

Interactive Web Apps with shiny Cheat Sheet

learn more at shiny.rstudio.com



Basics

A **Shiny** app is a web page (**UI**) connected to a computer running a live R session (**Server**)



Users can manipulate the UI, which will cause the server to update the UI's displays (by running R code).

App template

Begin writing a new app with this template. Preview the app by running the code at the R command line.

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

- **ui** - nested R functions that assemble an HTML user interface for your app
- **server** - a function with instructions on how to build and rebuild the R objects displayed in the UI
- **shinyApp** - combines **ui** and **server** into a functioning app. Wrap with **runApp()** if calling from a sourced script or inside a function.

Share your app

The easiest way to share your app is to host it on shinyapps.io, a cloud based service from RStudio

1. Create a free or professional account at <http://shinyapps.io>
2. Click the **Publish** icon in the RStudio IDE (≥ 0.99) or run:


```
rsconnect::deployApp("<path to directory>")
```

Build or purchase your own Shiny Server

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

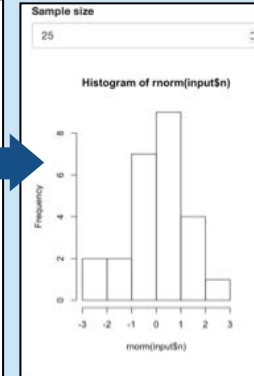


Building an App - Complete the template by adding arguments to fluidPage() and a body to the server function.

Add inputs to the UI with ***Input()** functions
 Add outputs with ***Output()** functions
 Tell server how to render outputs with R in the server function. To do this:

1. Refer to outputs with **output\$<id>**
2. Refer to inputs with **input\$<id>**
3. Wrap code in a **render*()** function before saving to output

```
library(shiny)
ui <- fluidPage(
  numericInput(inputId = "n",
    "Sample size", value = 25),
  plotOutput(outputId = "hist")
)
server <- function(input, output) {
  output$hist <- renderPlot({
    hist(rnorm(input$n))
  })
}
shinyApp(ui = ui, server = server)
```



Save your template as **app.R**. Alternatively, split your template into two files named **ui.R** and **server.R**.

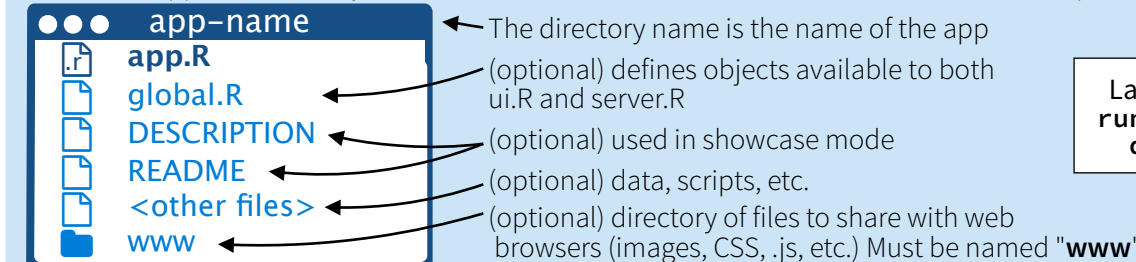
```
library(shiny)
ui <- fluidPage(
  numericInput(inputId = "n",
    "Sample size", value = 25),
  plotOutput(outputId = "hist")
)
server <- function(input, output) {
  output$hist <- renderPlot({
    hist(rnorm(input$n))
  })
}
shinyApp(ui = ui, server = server)
```

ui.R contains everything you would save to ui.

server.R ends with the function you would save to server.

No need to call **shinyApp()**.

Save each app as a directory that contains an **app.R** file (or a **server.R** file and a **ui.R** file) plus optional extra files.



Launch apps with **runApp(<path to directory>)**

Outputs - render*() and *Output() functions work together to add R output to the UI

	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)
	renderText (expr, env, quoted, func)		textOutput (outputId, container, inline)
	renderUI (expr, env, quoted, func)		uiOutput (outputId, inline, container, ...) & htmlOutput (outputId, inline, container, ...)

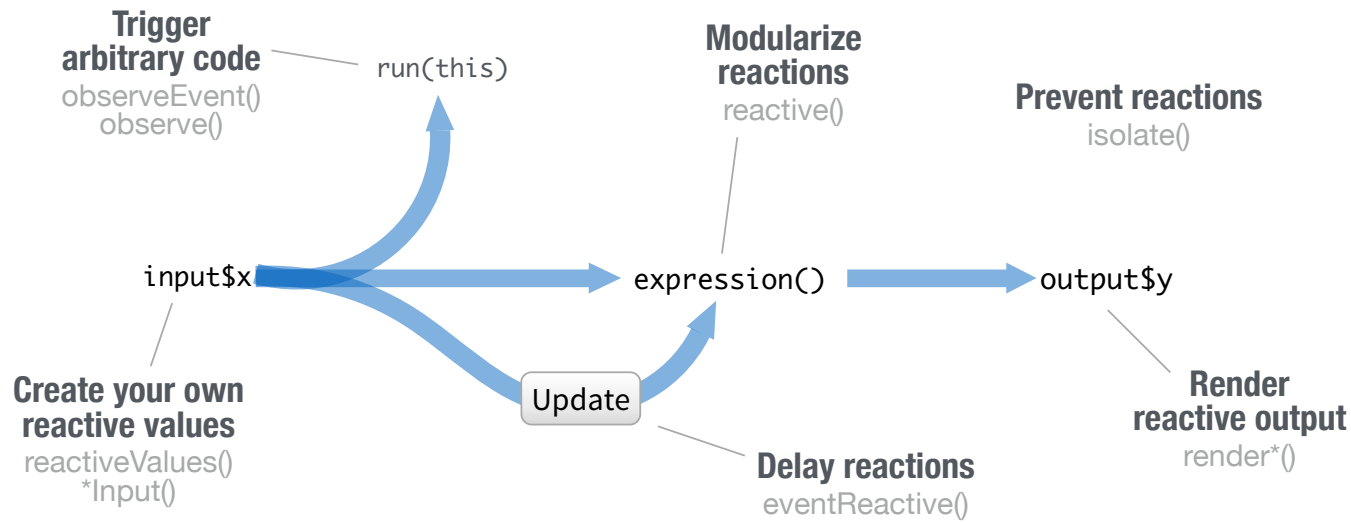
Inputs - collect values from the user

Access the current value of an input object with **input\$<inputId>**. Input values are **reactive**.

	actionButton (inputId, label, icon, ...)
	actionLink (inputId, label, icon, ...)
<input checked="" type="checkbox"/> Choice 1 <input checked="" type="checkbox"/> Choice 2 <input type="checkbox"/> Choice 3	checkboxGroupInput (inputId, label, choices, selected, inline)
<input checked="" type="checkbox"/> Check me	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)
<input type="text" value="1"/>	numericInput (inputId, label, value, min, max, step)
<input type="password" value="*****"/>	passwordInput (inputId, label, value)
<input checked="" type="radio"/> Choice A <input type="radio"/> Choice B <input type="radio"/> Choice C	radioButtons (inputId, label, choices, selected, inline)
<input type="text" value="Choice 1"/>	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)
<input type="text" value="Enter text"/>	textInput (inputId, label, value)

Reactivity

Reactive values work together with reactive functions. Call a reactive value from within the arguments of one of these functions to avoid the error **Operation not allowed without an active reactive context**.



Create your own reactive values

```
library(shiny)

ui <- fluidPage(
  textInput("a", "")
)

server <-
function(input, output){
  rv <- reactiveValues()
  rv$number <- 5
}

shinyApp(ui, server)
```

***Input() functions**
(see front page)

reactiveValues(...)

Each input function creates a reactive value stored as `input$<inputId>`

reactiveValues() creates a list of reactive values whose values you can set.

Render reactive output

```
library(shiny)

ui <- fluidPage(
  textInput("a", "")
)

server <-
function(input, output){
  output$b <-
  renderText({
    input$a
  })
}

shinyApp(ui, server)
```

render*() functions
(see front page)

Builds an object to display. Will rerun code in body to rebuild the object whenever a reactive value in the code changes.

Save the results to `output$<outputId>`

Prevent reactions

```
library(shiny)

ui <- fluidPage(
  textInput("a", ""),
  textOutput("b")
)

server <-
function(input, output){
  output$b <-
  renderText({
    isolate({input$a})
  })
}

shinyApp(ui, server)
```

isolate(expr)

Runs a code block. Returns a **non-reactive** copy of the results.

Trigger arbitrary code

```
library(shiny)

ui <- fluidPage(
  textInput("a", ""),
  actionButton("go", "")
)

server <-
function(input, output){
  observeEvent(input$go,
    print(input$a)
  )
}

shinyApp(ui, server)
```

observeEvent(eventExpr, handlerExpr, event.env, event.quoted, handler.env, handler.quoted, label, suspended, priority, domain, autoDestroy, ignoreNULL)

Runs code in 2nd argument when reactive values in 1st argument change. See **observe()** for alternative.

Modularize reactions

```
library(shiny)

ui <- fluidPage(
  textInput("a", ""),
  textInput("z", "")
)

server <-
function(input, output){
  re <- reactive({
    paste(input$a, input$b)
  })
  output$b <- renderText({
    re()
  })
}

shinyApp(ui, server)
```

reactive(x, env, quoted, label, domain)

Creates a **reactive expression** that

- caches its value to reduce computation
- can be called by other code
- notifies its dependencies when it has been invalidated

Call the expression with function syntax, e.g. `re()`

Delay reactions

```
library(shiny)

ui <- fluidPage(
  textInput("a", ""),
  actionButton("go", "")
)

server <-
function(input, output){
  re <- eventReactive(
    input$go, {input$a}
  )
  output$b <- renderText({
    re()
  })
}

shinyApp(ui, server)
```

eventReactive(eventExpr, valueExpr, event.env, event.quoted, value.env, value.quoted, label, domain, ignoreNULL)

Creates reactive expression with code in 2nd argument that only invalidates when reactive values in 1st argument change.

UI

An app's UI is an HTML document. Use Shiny's functions to assemble this HTML with R.

```
fluidPage(
  textInput("a", "")
)
## <div class="container-fluid">
## <div class="form-group shiny-input-container">
## <label for="a"></label>
## <input id="a" type="text"
##   class="form-control" value="" />
## </div>
## </div>
```

HTML Add static HTML elements with **tags**, a list of functions that parallel common HTML tags, e.g. **tags\$a()**. Unnamed arguments will be passed into the tag; named arguments will become tag attributes.

tags\$a	tags\$data	tags\$h6	tags\$nav	tags\$span
tags\$abbr	tags\$datalist	tags\$head	tags\$noscript	tags\$strong
tags\$address	tags\$dd	tags\$header	tags\$object	tags\$style
tags\$area	tags\$del	tags\$hgroup	tags\$ol	tags\$sub
tags\$article	tags\$details	tags\$hr	tags\$optgroup	tags\$summary
tags\$aside	tags\$dfn	tags\$HTML	tags\$option	tags\$sup
tags\$audio	tags\$div	tags\$i	tags\$output	tags\$table
tags\$b	tags\$d	tags\$iframe	tags\$p	tags <tbody< td=""> </tbody<>
tags\$base	tags\$dt	tags\$img	tags\$param	tags\$td
tags\$bdi	tags\$em	tags\$input	tags\$pre	tags\$textarea
tags\$bdo	tags\$embed	tags\$ins	tags\$progress	tagstfoot
tags\$blockquote	tags\$eventsource	tags\$kbd	tags\$q	tags\$th
tags\$body	tags\$fieldset	tags\$keygen	tags\$ruby	tags <thead< td=""> </thead<>
tags\$br	tags\$figcaption	tags\$label	tags\$rp	tags\$time
tags\$button	tags\$figure	tags\$legend	tags\$rt	tags\$title
tags\$canvas	tags\$footer	tags\$link	tags\$s	tags\$tr
tags\$caption	tags\$form	tags\$link	tags\$samp	tags\$track
tags\$cite	tags\$h1	tags\$mark	tags\$script	tags\$u
tags\$code	tags\$h2	tags\$menu	tags\$section	tags\$ul
tags\$col	tags\$h3	tags\$meta	tags\$select	tags\$var
tags\$colgroup	tags\$h4	tags\$meta	tags\$small	tags\$video
tags\$command	tags\$h5	tags\$meter	tags\$source	tags\$wbr

The most common tags have wrapper functions. You do not need to prefix their names with **tags\$**

```
ui <- fluidPage(
  h1("Header 1"),
  hr(),
  br(),
  p(strong("bold")),
  p(em("italic")),
  p(code("code")),
  a(href="http", "link"),
  HTML("<p>Raw html</p>")
)
```

CSS To include a CSS file, use **includeCSS()**, or

1. Place the file in the **www** subdirectory
2. Link to it with

```
tags$head(tags$link(rel = "stylesheet",
  type = "text/css", href = "<file name>"))
```

JS To include JavaScript, use **includeScript()** or

1. Place the file in the **www** subdirectory
2. Link to it with

```
tags$head(tags$script(src = "<file name>"))
```

IMAGES To include an image

1. Place the file in the **www** subdirectory
2. Link to it with `img(src="<file name>")`

Layouts

Combine multiple elements into a "single element" that has its own properties with a panel function, e.g.

```
wellPanel(
  dateInput("a", ""),
  submitButton()
)
```

- absolutePanel()
- conditionalPanel()
- fixedPanel()
- headerPanel()
- inputPanel()
- mainPanel()
- navlistPanel()
- sidebarPanel()
- tabPanel()
- tabsetPanel()
- titlePanel()
- wellPanel()

Organize panels and elements into a layout with a layout function. Add elements as arguments of the layout functions.

fluidRow()

```
ui <- fluidPage(
  fluidRow(column(width = 4),
    column(width = 2, offset = 3)),
  fluidRow(column(width = 12))
)
```

flowLayout()

```
ui <- fluidPage(
  flowLayout(# object 1,
    # object 2,
    # object 3
  )
)
```

sidebarLayout()

```
ui <- fluidPage(
  sidebarLayout(
    sidebarPanel(),
    mainPanel()
  )
)
```

splitLayout()

```
ui <- fluidPage(
  splitLayout(# object 1,
    # object 2
  )
)
```

verticalLayout()

```
ui <- fluidPage(
  verticalLayout(# object 1,
    # object 2,
    # object 3
  )
)
```

Layer **tabPanels** on top of each other, and navigate between them, with:

```
ui <- fluidPage(
  tabsetPanel(
    tabPanel("tab 1", "contents"),
    tabPanel("tab 2", "contents"),
    tabPanel("tab 3", "contents")
  )
)
```

```
ui <- fluidPage(
  navlistPanel(
    tabPanel("tab 1", "contents"),
    tabPanel("tab 2", "contents"),
    tabPanel("tab 3", "contents")
  )
)
```

```
ui <- navbarPage(title = "Page",
  tabPanel("tab 1", "contents"),
  tabPanel("tab 2", "contents"),
  tabPanel("tab 3", "contents")
)
```