RStudio

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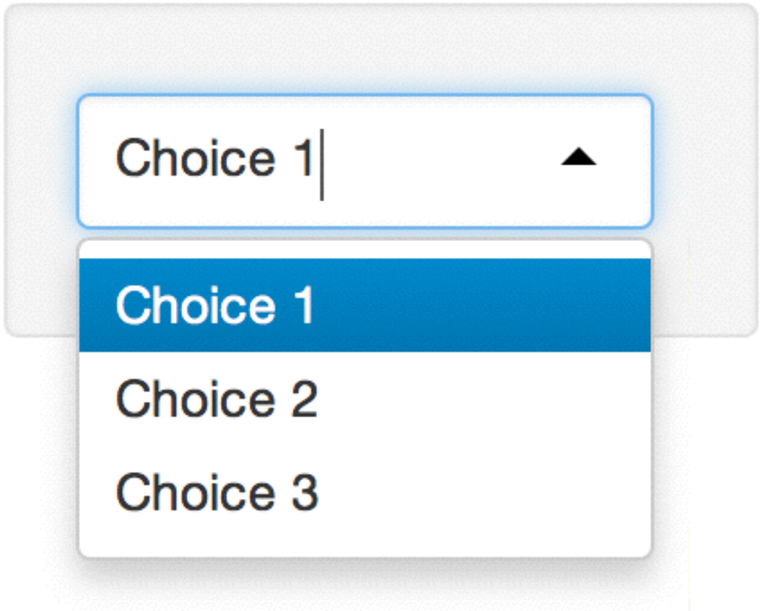
How to start with Shiny, Part 1

How to build a Shiny App



Garrett Grolemund

Data Scientist and Master Instructor
May 2015
Email: garrett@rstudio.com

Code and slides at:

bit.ly/shiny-quickstart-1

How to start with Shiny

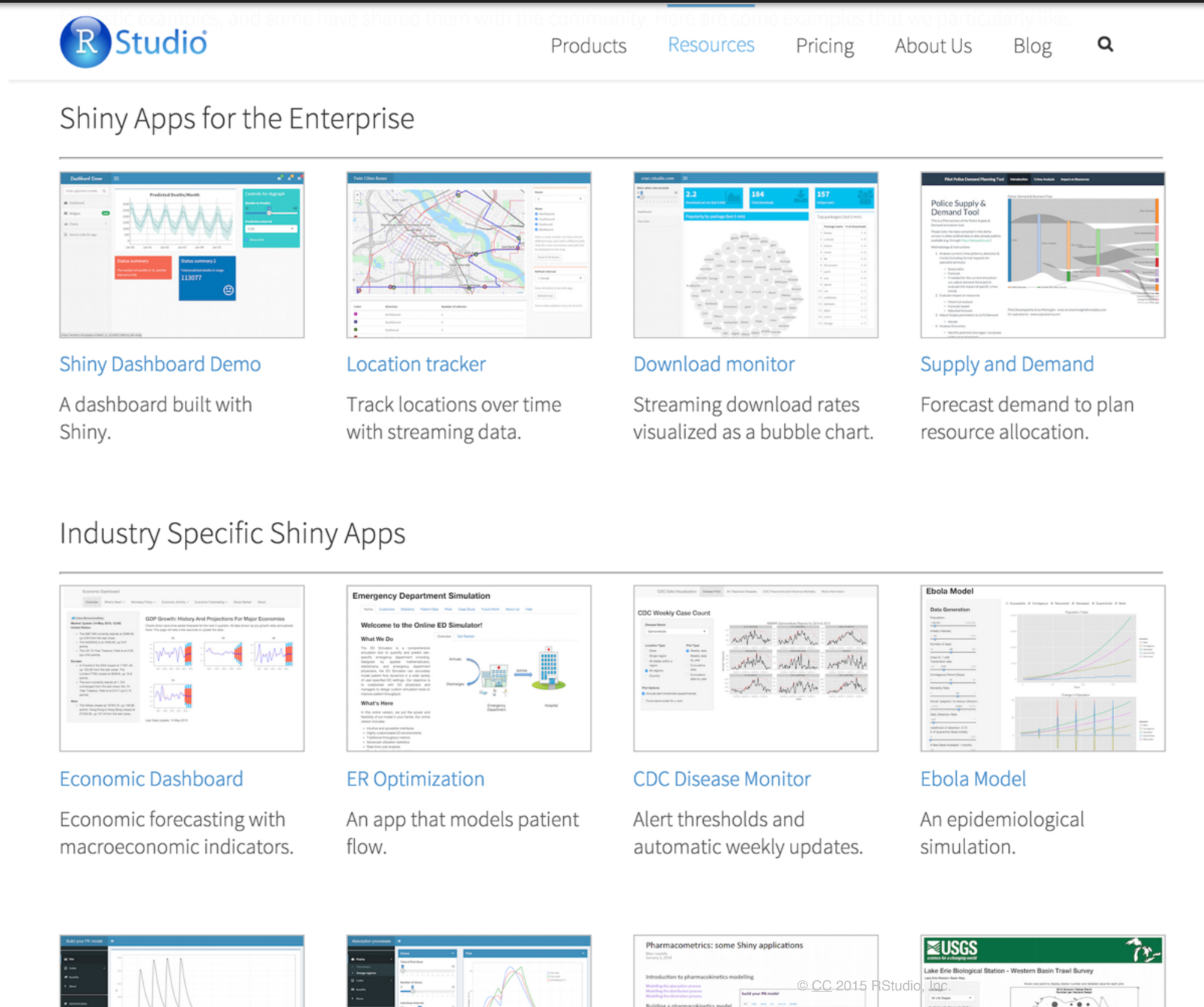
1. How to build a Shiny app (Today)

2. How to customize reactions (May 27)

3. How to customize appearance (June 3)

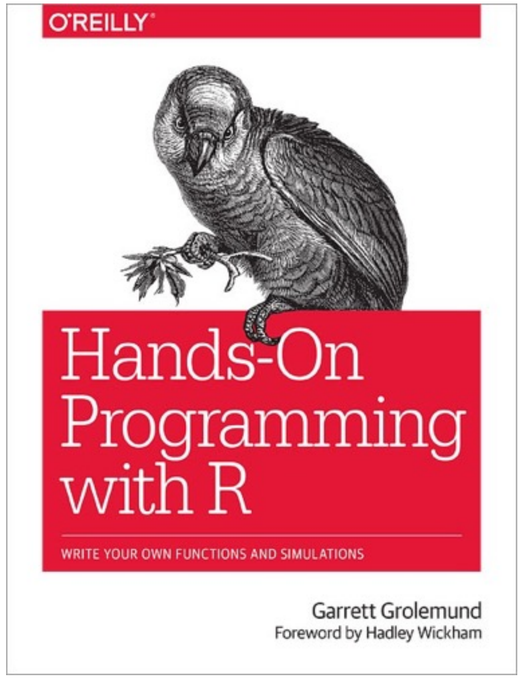
Shiny Showcase

www.rstudio.com/products/shiny/shiny-user-showcase/

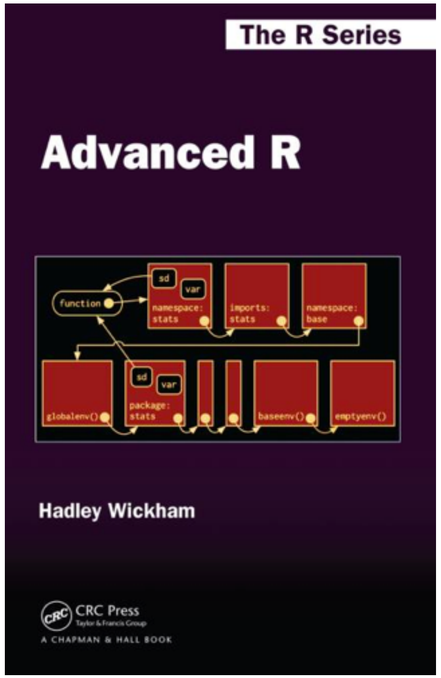


Learn R

Books

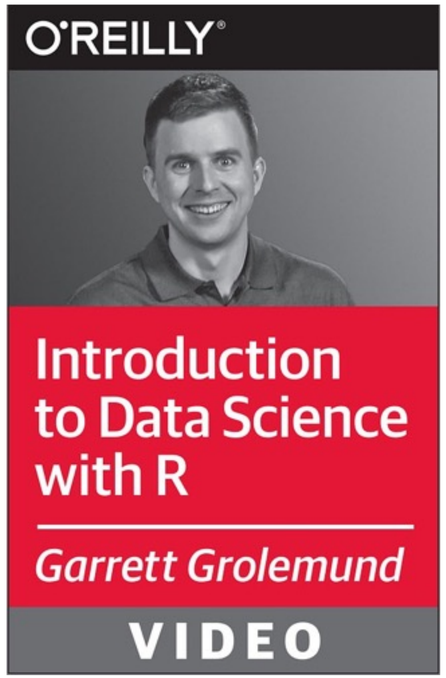


shop.oreilly.com/product/0636920028574.do

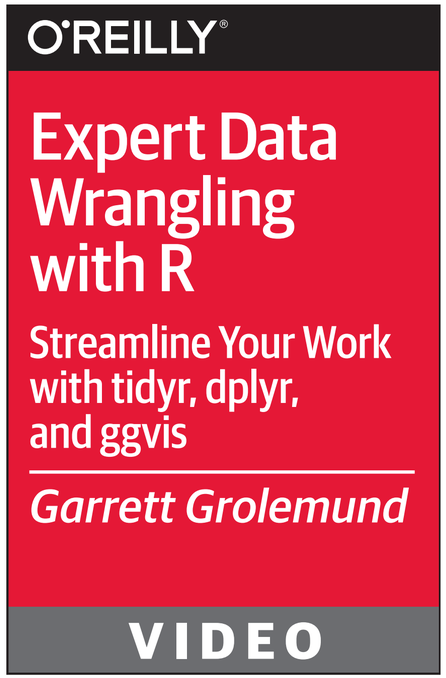


adv-r.had.co.nz/

Videos



shop.oreilly.com/product/0636920034834.do



shop.oreilly.com/product/0636920035992.do

Interactive tutorials

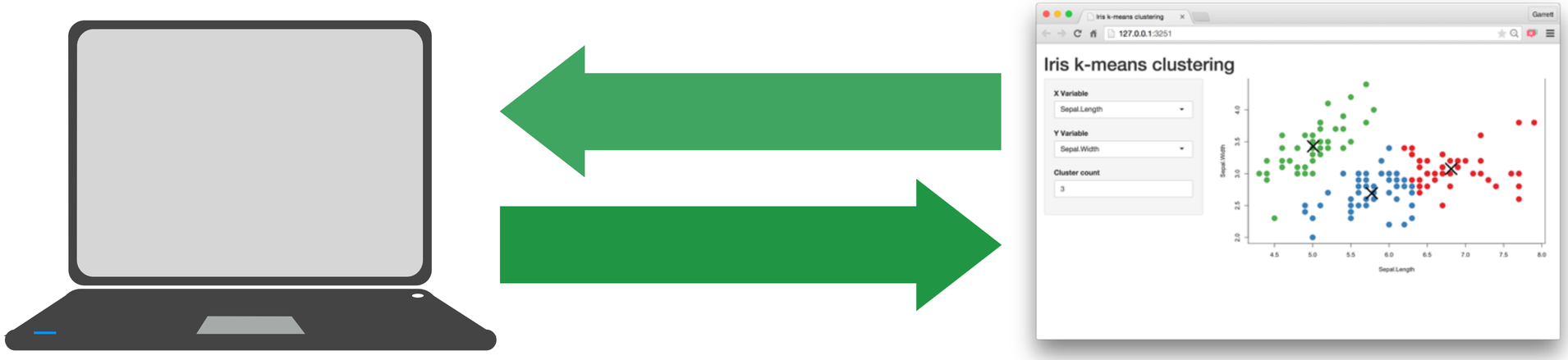
DataCamp

www.datacamp.com

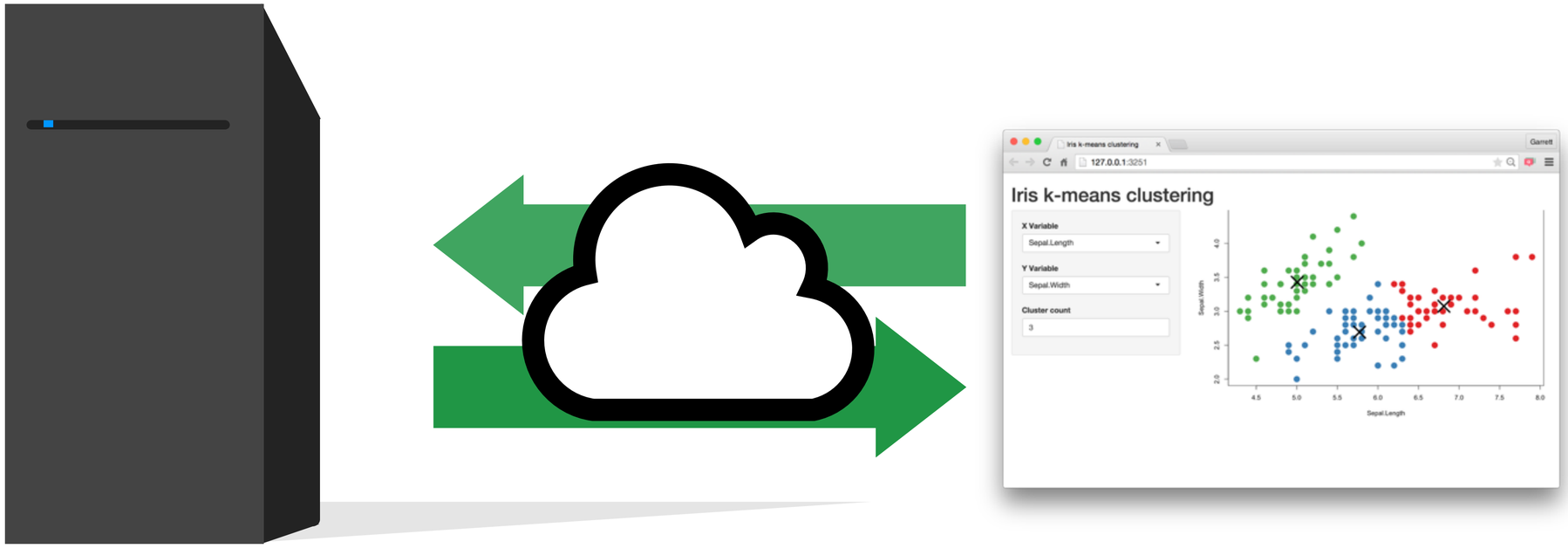
More at
www.rstudio.com/resources/training/online-learning/

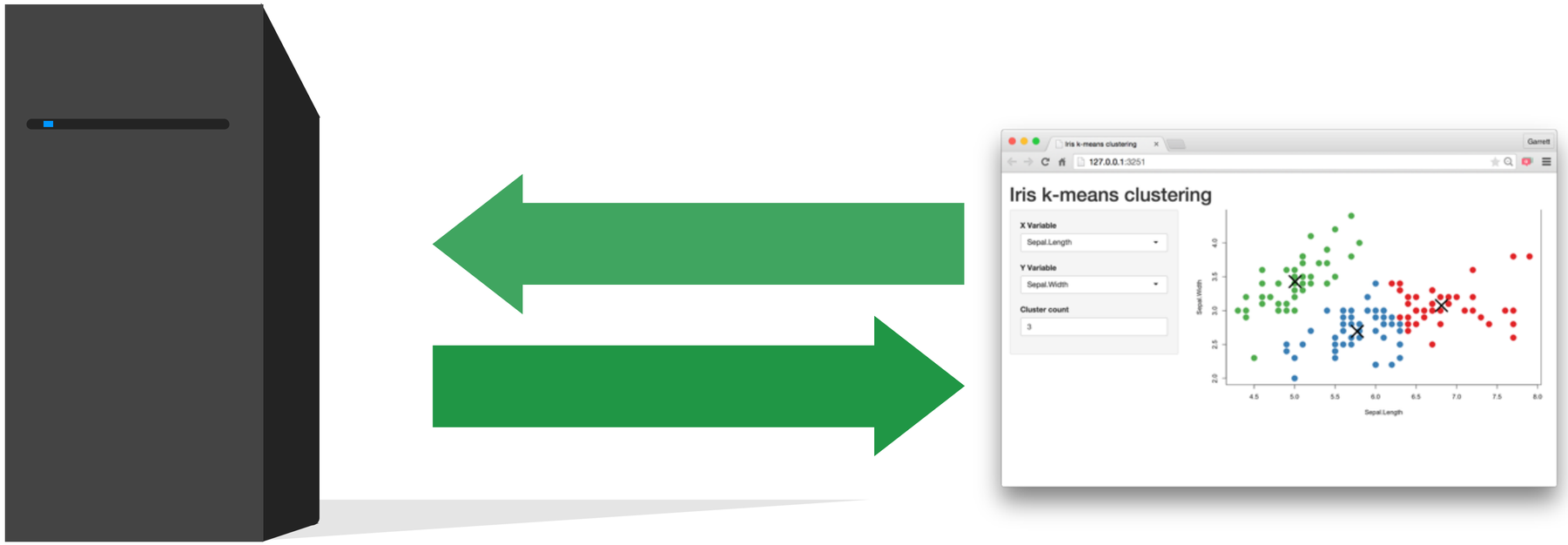
Understand the architecture

Every Shiny app is maintained by a computer running R



Every Shiny app is maintained by a computer running R





Server Instructions

User Interface (UI)

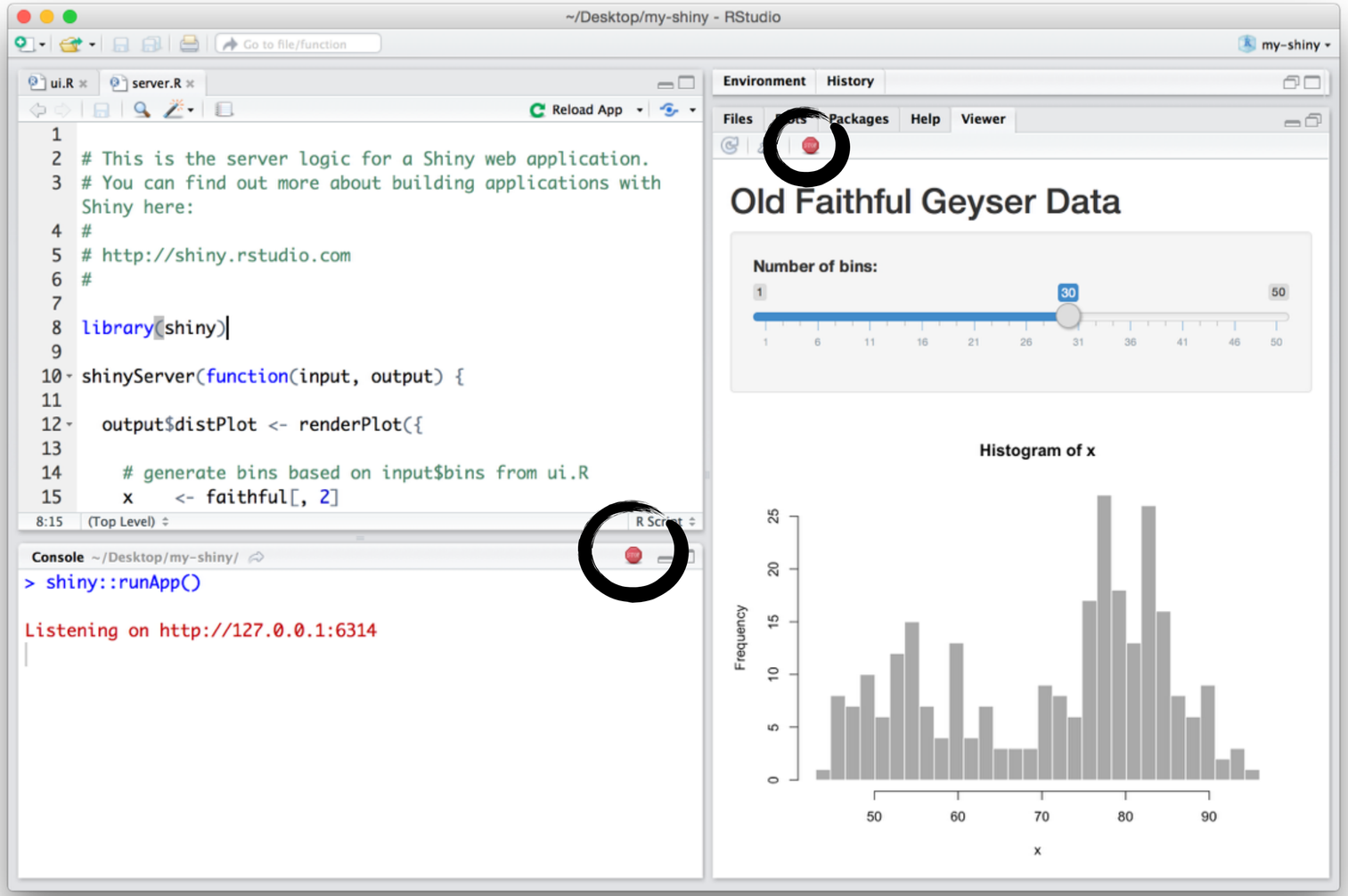
Use the template

App template

The shortest viable shiny app

```
library(shiny)

ui <- fluidPage()


server <- function(input, output) {}


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

Close an app

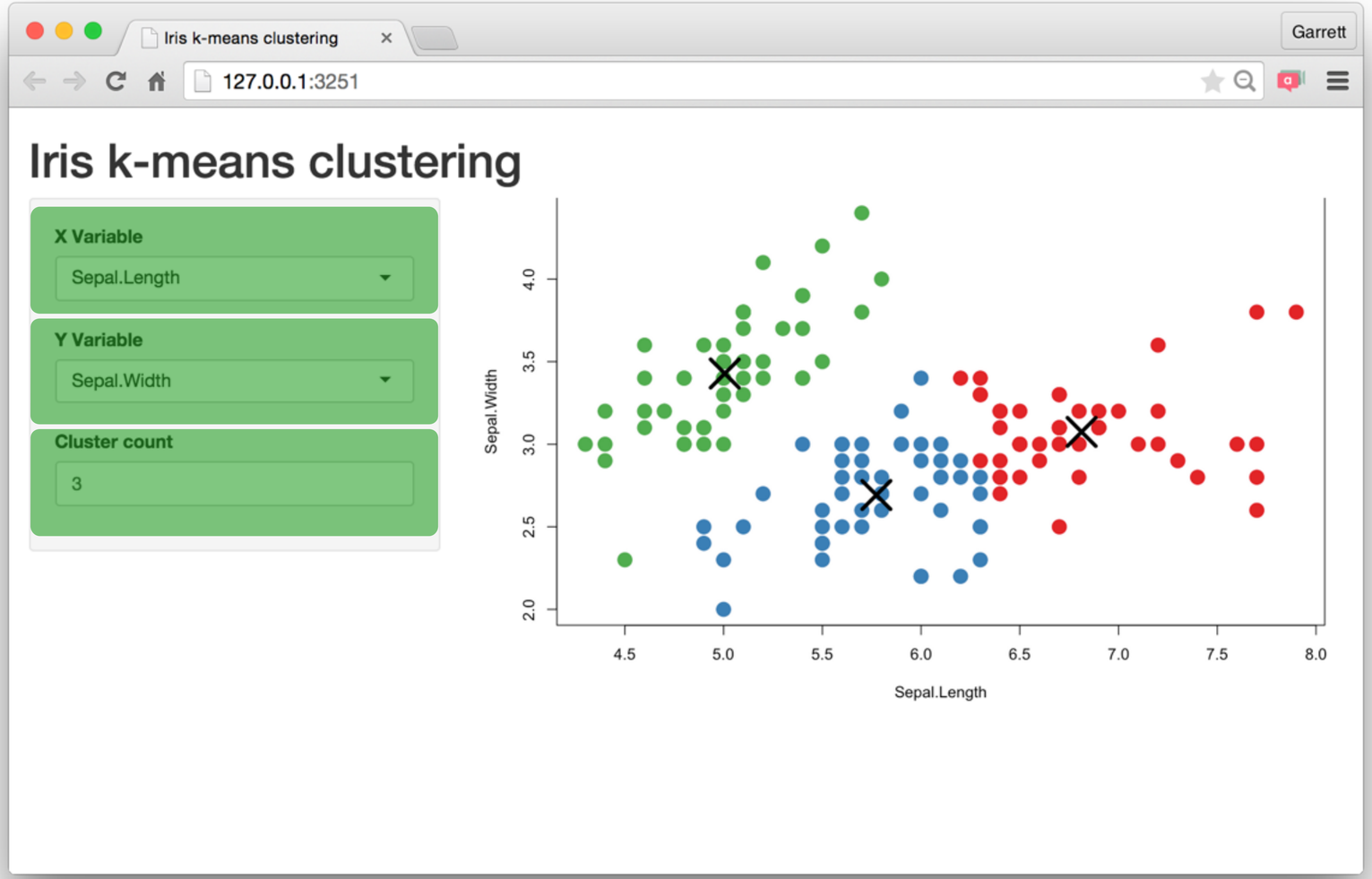


Add elements to your app as arguments to `fluidPage()`

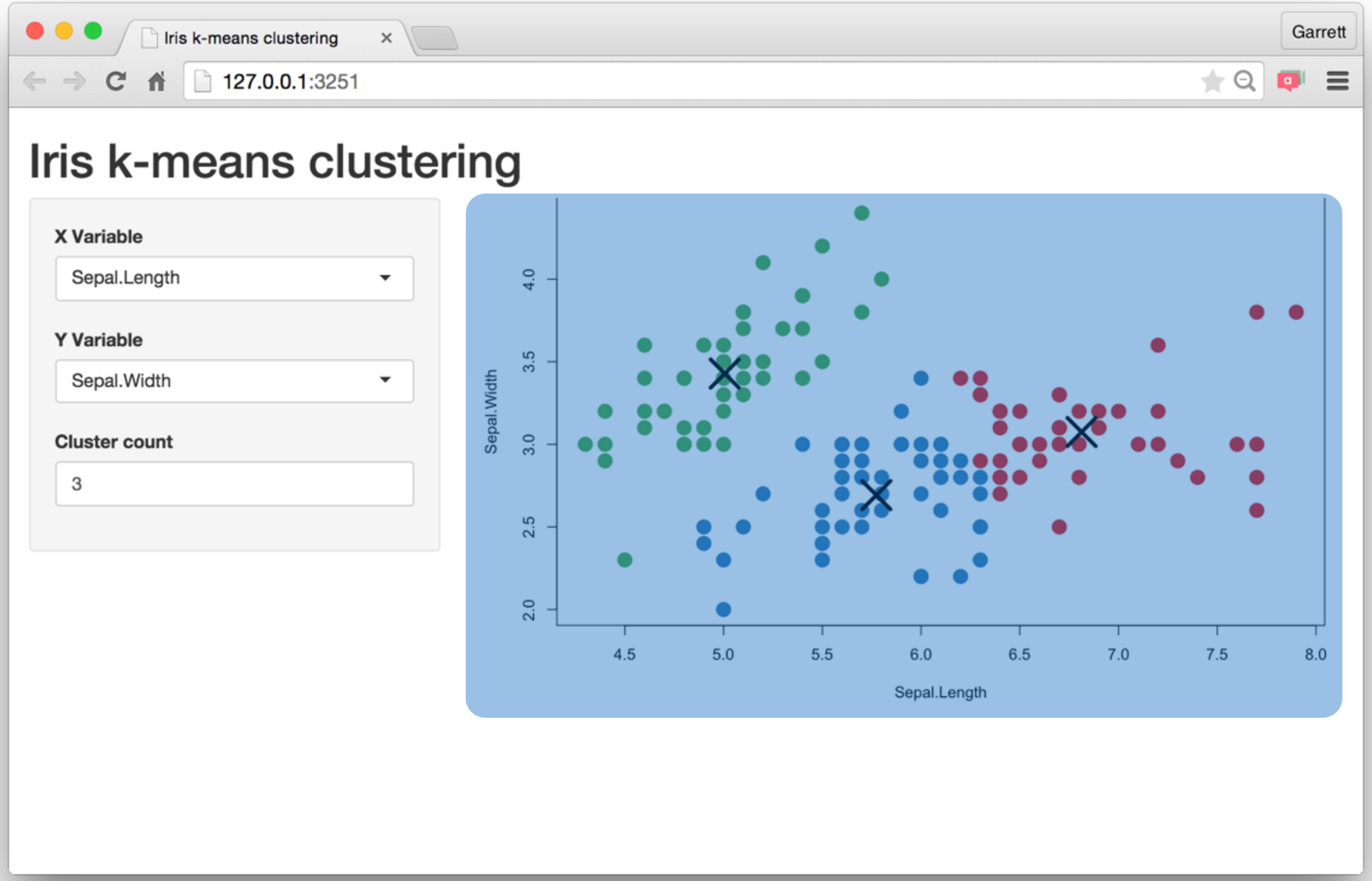
```
library(shiny)
ui <- fluidPage("Hello World")

server <- function(input, output) {}

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

Build your app around Inputs and Outputs

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



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



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

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

Inputs

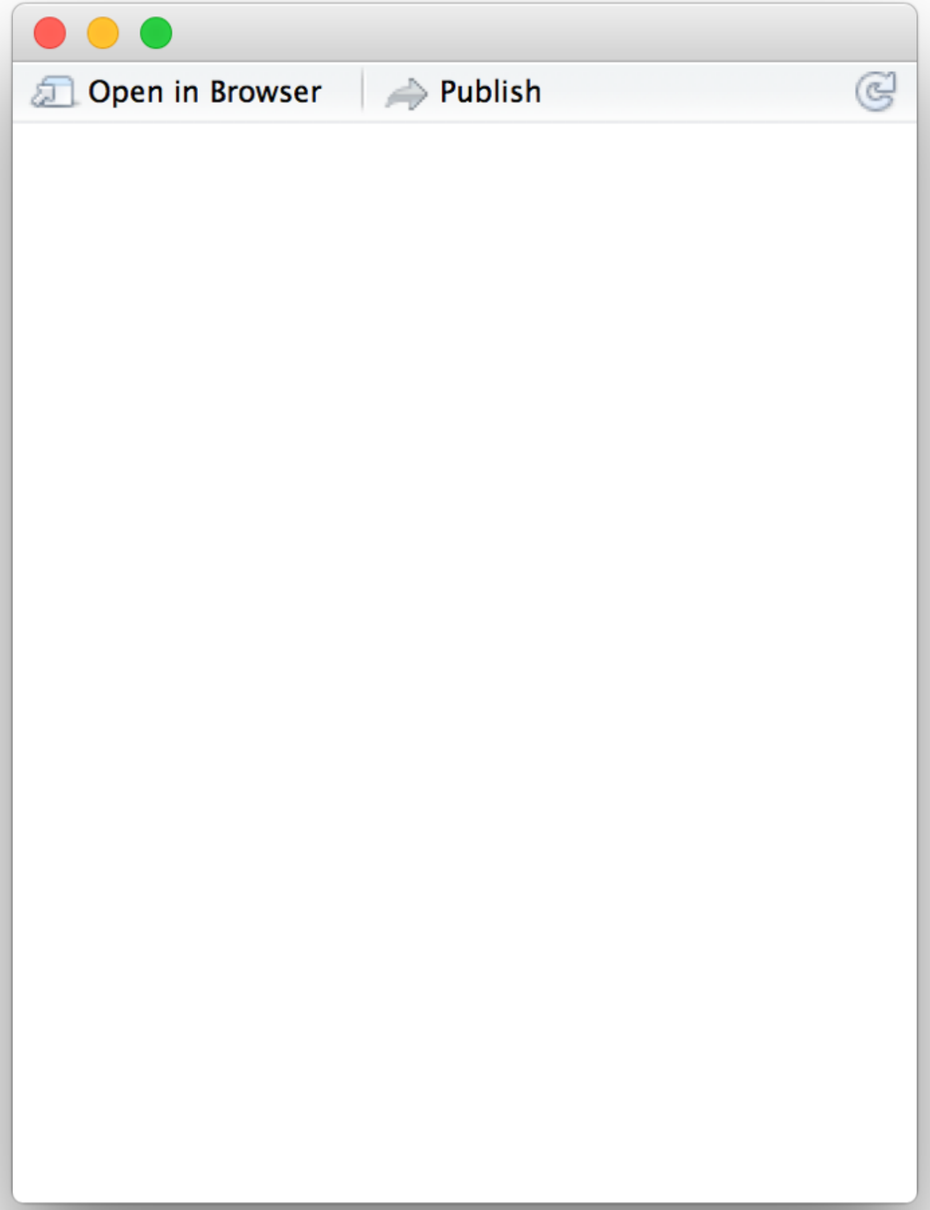
Create an input with an ***Input()** function.

```
sliderInput(inputId = "num",
  label = "Choose a number",
  value = 25, min = 1, max = 100)
```

```
<div class="form-group shiny-input-container">
  <label class="control-label" for="num">Choose a number</label>
  <input class="js-range-slider" id="num" data-min="1" data-max="100"
   data-from="25" data-step="1" data-grid="true" data-grid-num="9.9"
   data-grid-snap="false" data-prettify-separator="," data-keyboard="true"
   data-keyboard-step="1.01010101010101"/>
</div>
```

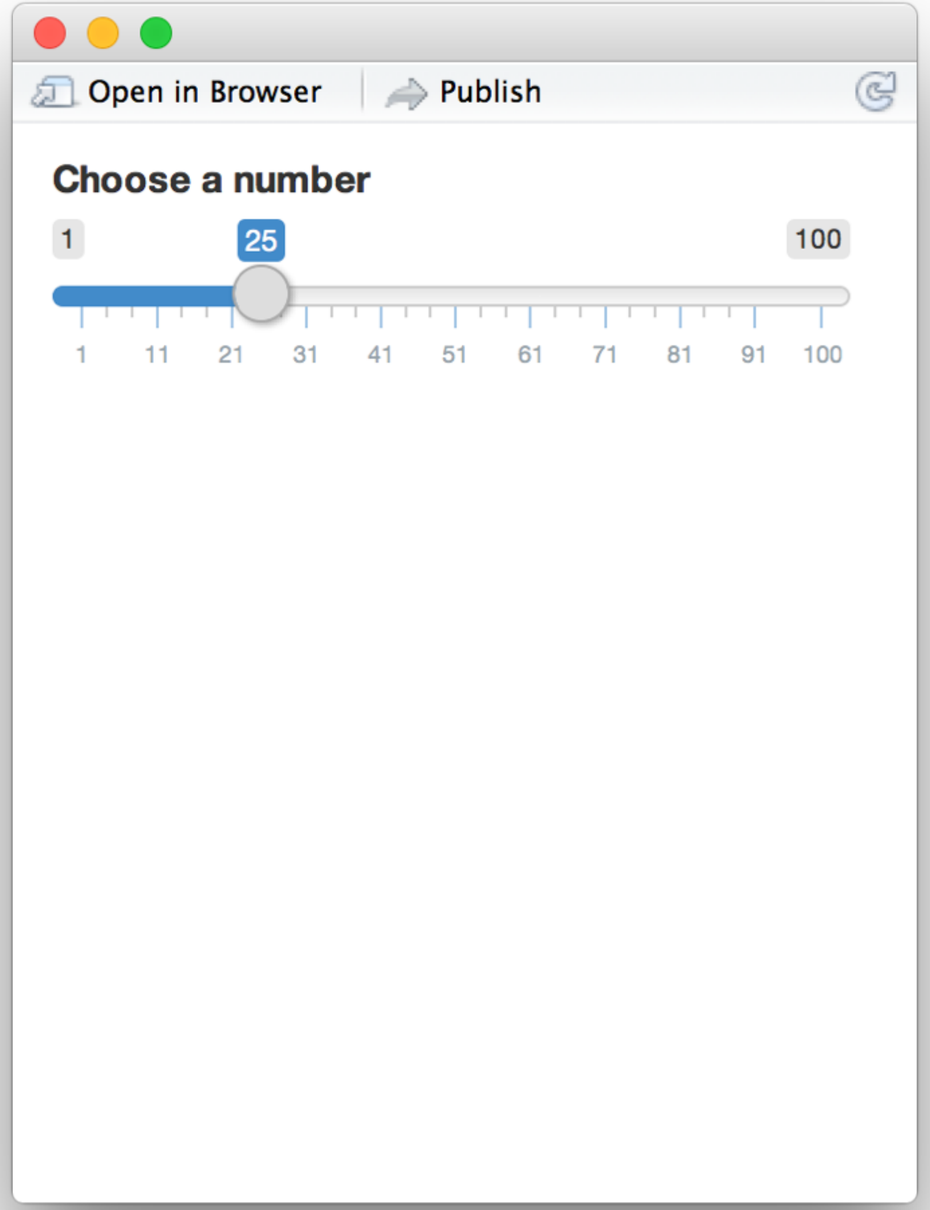
Create an input with an input function.

```
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)
```



Buttons

Action

Submit

actionButton()
submitButton()

Single checkbox

Choice A

checkboxInput()

Checkbox group

Choice 1
Choice 2
Choice 3

checkboxGroupInput()

Date input

2014-01-01

dateInput()

Date range

2014-01-24 to 2014-01-24

dateRangeInput()

File input

Choose File No file chosen

fileInput()

Numeric input

1

numericInput()

Password Input

passwordInput()

Radio buttons

Choice 1
Choice 2
Choice 3

radioButtons()

Select box

Choice 1

selectInput()

Sliders

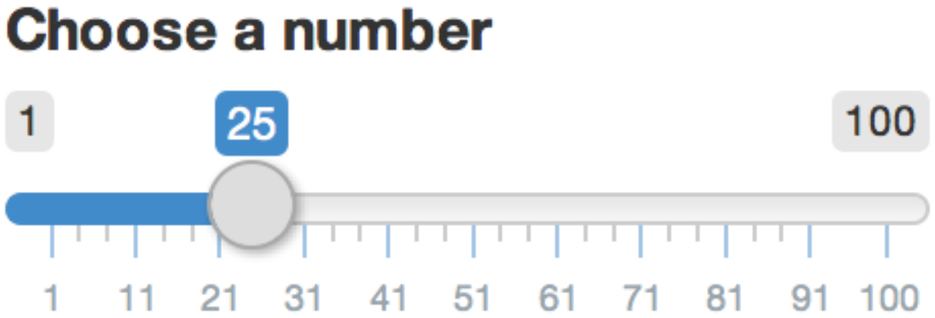
sliderInput()

Text input

Enter text...

textInput()

Syntax




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

input name
(for internal use)

Notice:
Id not ID

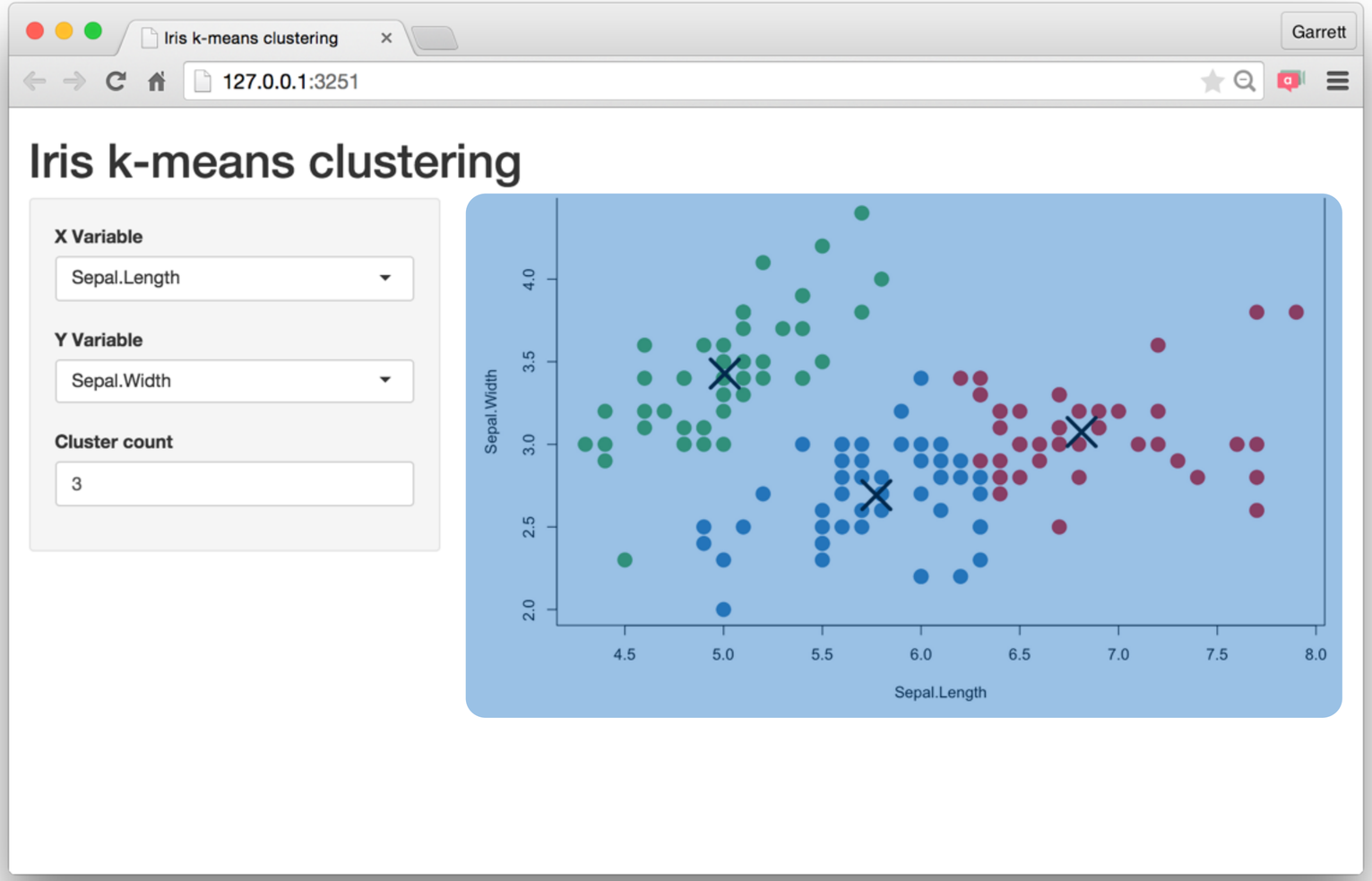
label to display

input specific arguments

```
?sliderInput
```

Outputs

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



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("hist")
```

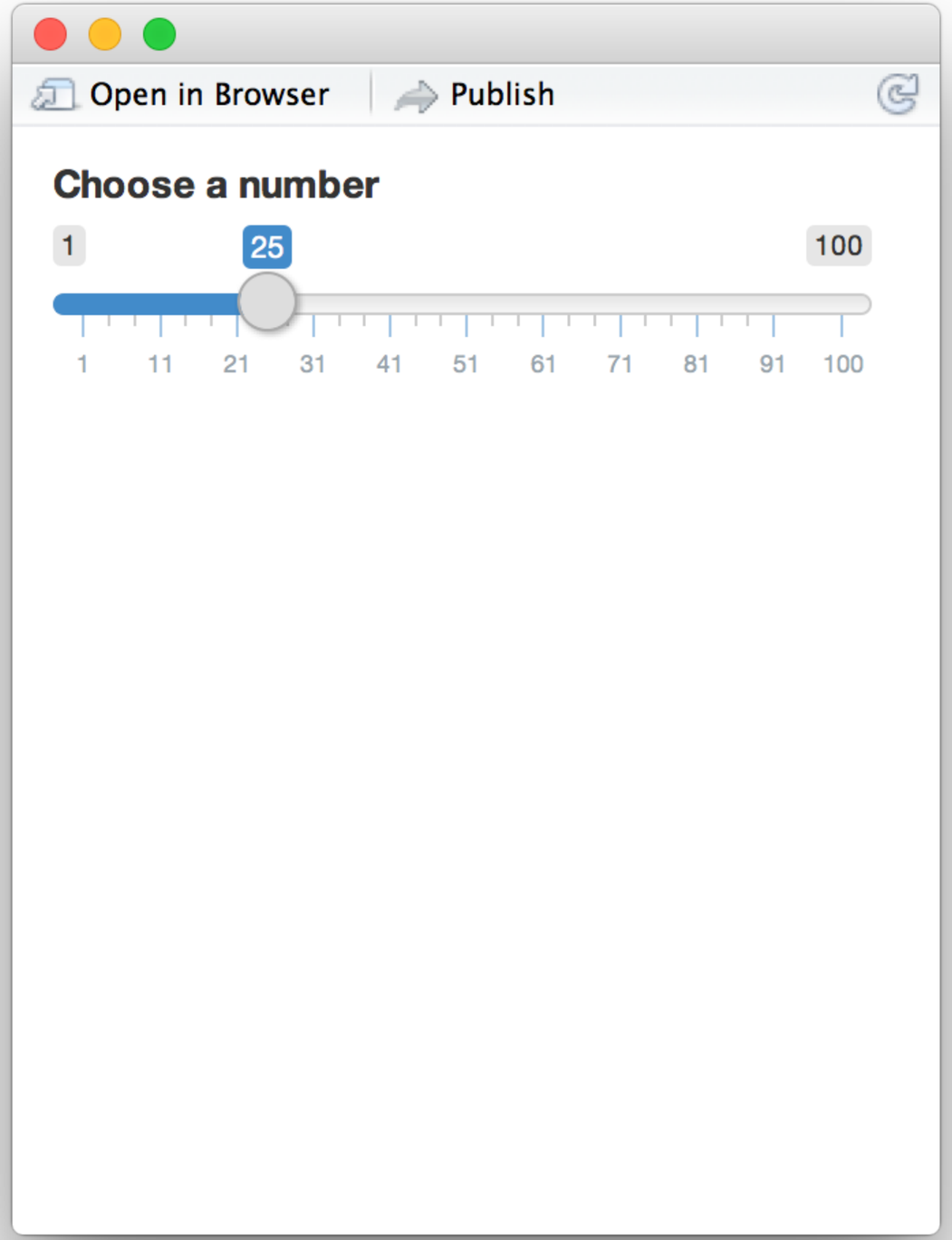
the type of output to display

name to give to the output object

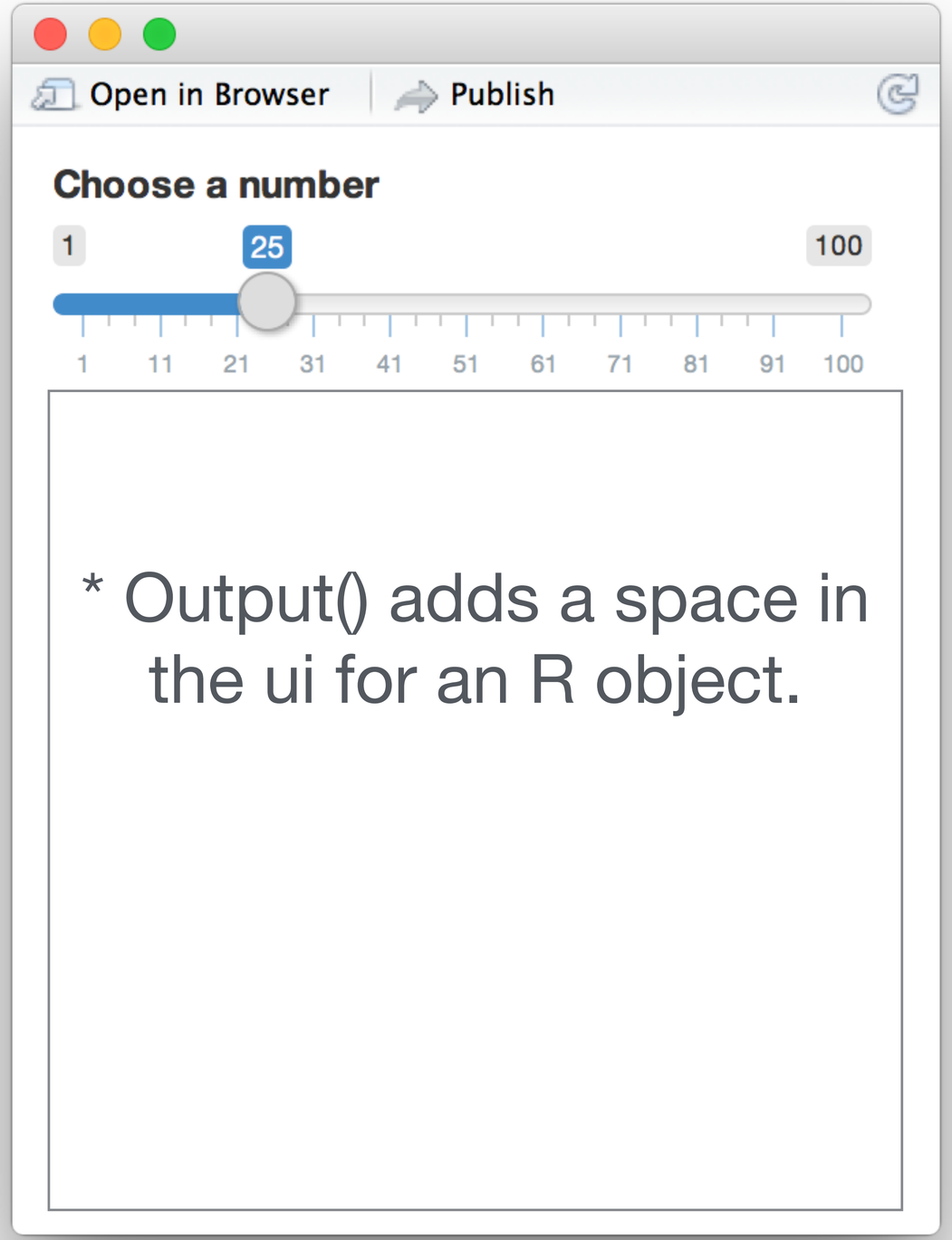
```
library(shiny)

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

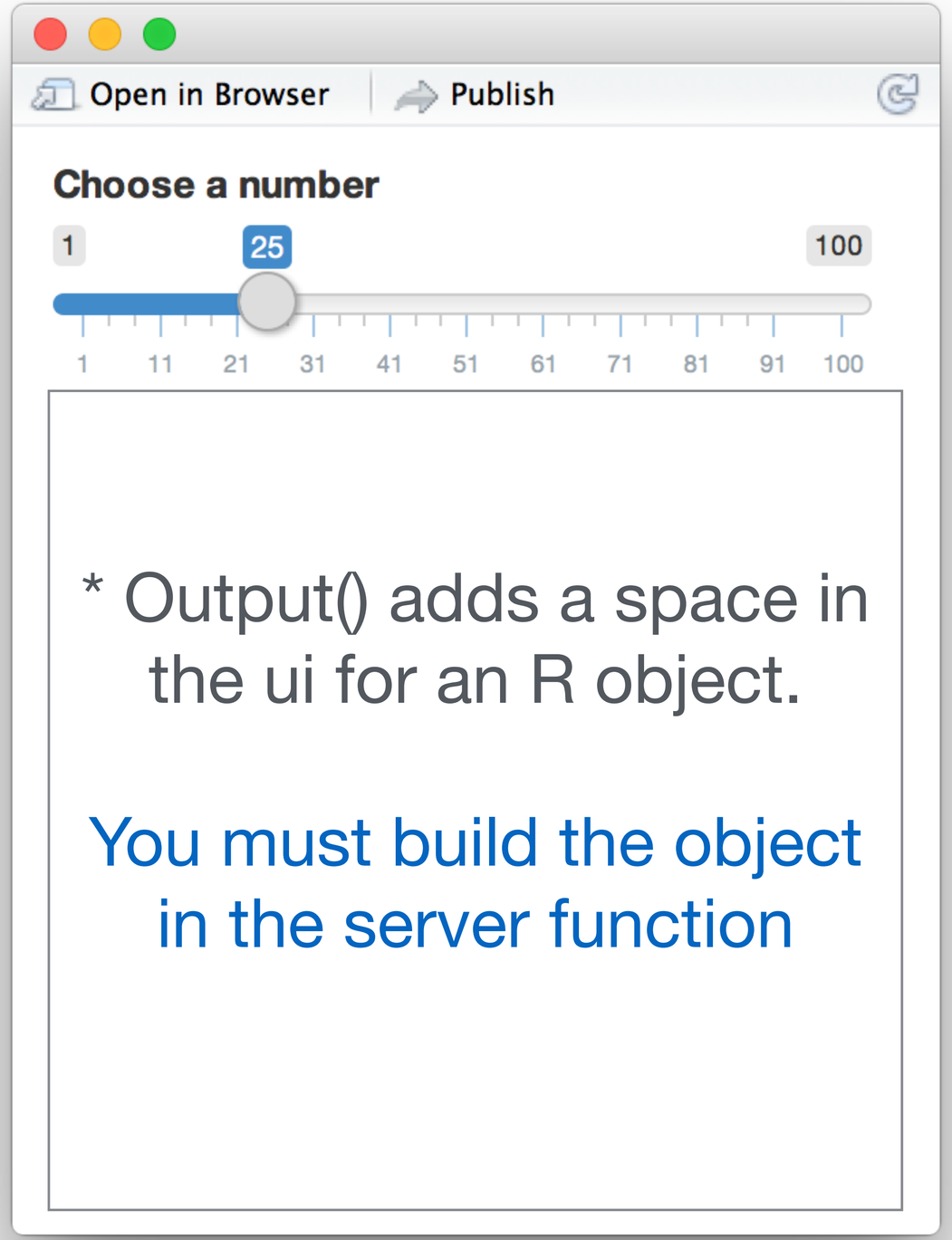
```
library(shiny)

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)
```



```
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)
```



```
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)
```

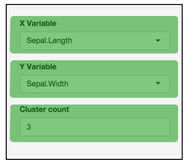


Recap

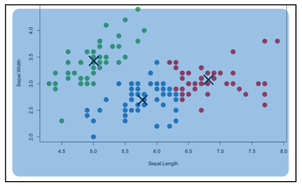
```
library(shiny)
ui <- fluidPage()
server <- function(input, output) {}
shinyApp(ui = ui, server = server)
```

Begin each app with the template

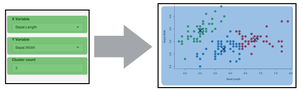
Add elements as arguments to **fluidPage()**



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



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



Assemble outputs from inputs in the server function

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$

```
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(rnorm(100)) })
```

type of object to build

code block that builds the object

2

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

```
server <- function(input, output) {
  output$hist <- renderPlot({
    hist(rnorm(100))
  })
}
```

2 Build objects to display with render*()

```
server <- function(input, output) {
  output$hist <- renderPlot({
    title <- "100 random normal values"
    hist(rnorm(100), main = title)
  })
}
```

3

Access **input** values with input$

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

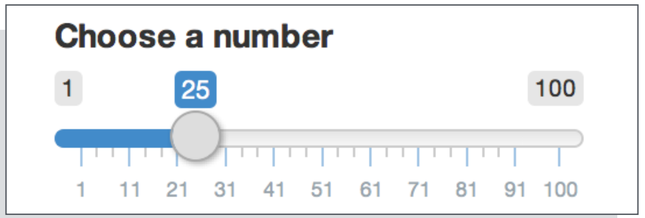
3 Access **input** values with input$

```
sliderInput(inputId = "num",…)
```

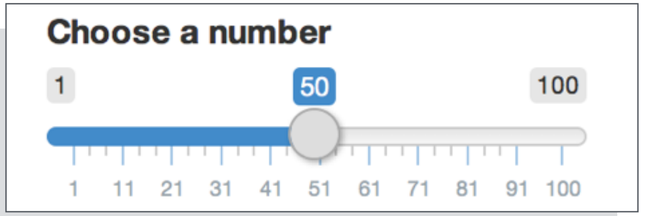
```
input$num
```

Input values

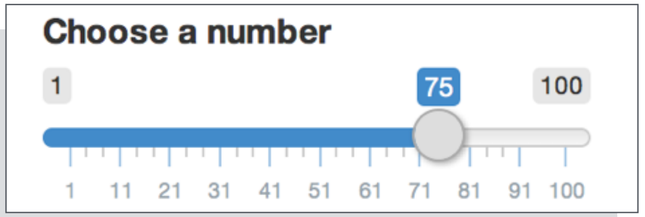
The input value changes whenever a user changes the input.




```
input$num = 25
```



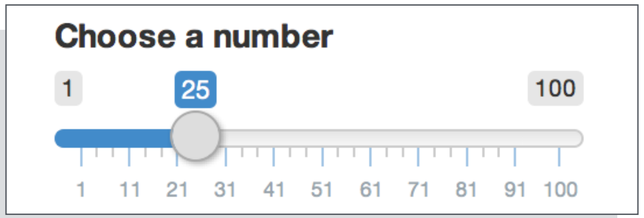

```
input$num = 50
```



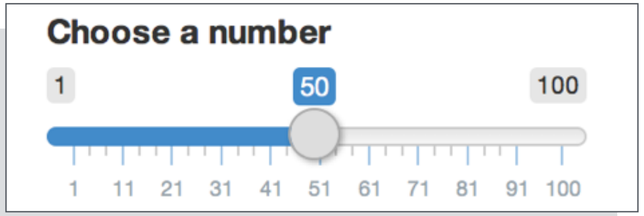

```
input$num = 75
```

Input values

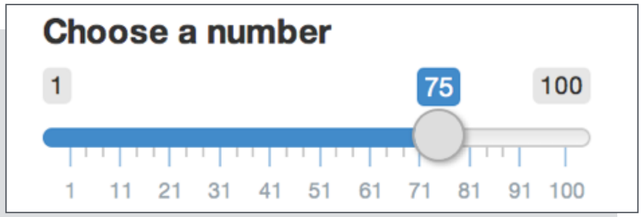
The input value changes whenever a user changes the input.




```
input$num = 25
```




```
input$num = 50
```




```
input$num =
```

Output will automatically update if you follow the 3 rules

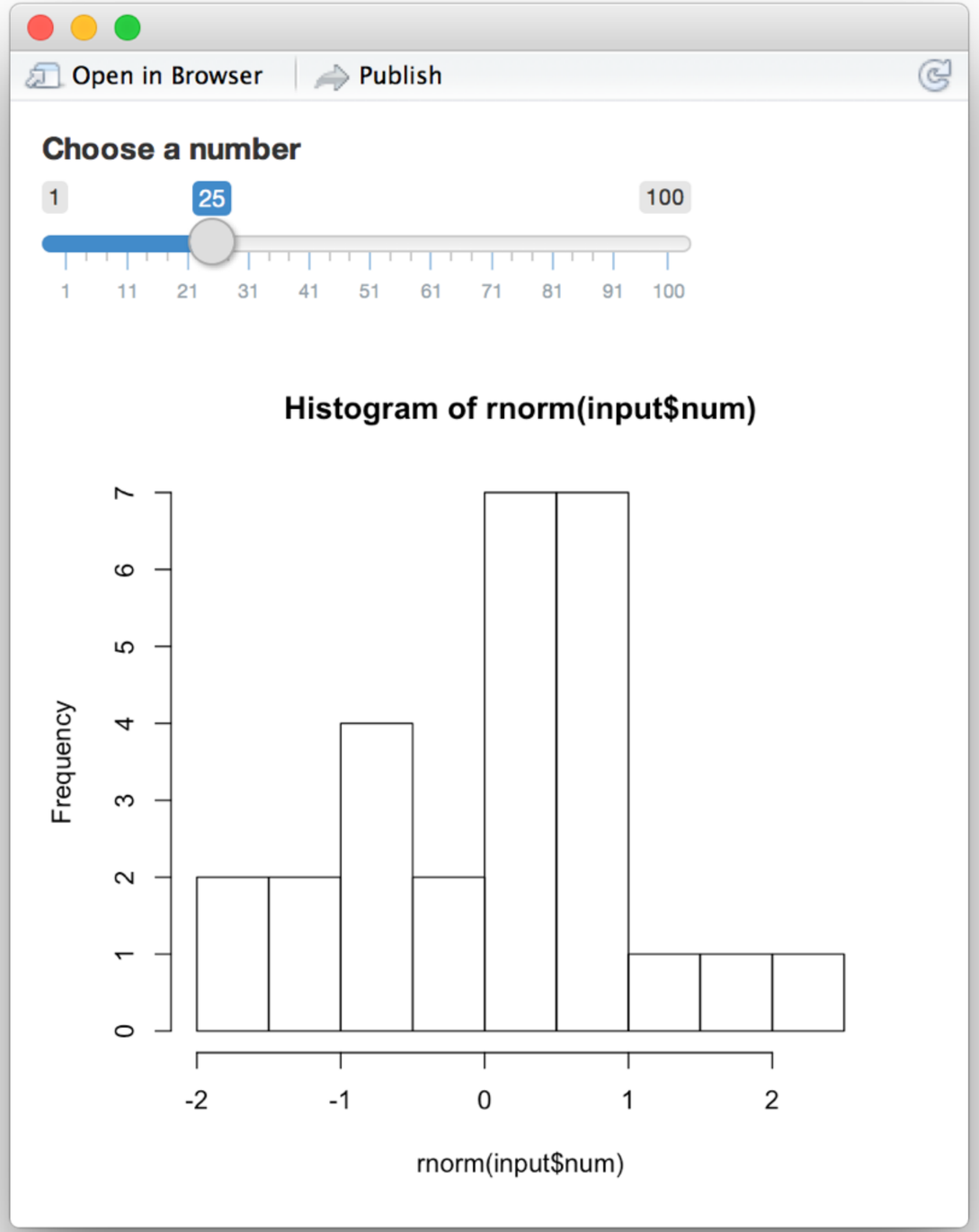
Reactivity 101

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

```
function(input, output) {
  output$hist <- renderPlot({
    hist(rnorm(input$num))
  })
})
```

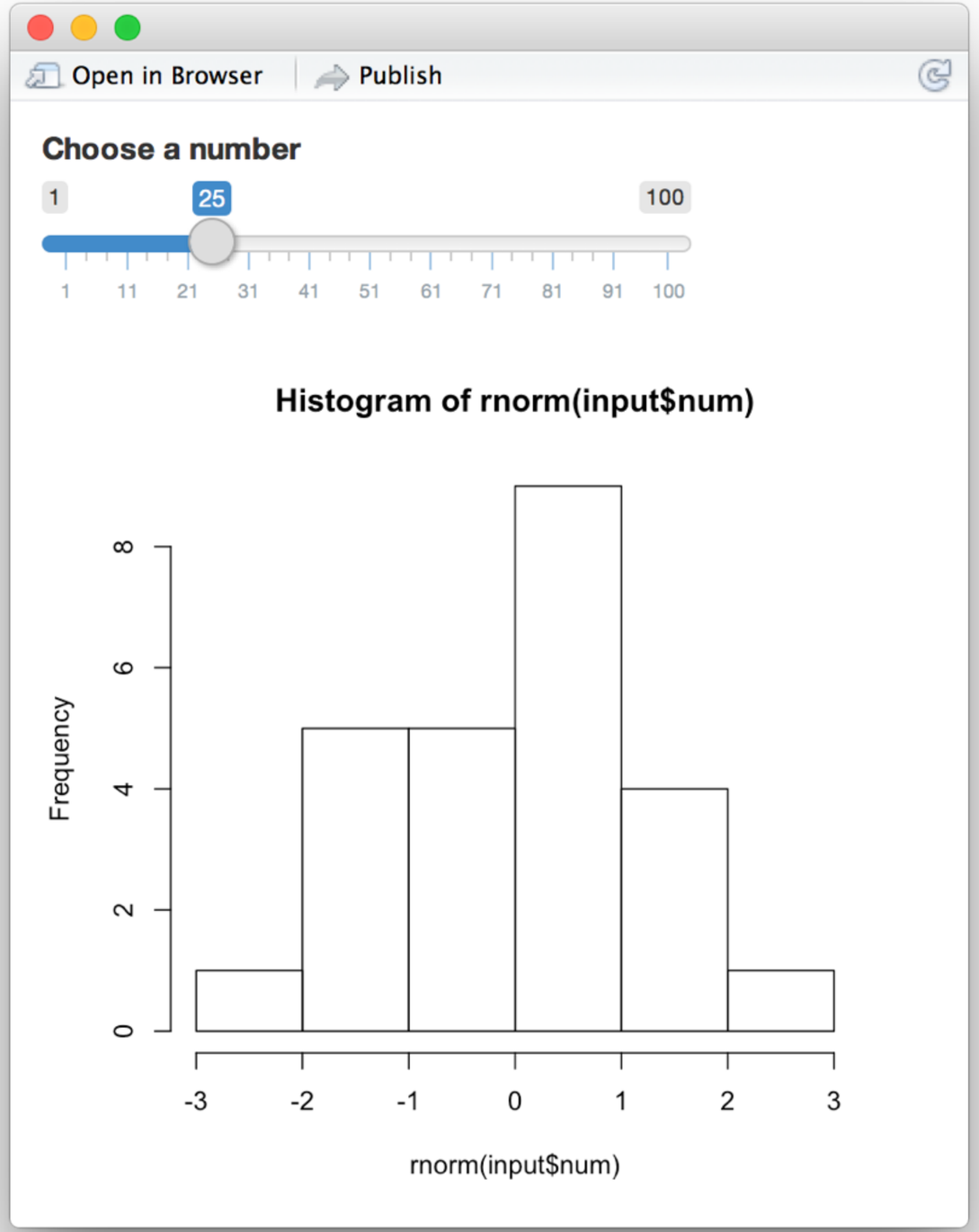
input$num

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



input$num

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



Recap: Server

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

`output$hist <-`

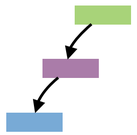
1. Save the output that you build to **output$**

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

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

`input$num`

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

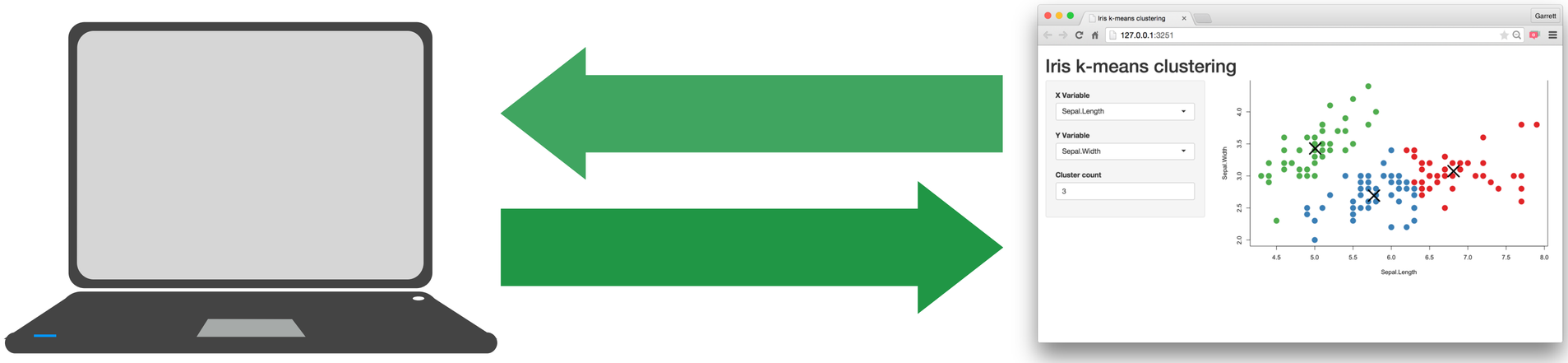


Create reactivity by using **Inputs** to build **rendered Outputs**

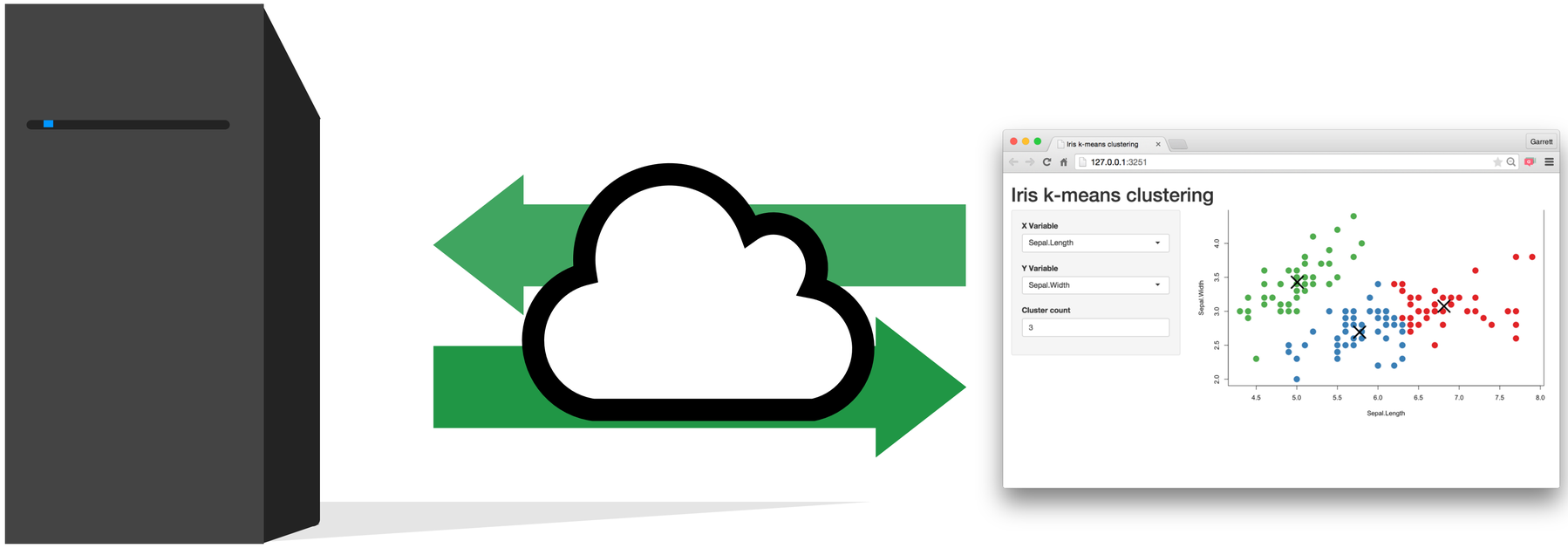
Share

your app

Every Shiny app is maintained by a computer running R



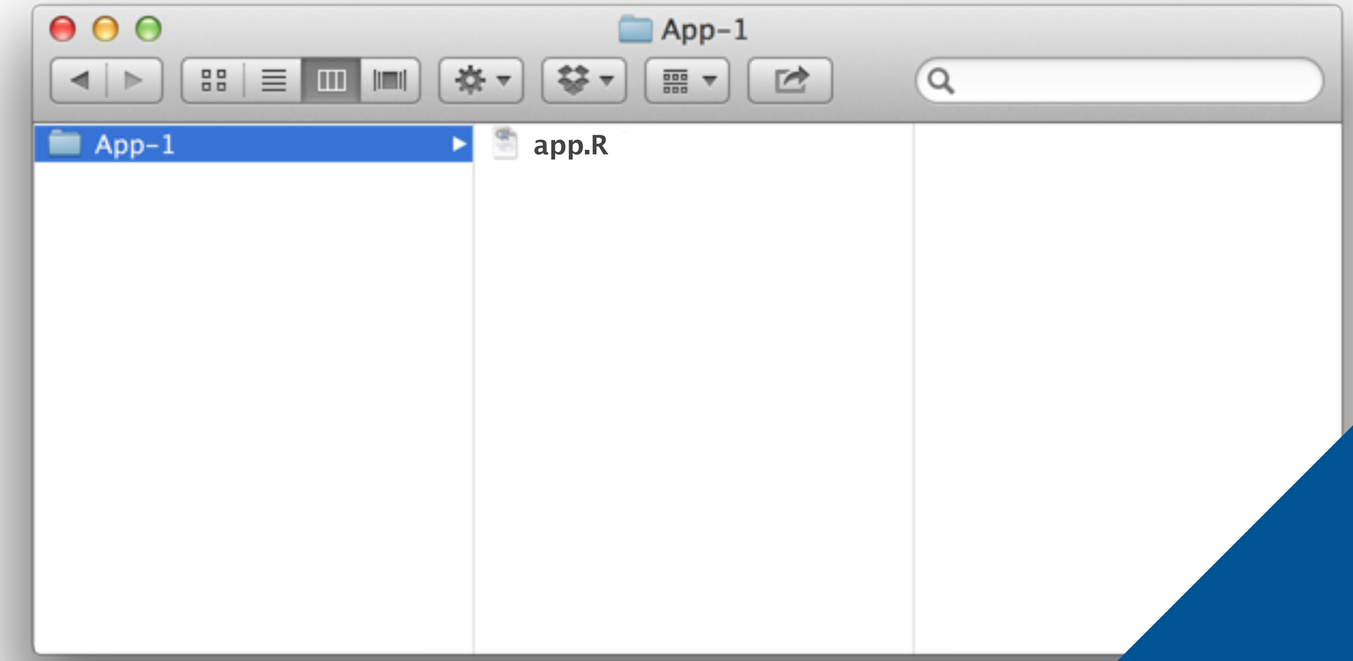
Every Shiny app is maintained by a computer running R



How to save your app

One directory with every file the app needs:

- app.R *(your script which ends with a call to shinyApp())*
- datasets, images, css, helper scripts, etc.



You must use this exact name (**app.R**)

Two file apps

```
library(shiny)

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

server <- function(input, output) {
  output$hist <- renderPlot({
    hist(rnorm(input$num))
  })
}

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

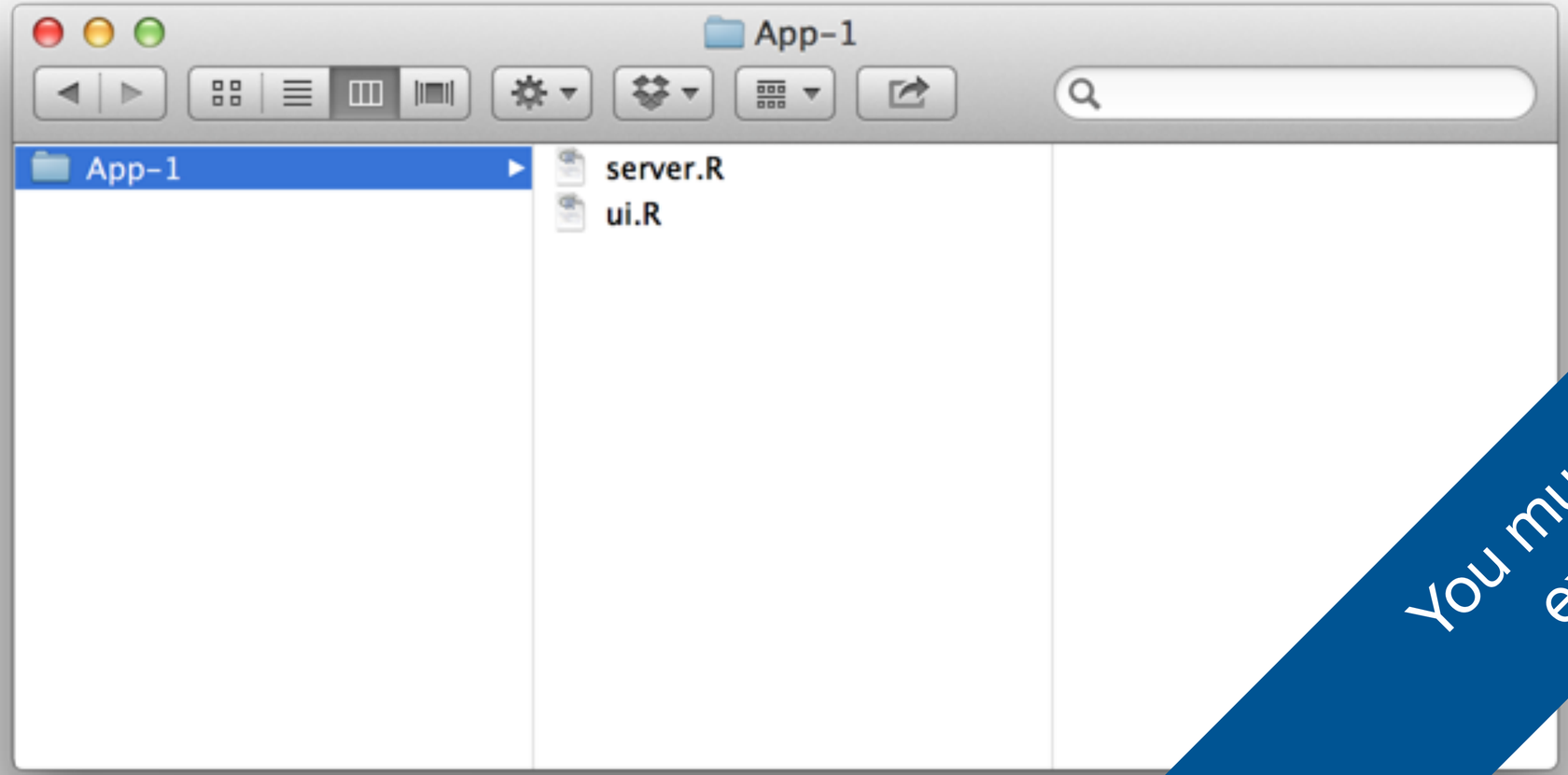
```
# ui.R
library(shiny)
fluidPage(
  sliderInput(inputId = "num",
    label = "Choose a number",
    value = 25, min = 1, max = 100),
  plotOutput("hist")
)
```

```
# server.R
library(shiny)
function(input, output) {
  output$hist <- renderPlot({
    hist(rnorm(input$num))
  })
}
```

Two file apps

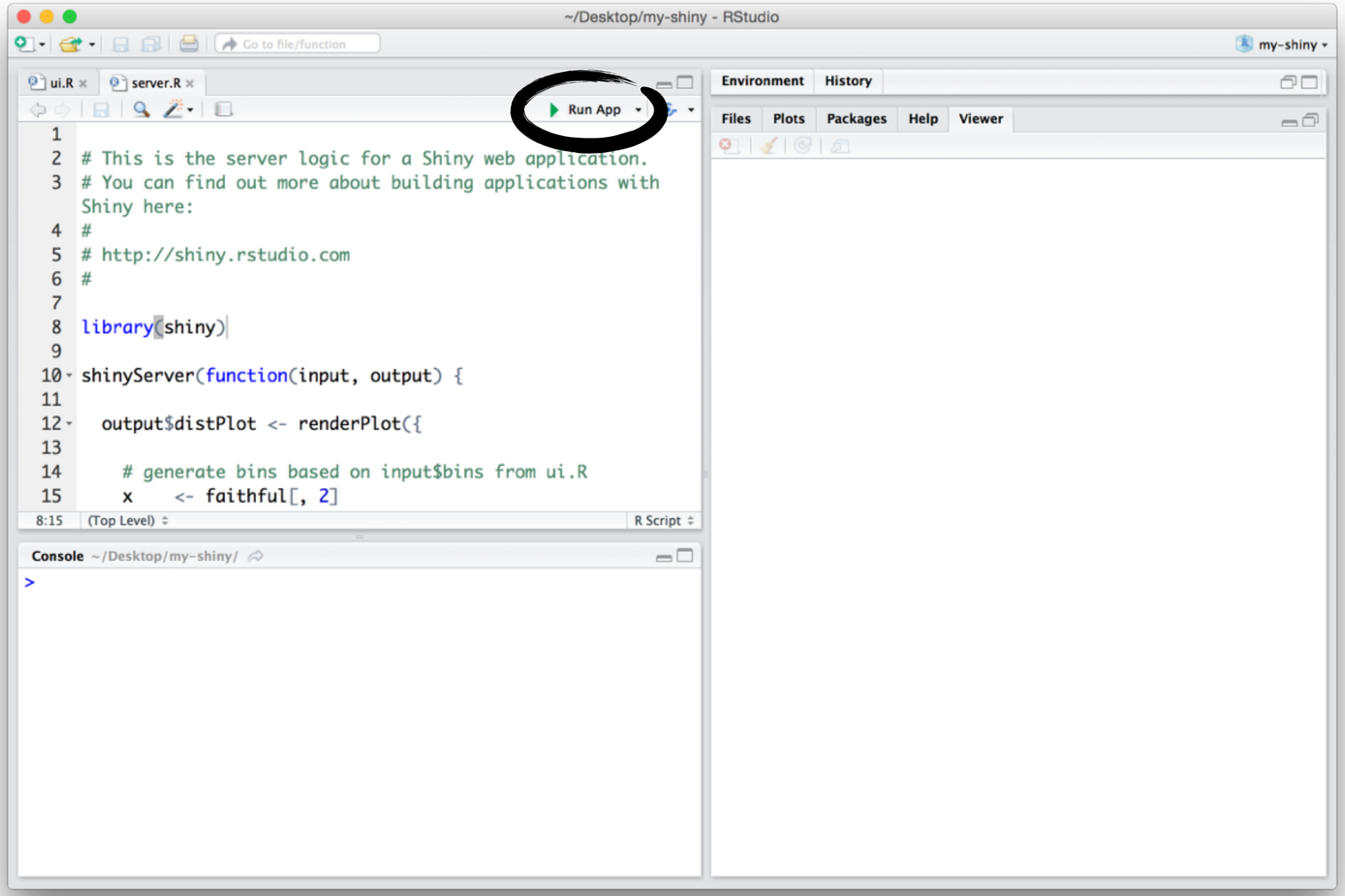
One directory with two files:

- server.R
- ui.R

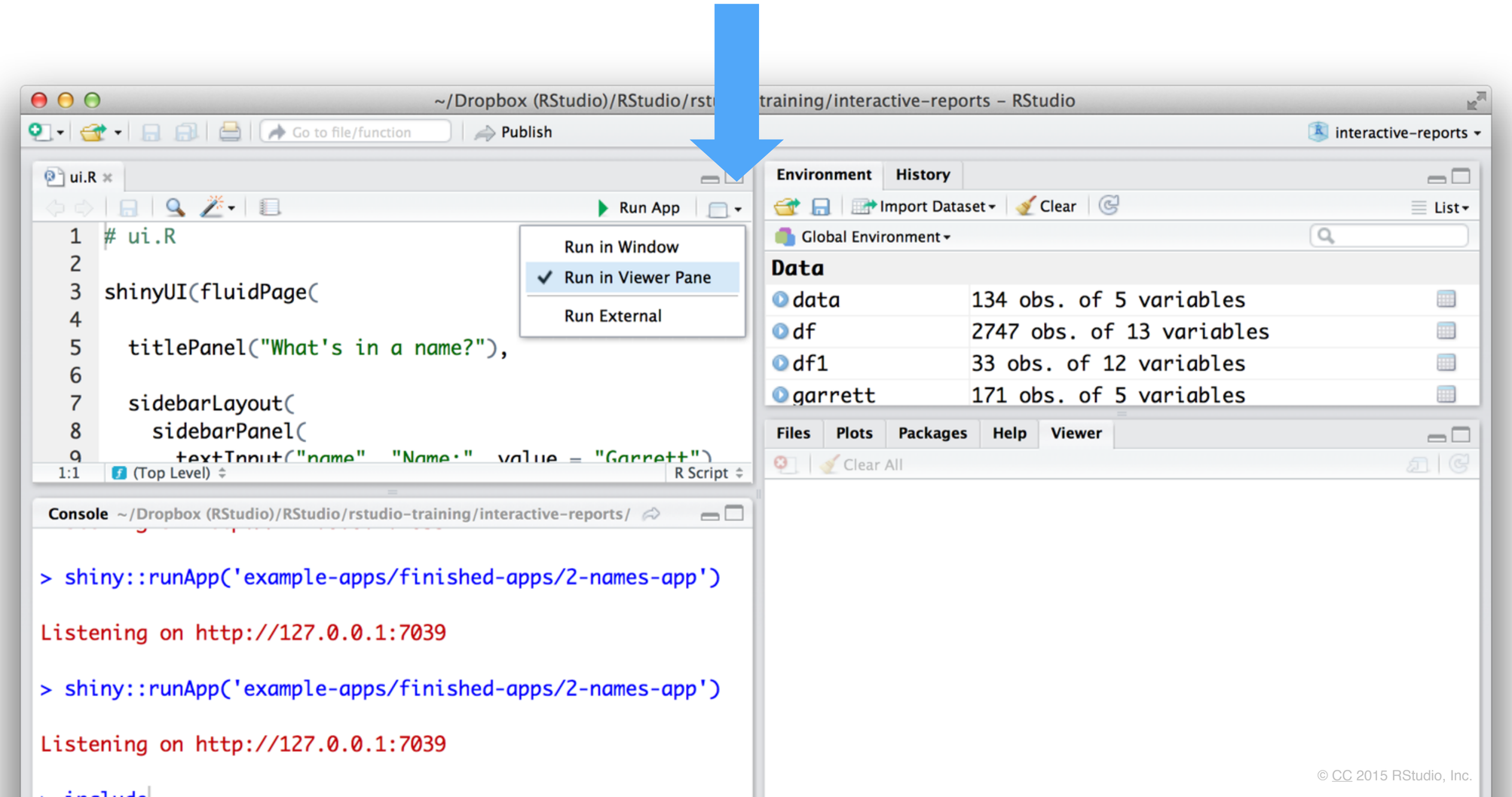


You must use these exact names

Launch an app



Display options

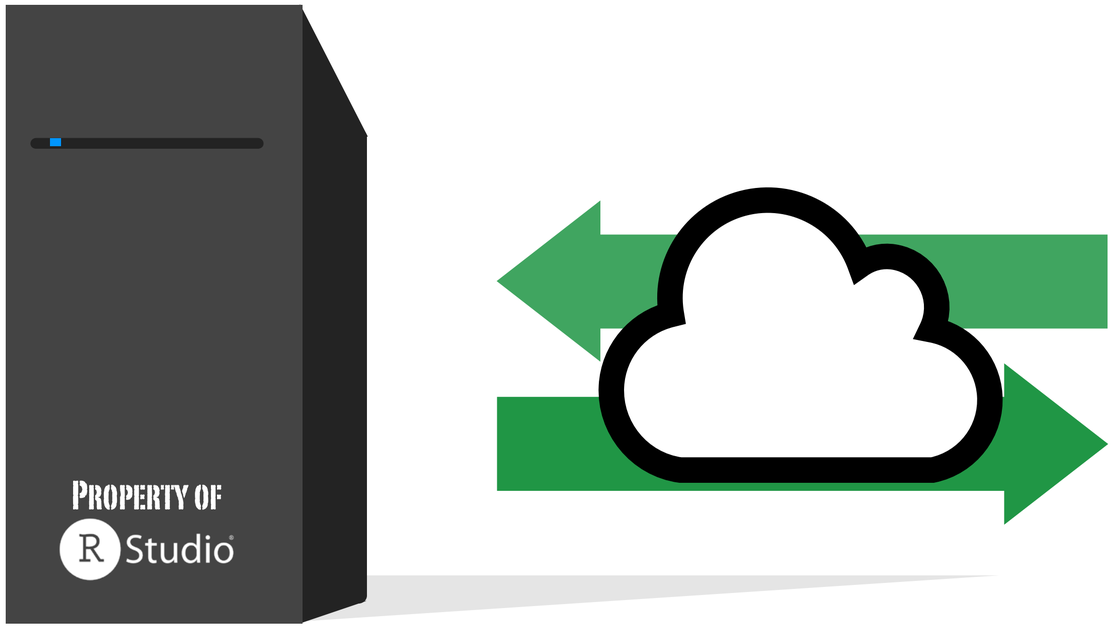


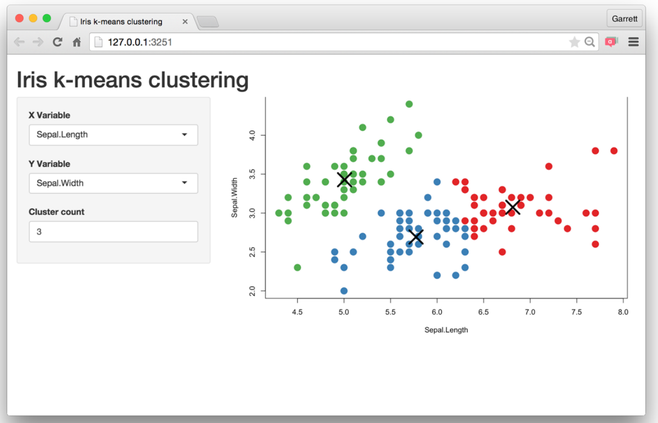
Use shinyapps.io

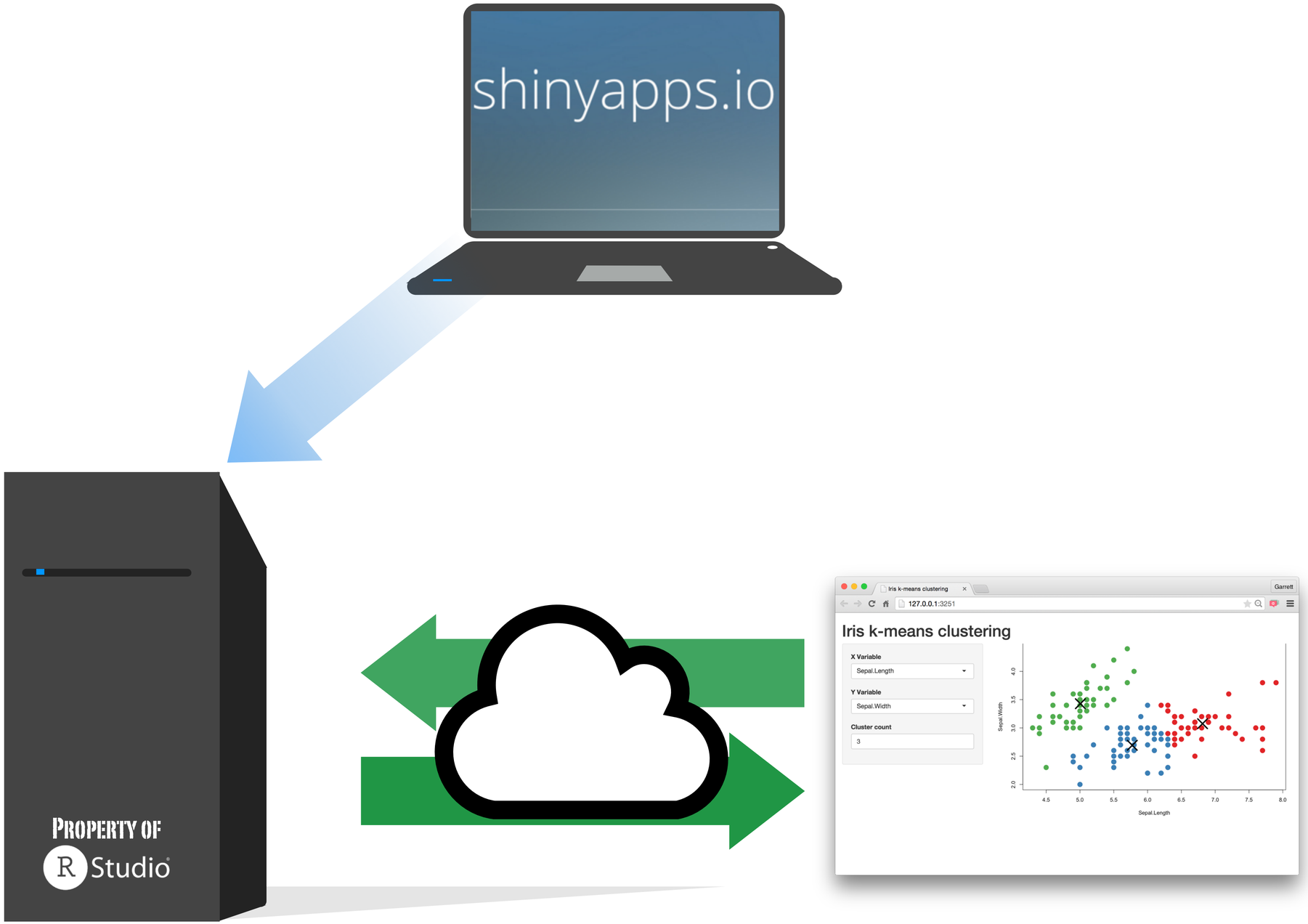
Shinyapps.io

A server maintained by RStudio

- free
- easy to use
- secure
- scalable

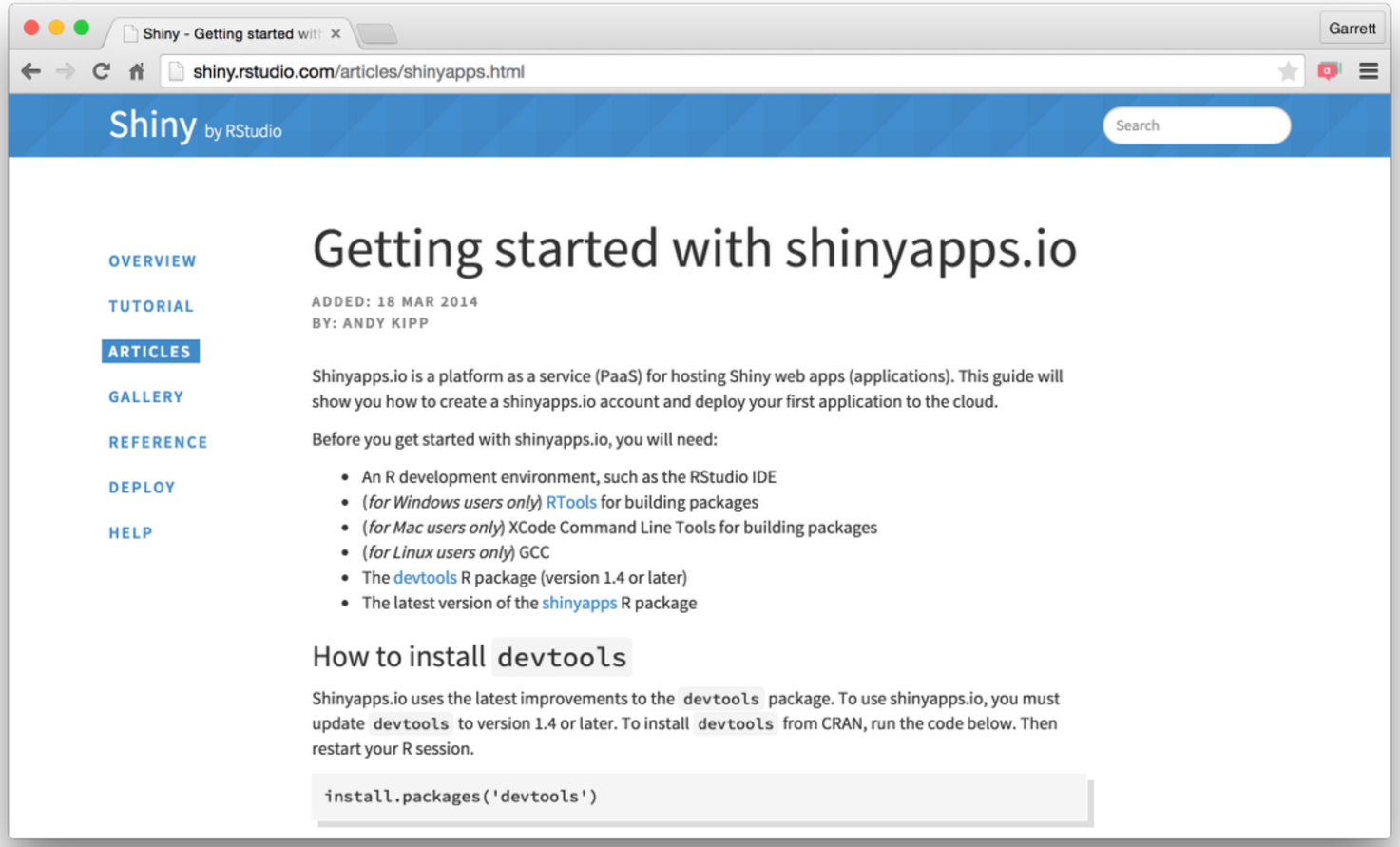






Getting started guide

shiny.rstudio.com/articles/shinyapps.html



FREE

$0 /month

New to Shiny? Deploy your applications to the cloud for FREE. Perfect for teachers and students or those who want a place to learn and play. No credit card required.

- **5** Applications
- **25** Active Hours
- Community Support
- RStudio Branding

BASIC

$39 /month

(or $440/year)

Take your users' experience to the next level. shinyapps.io Basic lets you scale your application performance by adding R processes dynamically as usage increases.

- **Unlimited** Applications
- **250** Active Hours
- Multiple Instances
- Email Support

STANDARD

$99 /month

(or $1,100/year)

Need password protection? shinyapps.io Standard lets you authenticate your application users.

- **Unlimited** Applications
- **1000** Active Hours
- Authentication
- Multiple Instances
- Email Support

PROFESSIONAL

$299 /month

(or $3,300/year)

shinyapps.io Professional has it all. Share an account with others in your business or change your shinyapps.io domain into a URL of your own.

- **Unlimited** Applications
- **5000** Active Hours
- Authentication
- Multiple Users
- Multiple Instances
- Custom Domains*
- Email Support

Build your own server

Shiny Server

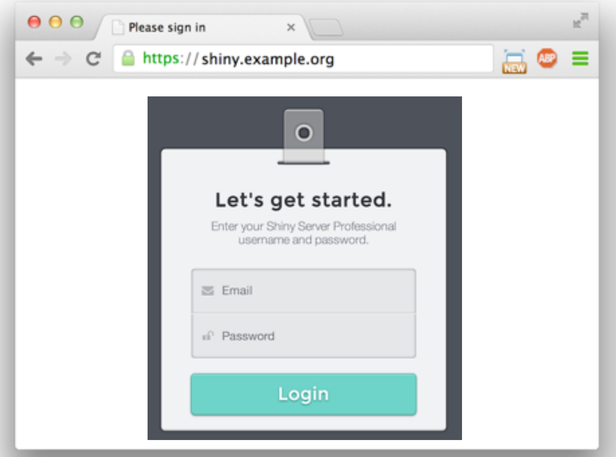
www.rstudio.com/products/shiny/shiny-server/

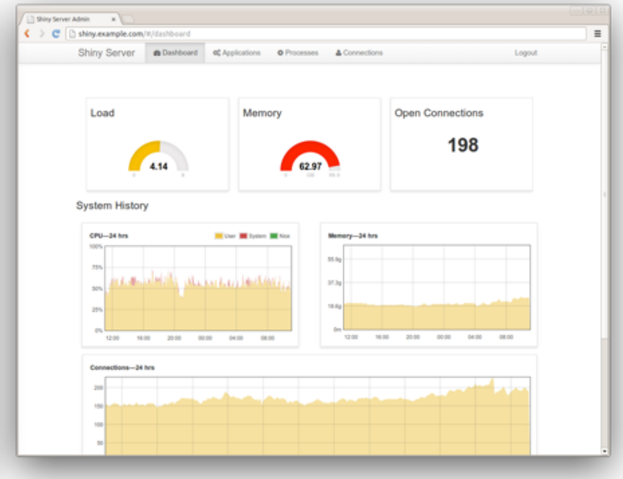
A back end program that builds a linux web server specifically designed to host Shiny apps.

Shiny Server **Pro**

www.rstudio.com/products/shiny/shiny-server/

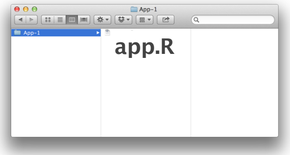
- **Secure access** - LDAP, GoogleAuth, SSL, and more
- **Performance** - fine tune at app and server level
- **Management** - monitor and control resource use
- **Support** - direct priority support





45 day evaluation free trial

Recap: Sharing



Save your app in its own directory as **app.R**, or **ui.R** and **server.R**

Host apps at **shinyapps.io** by:

1. Sign up for a free **shinyapps.io** account

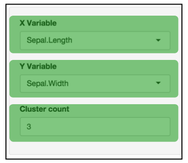
```
library(shinyapps)
```

2. Install the **`shinyapps`** package

Build your own server with **Shiny Server** or **Shiny Server Pro**

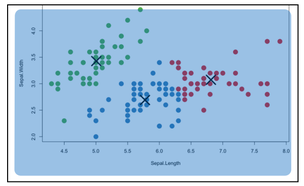
Learn more

You now how to



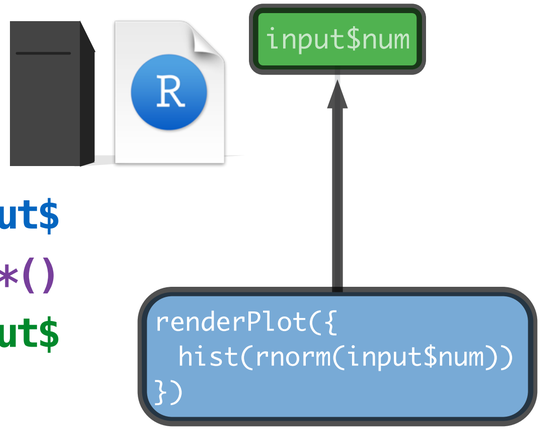
*Input()

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



*Output()

Build an app



Create interactions

Share your apps

How to start with Shiny

1. How to build a Shiny app (Today)

2. How to customize reactions (May 27)

3. How to customize appearance (June 3)

The Shiny Development Center

shiny.rstudio.com