Short overview of **Shiny** package: Building an interactive web application straight from R

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Outline

Since December 2016

CBI's BioInfomatic Genomic Analysis core facility (big-A)

CBI Toulouse
Centre de Biologie Intégrative

Activities :

- Process NGS raw Data
- Analyze data, Visualization, ...
- Train people and supervise students
- Automatize tasks

Core Facility

Needs:

- Share analysis
- Automatize some tasks (figures, tests, ...)

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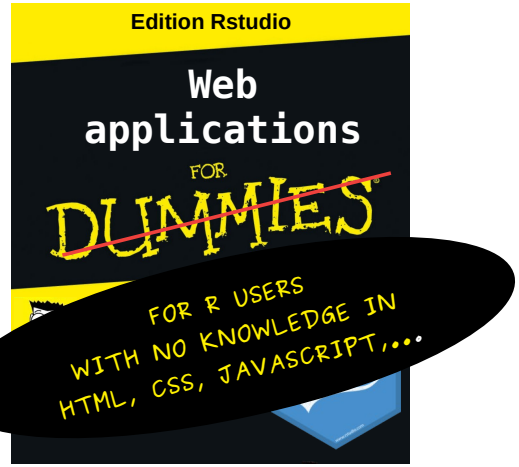

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Build interactive web applications or dashboards using R code

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"Makes it incredibly easy to build interactive web applications with R. [...] make it possible to build beautiful, responsive, and powerful applications with minimal effort."

What does it look like?

Gallery Shiny
http://shiny.rstudio.com/gallery/

Gallery of R Web Apps
http://www.showmeshiny.com/

How it works

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Very easy to start in R-Studio IDE

How it works

Shiny apps composed of 2 parts/files :

- ui : User Interface script for App layout
- server : Server script with R instructions

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

server <- function(input, output) {}

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


shinyApp() function creates a "ShinyApp object" from the pair Ui/Server

All in 1 "app.R" file

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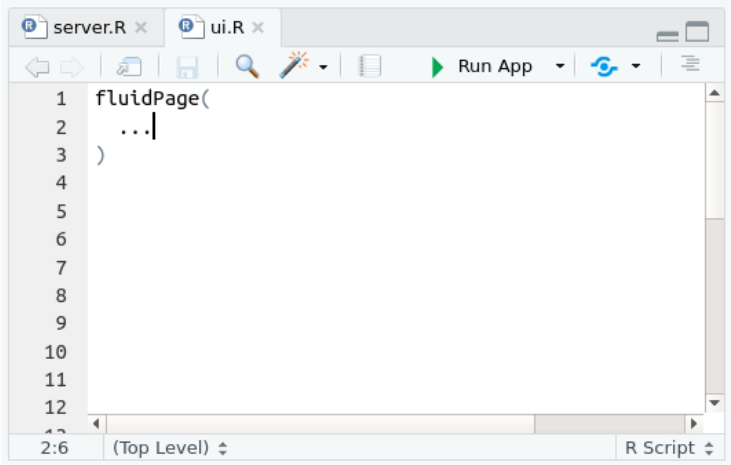

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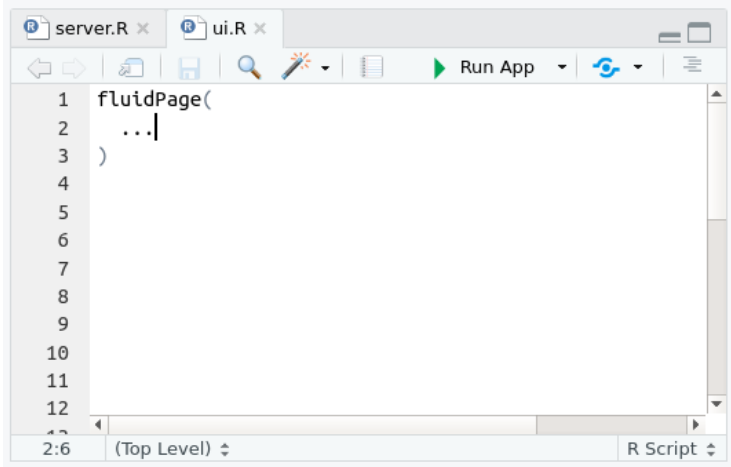
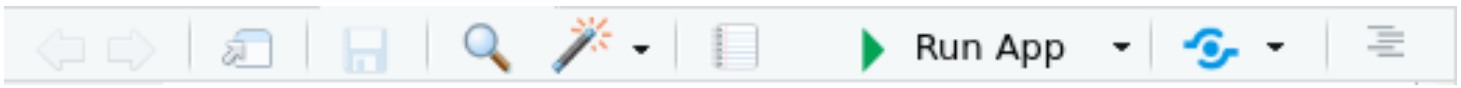


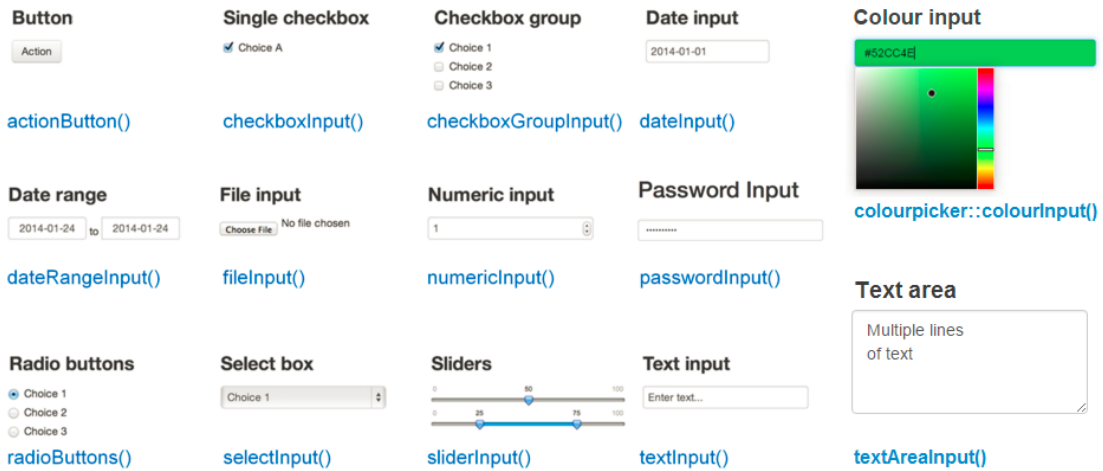
app <- shinyApp(ui, server)
runApp(app)

runApp("newdir")



Ui.R - Client file

1. Layout : plain and formatted text, HTML elements, title, theme layout, ...
2. Inputs (widgets)



3. Placeholders for outputs

Remark : All UI functions are simply HTML wrappers

Server.R

1. Acquire input
2. Run all analysis
3. Create outputs

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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

Rules :

1) Call outputs and inputs
2) Use $ to call input
3) Create output with *Render()* function (to generate HTML tags) and use $ to call it

Shiny Reactivity

Concept of reactive programming

Change input => run R code => Change output

3 types of reactive :

- reactive source : choose by user via interface
- reactive endpoint : display plots in user navigator
- reactive conductor : elements in between

Application deployment

1. shinyapps.io platform, Cloud hosted by R-Studio :
   - + : Free, Easy to use, Secure & Scalable
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2. Configure you own Shiny server
   - + :
     - Unlimited number of apps
     - Provide a unique URL for each application
     - Automatically start and stop applications
   - - :
     - Specific skills to maintain shiny server
     - Free only with few users
     - Restrict access not available with free version

To go further : Combining Shiny & R Markdown

RMarkdown interactive document

- add "runtime: shiny" to the documents YAML header
- add Shiny widgets and render functions to the R code chunks

Rmarkdown compile the document into a reactive Shiny app (html doc with reactive components)

```
1 ---
2 title: "shiny-Rmarkdown"
3 author: "M. Aguirrebengoa"
4 date: "6 mai 2019"
5 output: html_document
6 runtime: shiny
7 ---
```

"runtime:shiny" to notify RStudio, change "Knit" to "Run Document"

To go further : Some nice functions & packages

- Some functions to improve your app :
  - *DataTable()* : Javascript table with option
  - *conditionalPanel()* [ui.R] : display elements within condition
  - *reactiveValues()* [server.R] : store value in a list
  - *updateXXXInput()* [server.R] : Change input values
  - ...
- *rCharts* : Packages for dynamics JavaScript plots in R
- *shinythemes* : Predefine shiny themes
- *shinydashboard* : Package dashbord design
- Improve Shiny apps with html widgets programmed in R, or directly HTML, CSS ou JavaScript widgets
- ...

References I

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- To share your analysis in an interactive way
- Easy to use in R-Studio IDE
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Could easily replace classical R scripts or Rmd Reports

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Want to try it ?

Great tutorial done by R-Studio
https://shiny.rstudio.com/tutorial/