Getting started with Shiny

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apps/goog-index/app.R

DEMO

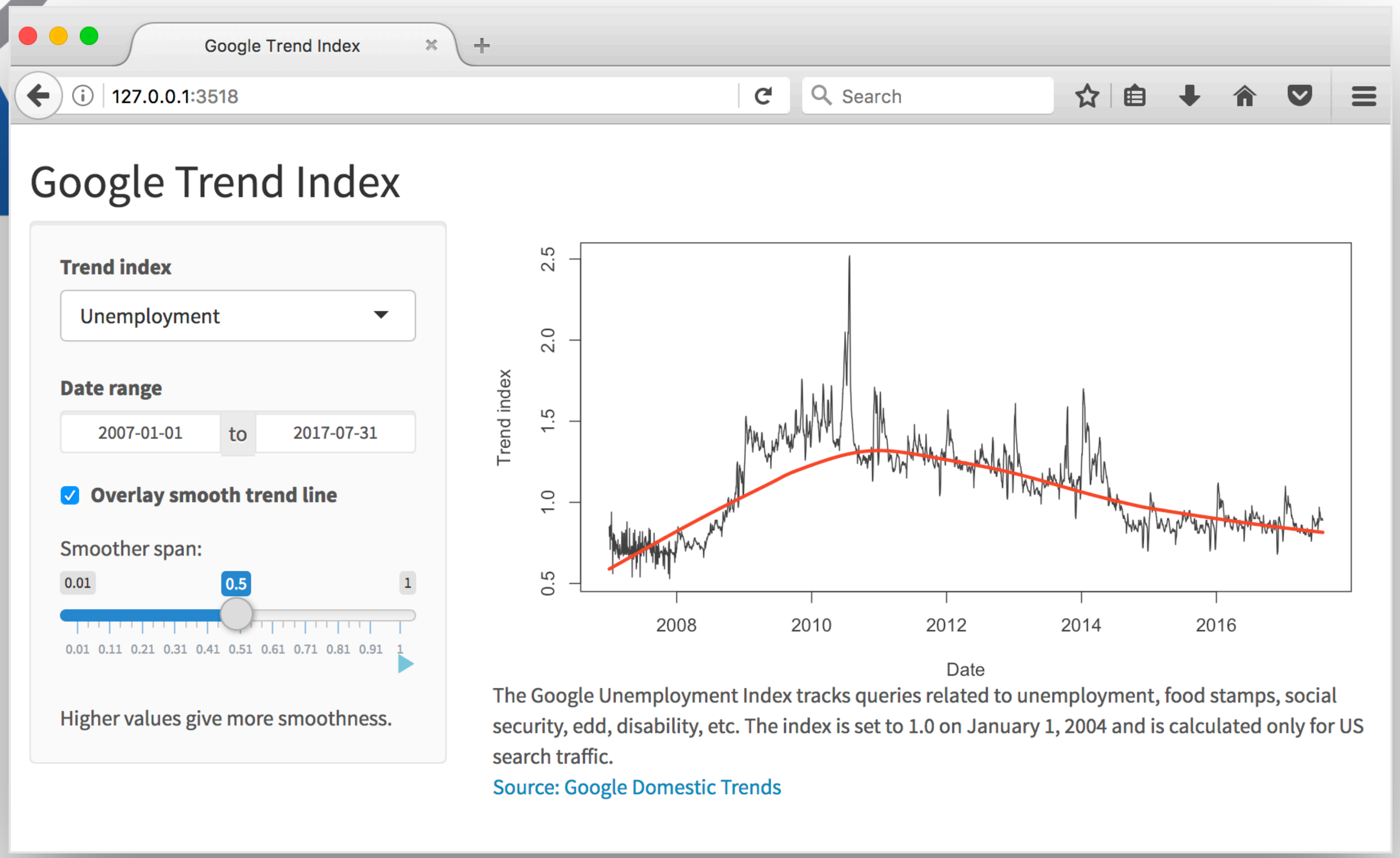
Your turn

- Open a new Shiny app with File ➔ New File ➔ Shiny Web App…
- Launch the app by opening app.R and clicking Run App
- Close the app by clicking the stop icon
- Select view mode in the drop down menu next to Run App

3m 00s

High level view

Every Shiny app has a webpage that the user visits, and behind this webpage there is a computer that serves this webpage by running R.



Google Trend Index

Trend index: Unemployment

Date range: 2007-01-01 to 2017-07-31

✓ Overlay smooth trend line

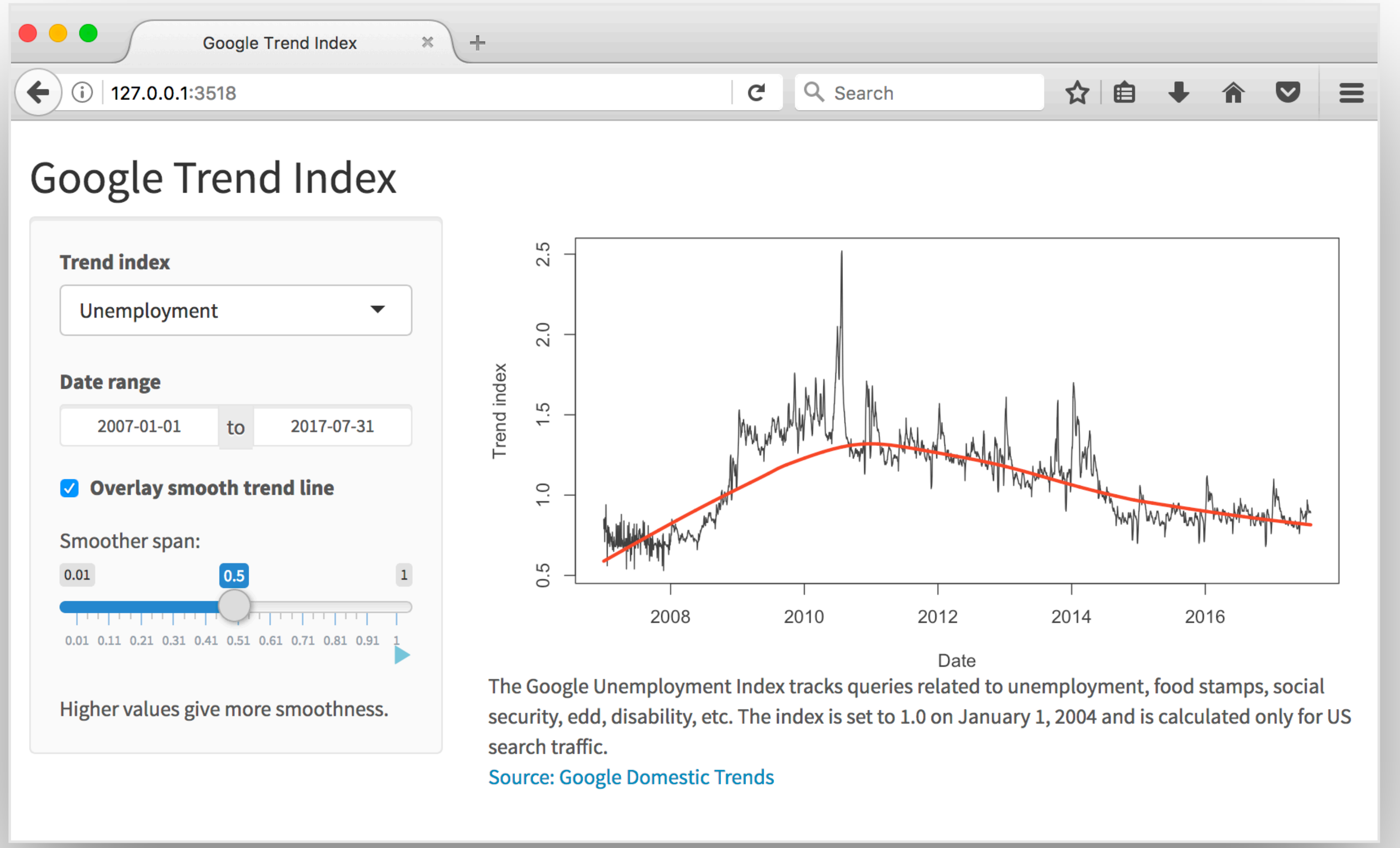
Smoother span: 0.5

Higher values give more smoothness.

The Google Unemployment Index tracks queries related to unemployment, food stamps, social security, edd, disability, etc. The index is set to 1.0 on January 1, 2004 and is calculated only for US search traffic.

Source: Google Domestic Trends

When running your app locally, the computer serving your app is your computer.



Google Trend Index

127.0.0.1:3518

Google Trend Index

Trend index

Unemployment

Date range

2007-01-01 to 2017-07-31

☑ **Overlay smooth trend line**

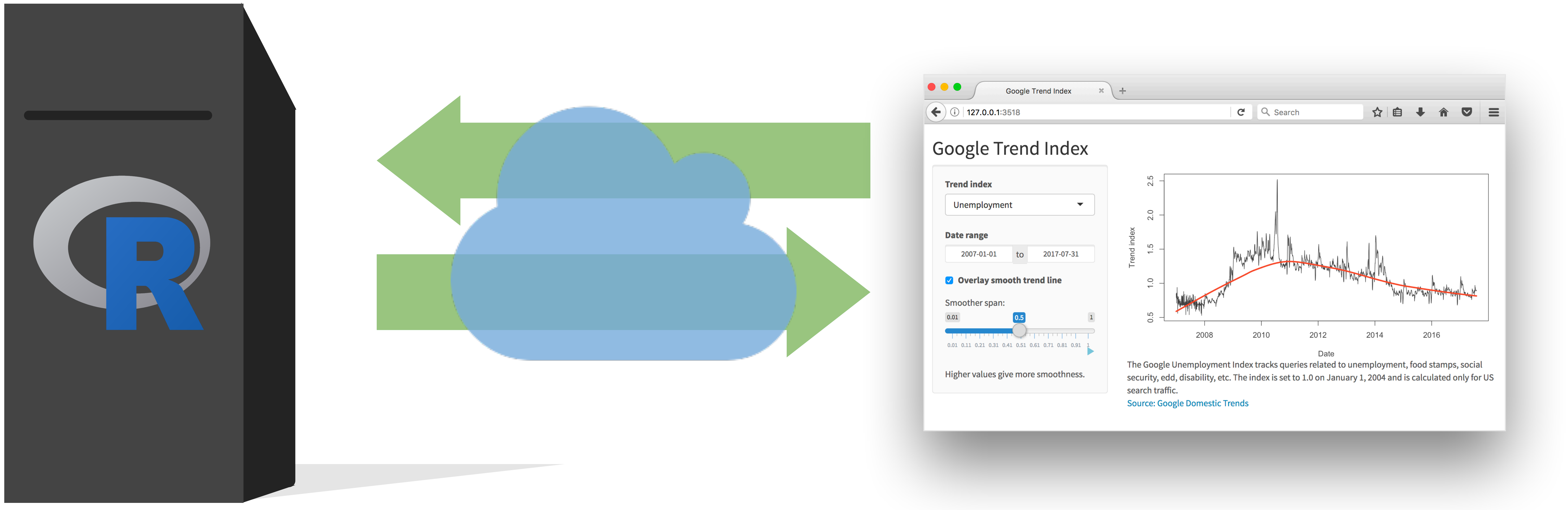
Smoother span: 0.5

Higher values give more smoothness.

The Google Unemployment Index tracks queries related to unemployment, food stamps, social security, edd, disability, etc. The index is set to 1.0 on January 1, 2004 and is calculated only for US search traffic.

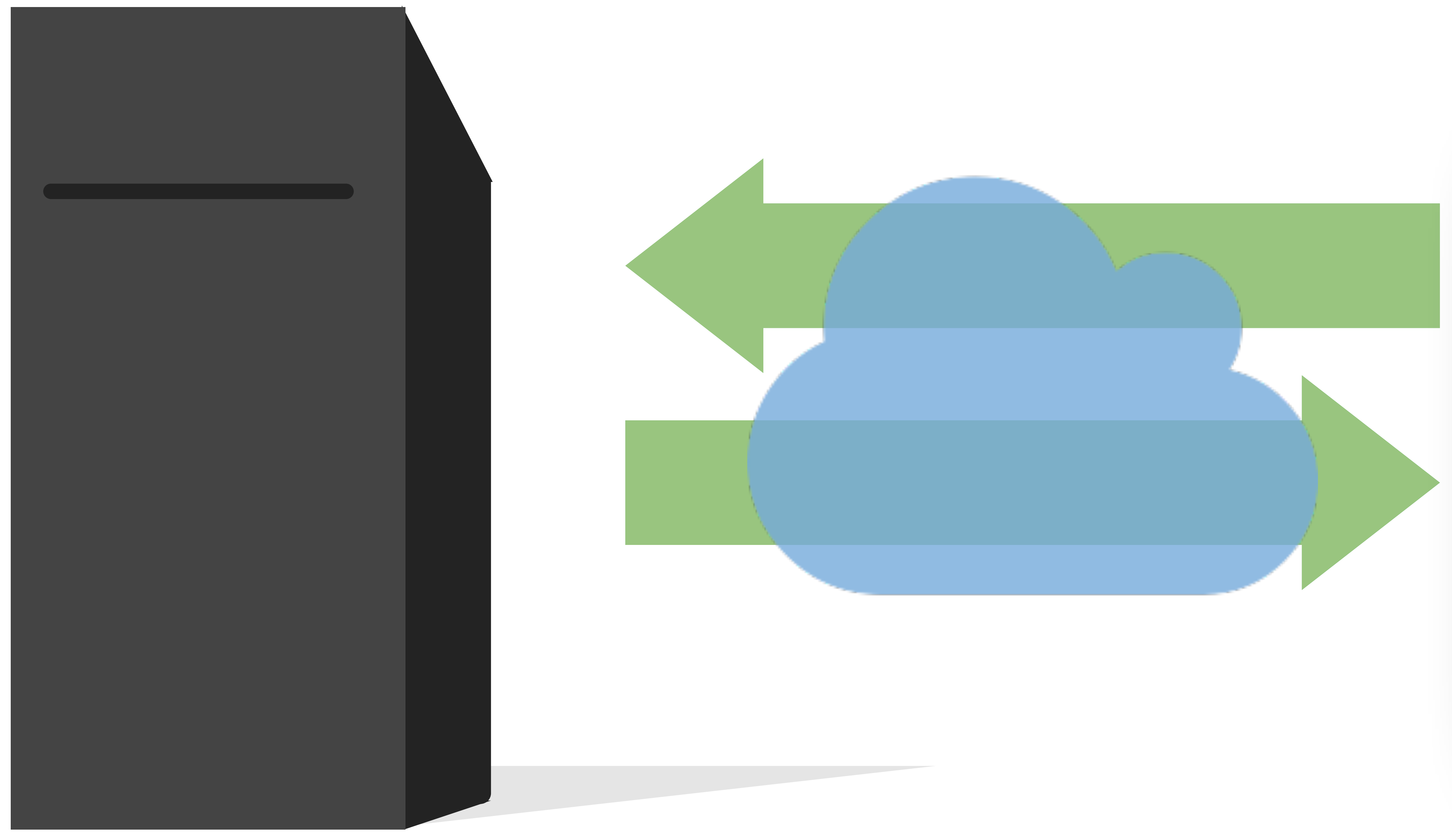
Source: Google Domestic Trends

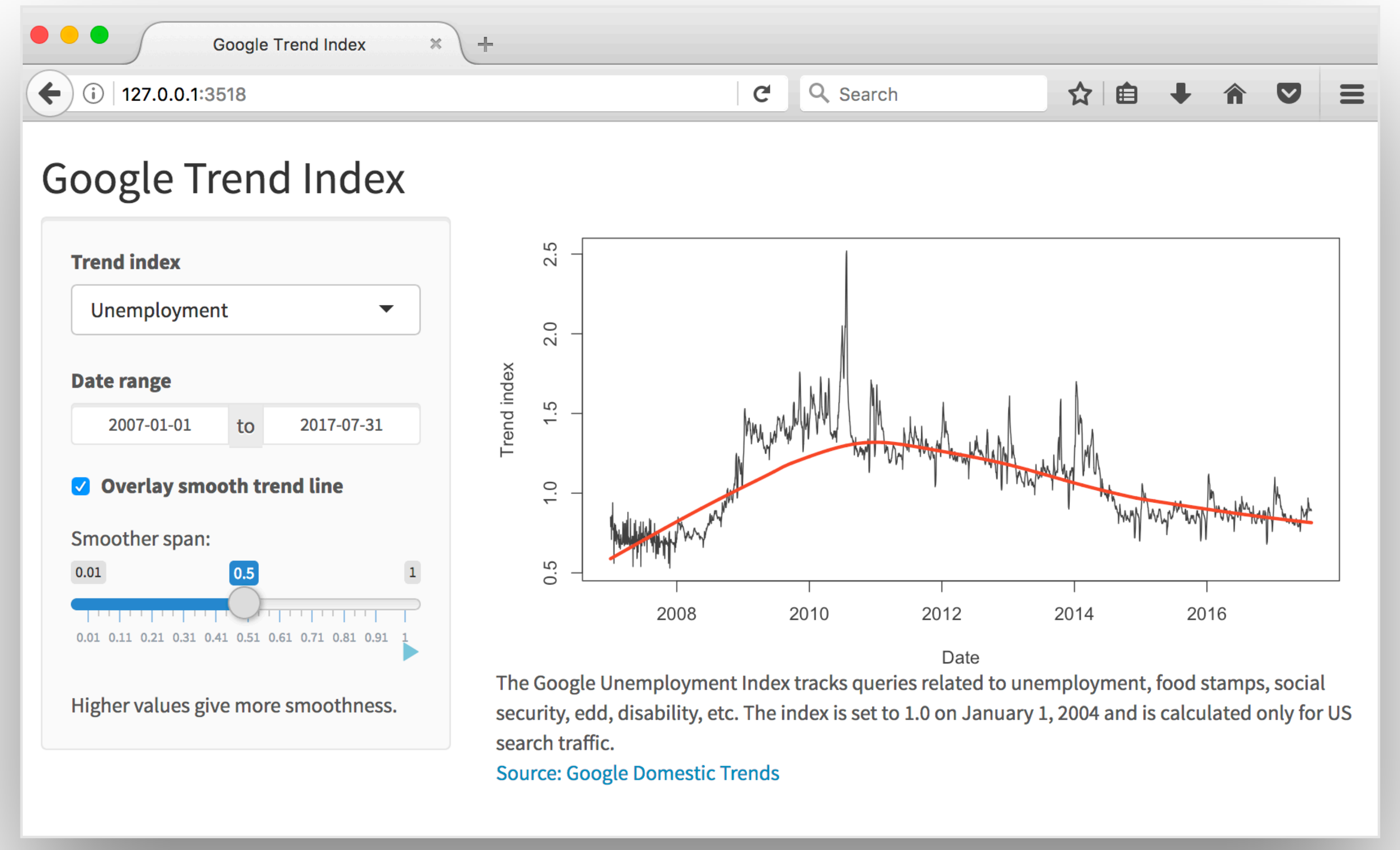
When your app is deployed, the computer serving your app is a web server.



The Google Unemployment Index tracks queries related to unemployment, food stamps, social security, edd, disability, etc. The index is set to 1.0 on January 1, 2004 and is calculated only for US search traffic.

Source: Google Domestic Trends




Google Trend Index

127.0.0.1:3518

Google Trend Index

Trend index

Unemployment

Date range

2007-01-01 to 2017-07-31

✓ **Overlay smooth trend line**

Smoother span:

0.01 0.5 1

Higher values give more smoothness.

The Google Unemployment Index tracks queries related to unemployment, food stamps, social security, edd, disability, etc. The index is set to 1.0 on January 1, 2004 and is calculated only for US search traffic.

Source: Google Domestic Trends

Server instructions

User interface

Anatomy of a Shiny app

What's in an app?

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


server <- function(input, output) {}


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

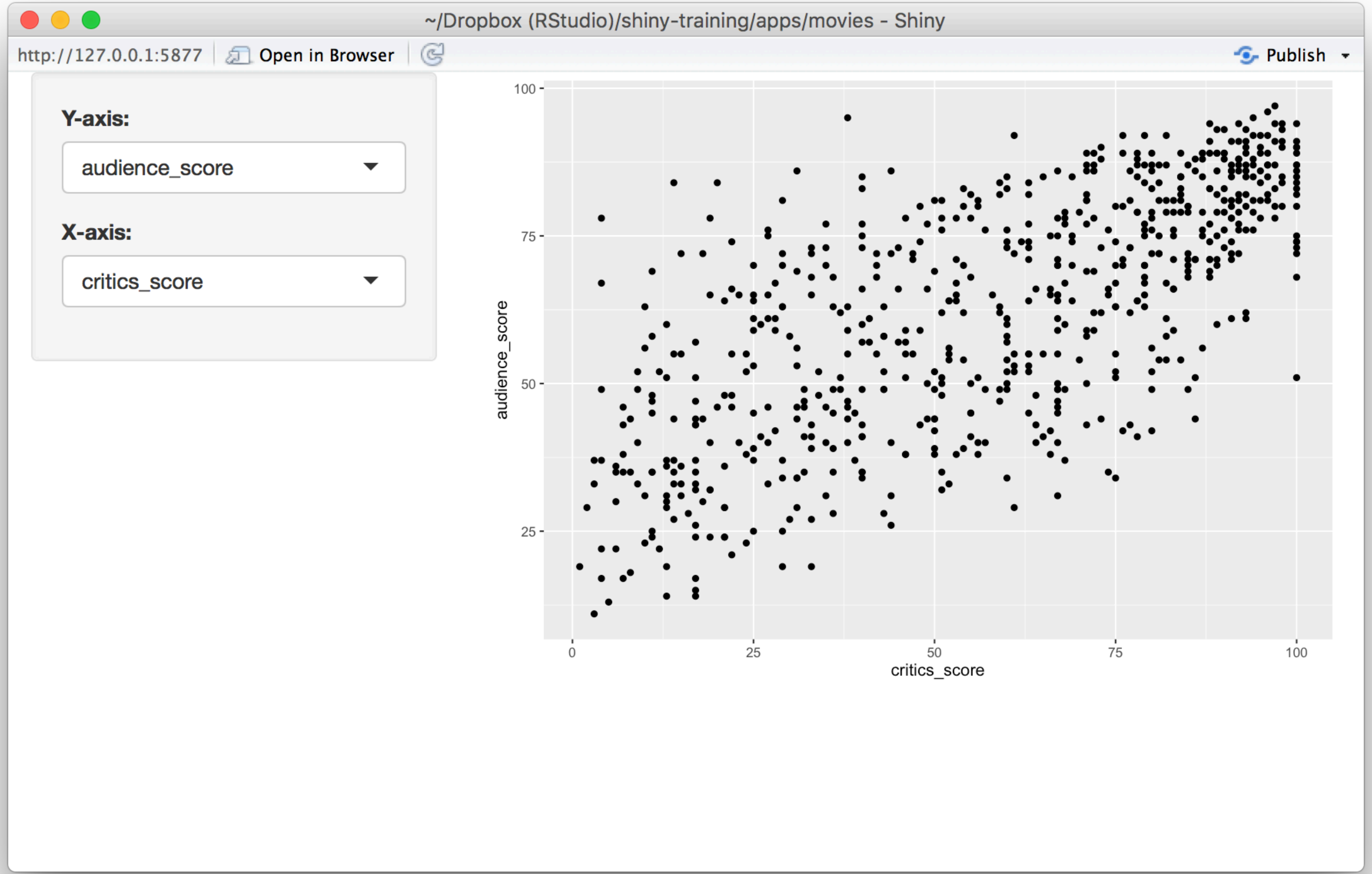
User interface
controls the layout and appearance of app

Server function
contains instructions needed to build app

Let's build a simple movie browser app!

data/movies.Rdata

Data from IMDB and Rotten Tomatoes on random sample of 651 movies released in the US between 1970 and 2014



Y-axis:

audience_score

X-axis:

critics_score

App template

```
library(tidyverse)
load("data/movies.Rdata")
ui <- fluidPage()


server <- function(input, output) {}


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

Dataset used for this app

User interface

```
# Define UI
ui <- fluidPage(

  # Sidebar layout with a input and output definitions
  sidebarLayout(
    # Inputs: Select variables to plot
    sidebarPanel(
      # Select variable for y-axis
      selectInput(inputId = "y", label = "Y-axis:",
                  choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
                  selected = "audience_score"),
      # Select variable for x-axis
      selectInput(inputId = "x", label = "X-axis:",
                  choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
                  selected = "critics_score")
    ),

    # Output: Show scatterplot
    mainPanel(
      plotOutput(outputId = "scatterplot")
    )
  )
)
```

```
# Define UI
ui <- fluidPage(

 # Sidebar layout with a input and output definitions
 sidebarLayout(
  # Inputs: Select variables to plot
  sidebarPanel(
   # Select variable for y-axis
   selectInput(inputId = "y", label = "Y-axis:",
               choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
               selected = "audience_score"),
   # Select variable for x-axis
   selectInput(inputId = "x", label = "X-axis:",
               choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
               selected = "critics_score")
  ),

  # Output: Show scatterplot
  mainPanel(
   plotOutput(outputId = "scatterplot")
  )
 )
)
```

Create fluid page layout

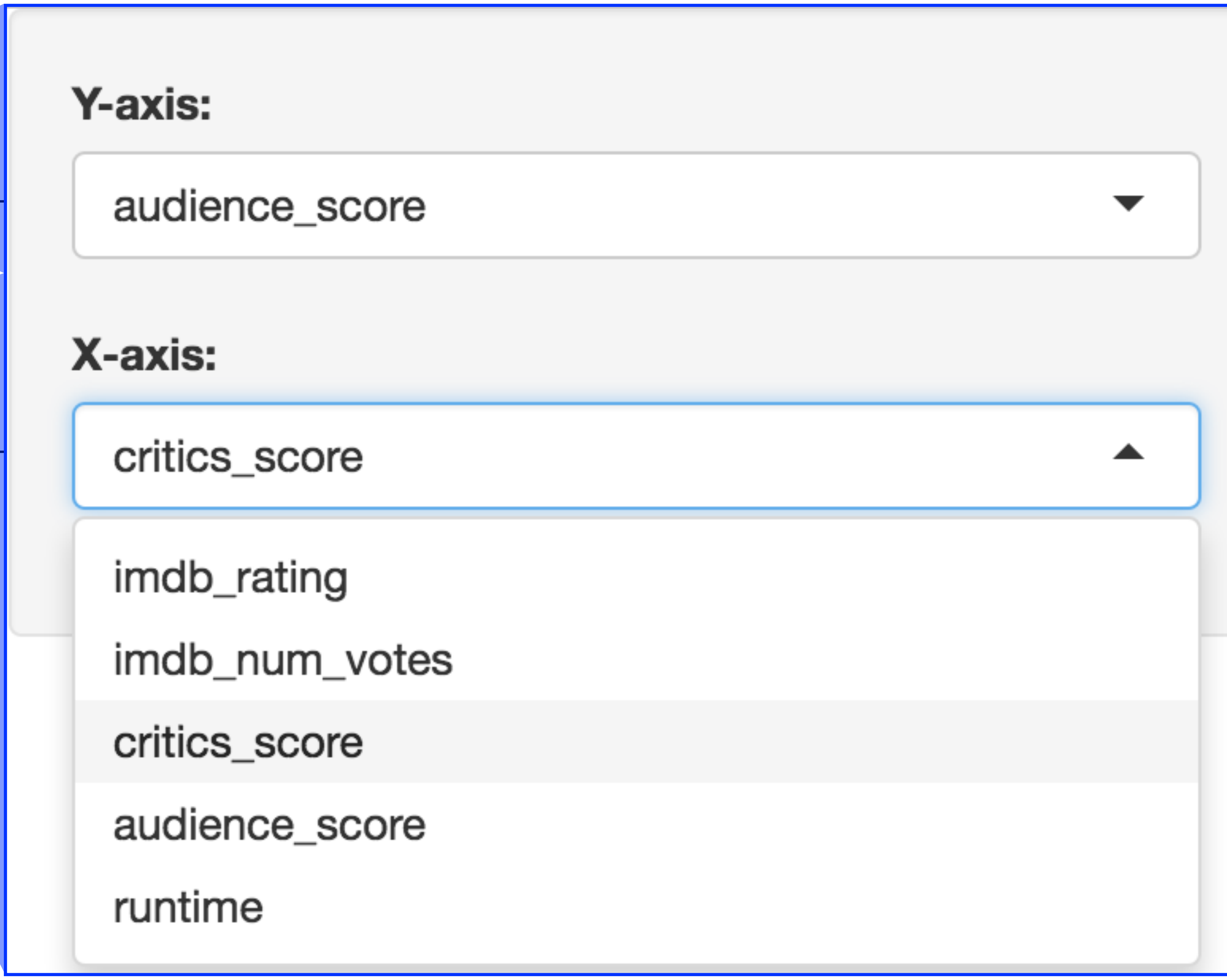
```
# Define UI
ui <- fluidPage(

 # Sidebar layout with a input and output definitions
 sidebarLayout(
  # Inputs: Select variables to plot
  sidebarPanel(
    # Select variable for y-axis
    selectInput(inputId = "y", label = "Y-axis:",
                choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
                selected = "audience_score"),
    # Select variable for x-axis
    selectInput(inputId = "x", label = "X-axis:",
                choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
                selected = "critics_score")
  ),

  # Output: Show scatterplot
  mainPanel(
    plotOutput(outputId = "scatterplot")
  )
 )
)
```

Create a layout with a sidebar and main area

```
# Define UI
ui <- fluidPage(

 # Sidebar layout with a input and output definitions
 sidebarLayout(
  # Inputs: Select variables to plot
  sidebarPanel(
   # Select variable for y-axis
   selectInput(inputId = "y", label = "Y-axis:",
               choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
               selected = "audience_score"),
   # Select variable for x-axis
   selectInput(inputId = "x", label = "X-axis:",
               choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
               selected = "critics_score")
  ),

  # Output: Show scatterplot
  mainPanel(
   plotOutput(outputId = "scatterplot")
  )
 )
)
```

Create a sidebar panel containing **input** controls that can in turn be passed to sidebarLayout

```
# Define UI
ui <- fluidPage(

  # Sidebar layout with a input and output definitions
  sidebarLayout(
    # Inputs: Select variables to plot
    sidebarPanel(
      # Select variable for y-axis
      selectInput(inputId = "y", label = "Y-axis:",
            choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience
            selected = "audience_score"),
      # Select variable for x-axis
      selectInput(inputId = "x", label = "X-axis:",
            choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience
            selected = "critics_score")
    ),

    # Output: Show scatterplot
    mainPanel(
      plotOutput(outputId = "scatterplot")
    )
  )
)
```



```r
# Define UI
ui <- fluidPage(

  # Sidebar layout with a input and output definitions
  sidebarLayout(
    # Inputs: Select variables to plot
    sidebarPanel(
      # Select variable for y-axis
      selectInput(inputId = "y", label = "Y-axis:",
                  choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
                  selected = "audience_score"),
      # Select variable for x-axis
      selectInput(inputId = "x", label = "X-axis:",
                  choices = c("imdb_rating", "imdb_num_votes", "critics_score", "audience_score", "runtime"),
                  selected = "critics_score")
    ),

    # Output: Show scatterplot
    mainPanel(
      plotOutput(outputId = "scatterplot")
    )
  )
)
```

Create a main panel containing **output** elements that get created in the server function can in turn be passed to sidebarLayout

Server

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

  # Create the scatterplot object the plotOutput function is expecting
  output$scatterplot <- renderPlot({
    ggplot(data = movies, aes_string(x = input$x, y = input$y)) +
      geom_point()
  })
}
```

```
# Define server function
server <- function(input, output, session) {

  # Create the scatterplot object the plotOutput function is expecting
  output$scatterplot <- renderPlot({
    ggplot(data = movies, aes_string(x = input$x, y = input$y)) +
      geom_point()
  })
}
```

Contains instructions needed to build app

```
# Define server function required to create the scatterplot
server <- function(input, output, session) {

  # Create the scatterplot object the plotOutput fun
  output$scatterplot <- renderPlot({
    ggplot(data = movies, aes_string(x = input$x, y
      geom_point()
  })
}
```

Renders a **reactive** plot that is suitable for assigning to an output slot

```
# Define server function
server <- function(input, output, session) {

  # Create the scatterplot object the plotOutput function is expecting
  output$scatterplot <- renderPlot({
    ggplot(data = movies, aes_string(x = input$x, y = input$y)) +
      geom_point()
  })
}
```

Good ol' ggplot2 code, with **input**s from UI

UI + Server

```r
# Create the Shiny app object
shinyApp(ui = ui, server = server)
```

Putting it all together…

apps/movies/movies-01.R

DEMO

Your turn

- Add new select menu to color the points by
  - inputId = "z"
  - label = "Color by:"
  - choices = c("title_type", "genre", "mpaa_rating", "critics_rating", "audience_rating")
  - selected = "mpaa_rating"
- Use this variable in the aesthetics of the ggplot function as the color argument to color the points by
- Run the app in the Viewer Pane
- Compare your code / output with the person sitting next to / nearby you

5m 00s

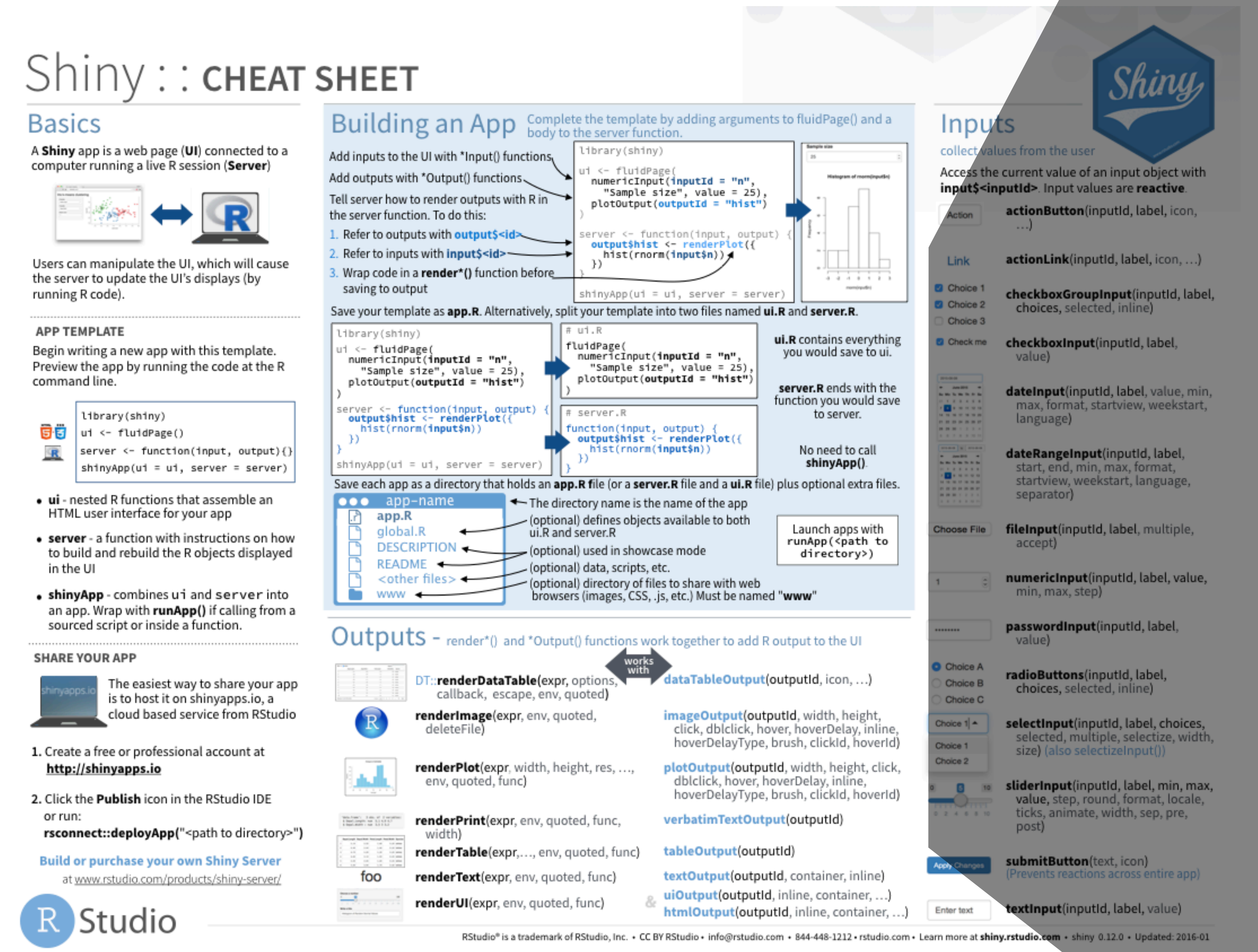
Solution to the previous exercise

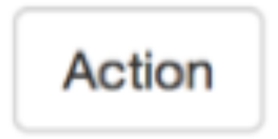
apps/movies/movies-02.R

✓

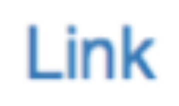
SOLUTION

Inputs

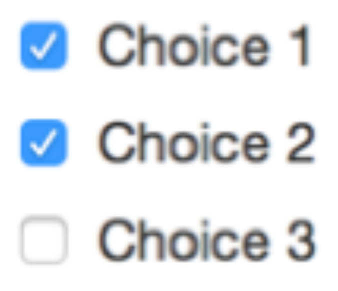




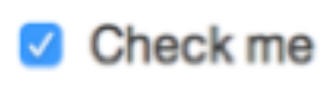
actionButton(inputId, label, icon, …**)**



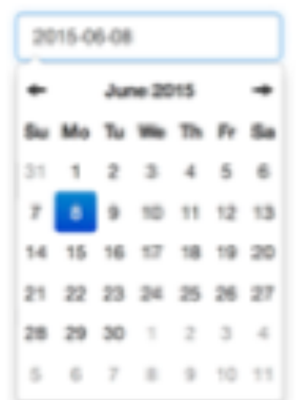
actionLink(inputId, label, icon, …**)**



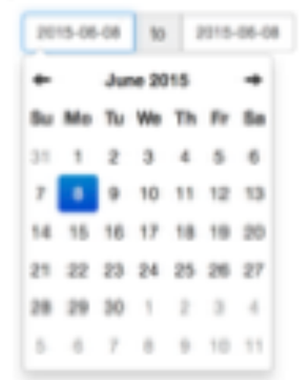
checkboxGroupInput(inputId, label, choices, selected, inline**)**



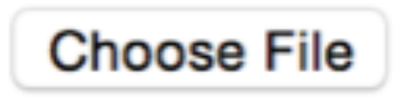
checkboxInput(inputId, label, value**)**



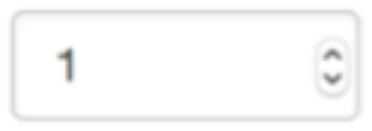
dateInput(inputId, label, value, min, max, format, startview, weekstart, language**)**



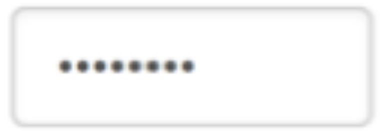
dateRangeInput(inputId, label, start, end, min, max, format, startview, weekstart, language, separator**)**



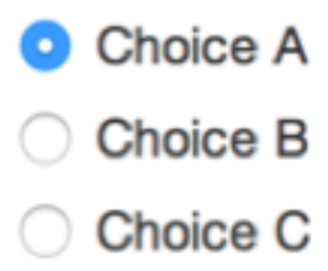
fileInput(inputId, label, multiple, accept**)**



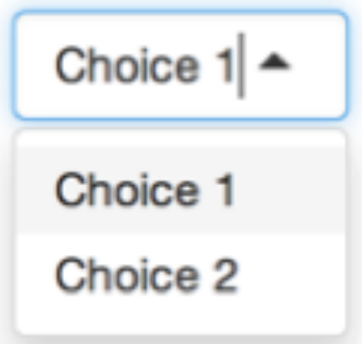
numericInput(inputId, label, value, min, max, step**)**



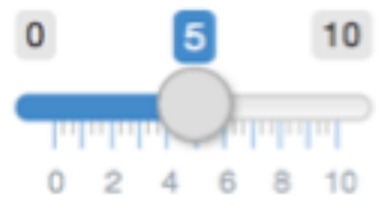
passwordInput(inputId, label, value**)**



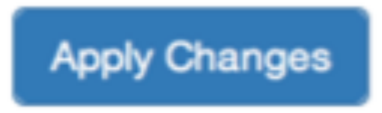
radioButtons(inputId, label, choices, selected, inline**)**



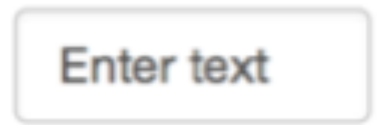
selectInput(inputId, label, choices, selected, multiple, selectize, width, size**)** (also **selectizeInput()**)



sliderInput(inputId, label, min, max, value, step, round, format, locale, ticks, animate, width, sep, pre, post**)**



submitButton(text, icon**)**
(Prevents reactions across entire app)



textInput(inputId, label, value**)**

Your turn

- Add new input variable to control the alpha level of the points
  - This should be a sliderInput
    - See shiny.rstudio.com/reference/shiny/latest/ for help
  - Values should range from 0 to 1
  - Set a default value that looks good
- Use this variable in the geom of the ggplot function as the alpha argument
- Run the app in a new window
- Compare your code / output with the person sitting next to / nearby you

5m 00s

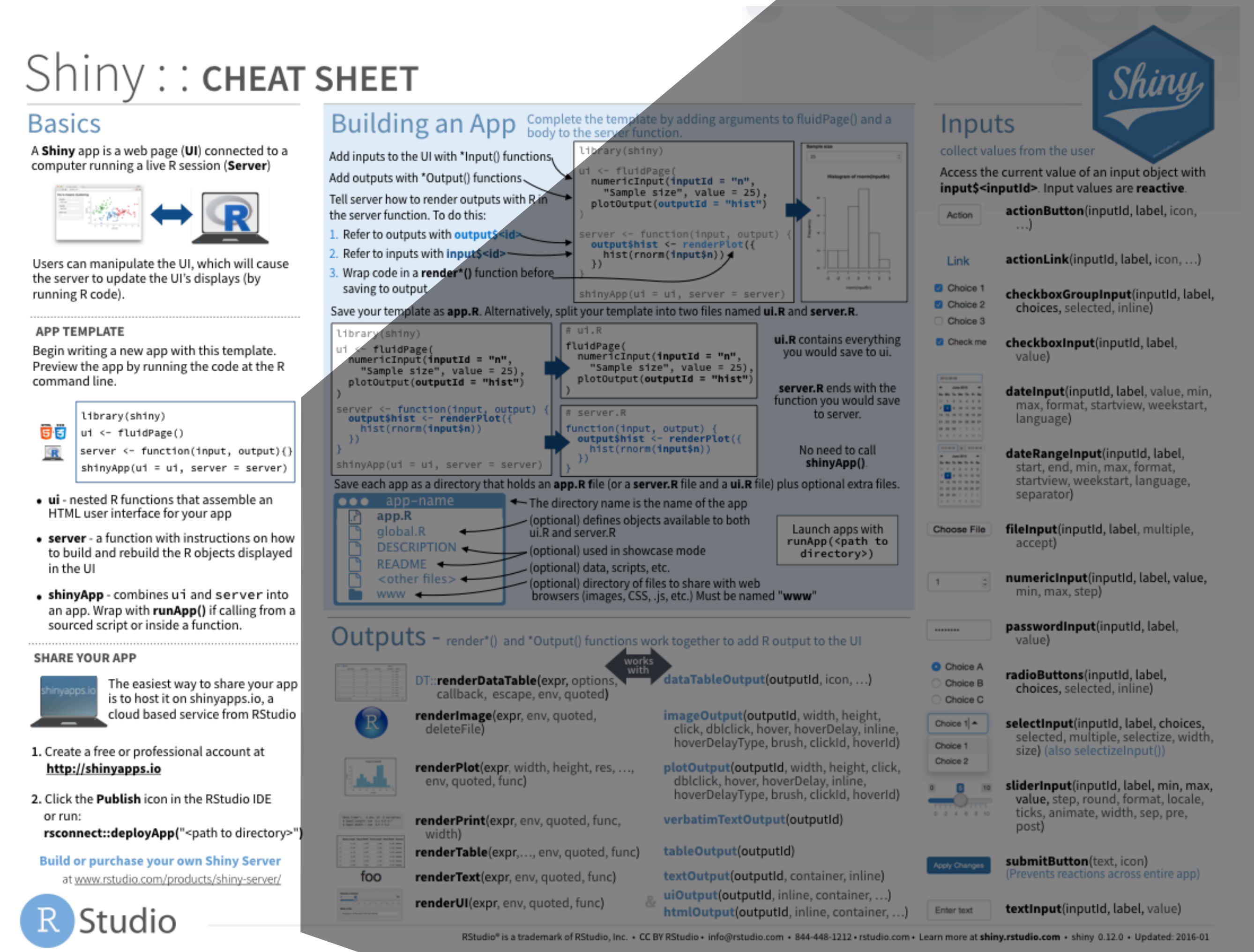
Solution to the previous exercise

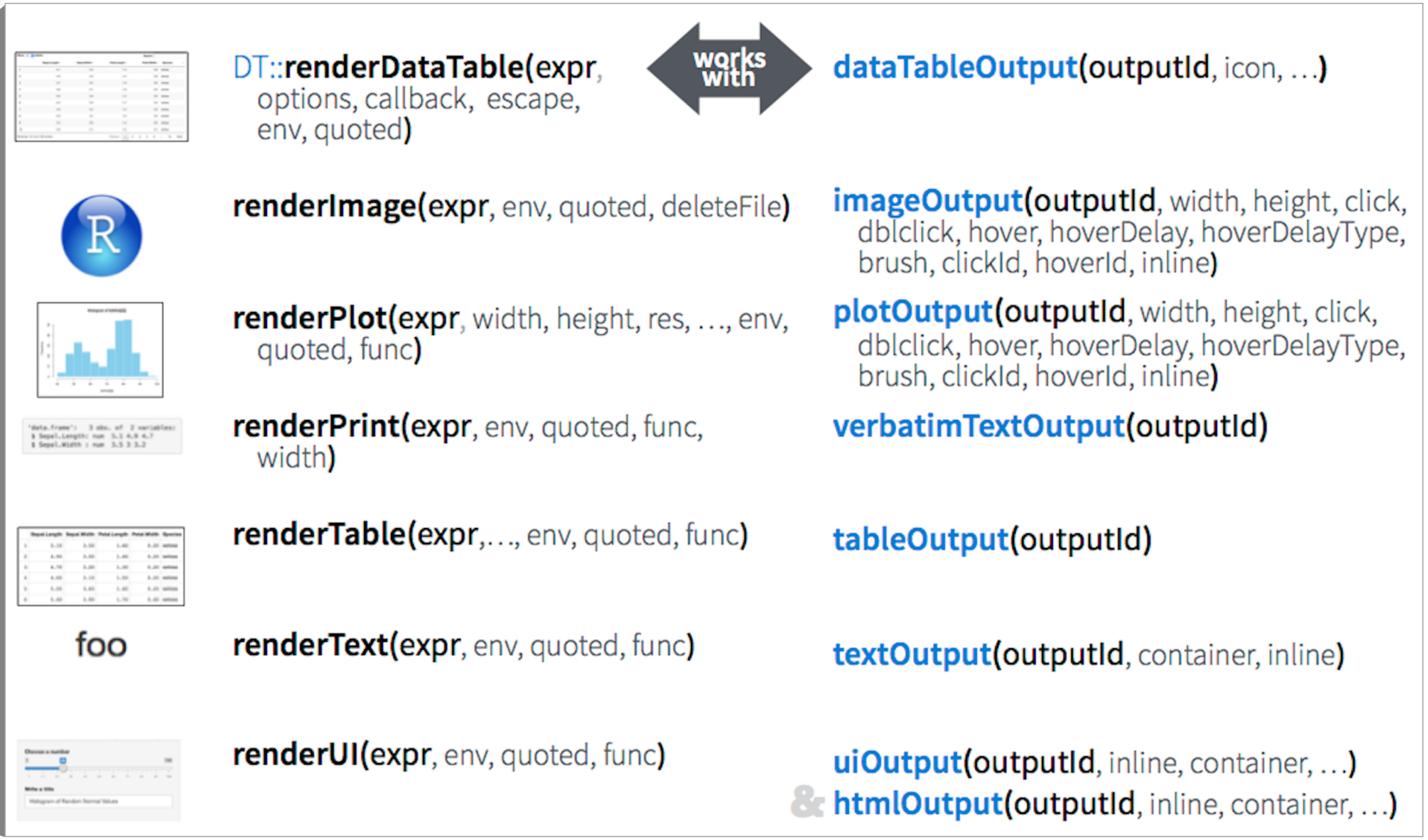
apps/movies/movies-03.R

✓

SOLUTION

Outputs





	DT::**renderDataTable**(**expr**, options, callback, escape, env, quoted)	works with	**dataTableOutput**(**outputId**, icon, …)
	renderImage(**expr**, env, quoted, deleteFile)		**imageOutput**(**outputId**, width, height, click, dblclick, hover, hoverDelay, hoverDelayType, brush, clickId, hoverId, inline)
	renderPlot(**expr**, width, height, res, …, env, quoted, func)		**plotOutput**(**outputId**, width, height, click, dblclick, hover, hoverDelay, hoverDelayType, brush, clickId, hoverId, inline)
	renderPrint(**expr**, env, quoted, func, width)		**verbatimTextOutput**(**outputId**)
	renderTable(**expr**,…, env, quoted, func)		**tableOutput**(**outputId**)
foo	**renderText**(**expr**, env, quoted, func)		**textOutput**(**outputId**, container, inline)
	renderUI(**expr**, env, quoted, func)		**uiOutput**(**outputId**, inline, container, …) & **htmlOutput**(**outputId**, inline, container, …)

Your turn

- Create a new output item using DT::renderDataTable.
- Show first seven columns of movies data, show 10 rows at a time, and hide row names, e.g.
  - data = movies[, 1:7]
  - options = list(pageLength = 10)
  - rownames = FALSE
- Add a DT::dataTableOutput to the main panel
- Run the app in a new Window
- Compare your code / output with the person sitting next to / nearby you
- **Stretch goal:** Make the number of columns visible in the table a user defined input

5m 00s

Solution to the previous exercise

apps/movies/movies-04.R

✓

SOLUTION

Your turn

- Add a title to your app with titlePanel, which goes before the sidebarLayout
- Prettify the variable names shown as input choices. Hint:
  - choices = c("IMDB rating" = "imdb_rating", …)
- Prettify the axis and legend labels of your plot. Hint: You might use
  - str_replace_all from the stringr package
  - toTitleCase from the tools package

10m 00s

Solution to the previous exercise

apps/movies/movies-05.R

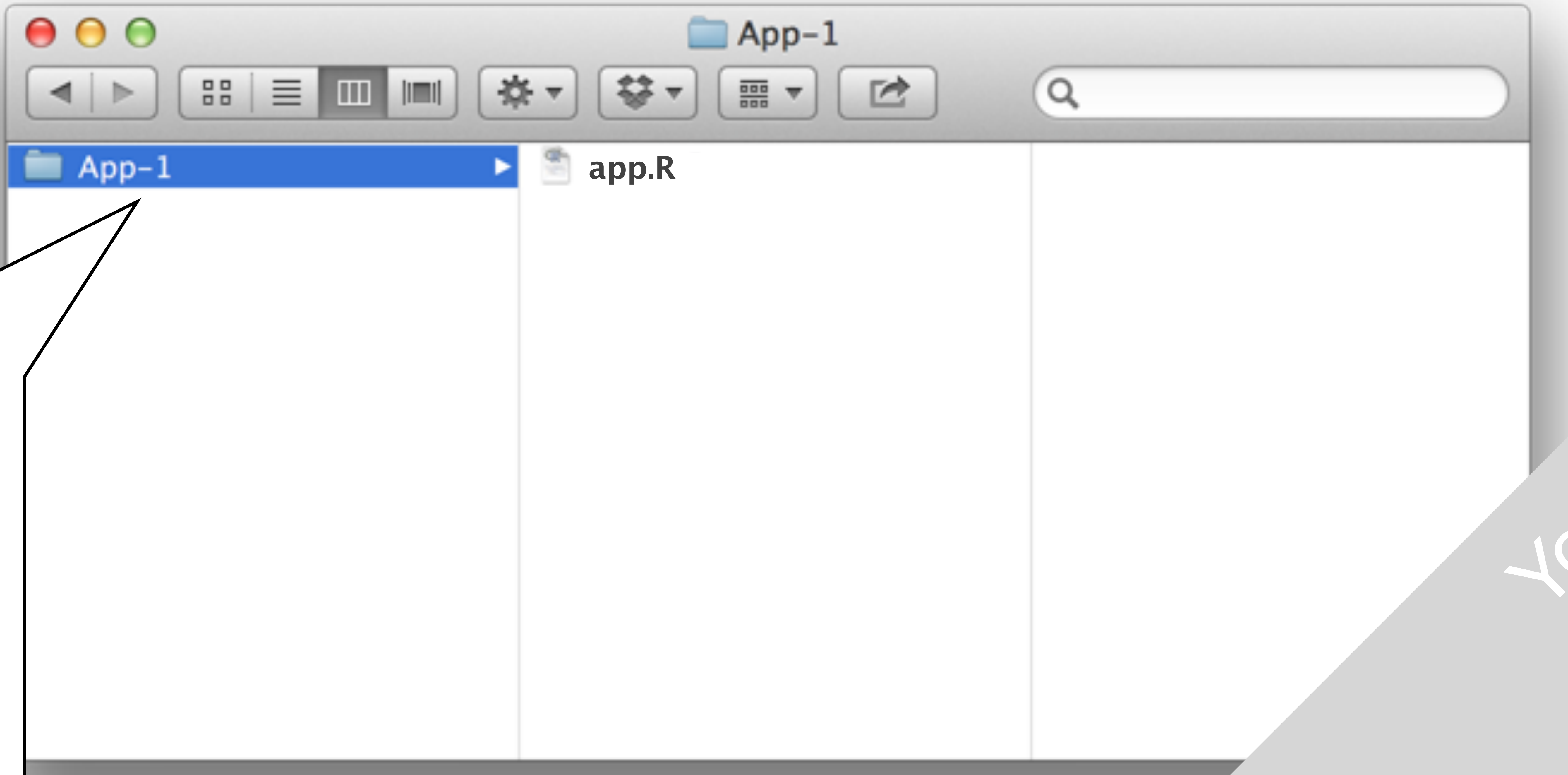
✓

SOLUTION

Source file structure

Single file

- 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.

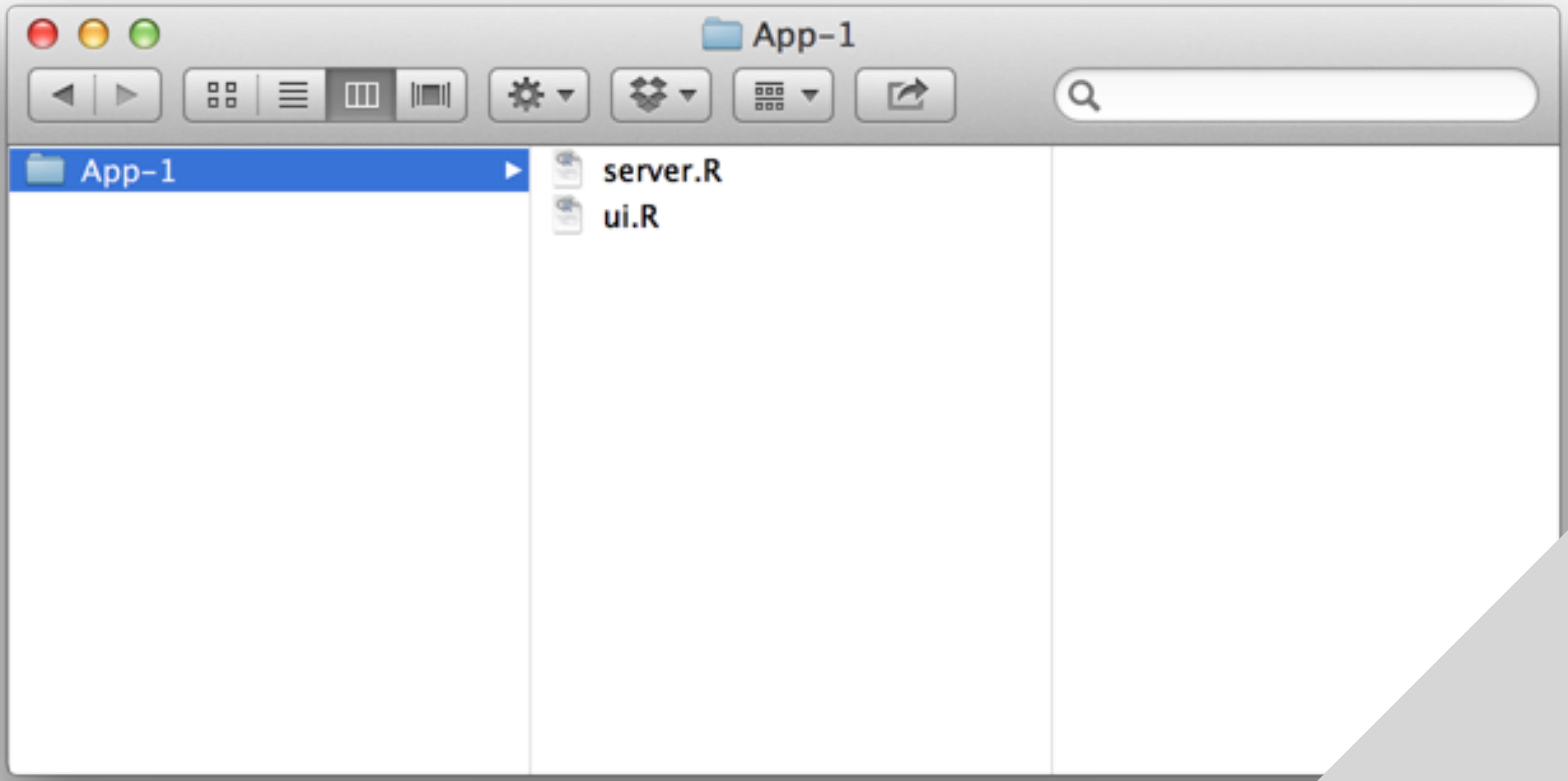


We will focus on the single file format throughout the workshop

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

Multiple files

- One directory with every file the app needs:
  - ui.R and server.R
  - datasets, images, css, helper scripts, etc.



You must use these exact names

Deploying your app

shinyapps.io

- A server maintained by RStudio
- Easy to use, secure, and scalable
- Built-in metrics
- Free tier available

Shiny Server

- Free and open source
- Deploy Shiny apps to the internet
- Run on-premises: move computation closer to the data
- Host multiple apps on one server
- Deploy inside the firewall

Shiny Server Pro / RStudio Connect

- Secure access and authentication
- Performance: fine tune at app and server level
- Management: monitor and control resource use
- Direct priority support

Your turn

- Create a folder called movies
- Move any one of the movies app R scripts you worked on into this folder, and rename it as app.R
- Also copy the movies.Rdata file into this folder. (For deployment, all needed files must be in the app's folder.)
- Run the app
- Go to shinyapps.io and create a free account. Follow the instructions and deploy

10m 00s