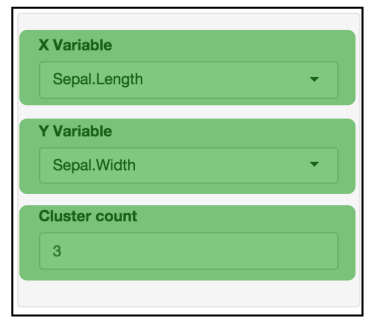


```
library(shiny)
ui <- fluidPage()
server <- function(input, output) {}
shinyApp(ui = ui, server = server)
```

Begin each app with the template

Hello World

Add elements as arguments to **fluidPage()**



X Variable
Sepal.Length
Y Variable
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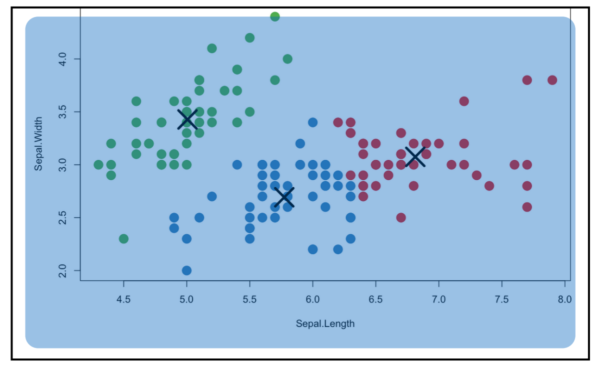
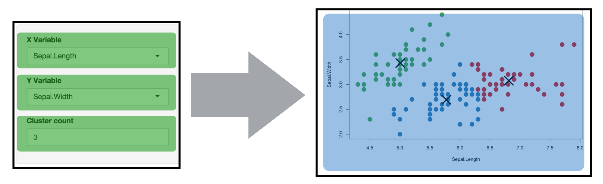
Cluster count
3

Create reactive inputs with an ***Input()** function



Display reactive results with an ***Output()** function



Use the server function to assemble inputs into outputs

Tell the

server

how to assemble
inputs into outputs

Use **3 rules** to write the server function

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



}
```

1

Save objects to display to output$

```r
server <- function(input, output) {
  output$hist <- # code



}
```

1

Save objects to display to output$

```
output$hist
   ↓
plotOutput("hist")
```

2

Build objects to display with **render*()**

```
server <- function(input, output) {
  output$hist <- renderPlot({


  })
}
```

Use the **render*()** function that creates the type of output you wish to make.

function	creates
`renderDataTable()`	An interactive table (from a data frame, matrix, or other table-like structure)
`renderImage()`	An image (saved as a link to a source file)
`renderPlot()`	A plot
`renderPrint()`	A code block of printed output
`renderTable()`	A table (from a data frame, matrix, or other table-like structure)
`renderText()`	A character string
`renderUI()`	a Shiny UI element

render*()

Builds reactive output to display in UI

```
renderPlot({ hist(vec) })
```

type of object to build

code block that builds the object

RStudio

2

Build objects to display with **render*()**

```
server <- function(input, output)
{
  output$hist <- renderPlot({
    hist(vec, breaks = input$num)
  })
}
```

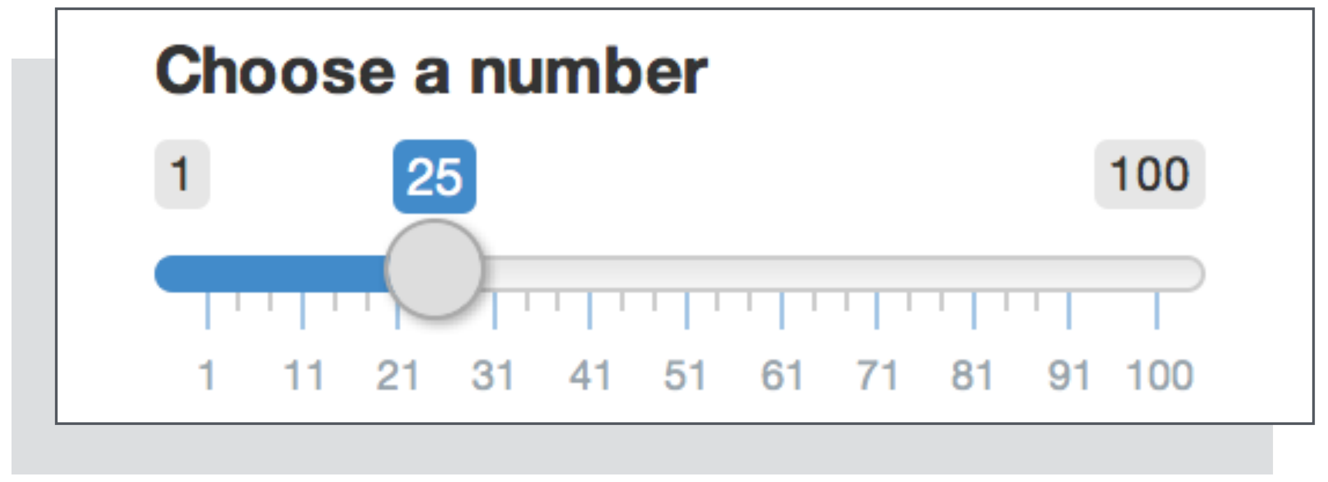
3

Use **input** values with input$

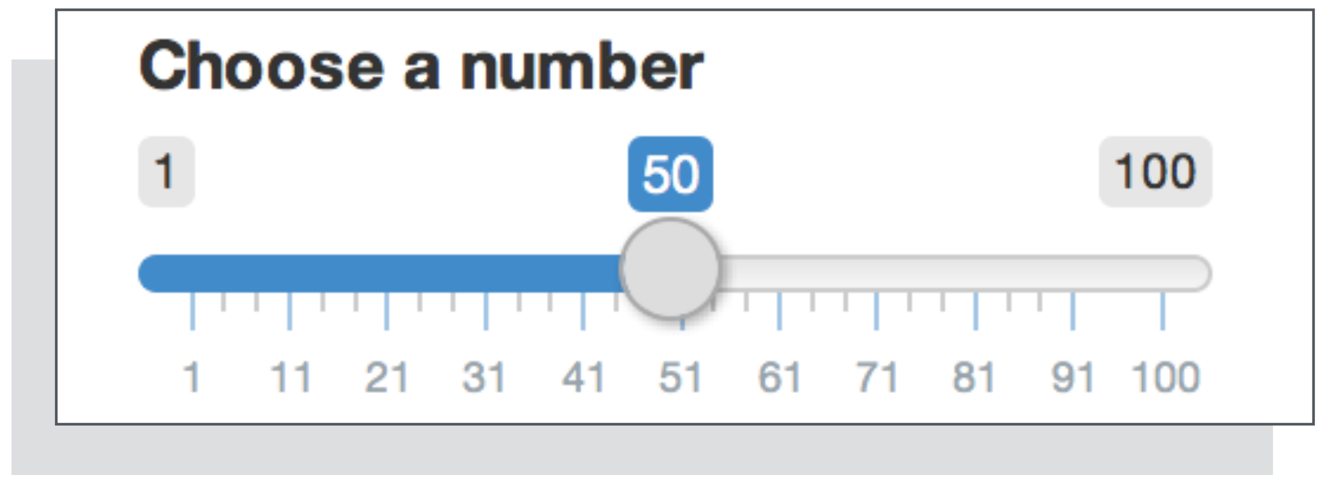
```
sliderInput(inputId = "num",…)

                 input$num
```

Input values

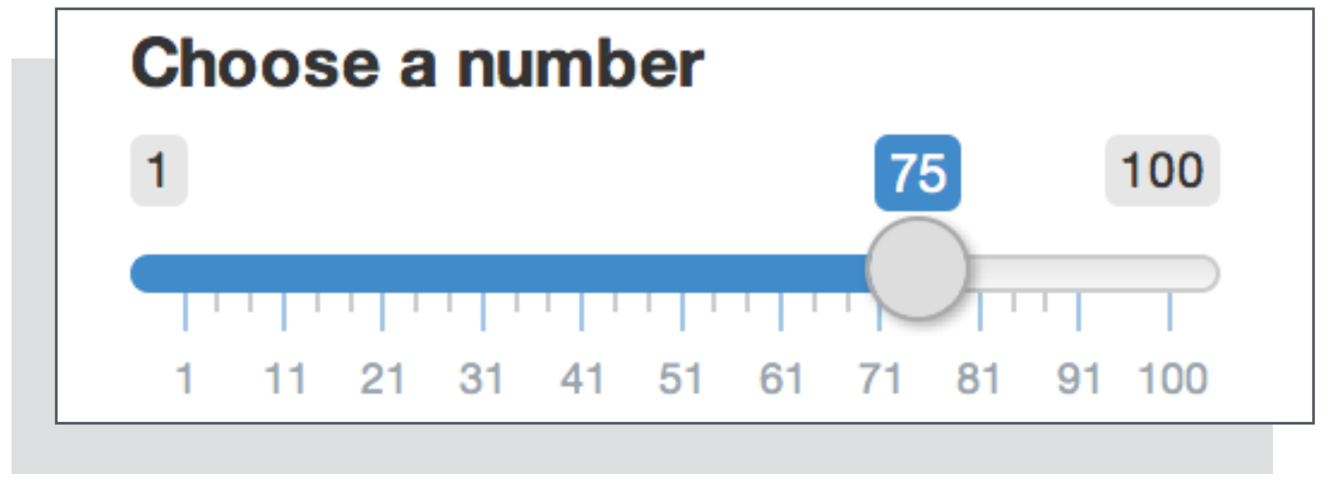
The input value changes whenever a user changes the input.



```
input$num = 25
```



```
input$num = 50
```



```
input$num = 75
```

3

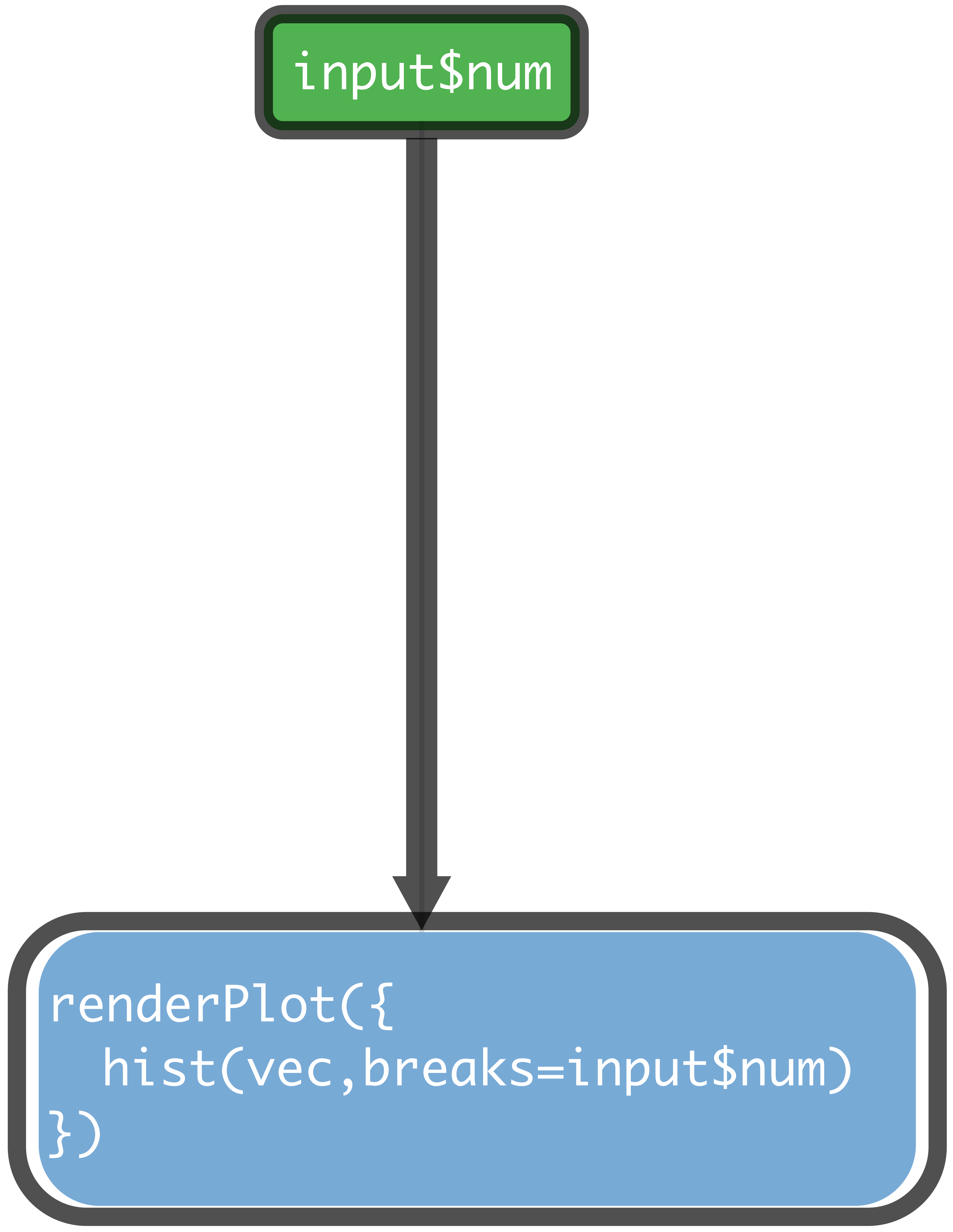
Use input values with input$

```
server <- function(input, output) {
  output$hist <- renderPlot({
    hist(vec, breaks = input$num)
  })
}
```

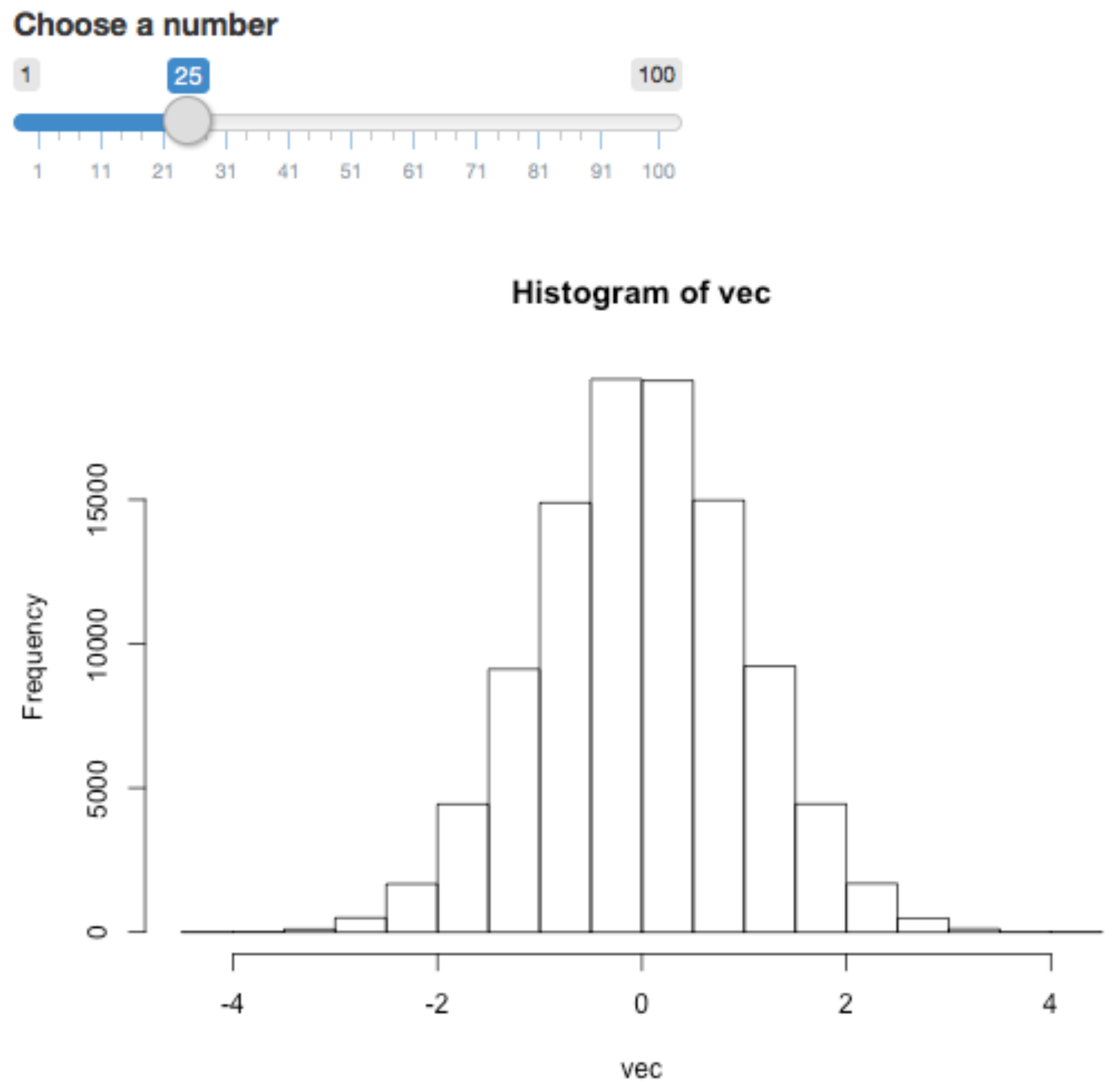
Reactivity 101

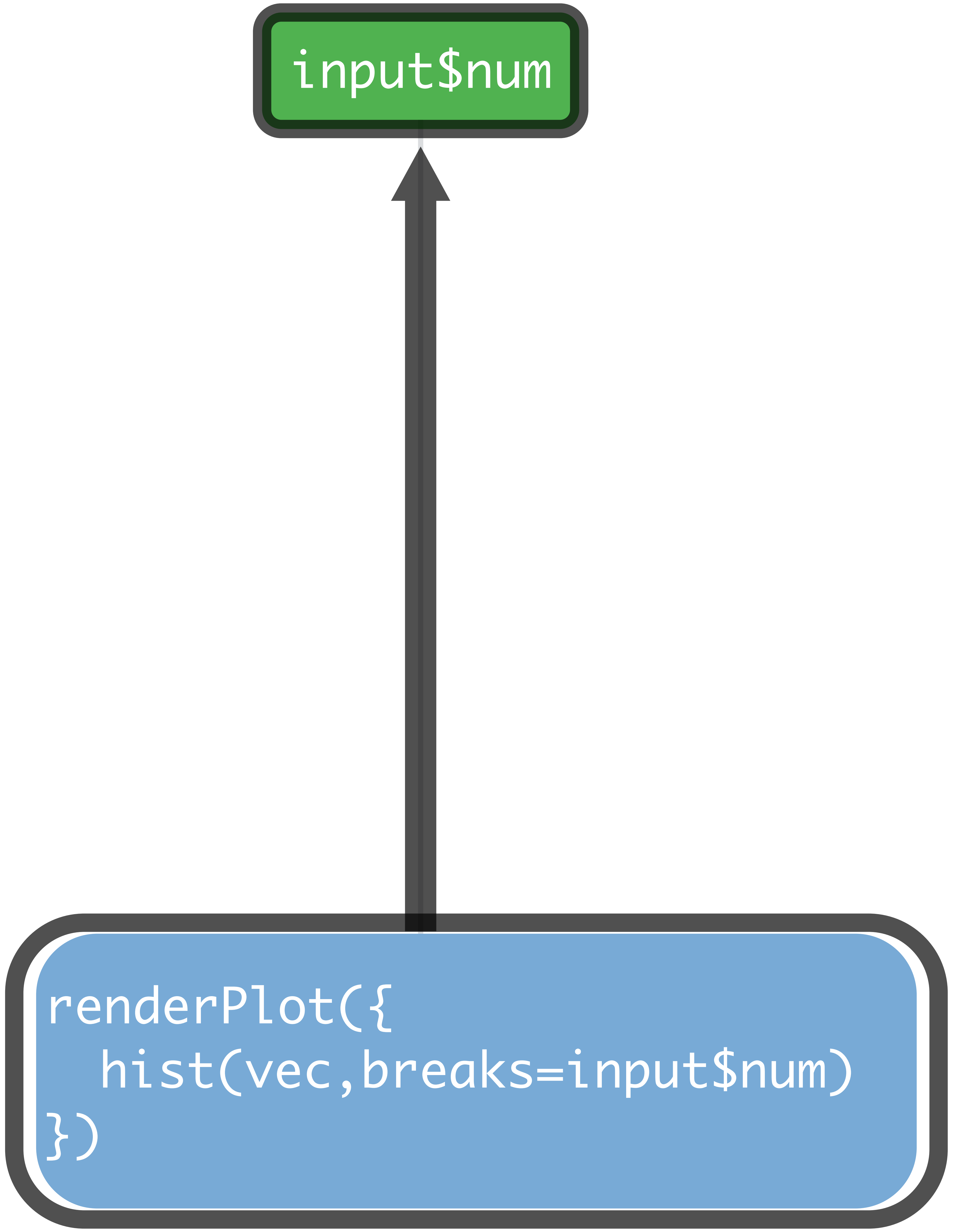
Reactivity automatically occurs whenever you use an input value to render an output object

```
function(input, output) {
  output$hist <- renderPlot({
    hist(vec, breaks = input$num)
  })
})
```

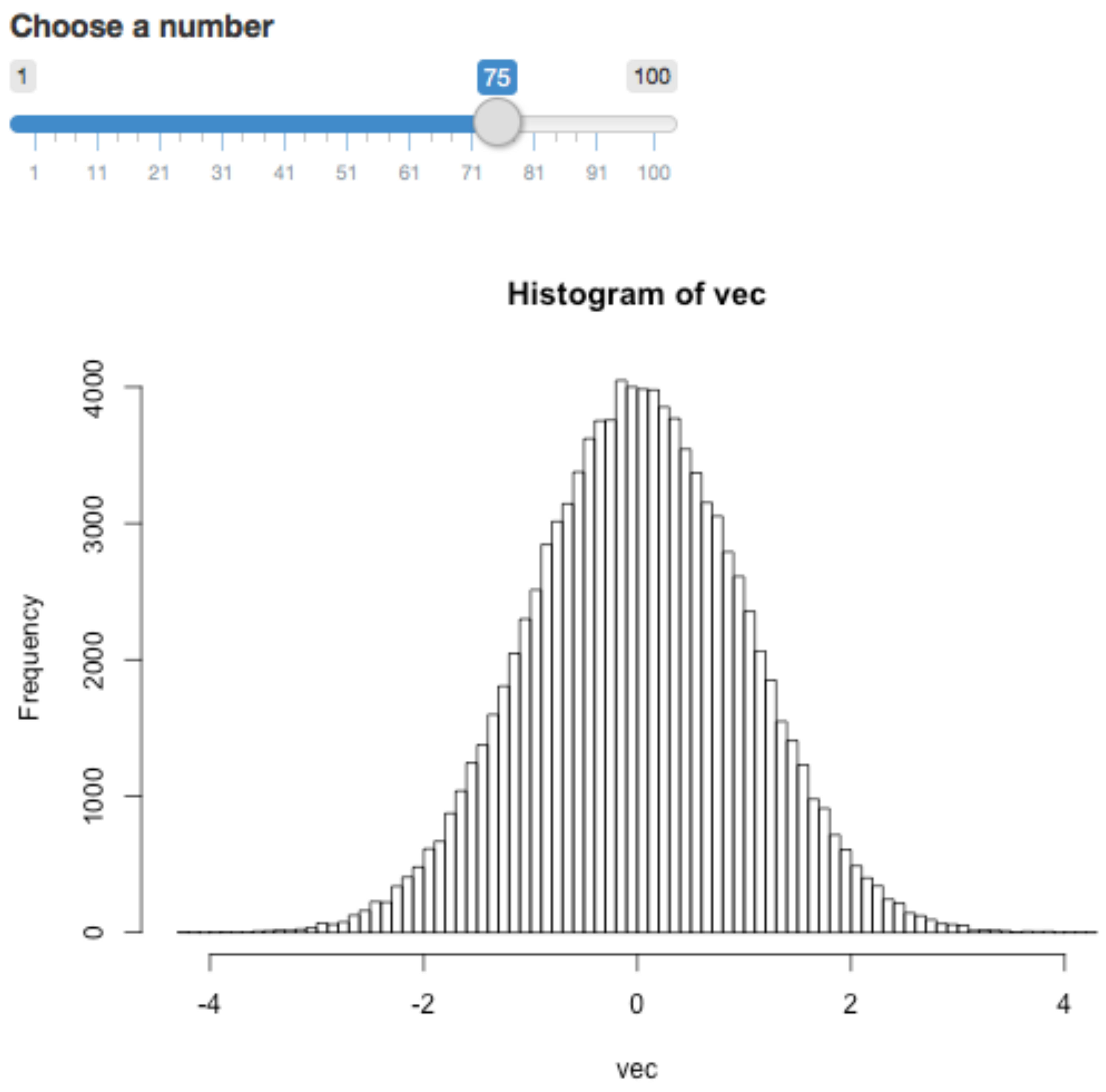


```
renderPlot({
  hist(vec,breaks=input$num)
})
```





```
renderPlot({
  hist(vec,breaks=input$num)
})
```



Recap: Server

Use the server function to assemble inputs into outputs. Follow 3 rules:

`output$hist <-`

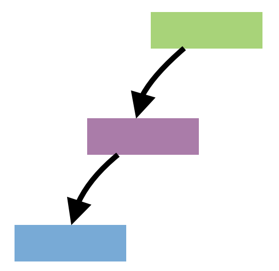
1. Save the output that you build to **output$**

```
renderPlot({
  hist(rnorm(input$num))
})
```

2. Build the output with a **render*()** function

`input$num`

3. Access input values with **input$**



Create reactivity by using **Inputs** to build **rendered Outputs**

Practice

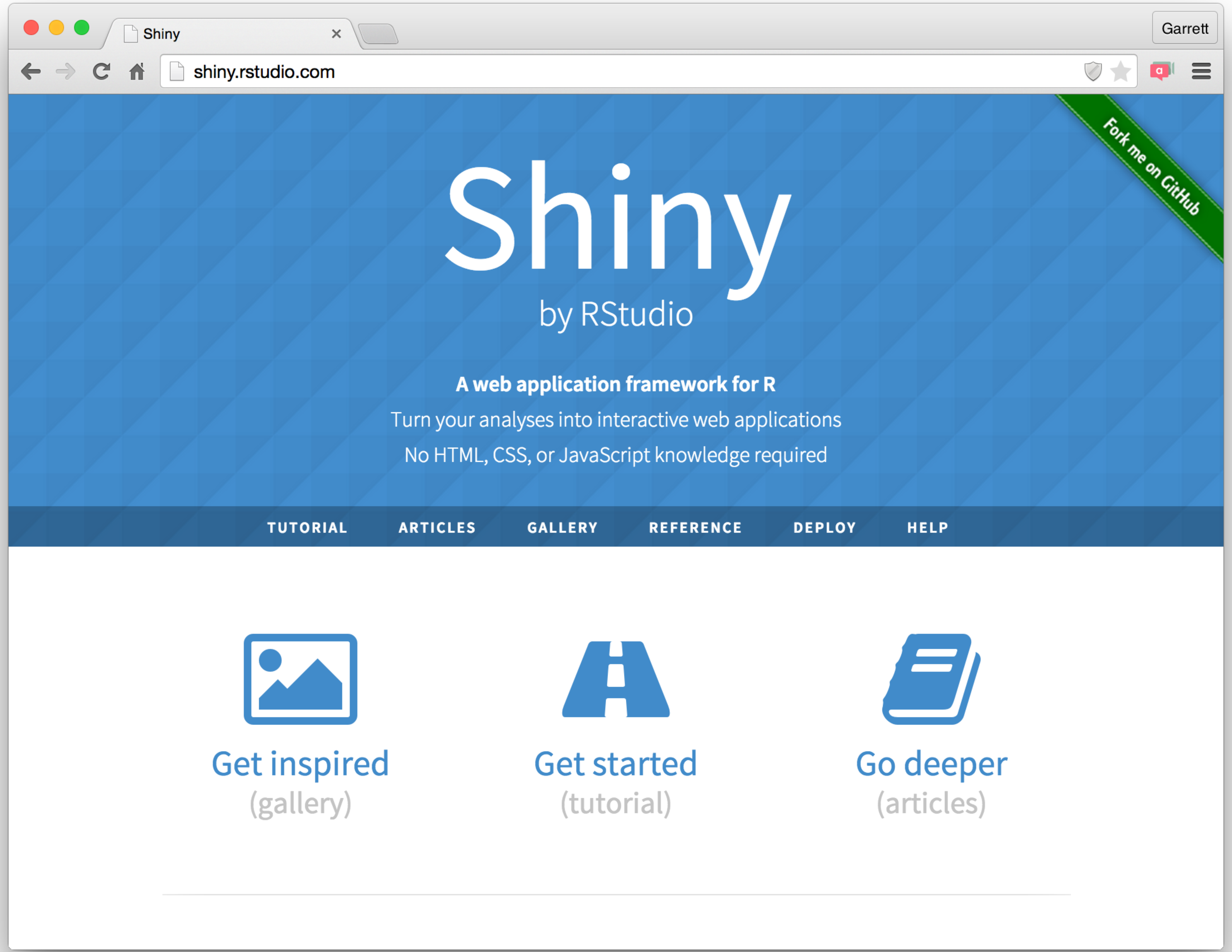
ZIP file containing R code and slides:

http://tinyurl.com/2016shiny

Learn more

The Shiny Development Center

shiny.rstudio.com



Shiny

by RStudio

A web application framework for R

Turn your analyses into interactive web applications

No HTML, CSS, or JavaScript knowledge required

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Special thanks to Garrett Grolemund with RStudio for many of these slides