Interactive Graphs

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臺北榮民總醫院家庭醫學部
臺北榮民總醫院醫學研究部大數據中心

課前作業

上課前請先安裝套件 : shiny DT plotly leaflet dygraphs zoo tesseract opencv

```
install.packages(c("shiny", "DT", "plotly", "leaflet", "dygraphs", "zoo", "tesseract", "opencv"))
```

需另外安裝

```
library(tesseract)
tesseract_download("chi_tra")
```

先載入tesseract套件 再利用其內的函數安裝資料

Topics

- Shiny
- Plotly for ggplot2
- htmlwidgets
- R for AI
- Resources

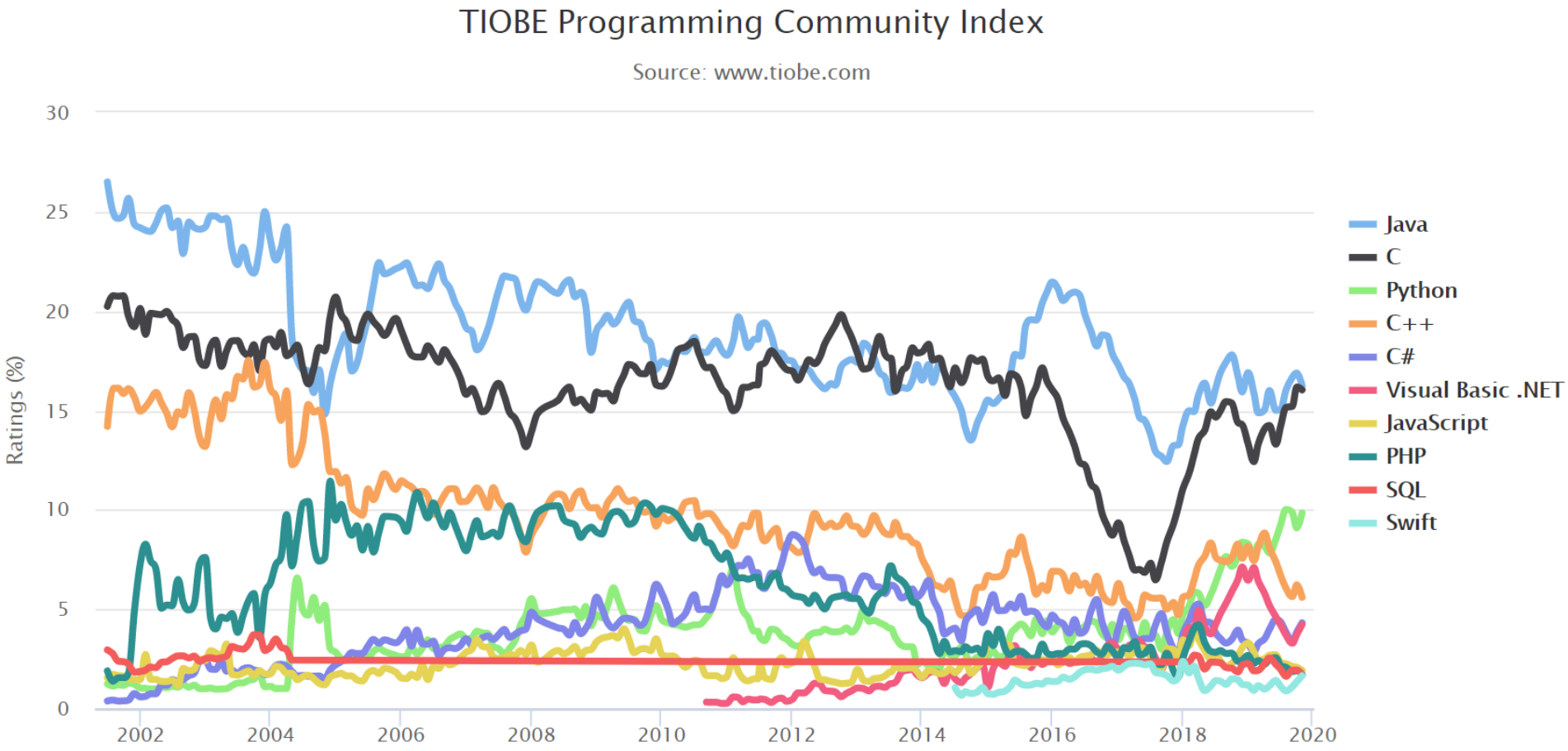
Interactive Data Visualization

- Users can manipulate and explore graphical representations of data directly.
- Common techniques:
  - Brushing
  - Painting
  - Identifying
  - Scaling
  - Linking

https://www.omnisci.com/technical-glossary/interactive-data-visualization

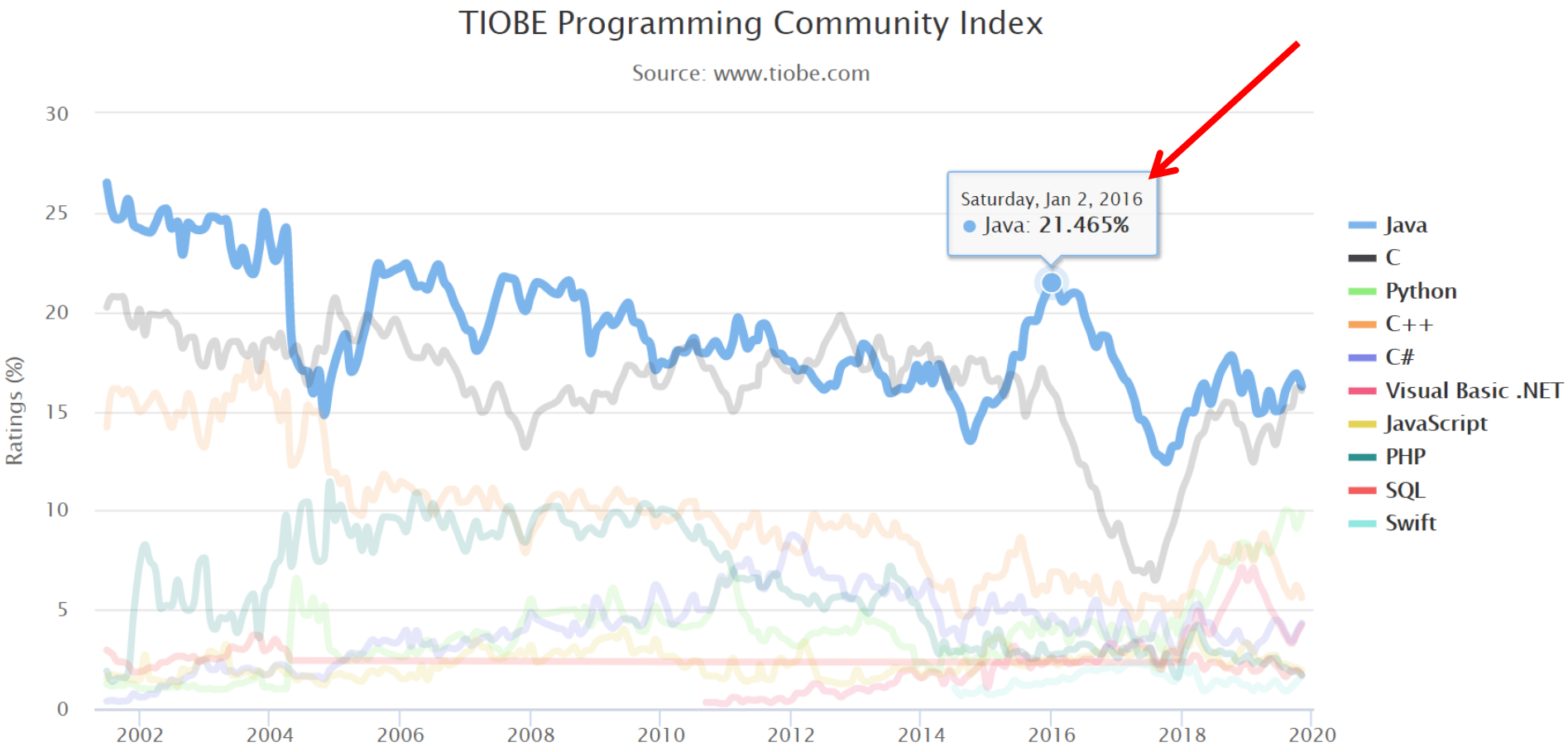
https://www.tiobe.com/tiobe-index/

榜樣



https://www.tiobe.com/tiobe-index/

榜樣



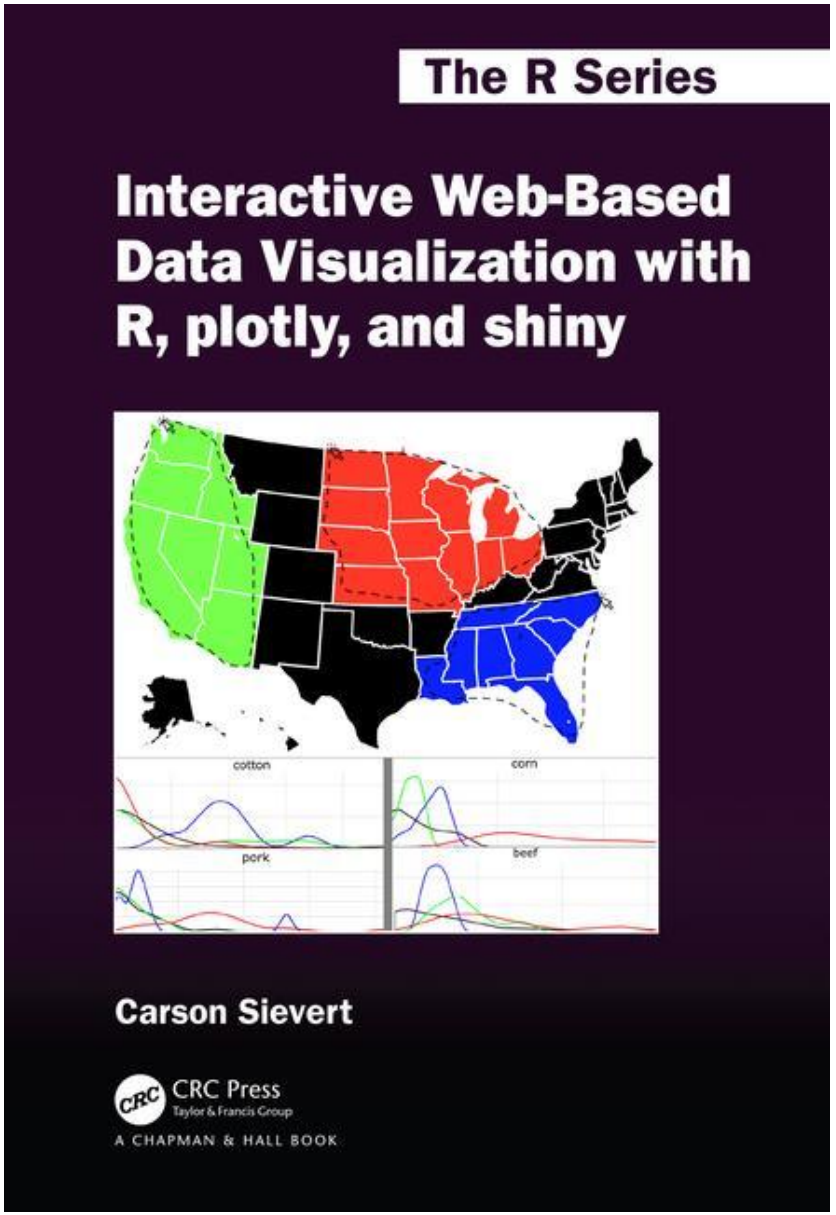
https://www.cmoney.tw/finance/f00041.aspx?s=1101

榜樣

https://tw.appledaily.com/life/20200326/FONETSFEQNSCZOA2FUVAV6HN2E/榜樣

* 2020 Mar 26

https://www.crcpress.com/Interactive-Web-Based-Data-Visualization-with-R-plotly-and-shiny/Sievert/p/book/9781138331457

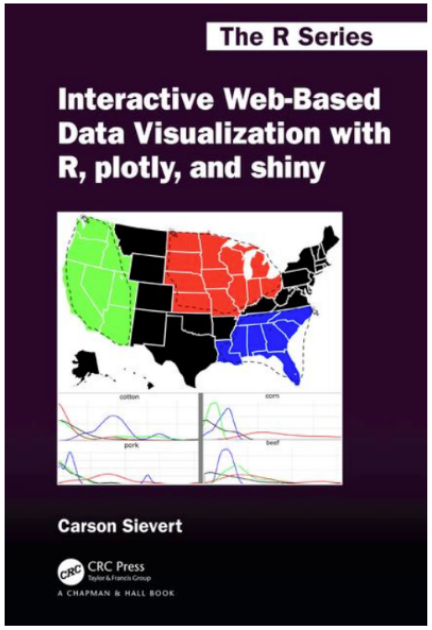


https://plotly-r.com/

Welcome

R Studio Cloud

This is the website for **"Interactive web-based data visualization with R, plotly, and shiny"**. In this book, you'll gain insight and practical skills for creating interactive and dynamic web graphics for data analysis from `R`. It makes heavy use of **plotly** for rendering graphics, but you'll also learn about other `R` packages that augment a data science workflow, such as the **tidyverse** and **shiny**. Along the way, you'll gain insight into best practices for visualization of high-dimensional data, statistical graphics, and graphical perception. By mastering these concepts and tools, you'll impress your colleagues with your ability to *generate more informative, engaging, and repeatable interactive graphics* using free software that you can share over email, export to pdf/png, and more.



SECTION I

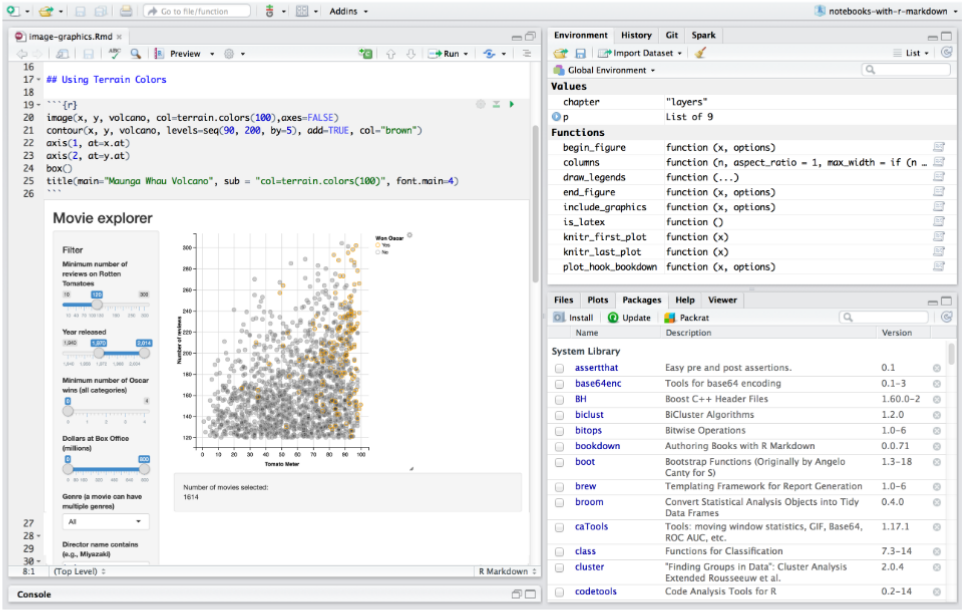
SHINY

https://shiny.rstudio.com/

Shiny from RStudio

Get Started Gallery Articles Reference Deploy Help Contribute

Shiny is an R package that makes it easy to build interactive web apps straight from R. You can host standalone apps on a webpage or embed them in R Markdown documents or build dashboards. You can also extend your Shiny apps with CSS themes, htmlwidgets, and JavaScript actions.



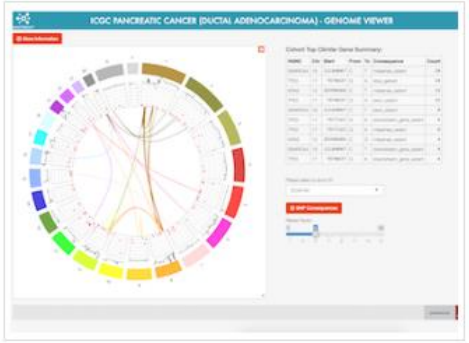
https://shiny.rstudio.com/gallery/

Shiny from RStudio | Get Started | Gallery | Articles | Reference | Deploy | Help | Contribute

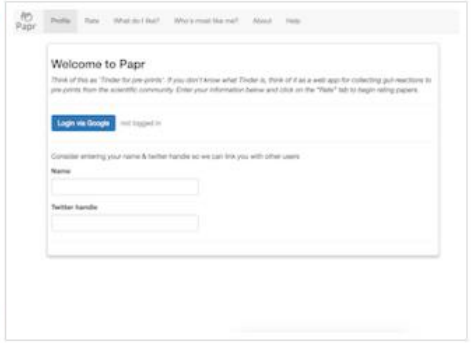
Gallery

Shiny User Showcase

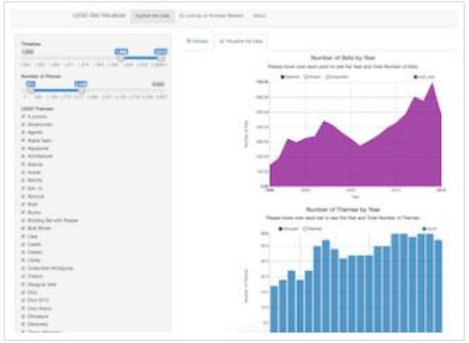
The Shiny User Showcase contains an inspiring set of sophisticated apps developed and contributed by Shiny users.



Genome browser



Papr

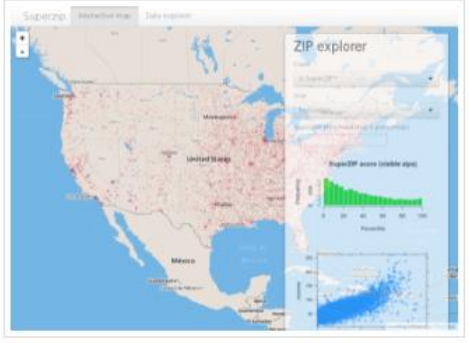


Lego Set Database Explorer

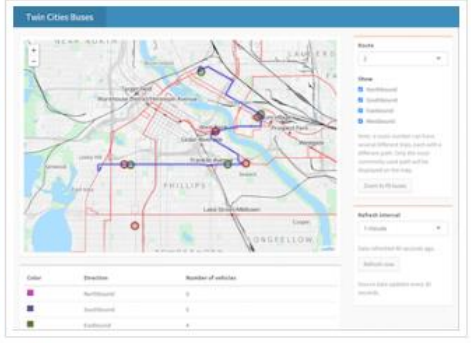
See more

Interactive visualizations

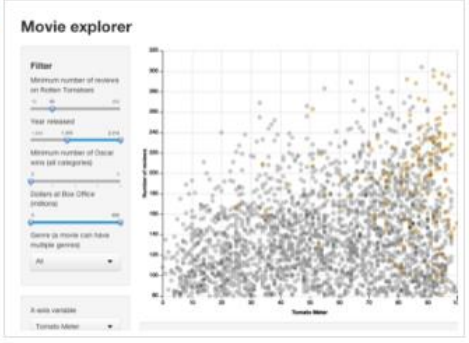
Shiny is designed for fully interactive visualization, using JavaScript libraries like d3, Leaflet, and Google Charts.



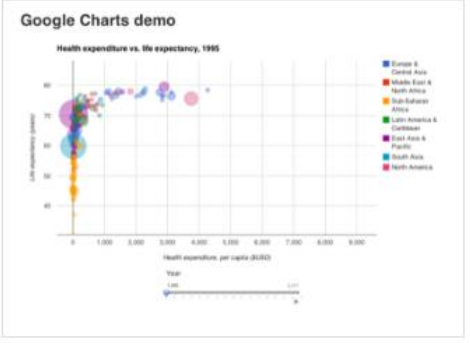
SuperZip example



Bus dashboard



Movie explorer



Google Charts

https://shiny.rstudio.com/gallery/telephones-by-region.html

Shiny from RStudio

Back to Gallery Get Code

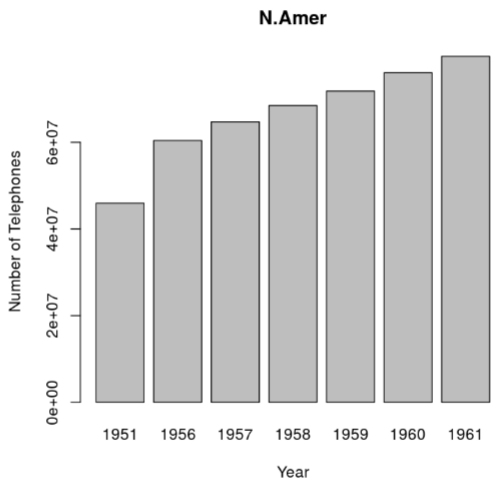
程式碼

Telephones by region

Region:

N.Amer

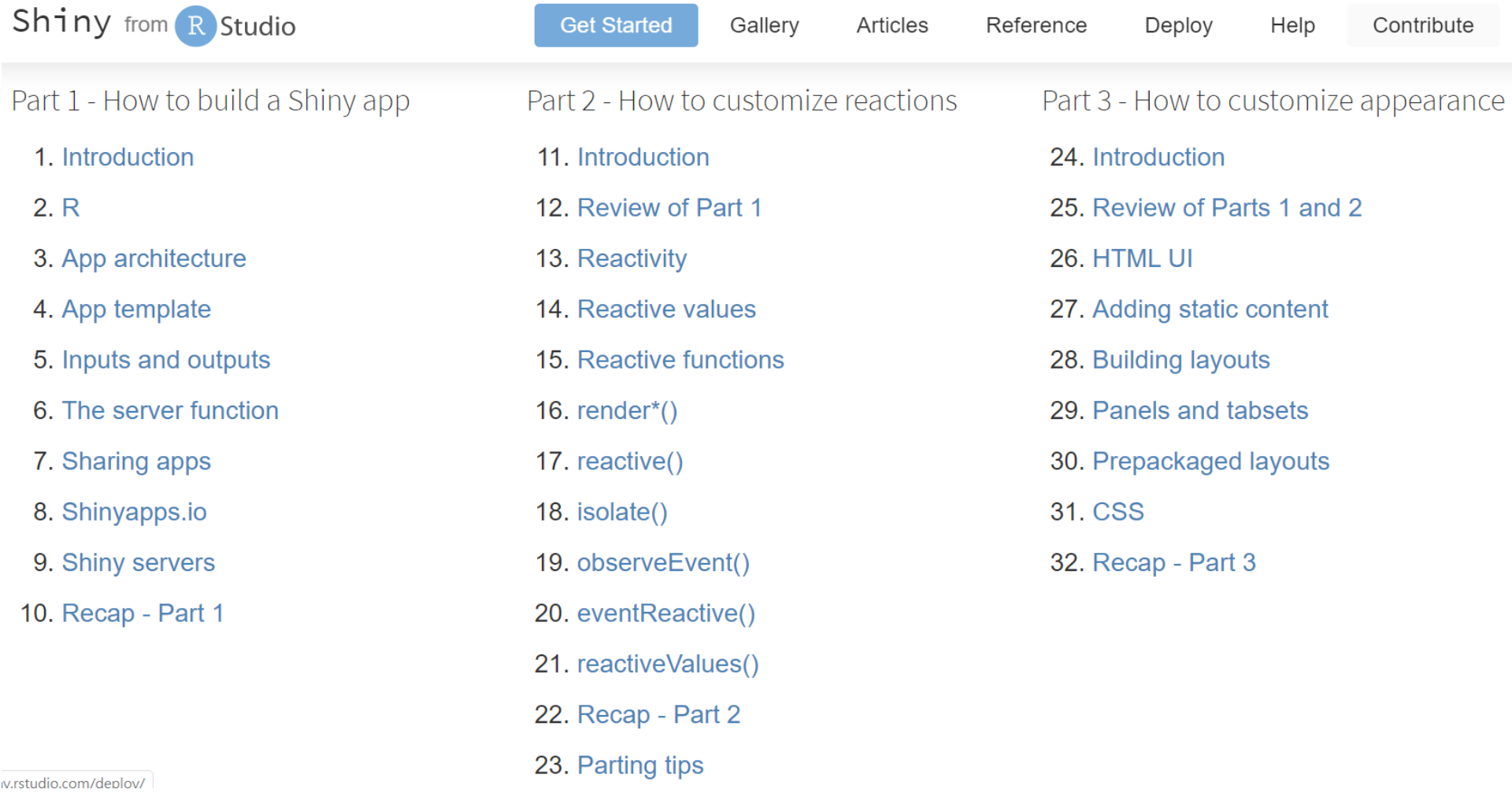
Data from AT&T (1961) The World's Telephones.



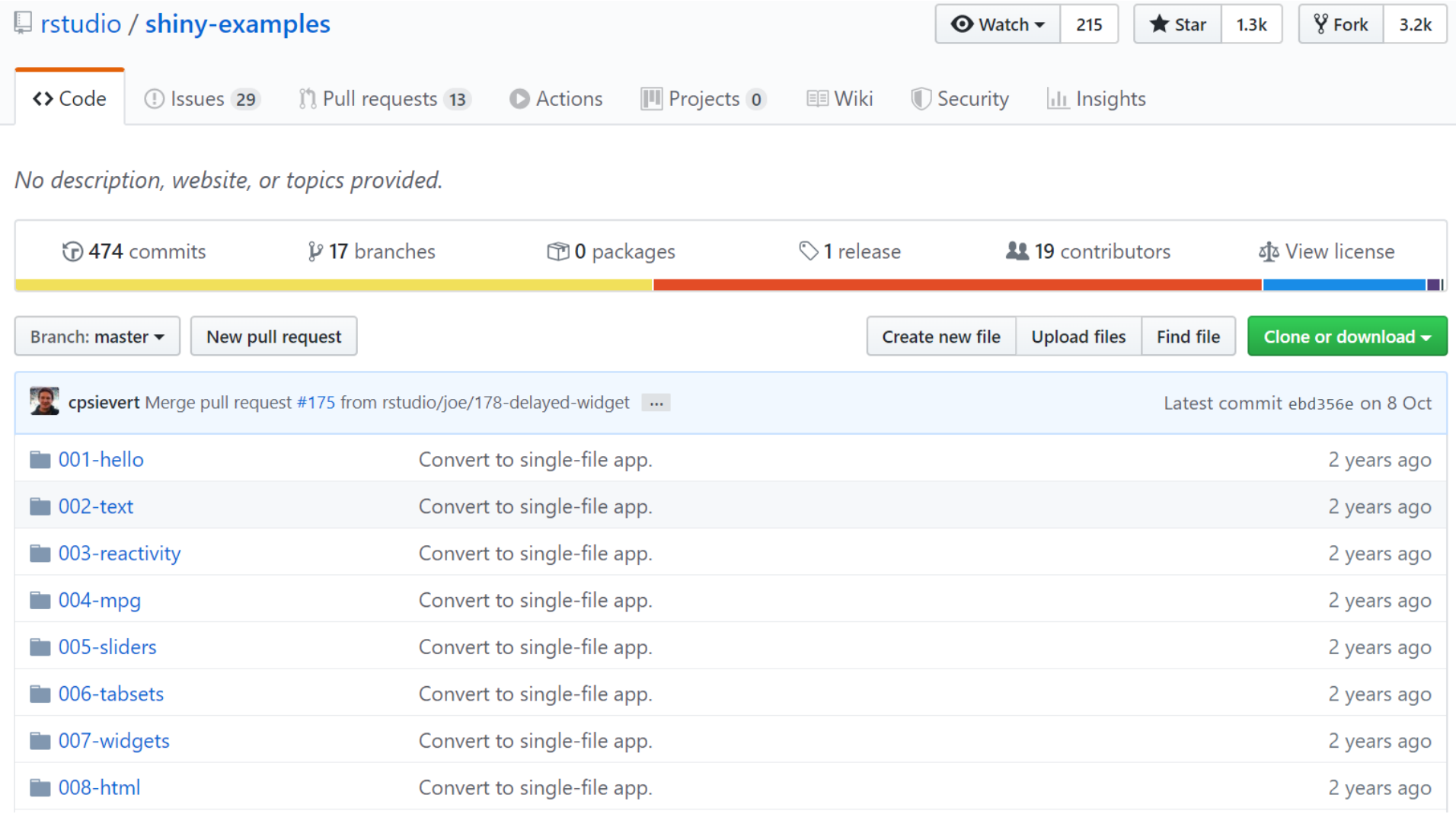
server.R ui.R show below

```r
# Rely on the 'WorldPhones' dataset in the datasets
# package (which generally comes preloaded).
library(datasets)

# Define a server for the Shiny app
function(input, output) {

  # Fill in the spot we created for a plot
  output$phonePlot <- renderPlot({

    # Render a barplot
    barplot(WorldPhones[,input$region]*1000,
            main=input$region,
            ylab="Number of Telephones",
            xlab="Year")
  })
}
```

https://shiny.rstudio.com/tutorial/



https://github.com/rstudio/shiny-examples

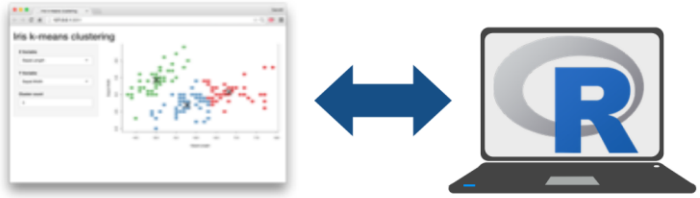


顯示內建示範圖例

- 安裝與載入 shiny 套件後，一一執行範例

```
if (! require(shiny)) install.packages("shiny")
library(shiny)
runExample("01_hello")

runExample("02_text") # 資料表格
runExample("03_reactivity") # 回應設計 + 資料表格
runExample("04_mpg") # 繪圖
runExample("05_sliders") # 側欄工具 + 表格
runExample("06_tabsets") # tab 頁面
runExample("07_widgets") # 行為按鈕
runExample("08_html") # 結合 html
runExample("09_upload") # 上傳檔案工具
runExample("10_download") # 下載檔案工具
runExample("11_timer") # 計時器
```

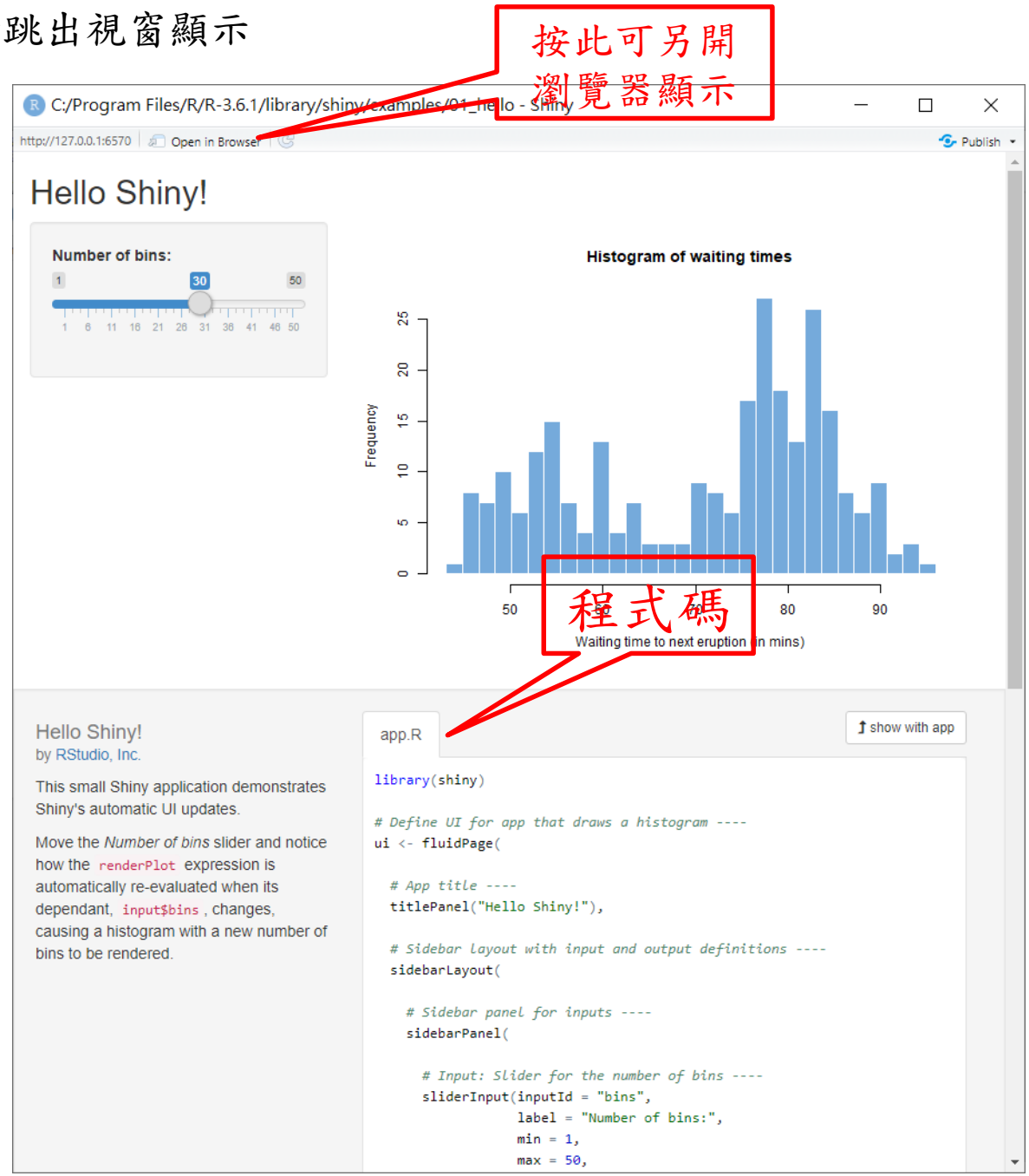
A **Shiny** app is a web page (**UI**) connected to a computer running a live R session (**Server**)



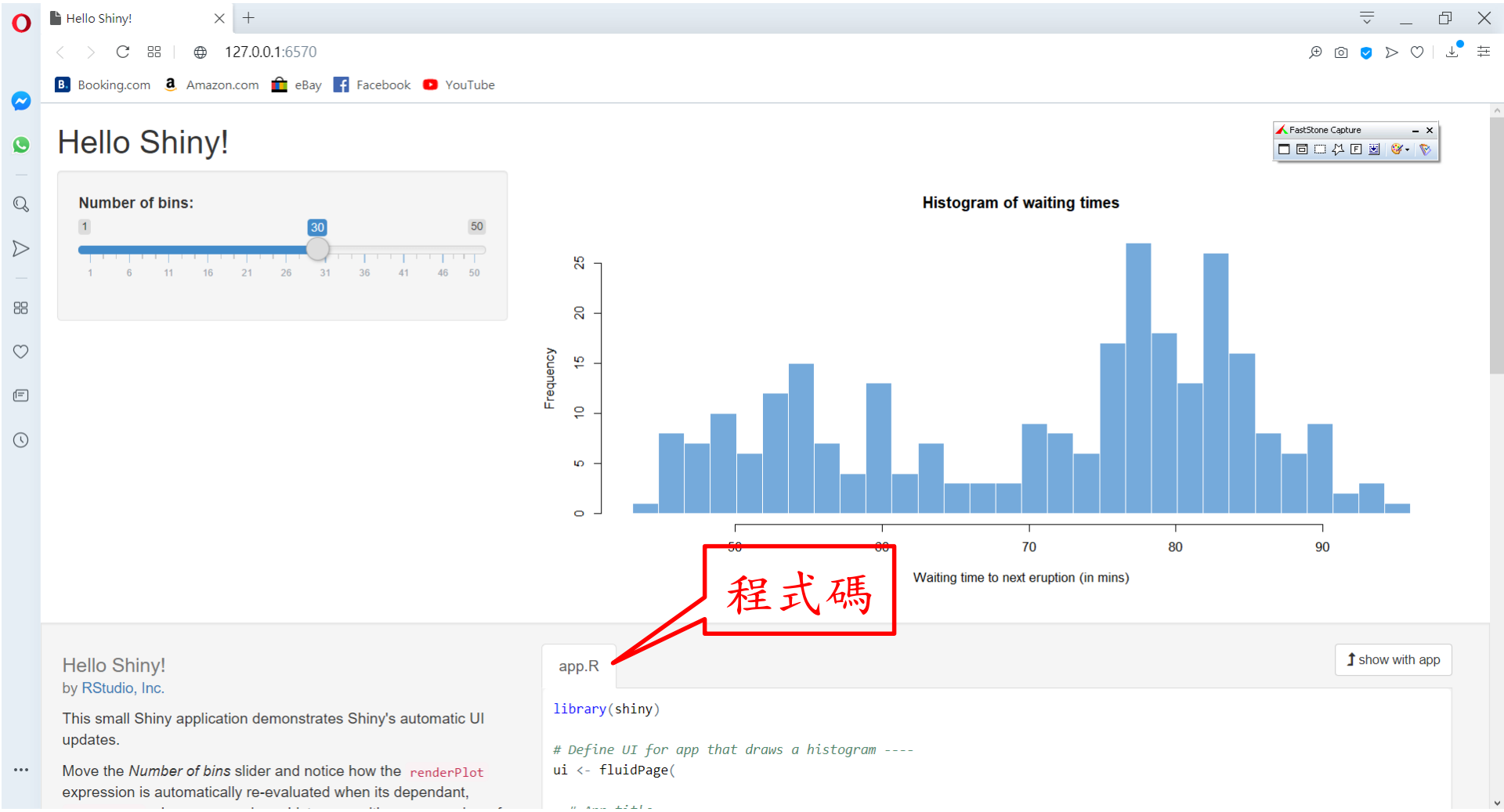
Users can manipulate the UI, which will cause the server to update the UI's displays (by running R code).

https://shiny.rstudio.com/images/shiny-cheatsheet.pdf

在 RStudio 會跳出視窗顯示



另開瀏覽器顯示


Hello Shiny!
127.0.0.1:6570
Booking.com
Amazon.com
eBay
Facebook
YouTube
Hello Shiny!
Number of bins:
1
30
50
1 6 11 16 21 26 31 36 41 46 50
FastStone Capture
Histogram of waiting times
Frequency
0 5 10 15 20 25
50 60 70 80 90
Waiting time to next eruption (in mins)
程式碼
Hello Shiny!
by RStudio, Inc.
This small Shiny application demonstrates Shiny's automatic UI updates.
Move the Number of bins slider and notice how the renderPlot expression is automatically re-evaluated when its dependant,
app.R
show with app
library(shiny)
# Define UI for app that draws a histogram ----
ui <- fluidPage(

Shiny 程式製作流程

- 挑選範例，複製程式碼供參考，修改程式碼
- 程式分為
  - 載入 shiny 套件
  - 匯入資料
  - 資料彙整計算，用以輸出圖形
  - 前端介面控制 ui (ui.R 部分)
  - 後端資料運算 server (server.R 部分)
  - 產製 Shiny app ： shinyApp(ui, server)

也可產製App供網頁與手機用

```
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 an app. Wrap with **runApp()** if calling from a sourced script or inside a function.

https://shiny.rstudio.com/images/shiny-cheatsheet.pdf

多條件篩選資料表

- 利用 Shiny_BasicDatatable.r
- 假設已先利用Import_tidyverse.r匯入資料，如果資料檔放置於其他位置，請更改程式碼內的檔案路徑
- 請在 RStudio 裡執行程式，也可在 RGui 裡執行
- 參考 https://shiny.rstudio.com/gallery/basic-datatable.html

程式碼置於 Shiny 子目錄

https://shiny.rstudio.com/gallery/basic-datatable.html

範例

程式碼

Basic DataTable

Manufacturer: All

Transmission: All

Cylinders: All

Show 10 entries Search:

	manufacturer	model	displ	year	cyl	trans	drv	cty	hwy	fl	class
1	audi	a4	1.8	1999	4	auto(l5)	f	18	29	p	compact
2	audi	a4	1.8	1999	4	manual(m5)	f	21	29	p	compact
3	audi	a4	2	2008	4	manual(m6)	f	20	31	p	compact
4	audi	a4	2	2008	4	auto(av)	f	21	30	p	compact
5	audi	a4	2.8	1999	6	auto(l5)	f	16	26	p	compact
6	audi	a4	2.8	1999	6	manual(m5)	f	18	26	p	compact
7	audi	a4	3.1	2008	6	auto(av)	f	18	27	p	compact
8	audi	a4 quattro	1.8	1999	4	manual(m5)	4	18	26	p	compact
9	audi	a4 quattro	1.8	1999	4	auto(l5)	4	16	25	p	compact
10	audi	a4 quattro	2	2008	4	manual(m6)	4	20	28	p	compact

Showing 1 to 10 of 234 entries Previous 1 2 3 4 5 … 24 Next

server.R | ui.R

```
# Load the ggplot2 package which provides
# the 'mpg' dataset.
library(ggplot2)

function(input, output) {

  # Filter data based on selections
  output$table <- DT::renderDataTable(DT::datatable({
    data <- mpg
    if (input$man != "All") {
      data <- data[data$manufacturer == input$man,]
    }
    if (input$cyl != "All") {
      data <- data[data$cyl == input$cyl,]
    }
    if (input$trans != "All") {
      data <- data[data$trans == input$trans,]
    }
    data
  }))

}
```

https://shiny.rstudio.com/gallery/basic-datatable.html

server.R ui.R

```r
# Load the ggplot2 package which provides
# the 'mpg' dataset.
library(ggplot2)

function(input, output) {

  # Filter data based on selections
  output$table <- DT::renderDataTable(DT::datatable({
    data <- mpg
    if (input$man != "All") {
      data <- data[data$manufacturer == input$man,]
    }
    if (input$cyl != "All") {
      data <- data[data$cyl == input$cyl,]
    }
    if (input$trans != "All") {
      data <- data[data$trans == input$trans,]
    }
    data
  }))

}
```

server.R ui.R

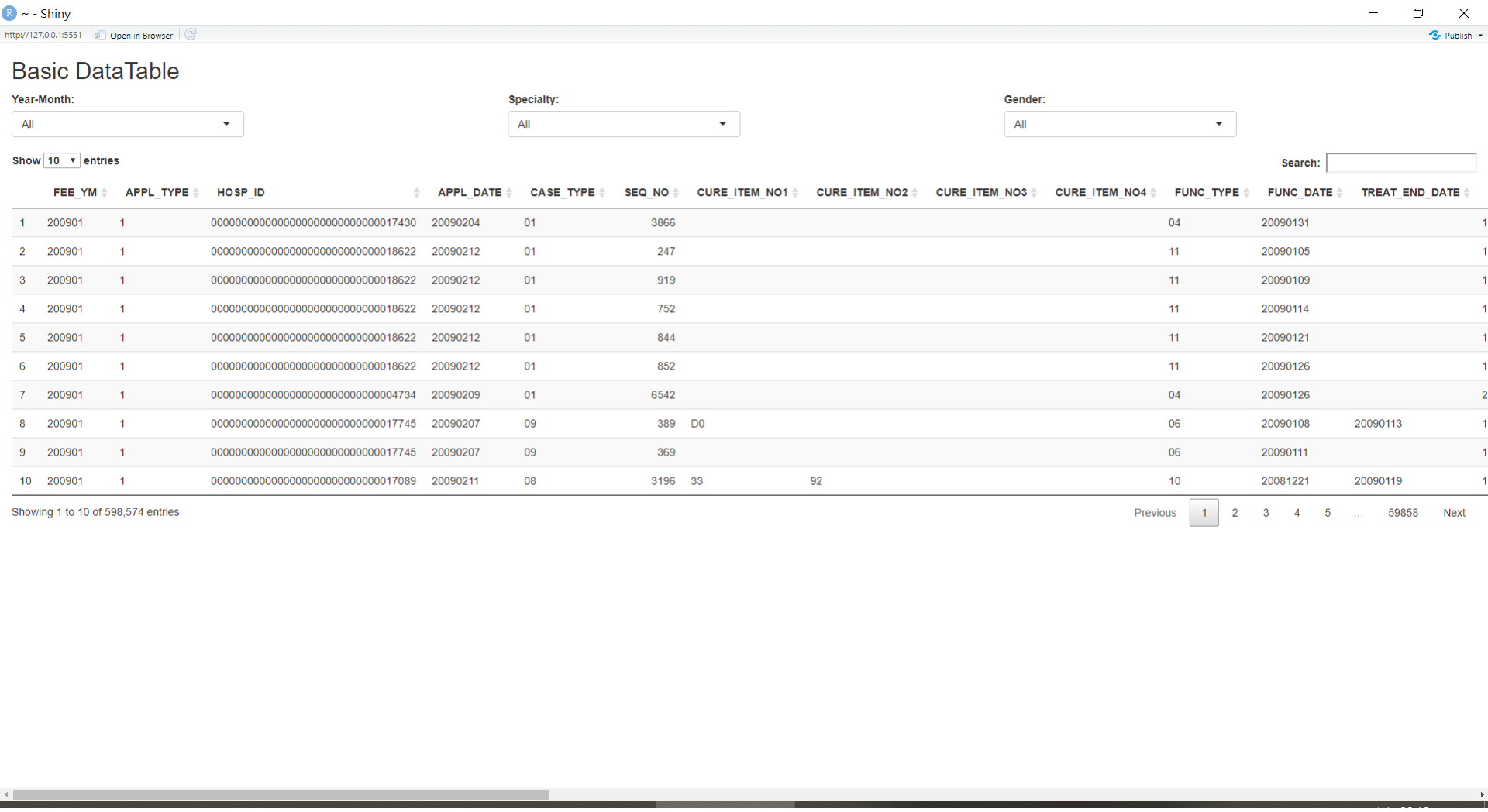
```r
# Load the ggplot2 package which provides
# the 'mpg' dataset.
library(ggplot2)

fluidPage(
  titlePanel("Basic DataTable"),

  # Create a new Row in the UI for selectInputs
  fluidRow(
    column(4,
        selectInput("man",
                    "Manufacturer:",
                    c("All",
                      unique(as.character(mpg$manufacturer))))
    ),
    column(4,
        selectInput("trans",
                    "Transmission:",
                    c("All",
                      unique(as.character(mpg$trans))))
    ),
    column(4,
        selectInput("cyl",
                    "Cylinders:",
                    c("All",
                      unique(as.character(mpg$cyl))))
    )
  ),
  # Create a new row for the table.
  DT::dataTableOutput("table")
)
```

```
# 更改網站上的程式碼
# 紅字為更改處
# Shiny_BasicDatatable.r


if (! require(tidyverse)) { install.packages("tidyverse"); require(tidyverse) }
if (! require(shiny)) { install.packages("shiny"); require(shiny) }

# 匯入資料集cd  可視CD2009.DAT實際擺放位置 更動路徑
# ……
# ……
# 假設已先利用Import_tidyverse.r匯入資料 => 此匯入步驟可省略
# 否則依Shiny_BasicDatatable.r程式碼，匯入CD2009.DAT
```

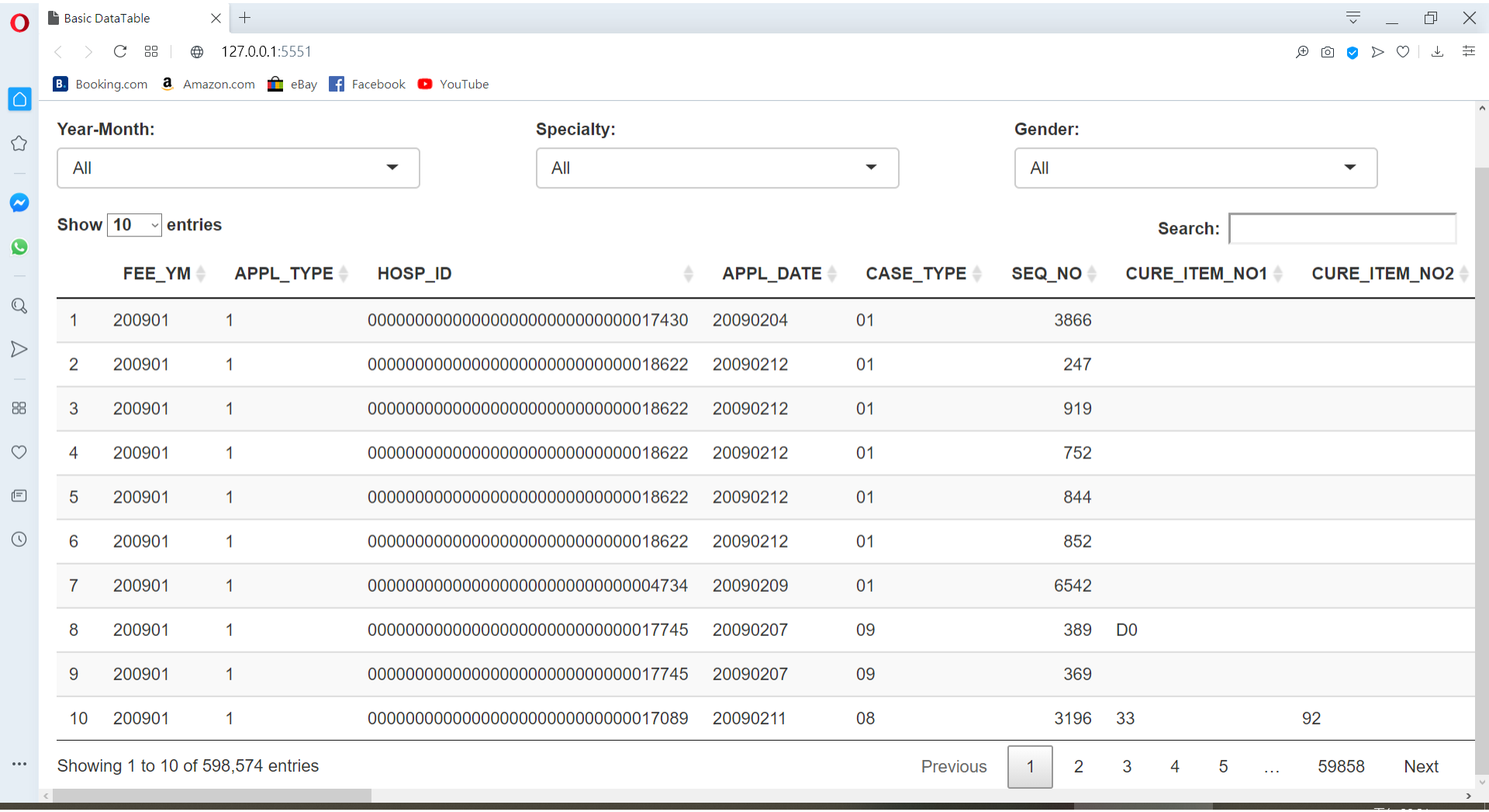
```
# Define UI for random distribution app ----
ui <- fluidPage(
  titlePanel("Basic DataTable"),

  # Create a new Row in the UI for selectInputs
  fluidRow(
    column(4,
        selectInput("feeym",
                    "Year-Month:",
                    c("All",
                      sort(unique(as.character(cd$FEE_YM)))))
    ),
    column(4,
        selectInput("specialty",
                    "Specialty:",
                    c("All",
                      sort(unique(as.character(cd$FUNC_TYPE)))))
    ),
    column(4,
        selectInput("idsex",
                    "Gender:",
                    c("All",
                      sort(unique(as.character(cd$ID_SEX)))))
    )
  ),

  # Create a new row for the table.
  DT::dataTableOutput("table")
)
```

```
# Define server logic for random distribution app ----
server <- function(input, output) {
  # Filter data based on selections
  output$table <- DT::renderDataTable(DT::datatable({
    data <- cd
    if (input$feeym != "All") {
      data <- data[data$FEE_YM == input$feeym,]
    }
    if (input$specialty != "All") {
      data <- data[data$FUNC_TYPE == input$specialty,]
    }
    if (input$idsex != "All") {
      data <- data[data$ID_SEX == input$idsex,]
    }
    data
  }))
}


# Create Shiny app ----
shinyApp(ui, server)
```

在 RStudio 會跳出視窗顯示



另開瀏覽器顯示

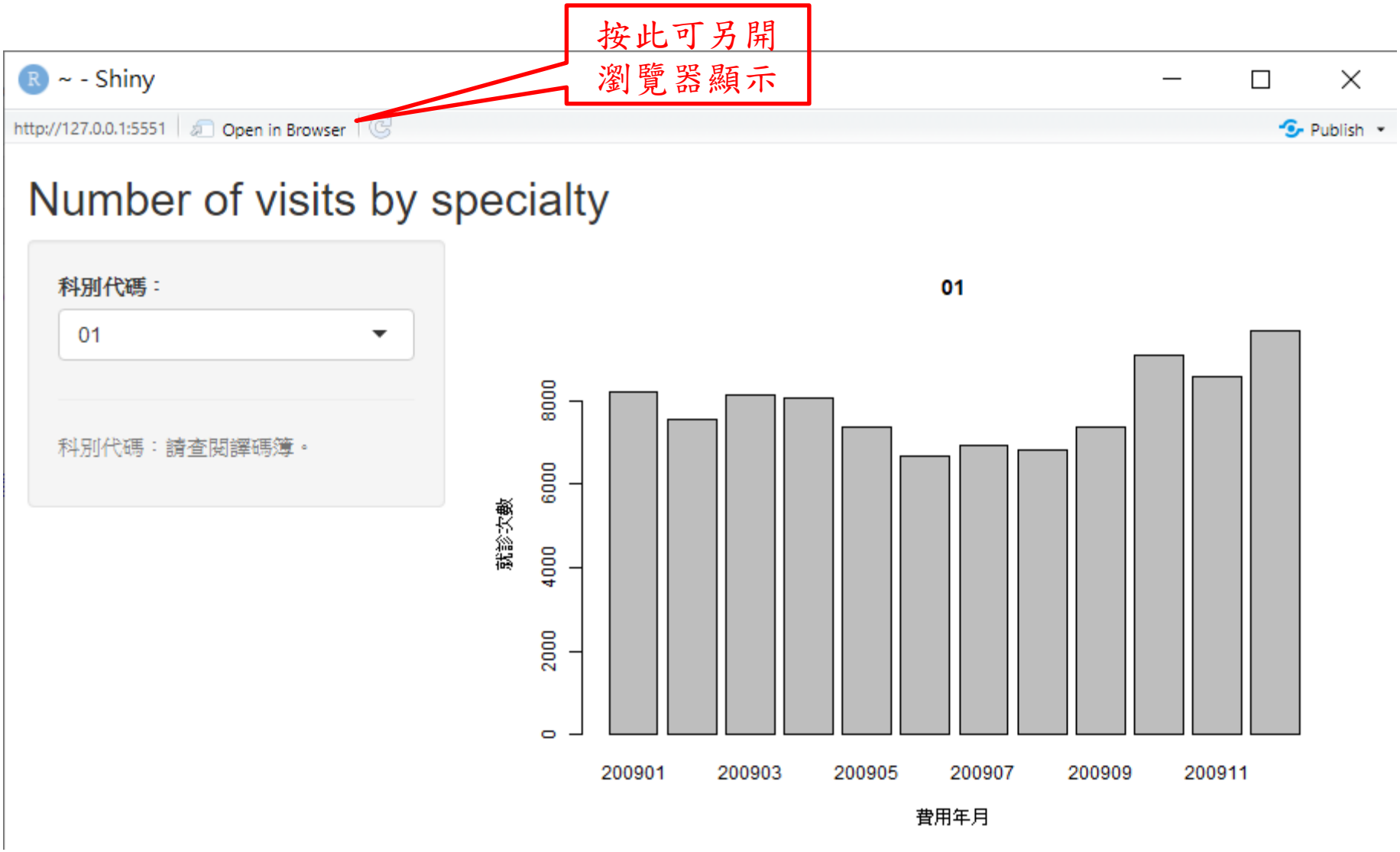

Basic DataTable
127.0.0.1:5551
Booking.com
Amazon.com
eBay
Facebook
YouTube
Year-Month:
All
Specialty:
All
Gender:
All
Show 10 entries
Search:
FEE_YM
APPL_TYPE
HOSP_ID
APPL_DATE
CASE_TYPE
SEQ_NO
CURE_ITEM_NO1
CURE_ITEM_NO2
1 200901 1 00000000000000000000000000017430 20090204 01 3866
2 200901 1 00000000000000000000000000018622 20090212 01 247
3 200901 1 00000000000000000000000000018622 20090212 01 919
4 200901 1 00000000000000000000000000018622 20090212 01 752
5 200901 1 00000000000000000000000000018622 20090212 01 844
6 200901 1 00000000000000000000000000018622 20090212 01 852
7 200901 1 00000000000000000000000000004734 20090209 01 6542
8 200901 1 00000000000000000000000000017745 20090207 09 389 D0
9 200901 1 00000000000000000000000000017745 20090207 09 369
10 200901 1 00000000000000000000000000017089 20090211 08 3196 33 92
Showing 1 to 10 of 598,574 entries
Previous
1
2
3
4
5
…
59858
Next

Bar Chart 長條圖

- 利用 Shiny_BarChart.r
- 假設已先利用Import_tidyverse.r匯入資料，如果資料檔放置於其他位置，請更改程式碼內的檔案路徑
- 參考 https://shiny.rstudio.com/gallery/telephones-by-region.html
- Shiny_BarChart_WithChineseNames.r 裡，將科別代碼改成中文

程式碼置於 Shiny 子目錄

在 RStudio 會跳出視窗顯示



另開瀏覽器顯示

Number of visits by speci

127.0.0.1:5551

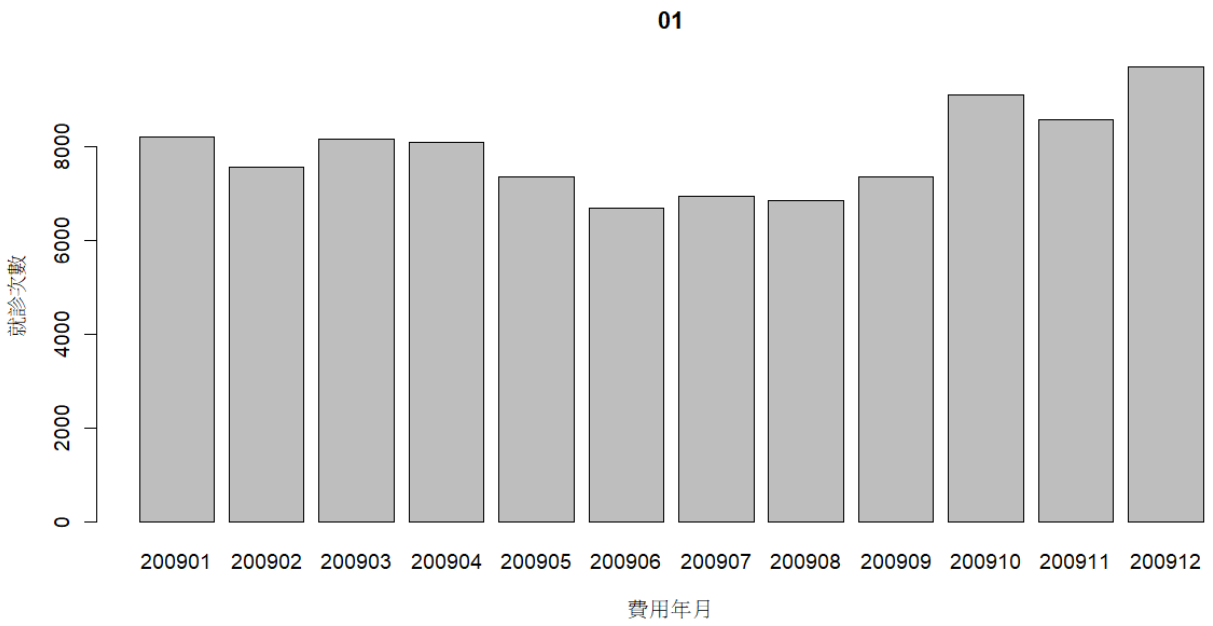
Booking.com Amazon.com eBay Facebook YouTube

Number of visits by specialty

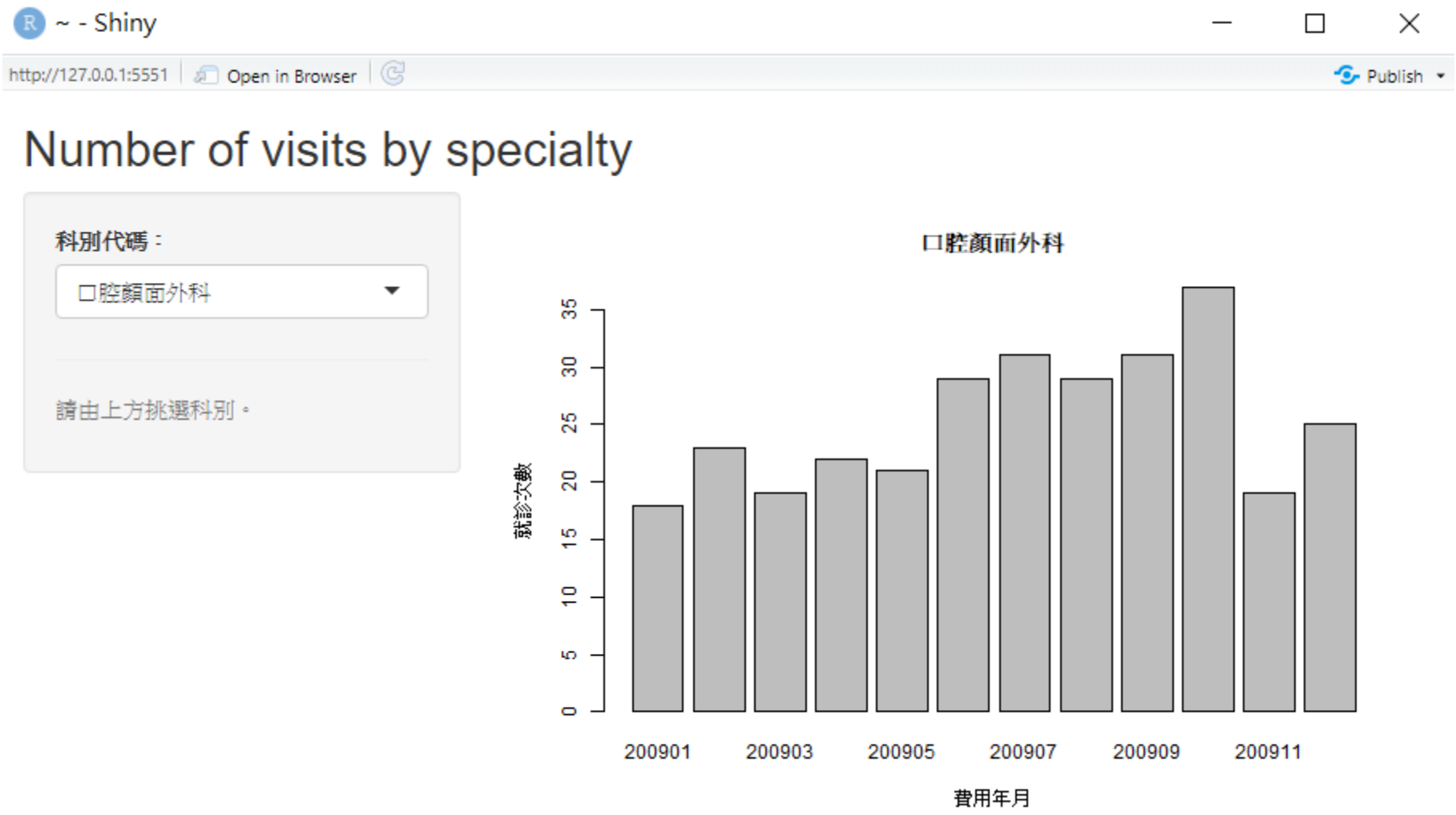
科別代碼：

01

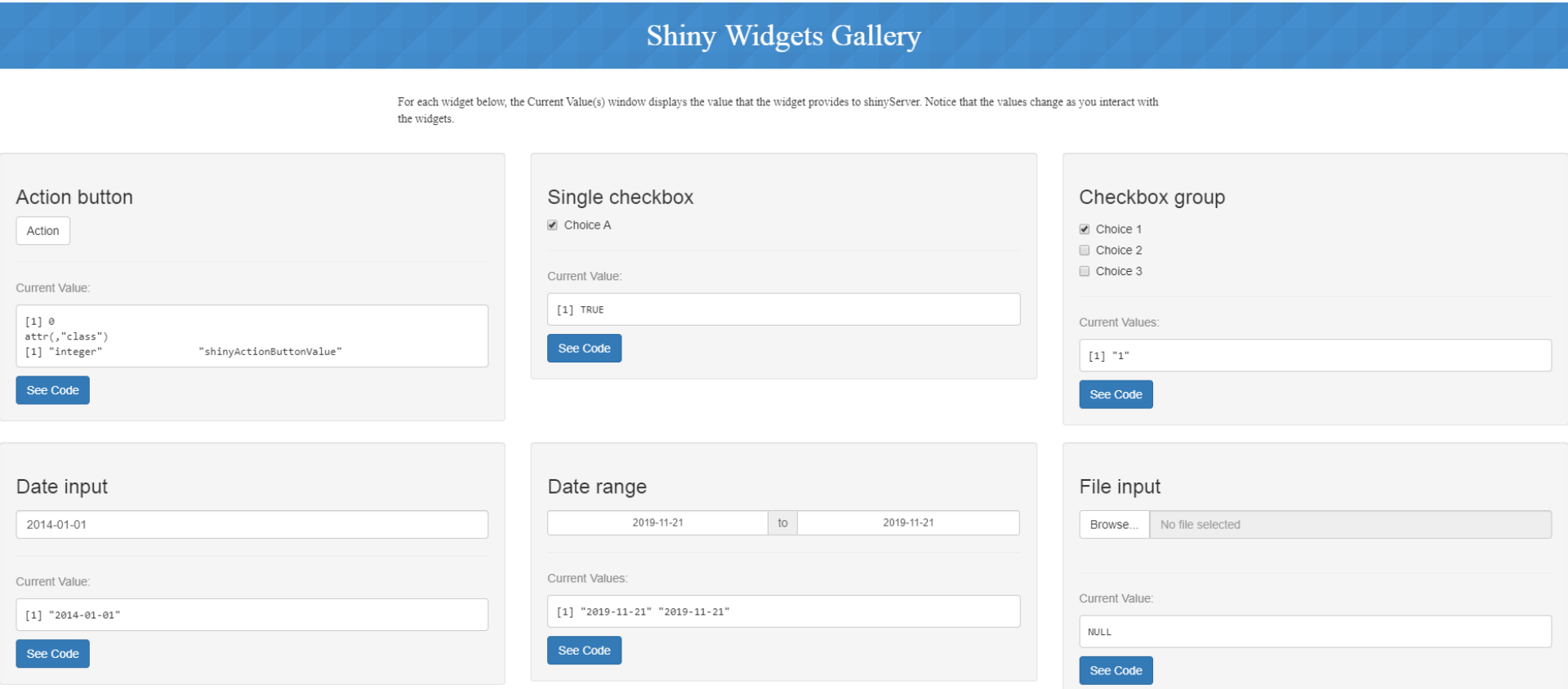
科別代碼：請查閱譯碼簿。



科別代碼以中文顯示


~ - Shiny
http://127.0.0.1:5551
Open in Browser
Publish
Number of visits by specialty
科別代碼：
口腔顏面外科
請由上方挑選科別。
口腔顏面外科
就診次數
0
5
10
15
20
25
30
35
200901
200903
200905
200907
200909
200911
費用年月

https://shiny.rstudio.com/gallery/widget-gallery.html

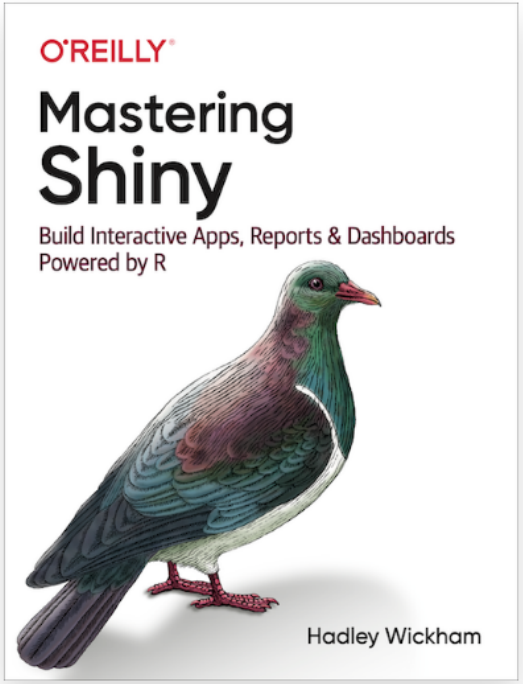


* 有12種元件及其程式碼可供參考

https://mastering-shiny.org/

Welcome

This is the online version of *Mastering Shiny*, a book **currently under early development** and intended for a late 2020 release by O'Reilly Media.



Shiny is a framework for creating web applications using R code. It is designed primarily with data scientists in mind, and to that end, you can create pretty complicated Shiny apps with no knowledge of HTML, CSS, or JavaScript. On the other hand, Shiny doesn't limit you to creating trivial or prefabricated apps: its user interface components can be easily customized or extended, and its server uses reactive programming to let you create any type of back end logic you want. Shiny is designed to feel almost magically easy when you're getting started, and yet the deeper you get into how it works, the more you realize it's built out of general building blocks that have strong software engineering principles behind them.

SECTION II

PLOTLY FOR GGPLOT2

https://plotly.com/ggplot2/

plotly | Graphing Libraries ggplot2 Star 1,933 DO MORE WITH

Search...

Quick Start

Getting Started

GitHub

community.plotly.com

Examples

Basic Charts

Statistical Charts

Animations

Layout Options

Plotly ggplot2 Library

With ggplotly() by Plotly, you can convert your ggplot2 figures into interactive ones powered by plotly.js, ready for embedding into Dash applications.

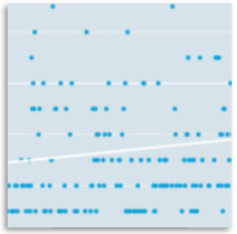
Building AI apps or dashboards in R? Deploy them to Dash Enterprise for hyper-scalability and pixel-perfect aesthetic.

10% of the Fortune 500 uses Dash Enterprise to productionize AI & data science apps.

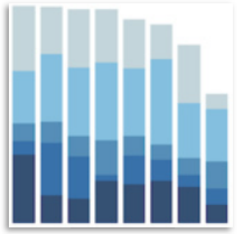
Find out if your company is using Dash Enterprise

Install Dash Enterprise on Azure | *Install Dash Enterprise on AWS*

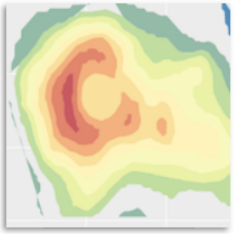
Basic Charts



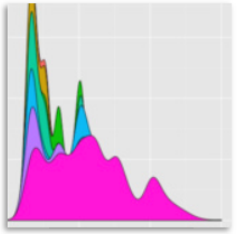
geom_abline



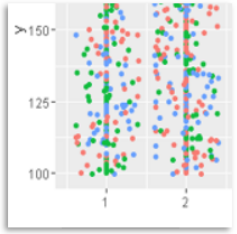
geom_bar



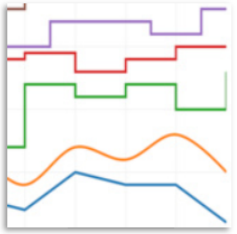
geom_contour



geom_density



geom_jitter



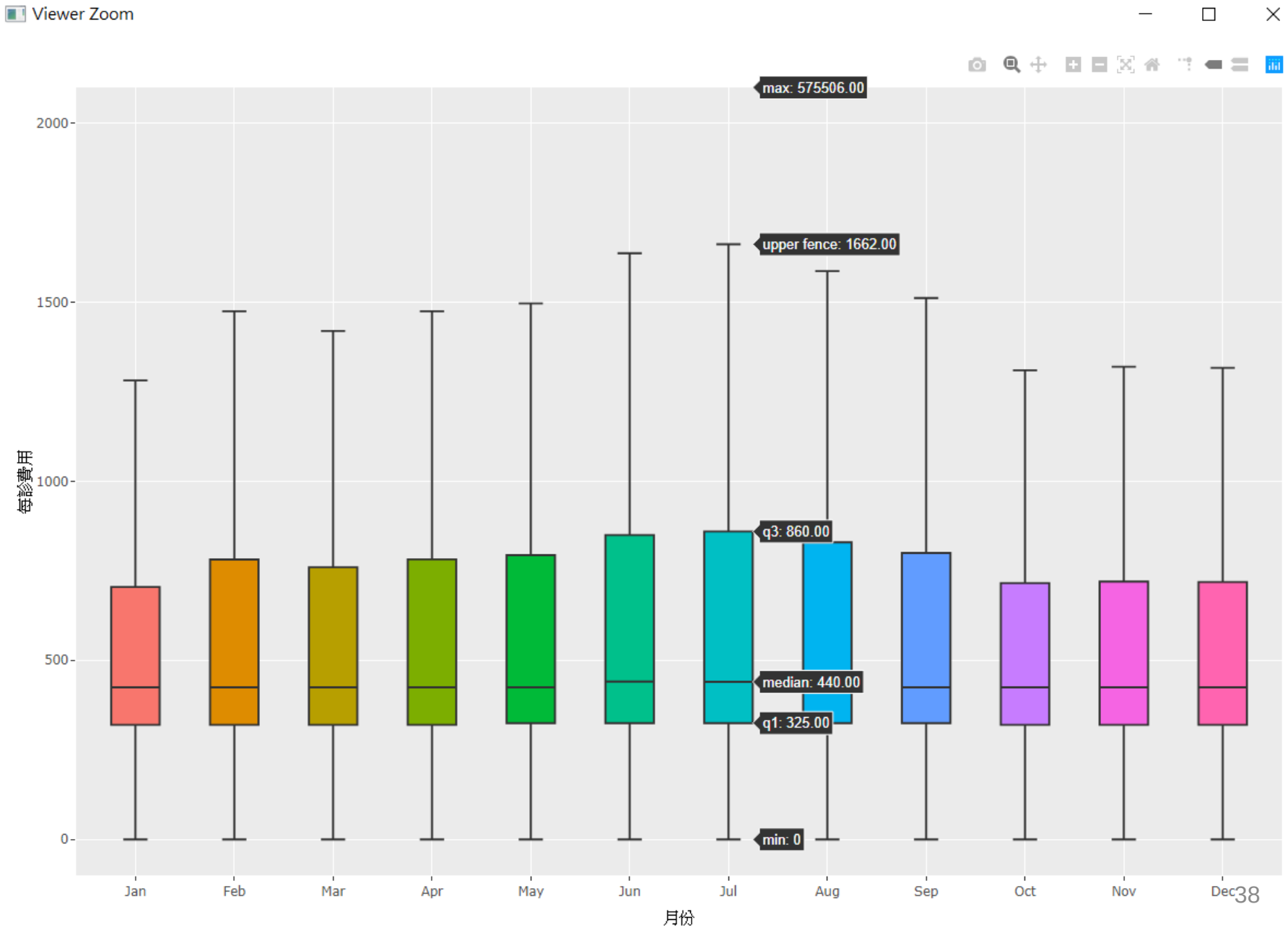
geom_line

Box Plot 箱形圖(盒鬚圖)

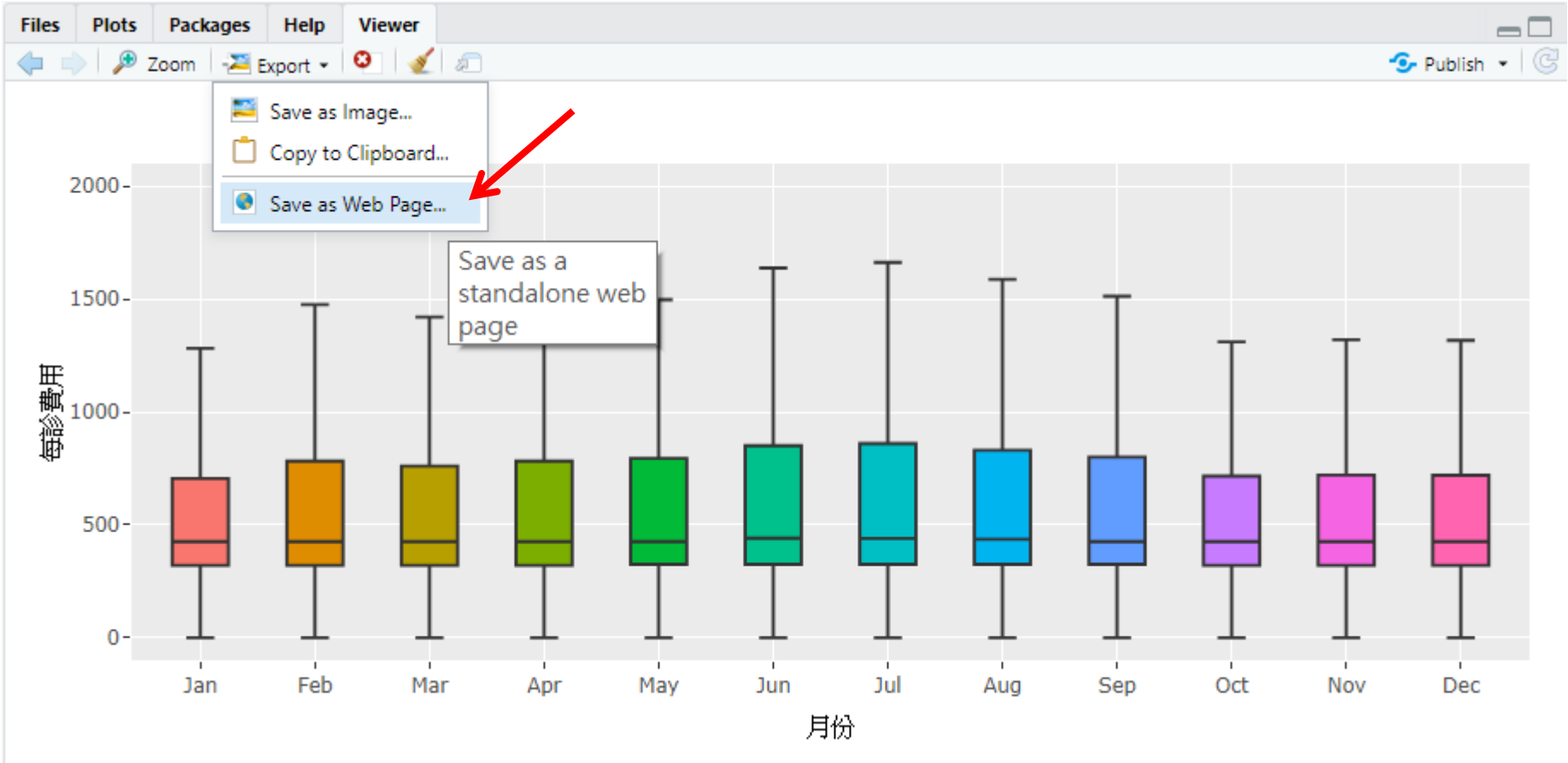
- 利用 Plotly_ggplot2_Boxplot.r
- 假設已先利用Import_tidyverse.r匯入資料，如果資料檔放置於其他位置，請更改程式碼內的檔案路徑
- 參考 https://plotly.com/ggplot2/box-plots/

程式碼置於 Plotly_ggplot2 子目錄

在 RStudio 顯示 (Viewer)



可存成網頁(內含互動式圖形)



在瀏覽器裡顯示網頁


Plotly_ggplot2_Boxplot.ht
file:///E:/R2020_YM/Ref/5_InteractiveGraphs/Plotly_ggplot2/Plotly_ggplot2_Boxplot.html
Booking.com
Amazon.com
eBay
Facebook
YouTube
max: 575506.00
upper fence: 1662.00
q3: 860.00
median: 440.00
q1: 325.00
min: 0
2000
1500
1000
500
0
每診費用
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
月份

SECTION III

HTMLWIDGETS

https://www.htmlwidgets.org/

htmlwidgets for R

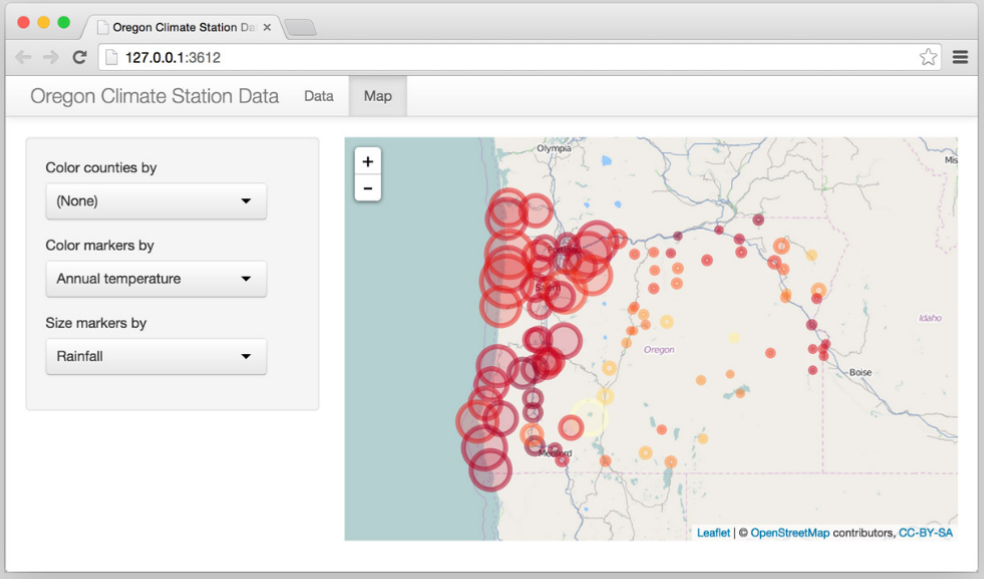
Home | Showcase | Develop | Flexdashboard | Crosstalk | Gallery | GitHub

Bring the best of JavaScript data visualization to R

Use JavaScript visualization libraries **at the R console**, just like plots

Embed widgets in **R Markdown** documents and **Shiny** web applications

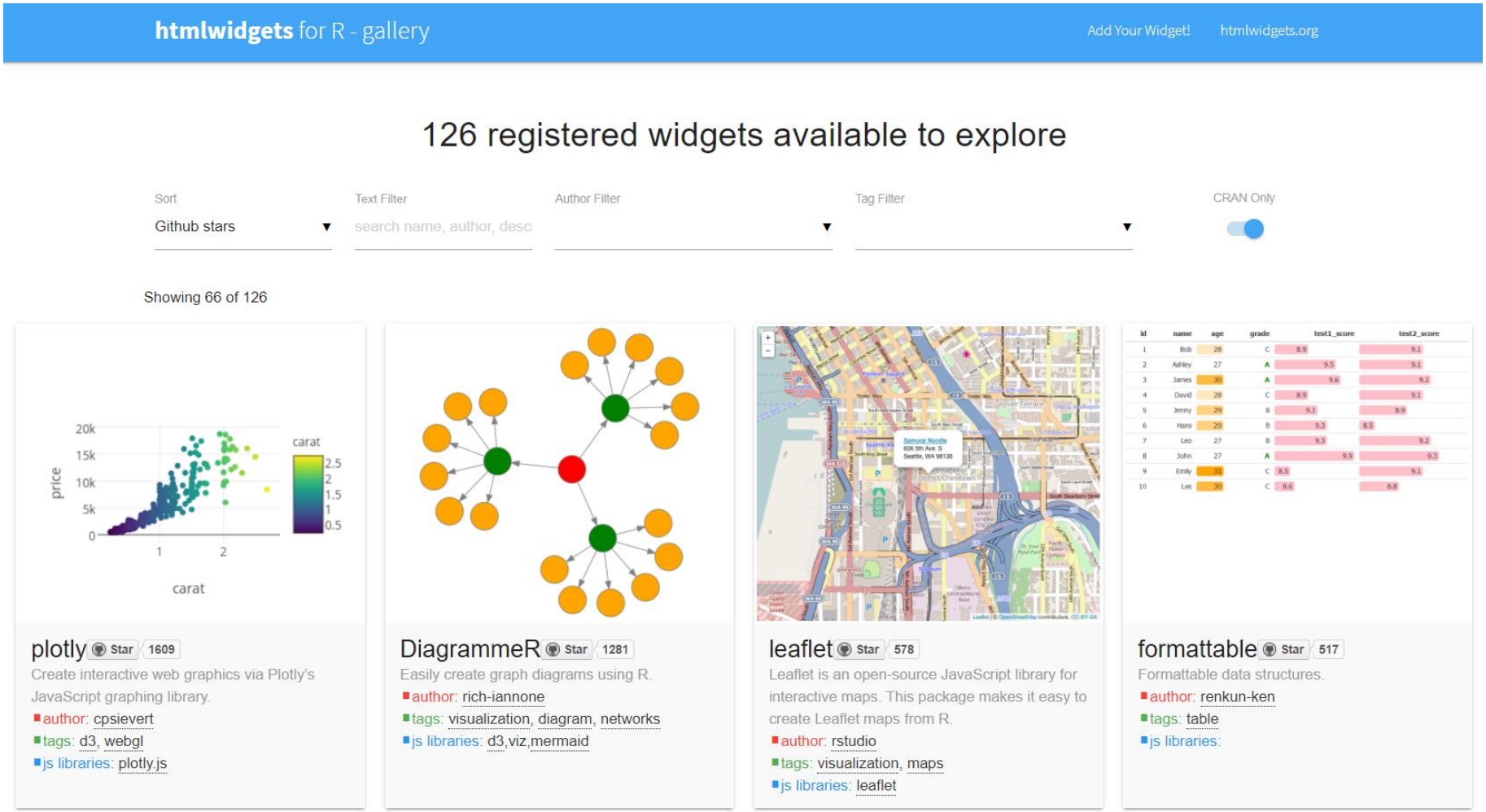
Develop new widgets using a framework that seamlessly bridges R and JavaScript



At the R console | In R Markdown docs | In Shiny apps

rmarkdown.rstudio.com/flexdashboard/

https://gallery.htmlwidgets.org/



htmlwidgets

- 一種簡便的框架，讓 R 可以使用 JavaScript library
- 讓 JavaScript 資料視覺化的套件能在 R 中使用
- 可以輸出為單獨的網頁

- widget : 控制項 / 控制元件 (https://en.wikipedia.org/wiki/Widget_(GUI))

htmlwidgets

- Leaflet : geo-spatial mapping
- dygraphs : time series charting
- Plotly : interactive graphics with D3
- rbokeh : R interface to Bokeh
- Highcharter : R interface to Highcharts
- visNetwork : graph data visualization with vis.js
- networkD3 : graph data visualization with D3
- DataTables : tabular data display
- threejs : 3D scatterplots and globes
- rglwidget : render scenes created with rgl
- DiagrammeR : diagrams and flowcharts
- MetricsGraphics : scatterplots and line charts with D3

https://www.htmlwidgets.org/showcase_leaflet.html

https://d3js.org/

Data-Driven Documents

Like visualization and creative coding? Try interactive JavaScript notebooks in **Observable!**

D3.js is a JavaScript library for manipulating documents based on data. **D3** helps you bring data to life using HTML, SVG, and CSS. D3's emphasis on web standards gives you the full capabilities of modern browsers without tying yourself to a proprietary framework, combining powerful visualization components and a data-driven approach to DOM manipulation.

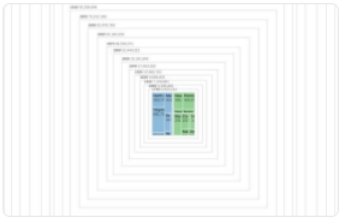
https://observablehq.com/@d3/gallery

Gallery

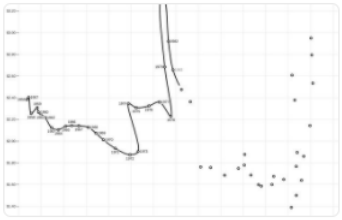
Looking for a good D3 example? Here's a few (okay, 168…) to peruse.

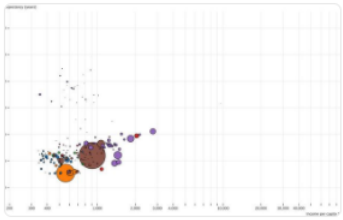
Animation

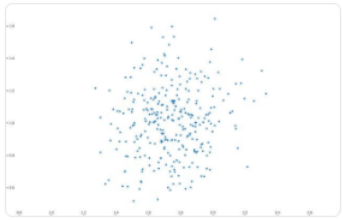
D3's data join, interpolators, and easings enable flexible animated transitions between views while preserving object constancy.


Animated treemap

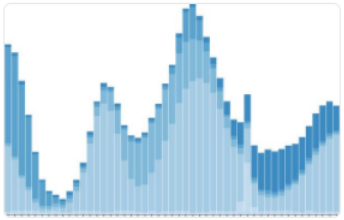

Temporal force-directed graph

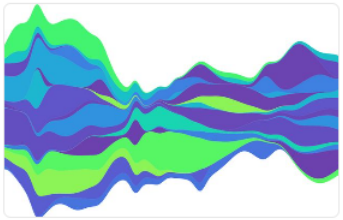

Connected scatterplot

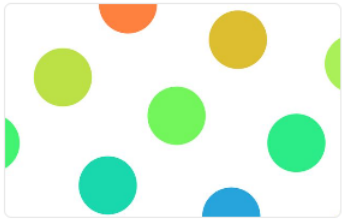

The wealth & health of nations


Scatterplot tour


Bar chart race


Stacked-to-grouped bars


Streamgraph transitions

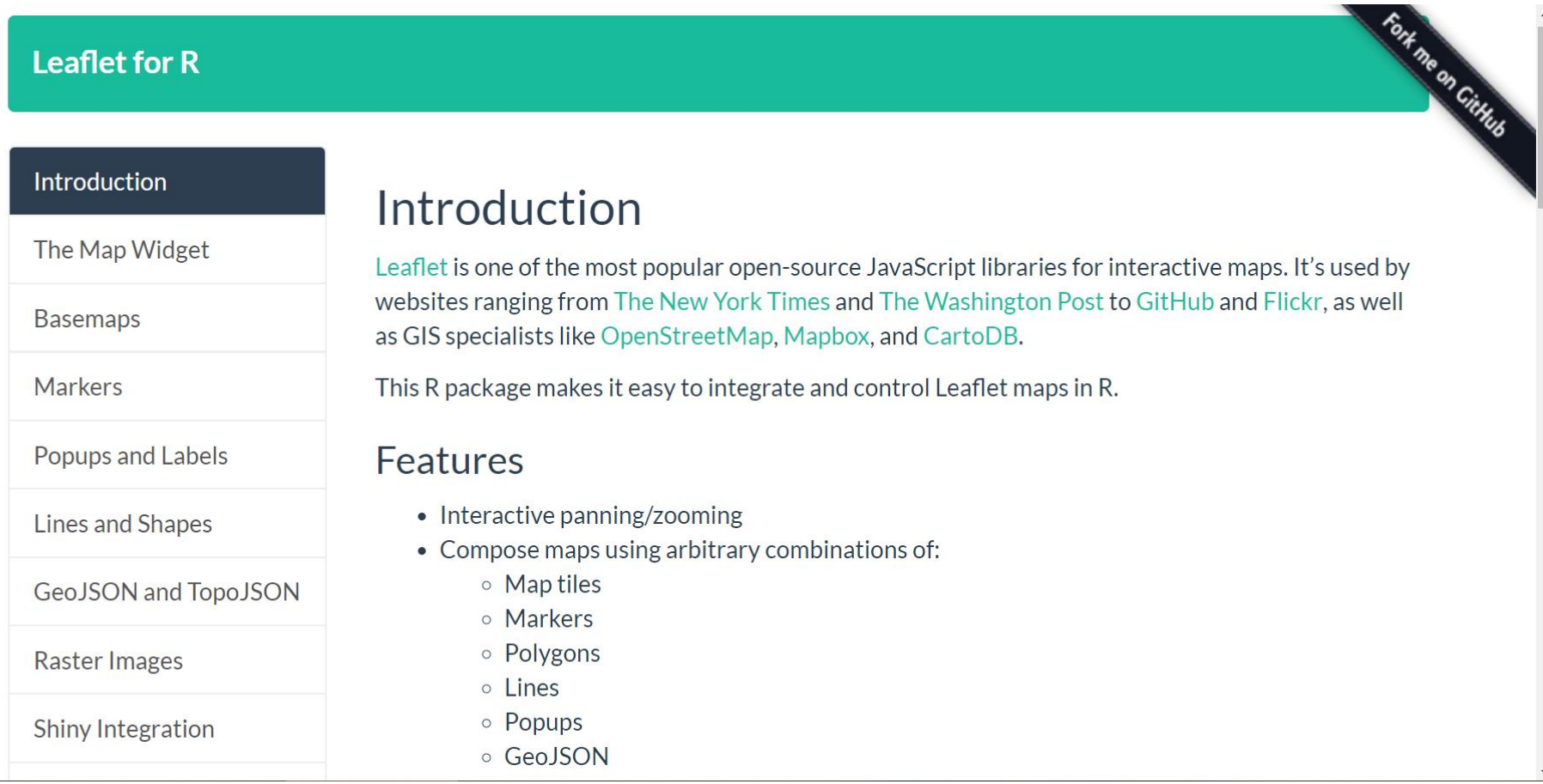

Smooth zooming


Zoom to bounding box

SECTION III-A

LEAFLET FOR R

https://rstudio.github.io/leaflet/



https://leafletjs.com/
https://github.com/rstudio/cheatsheets/raw/master/leaflet.pdf

Interactive Map 互動式地圖

```
if (! require(leaflet)) install.packages("leaflet")
library(leaflet)
leaflet() %>%
  addTiles() %>%
  addMarkers(lng = 121.515504, lat = 25.122318, popup = "上課地點")
# 可先用Google 地圖找出欲顯示地點的經緯度
# 預設地圖為 OpenStreetMap
# 請在 RStudio 裡執行程式，如果以 RGui 執行，會開啟瀏覽器來顯示地圖
# 程式碼置於 Map 子目錄
```


+
−
奇岩
軍艦岩
188 m
琪哩岸山
164 m
奇岩山
91 m
奇岩山西
峰
67 m
東華山
42 m
立農
琪哩岸
石牌路二段
台北護理
健康大學
天母西路
中山北路


+
−
上課地點
國立陽明
大學
綜合教
室/第
教學
大樓
第二教
學大樓
研究大
樓
動物中
心
陽明路二段
陽明路一段
奇岩里
神農坡打
石場公園
男一舍
男三舍
可販賣回
收資源場
女二舍
醫學館、
教師發
展中心
蔣介石像
水亭
榮陽隧道
真知路
神農坡路
山上村路
職務宿
舍1-4
號
校長職
務宿舍
行政大樓
軍艦岩親山步道
學生心理
諮商中心
陽明大學
保健室
室內靶
場
陽明大學
幹細胞研
究中心
醫護宿
舍
Leaflet | © OpenStreetMap contributors, CC-BY-SA

SECTION III-B

PLOTLY FOR R

https://plotly.com/r/

plotly Dash Consulting

SIGN IN SIGN UP

Help | Open Source Graphing Libraries | R

Quick Start

- Getting Started
- Cheat Sheet
- Full Reference
- User Guide
- Use Offline
- ggplot2
- Shiny Gallery
- Shiny for Python

Examples

- Plotly Fundamentals
- Basic
- Statistical
- Scientific
- Financial
- Maps
- 3D

Plotly R Open Source Graphing Library

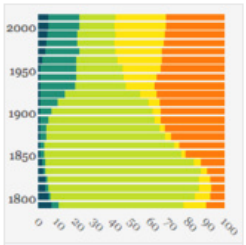
Plotly's R graphing library makes interactive, publication-quality graphs online. Examples of how to make line plots, scatter plots, area charts, bar charts, error bars, box plots, histograms, heatmaps, subplots, multiple-axes, and 3D (WebGL based) charts.

Search

Search Plotly's R & ggplot2 D

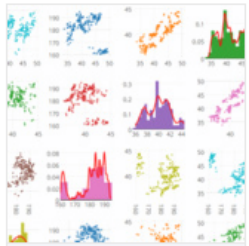
Plotly Fundamentals

Dashboards

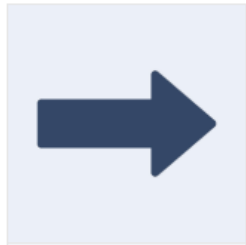


Updating Plotly Graphs

Static Image Export

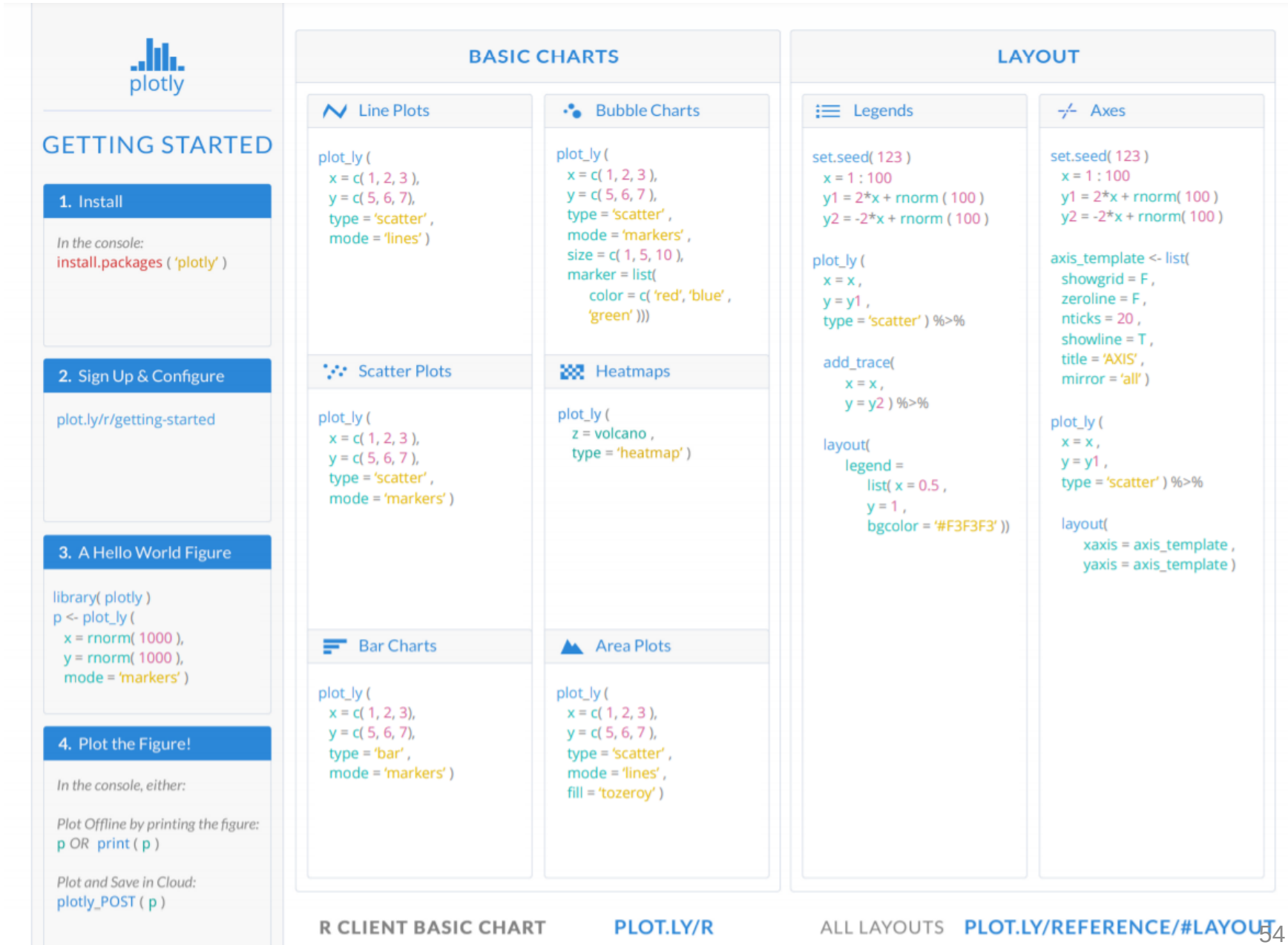


Embedding Graphs with Knitr



More Plotly Fundamentals

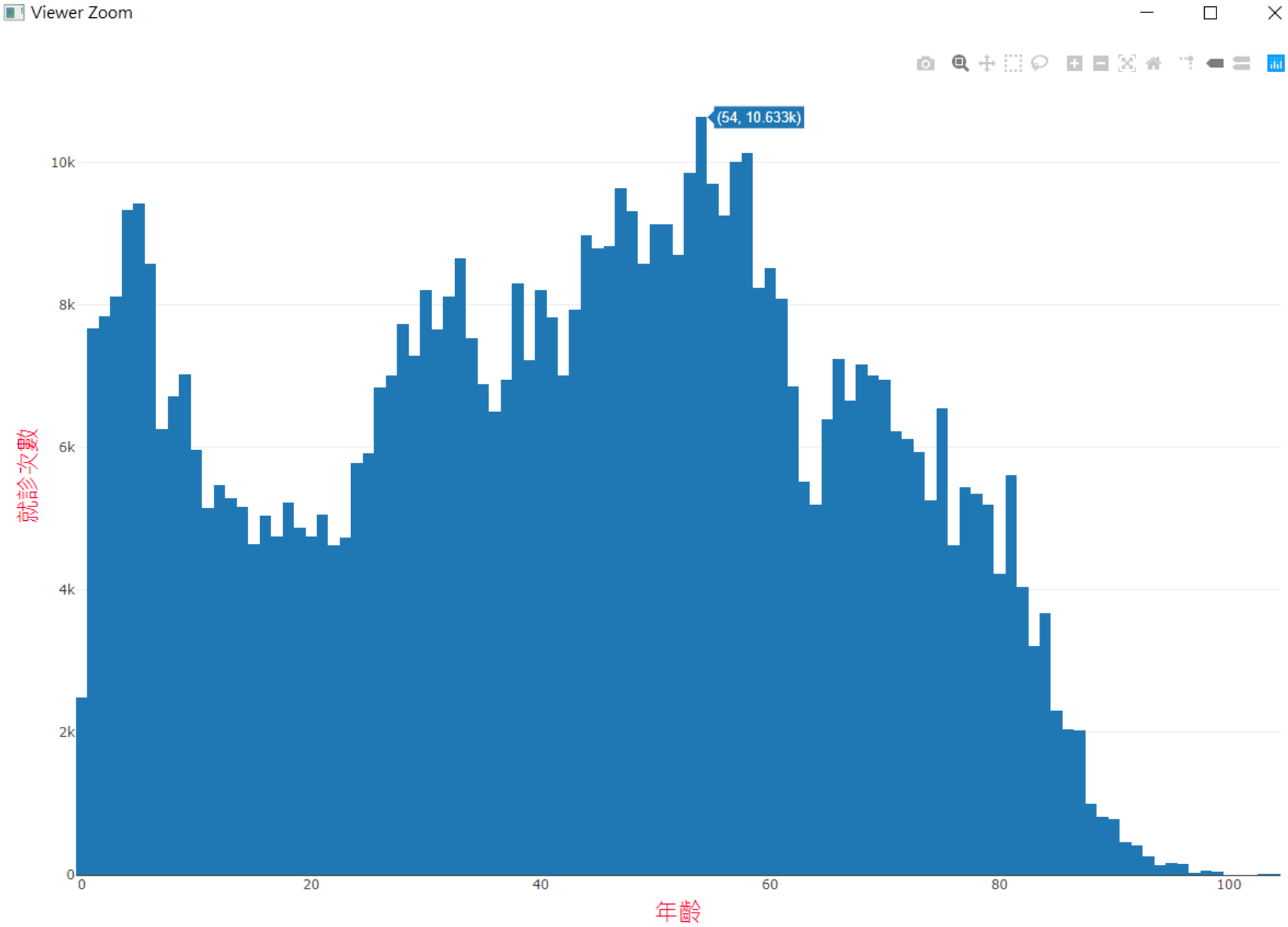
https://images.plot.ly/plotly-documentation/images/r_cheat_sheet.pdf



Histogram 直方圖

- 利用 Plotly_r_Histiogram.r
- 假設已先利用Import_tidyverse.r匯入資料，如果資料檔放置於其他位置，請更改程式碼內的檔案路徑
- 請在 RStudio 裡執行程式，也可在 RGui 裡執行
- 請參考 https://plotly.com/r/histograms/

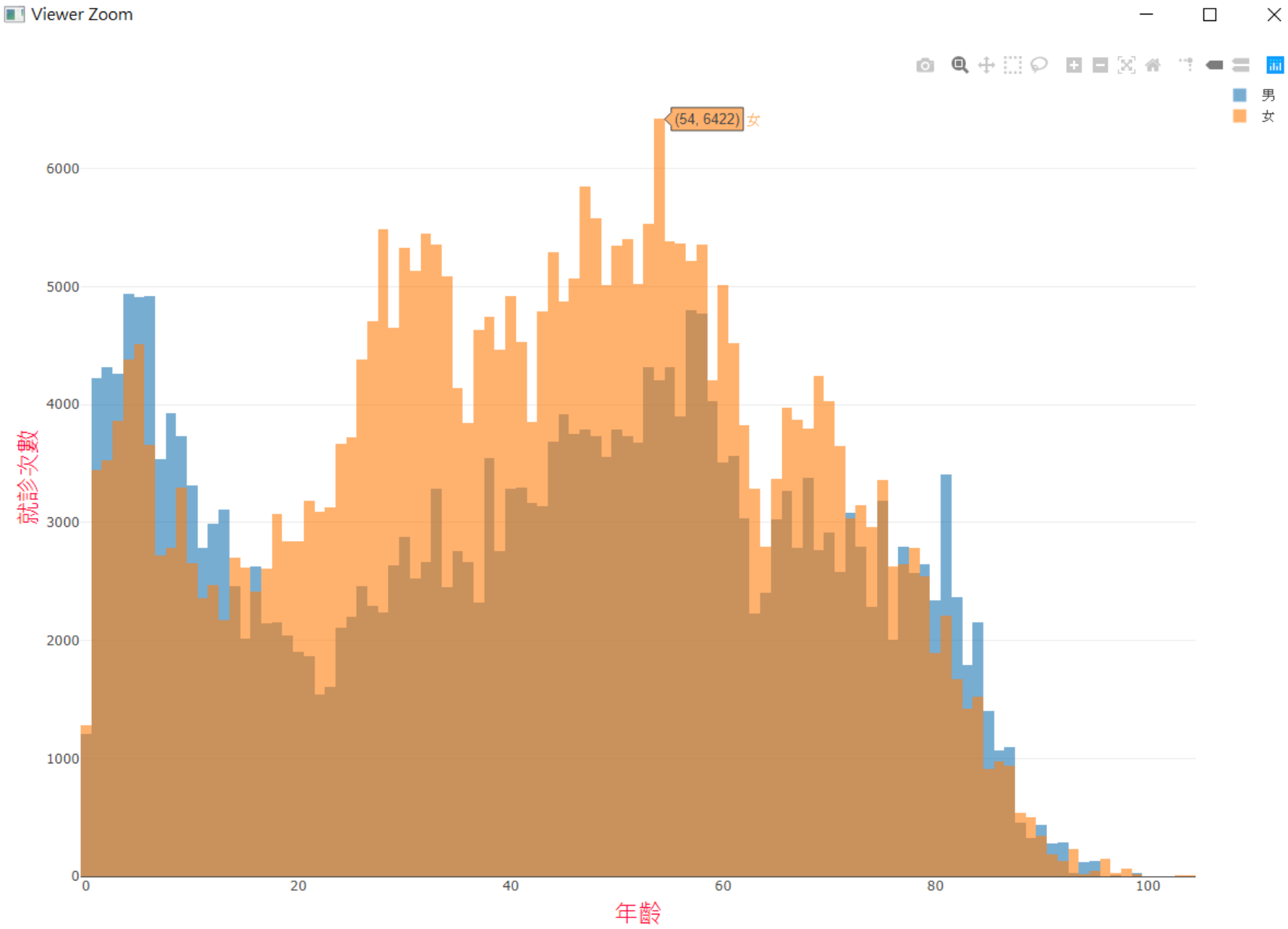
程式碼置於 Plotly_R 子目錄


Viewer Zoom
(54, 10.633k)
10k
8k
6k
4k
2k
0
就診次數
0
20
40
60
80
100
年齡

Overlaid Histogram

- 利用 Plotly_r_Histiogram_Overlay.r
- 假設已先利用Import_tidyverse.r匯入資料，如果資料檔放置於其他位置，請更改程式碼內的檔案路徑
- 請在 RStudio 裡執行程式，也可在 RGui 裡執行
- 請參考 https://plotly.com/r/histograms/

程式碼置於 Plotly_R 子目錄


Viewer Zoom
男
女
(54, 6422)
6000
5000
4000
3000
2000
1000
0
就診次數
0
20
40
60
80
100
年齡

Choropleth Map 分級著色圖

- 利用 ChoroplethMap_plotly.r
- 資料來源 Int J Health Plann Manage 2019;34:e291 (doi: 10.1002/hpm.2647) [PMID: 30204262] 的 Figure 1
- 參考 https://plotly.com/r/choropleth-maps/ 的 World Choropleth Map
- choro : area; pleth : value

檔案置於 IMG 子目錄

https://plotly.com/r/choropleth-maps/

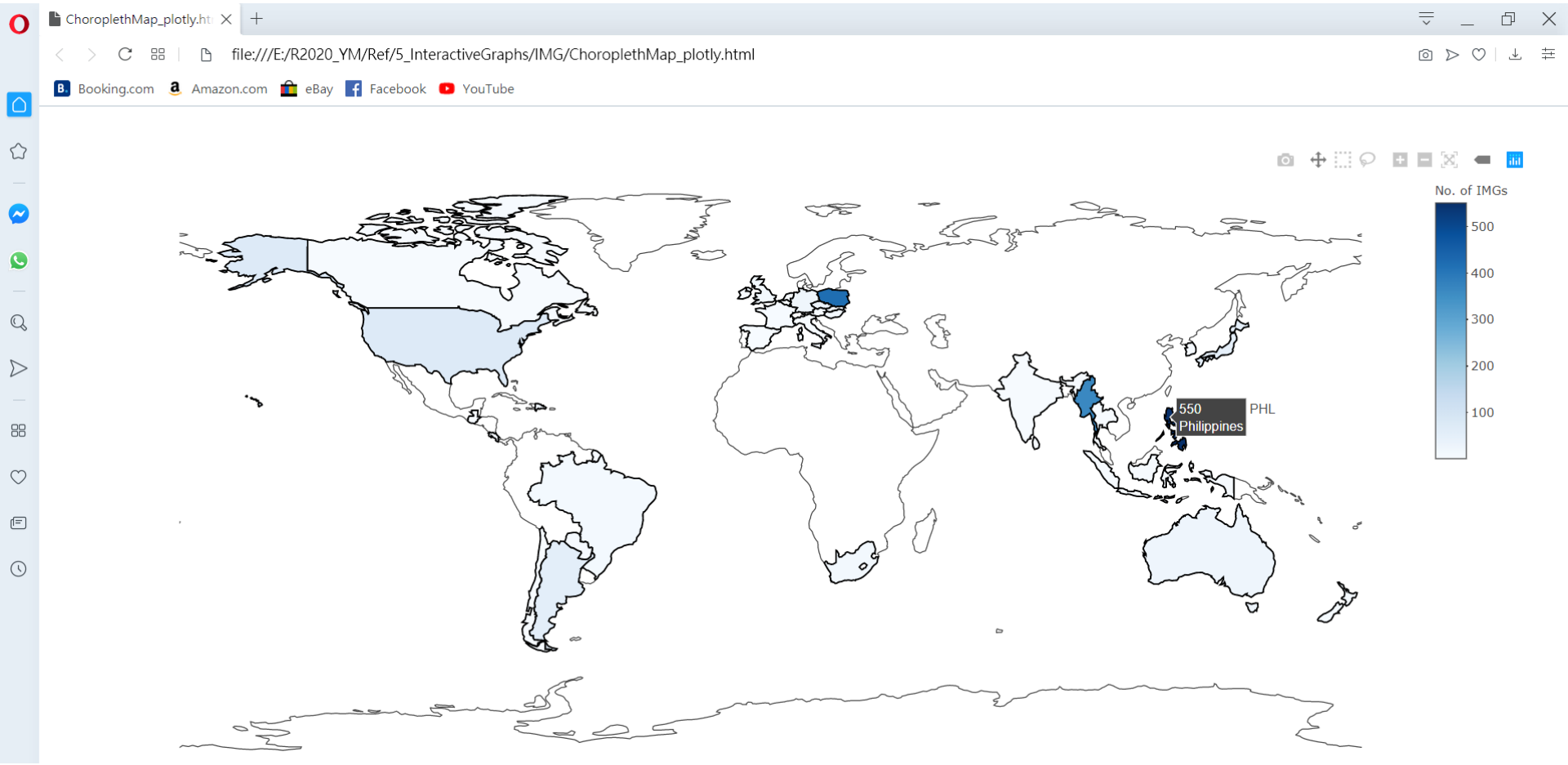
```r
library(plotly)

df <- read.csv('https://raw.githubusercontent.com/plotly/datasets/master/2014_world_gdp_with_codes.csv')

# Light grey boundaries
l <- list(color = toRGB("grey"), width = 0.5)

# specify map projection/options
g <- list(
  showframe = FALSE,
  showcoastlines = FALSE,
  projection = list(type = 'Mercator')
)

fig <- plot_geo(df)
fig <- fig %>% add_trace(
    z = ~GDP..BILLIONS., color = ~GDP..BILLIONS., colors = 'Blues',
    text = ~COUNTRY, locations = ~CODE, marker = list(line = l)
  )
fig <- fig %>% colorbar(title = 'GDP Billions US$', tickprefix = '$')
fig <- fig %>% layout(
    title = '2014 Global GDP<br>Source:<a href="https://www.cia.gov/library/publications/the-world-factbook/fields/2195.html">CIA World Factbook</a>',
    geo = g
  )

fig
```

```
# 更改網站上的程式碼
# 紅字為更改處
# ChoroplethMap_plotly.r

library(plotly)

Country <-
c("Philippines","Poland","Myanmar","USA","Argentina","Japan","Czech","Australia","
Germany","Dominican Republic","South Africa","Hungary","Brazil","UK","Costa
Rica","Paraguay","New
Zealand","Grenada","Austria","Canada","India","Indonesia","Ireland","France","Kore
a","Italy","Spain","Belgium","Chile","Guatemala","Netherlands","Slovakia","Sri
Lanka","Thailand")

CountryCode <-
c("PHL","POL","MMR","USA","ARG","JPN","CZE","AUS","DEU","DOM","ZAF","HU
N","BRA","GBR","CRI","PRY","NZL","GRD","AUT","CAN","IND","IDN","IRL","FRA","
KOR","ITA","ESP","BEL","CHL","GTM","NLD","SVK","LKA","THA")

IMG <-
c(550,420,364,73,56,47,30,26,23,18,16,13,12,12,8,8,7,6,5,5,5,5,5,4,4,2,2,1,1,1,1,1,
1,1)

df <- data.frame(Country, CountryCode, IMG)
```

```
l <- list(color = toRGB("black"), width = 1.5)

# specify map projection/options
g <- list(
  showframe = FALSE,
  showcoastlines = TRUE,
  projection = list(type = 'Mercator')
)

fig <- plot_geo(df)
fig <- fig %>% add_trace(
    z = ~IMG, color = ~IMG, colors = 'Blues',
    text = ~Country, locations = ~CountryCode, marker = list(line = l)
)
fig <- fig %>% colorbar(title = 'No. of IMGs')
fig <- fig %>% layout(
    geo = g
)

fig
```


Viewer Zoom
No. of IMGs
500
400
300
200
100
420
Poland
POL

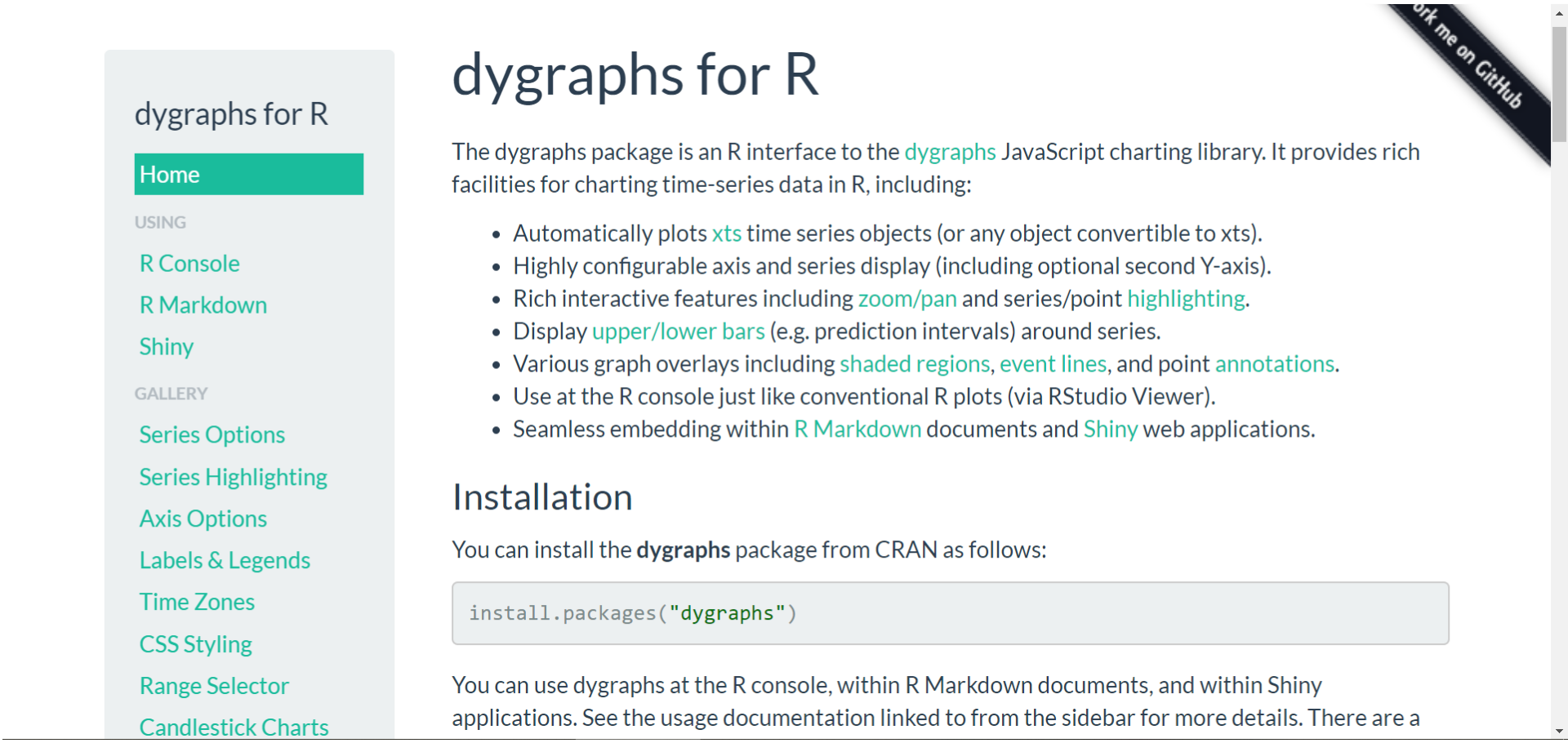
另存為網頁顯示


ChoroplethMap_plotly.ht
file:///E:/R2020_YM/Ref/5_InteractiveGraphs/IMG/ChoroplethMap_plotly.html
Booking.com
Amazon.com
eBay
Facebook
YouTube
No. of IMGs
500
400
300
200
100
550
Philippines
PHL

SECTION III-C

DYGRAPHS FOR R

https://rstudio.github.io/dygraphs/

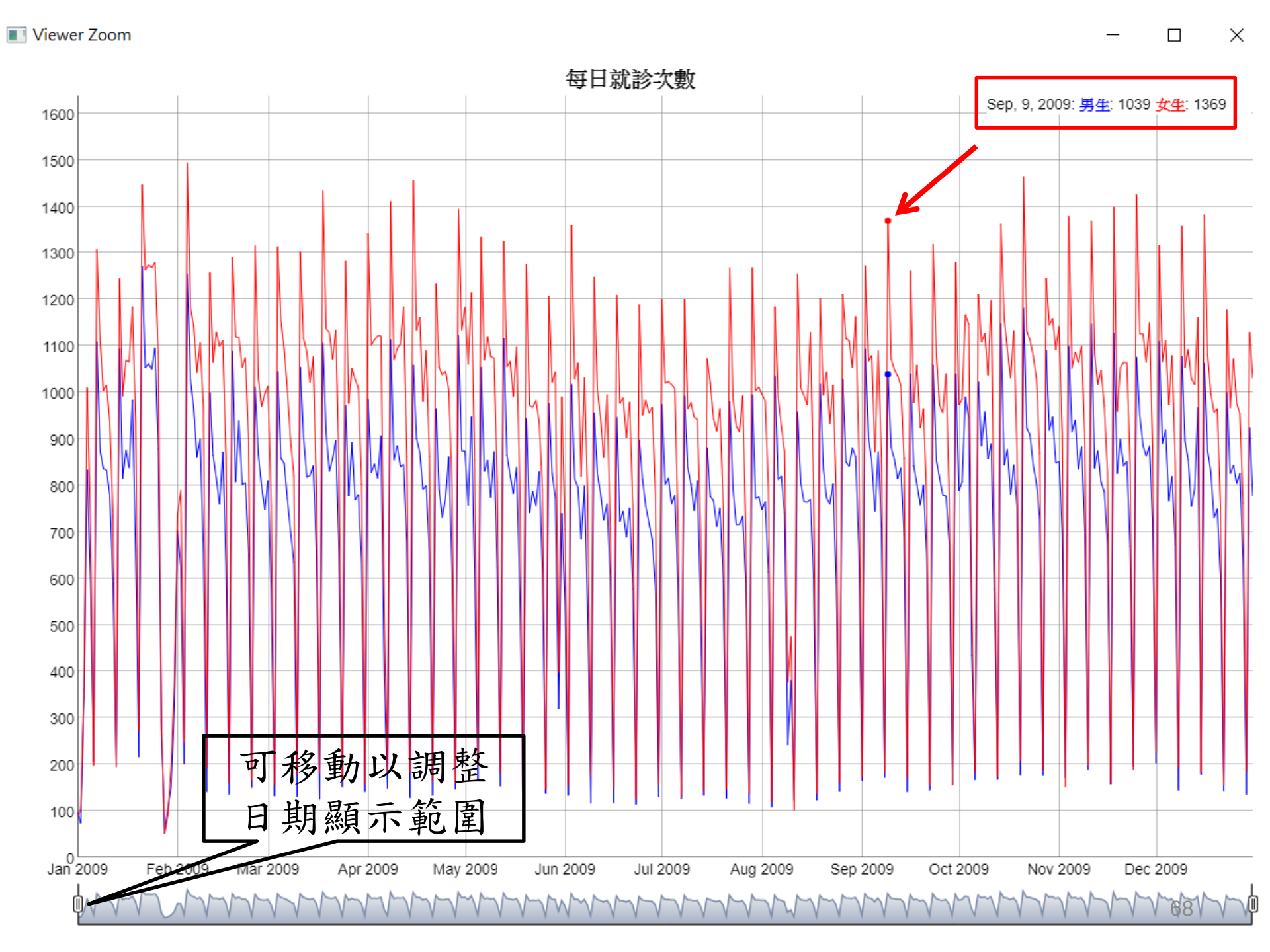


https://dygraphs.com/
https://dygraphs.com/gallery/

Time Series Chart 時間序列圖

- 利用 Dygpraphs_TimeSeries.r
- 假設已先利用Import_tidyverse.r匯入資料，如果資料檔放置於其他位置，請更改程式碼內的檔案路徑
- 請在 RStudio 裡執行程式，也可在 RGui 裡執行

程式碼置於 Dygpraphs 子目錄


Viewer Zoom
每日就診次數
Sep, 9, 2009: 男生: 1039 女生: 1369
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Jan 2009
Feb 2009
Mar 2009
Apr 2009
May 2009
Jun 2009
Jul 2009
Aug 2009
Sep 2009
Oct 2009
Nov 2009
Dec 2009
可移動以調整
日期顯示範圍
68

SECTION IV

R FOR AI

SECTION IV-A

OCR

Tesseract

- an optical character recognition (OCR) engine for various operating systems
- free software

- 1985-1994 : developed at Hewlett Packard labs
- 2005 : released as open source
- 2006 : sponsored by Google

https://en.wikipedia.org/wiki/Tesseract_(software)

Demo with tesseract

```
if (! require(tesseract)) install.packages("tesseract")
library(tesseract)

write( ocr("D:/1.jpg", engine = tesseract("eng")), file = "D:/1.txt" )


tesseract_download("chi_tra")
write( ocr("D:/2.png", engine = tesseract("chi_tra")), file = "D:/2.txt" )

# 請自行更改圖檔與文檔的存放位置

# 檔案置於 OCR 子目錄
```

Deep learning (also known as **deep structured learning** or **hierarchical learning**) is part of a broader family of machine learning methods based on learning data representations, as opposed to task-specific algorithms. Learning can be supervised, semi-supervised or unsupervised.[1][2][3]

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broader family of machine learning methods based on learning data representations, as
opposed to task-specific algorithms. Learning can be supervised, semi-supervised or
unsupervised [12115]

* 不同作業系統，不同套件版本，辨識結果略有差異

- 第一境界：（出於外而能觀）昨夜西風凋碧樹，獨上高樓，望盡天涯路。（引自晏殊的《蝶戀花》）
- 第二境界：（入於內而能寫）衣帶漸寬終不悔，為伊消得人憔悴。（引自柳永的《蝶戀花》）
- 第三境界：（內外圓融而悟）眾裡尋他千百度，驀然回首，那人卻在燈火闌珊處。（引自辛棄疾的《青玉案·元夕》）

·第一境界: (出於外而能觀) 昨夜西風凋百樹,獨上高樓,匡盡天涯路。(引自旻殊的《蝶匕花》)
·第二境界: (人於內而熊寫)衣帶漸竟終不悔,為伊消得人憔悴。 (引自柳永的《蝶匕花》)
·第三境界: (內外圓融而悟) 眾裡尋他千百度,醫然回首,那人卻在燈火閑珊處。 (引自辛棄疾的《青玉案'元夕》)

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SECTION IV-B

HUMAN FACE DETECTION

OpenCV (Open Source Computer Vision)

- a library of programming functions
- 1999年 英特爾公司啟動
  - 為推進機器視覺的研究，提供一套開源且最佳化的基礎庫
  - 提供一個共同的基礎庫，使得開發人員的代碼更容易閱讀和轉讓，促進了知識的傳播
  - 通過提供一個不需要開源或免費的軟體許可，促進商業應用軟體的開發
- 2000年 在IEEE Conference on Computer Vision and Pattern Recognition公開
- 2006年 釋出1.0版本
- 2012年 OpenCV的支援由一個非盈利性組織(OpenCV.org)來提供

https://www.opencv.org/
https://cran.r-project.org/web/packages/opencv/index.html
https://zh.wikipedia.org/wiki/OpenCV

Demo with opencv

```
if (! require(opencv)) install.packages("opencv")
library(opencv)

ocv_write( ocv_face( ocv_read("D:/ym.jpg") ), "D:/ym_ocv.jpg")
```

請自行更改圖檔的存放位置

僅展示第一步驟偵測臉部位置。若欲進一步比對臉部，需有可供比對的人臉資料。

檔案置於 HumanFaceDetection 子目錄

https://github.com/ropensci/opencv

https://cran.r-project.org/web/packages/opencv/index.html

SECTION IV-C

DEEP LEARNING

Deep Learning

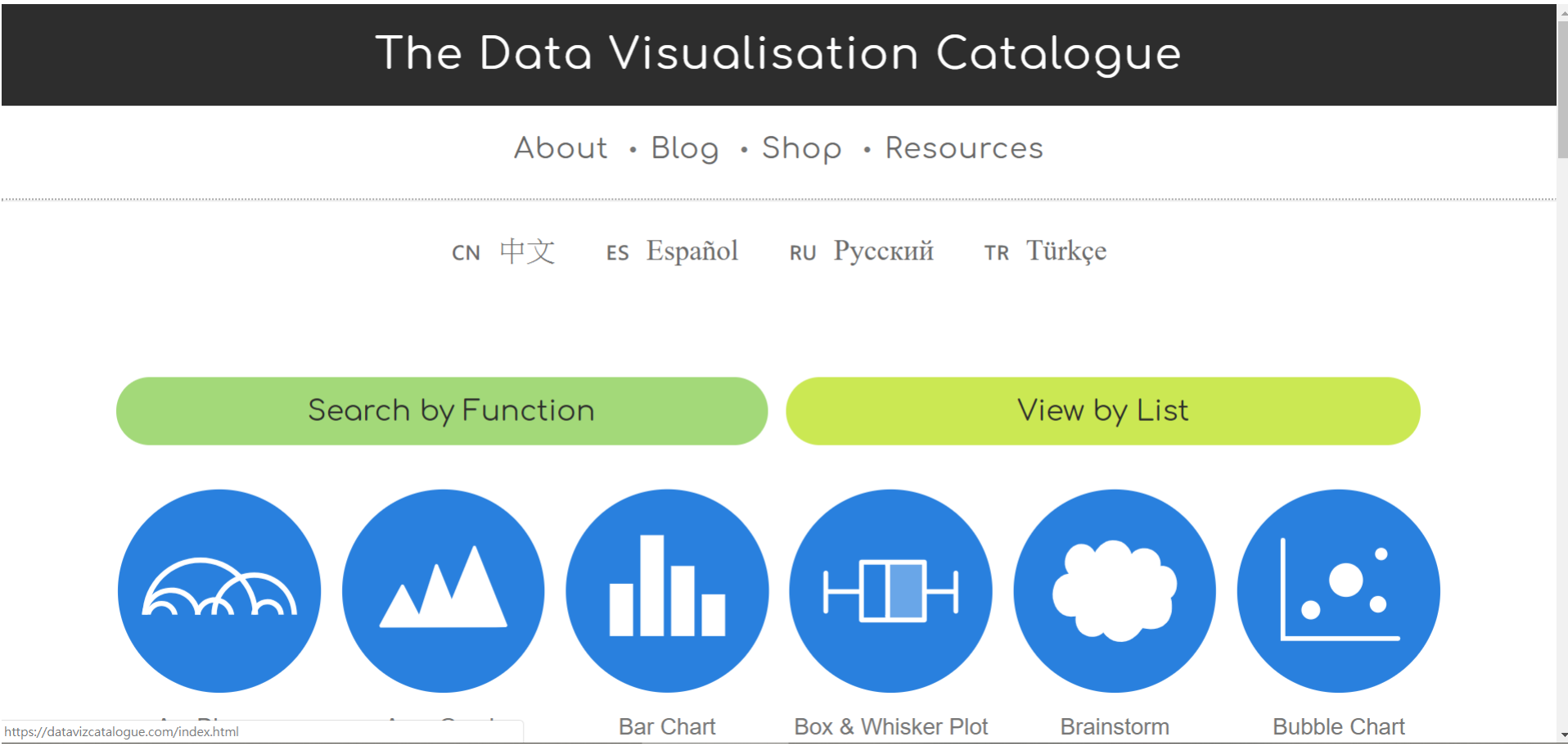
- R interface to TensorFlow : an open-source software library for machine intelligence (https://tensorflow.rstudio.com/) (https://www.tensorflow.org/)
- R interface to Keras : a high-level neural networks API (https://keras.rstudio.com/) (https://keras.io/)
- R interface to H2O : an open-source artificial intelligence platform (https://www.h2o.ai/)
- R interface to Python via reticulate (https://github.com/rstudio/reticulate)

https://github.com/rstudio/reticulate

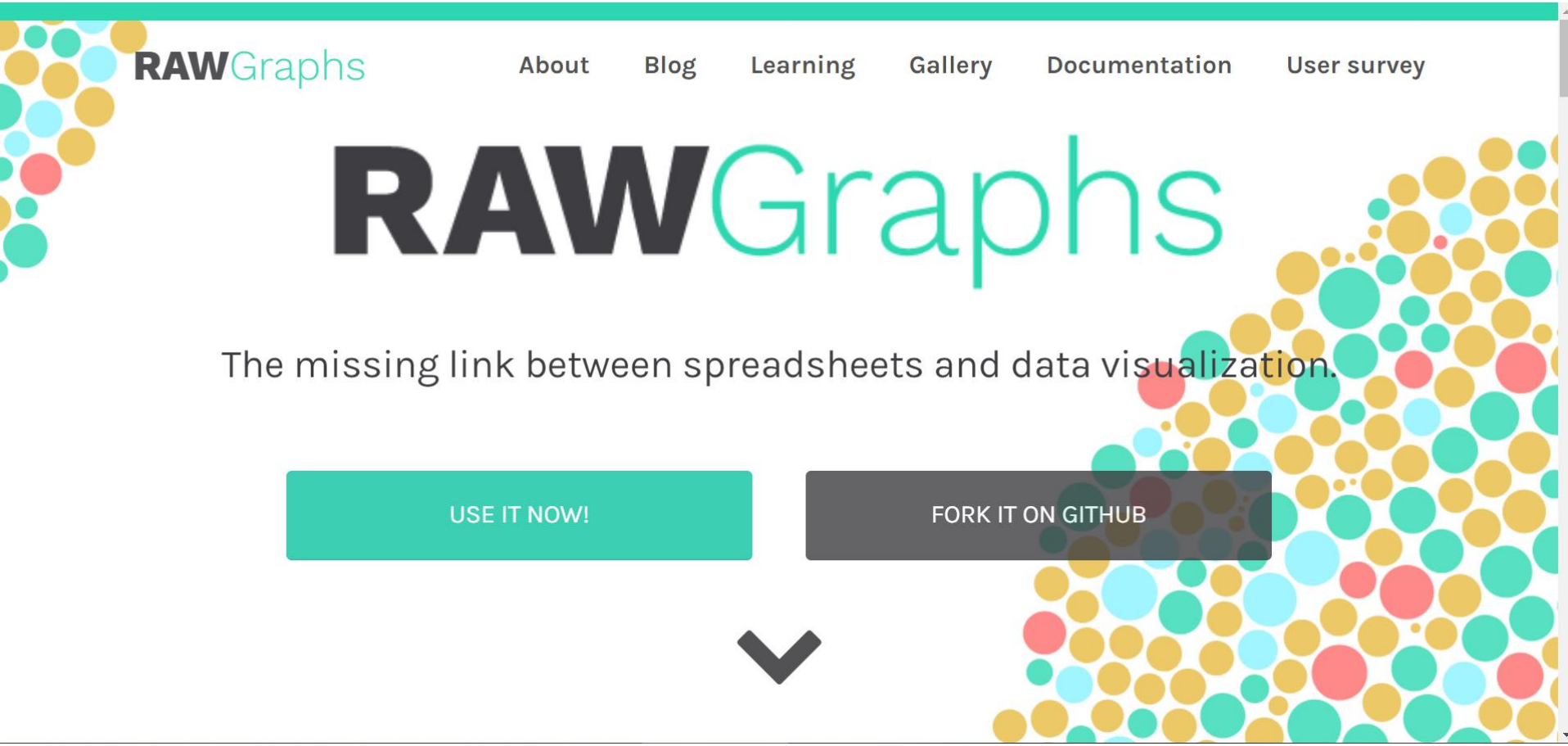
SECTION V

VALUABLE RESOURCES

https://datavizcatalogue.com/



https://rawgraphs.io/



https://www.r-graph-gallery.com/interactive-charts.html

Interactive charts

An interactive charts allows the user to perform actions: zooming, hovering a marker to get a tooltip, choosing a variable to display and more. `R` offers a set of packages called the `htmlwidgets` : they allow to build interactive dataviz directly from `R` .

Thanks for Your Attention !