

Creating Shiny Apps for biostatisticians and bioinformaticians

ISGlobal

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Part I: Introduction to Shiny and first examples

Course outline

- **Part II:** Layout of the form elements
 - Input elements
 - Output elements
 - Layout
 - Conditional panels
- **Part III:** How Shiny works
 - How Shiny works
 - Isolate
 - Reactive objects
 - Upload data
 - Download files
 - Validate inputs
 - Rendering elements
- **Part IV:** How to improve the appearance and functionality of the application
 - HTML and CSS
 - Pop-ups and Modals
 - Collapse panels
 - Themes (app appearance)
 - Sizeable
 - Input alerts
 - Loader & progress bar
- **Part V:** Advanced issues
 - observe and observeEvent functions.
 - Updating elements
 - Reactive variables
 - hide, show, toggle and disable functions

Introduction to Shiny and first examples

What is Shiny?

- **Shiny** is an **R** package meant to build web based interactive apps.
- It has been created by **RStudio** team. (**Joe Chen**)
- No knowledge of web languages such as **HTML**, **JavaScript** or **PHP** is required. It only uses **R** code.
- Very flexible and powerful apps can be designed by writing small pieces of code.
- Useful to make your R written functions or packages be used by many users not familiarized with R who prefers "click" than "type".
- See **Shiny web page** with lots of examples and extensive help documents.

Shiny website pages


Shiny from R Studio

Get Started Gallery Articles Reference Deploy Help Contribute

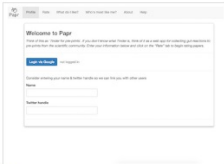
Gallery

Shiny User Showcase

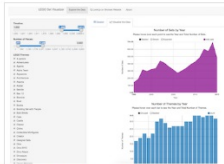
The [Shiny User Showcase](#) contains an inspiring set of sophisticated apps developed and contributed by Shiny users.




Genome browser



Papr



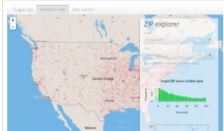
Lego Set Database Explorer

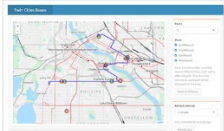



See more

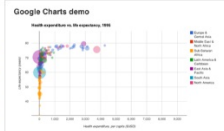
Interactive visualizations

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









Shiny from R Studio

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Learn Shiny

The tutorials on this page are primarily designed for users who are new to Shiny and want a guided introduction. If you use Shiny on a regular basis, you may want to skip these tutorials and visit the [articles](#) section where we cover individual Shiny topics at an advanced level.

Get started materials are organized in two sections: [videos](#) and [written](#) tutorials.

Video tutorials

How to Start Shiny tutorial

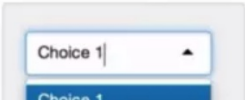
The How to Start Shiny video series will take you from R programmer to Shiny developer. Watch the complete tutorial, or jump to a specific chapter by clicking a link below. The entire tutorial is two hours and 25 minutes long. Download the slides and exercises here: [Part 1](#), [Part 2](#), and [Part 3](#).

R Studio

250 North St, Boston, MA 02210
Phone: 617-452-1212

Email: info@rstudio.com
Web: <http://www.rstudio.com>

How to start with Shiny, Part 1



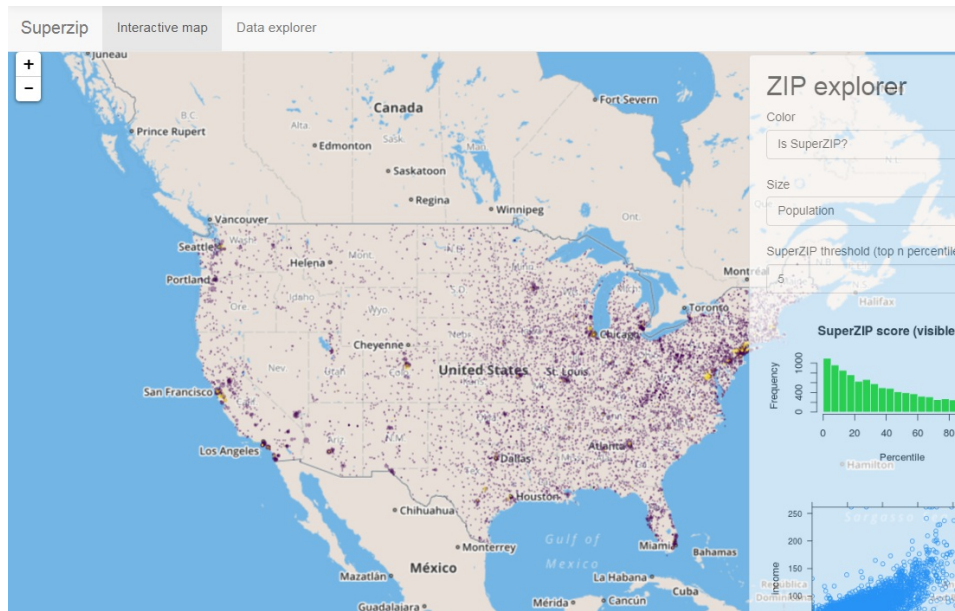
Shiny from R Studio

Get Started Gallery Articles Reference Deploy Help Contribute

Articles

Start	>	Build	>	Improve	>	Share	>
Your first Shiny app		Structure		Refactor		Deployment	
Help		Standalone apps		Code quality		Distribution	
		Interactive documents		Testing		Bookmarking	
		Dashboards		Modules			
		Gadgets		Scale			
		Backend		Measure usage			
		Reactivity		Performance			
		Data		Profiling			
		Frontend		Tuning			
		User interface					
		Graphics & visualization					
		Shiny extensions					
		Customizing Shiny					

Shiny website examples



More Widgets

Choose a dataset:

rock

Number of observations to view:

10

Note: while the data view will show only the specified number of observations, the summary will still be based on the full dataset.

Update View

Summary

area	peri	shape	perm
Min. : 1016	Min. : 308.6	Min. : 0.09033	Min. : 6.30
1st Qu.: 5305	1st Qu.: 1414.9	1st Qu.: 0.16226	1st Qu.: 76.45
Median : 7487	Median : 2536.2	Median : 0.19886	Median : 130.50
Mean : 7188	Mean : 2682.2	Mean : 0.21811	Mean : 415.45
3rd Qu.: 8870	3rd Qu.: 3989.5	3rd Qu.: 0.26267	3rd Qu.: 777.50
Max. : 12212	Max. : 4864.2	Max. : 0.46413	Max. : 1300.00

Observations

area	peri	shape	perm
4990	2791.90	0.09	6.30
7002	3892.60	0.15	6.30
7558	3930.66	0.18	6.30
7352	3069.32	0.12	6.30
7943	3948.54	0.12	17.10
7979	4010.15	0.17	17.10
9333	4345.75	0.19	17.10
8209	4344.75	0.16	17.10
8393	3682.04	0.20	119.00
6425	3098.65	0.16	119.00

Shiny from RStudio

Back to Gallery Get Co

Iris k-means clustering

X Variable

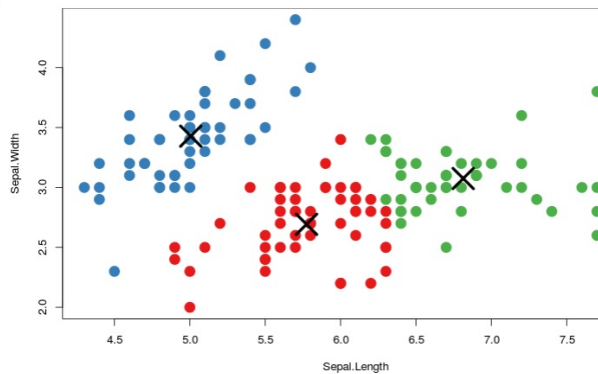
Sepal.Length

Y Variable

Sepal.Width

Cluster count

3



Kmeans example
by Joe Cheng <joe@rstudio.com>

server.R

ui.R

show with

```
function(input, output, session) {
```

R packages with Shiny-GUIs

Step 1. Load data

Upload your own data set from a file

...or choose an example data set

REGICOR

PREDIMED

SNPS

Browse... No file selected

Step 2. Select variables

Step 3. Settings

Step 4. Display

Step 5. Save table

ABOUT DATA TABLE PLOT SNPs

compare-Groups Project

- Create data summaries for quality control, extensive reports for exploring data, as well publication-ready univariate or bivariate tables in several formats:
 - plain text (csv), HTML, PDF, Word or Excel
- Perform figures to quickly visualise the distribution of your data (boxplots, barplots, normal plots, etc.).
- Display statistics (mean, median, frequencies, incidences, etc.)
- Perform the appropriate tests (t-test, Analysis of variance, Kruskal-Wallis, Fisher, log-rank, depending on the nature of the described variable (normal, non-normal or qualitative).
- Summarize genetic data (Single Nucleotids Polymorphisms) data displaying Allele Frequencies and performing Hardy-Weinberg Equilibrium tests among other typical statistics and tests these kind of data.

view examples

compare-Groups Web User Interface (WUI)

MAVIS: Meta Analysis via Shiny

Main

Input Examples

Inter-rater reliability

Model Options and Settings

Publication Bias

Effect Size Calculator

About MAVIS

Data Analysis and Input Options:

Mean Differences (n, M, SD)

Mean Differences (n, Effect size d)

Correlations (n, r)

Dichotomous Models

See Dichotomous Model Options, default is set to log odds ratio

The data contains a categorical moderator (subgroup) variable.

Update View

Click here to update your results, you need to do this after you change the data, model, or any of the settings

Quit

Press Quit to exit the application

Note: Input values must be separated by tabs. Copy and paste from Excel.

Your data needs to have exactly the same header (variable names) in the first row.

For examples of how this data should look click on the Input Examples tab

Study	Moderator	N1	M1	SD1	N2	M2	SD2
Burkman et al (2013)	INTERNET	38	55.84	18.23	38	43.58	16.58
Fledderus et al (2012)	BOOK	125	134.73	16.17	126	115.7	18.76
Gluck & Maerker (2011)	INTERNET	28	38.77	5.38	21	40.67	6.78
Hesser et al (2012)	INTERNET	33	44.27	9.69	32	36.81	10.95
Hjefl/Hayes (2012)	BOOK	103	135.81	18.72	109	123.18	19.39
Johnson et al (2012)	BOOK	5	77.4	9.18	62.3	24.8	
Lappalainen et al (2013)	INTERNET	12	55.73	6.25	32	53.67	9.6
Marledge et al (2013)	INTERNET	184	3.86	0.82	184	3.65	0.89
Muto et al (2011)	BOOK	30	44.3	6.67	31	43.48	8.63
Thorsell et al (2011)	BOOK	52	62.3	20.91	38	58	19.11

Data for this example is from the foil

PCA on the dataset decathlon

Graphs

Values

Automatic description of axes

Summary of dataset

Data

Show PCA parameters

Show graphs options

Save graphs as

PNG

JPG

PDF

Get the PCA code

Quit the app

Individuals factor map (PCA)

Variables factor map (PCA)

Download as png

Download as png

How to use Shiny: (1) locally

Requirements:

R and **shiny** package must be installed in your PC or Mac.

Steps

1. Write the app code in two files named "**ui.R**" and "**server.R**" placed in the same folder.
2. Call `runApp()`.

Alternative

1. Write all code in a single file named **app.R**.
2. call `runApp(list(ui, server))` or `shinyApp(ui, server)`.

How to use Shiny: (2) remote server

Own server

- Advantages
 - Accessible from any device with internet explorer.
 - No need to have **R**, **shiny** or other packages/software.
- Requirements
 - **R**, **shiny** and other required packages/software installed in the server.
 - Install required software. More info [here](#).
 - OS must be Linux.

Shiny server

- Pros
 - Very simple: only need to install **shinyapps** and register to www.shinyapps.io/.
 - Accessible from any device with internet explorer.
 - **Shiny server** offers use statistics.
- Cons
 - Free up to a maximum number of hours and users.

Shiny extensions used in this course

Packages available on CRAN to improve both app appearance and functionality.

- **shinyBS**: to create pop-ups, modals,... [More info](#)
- **shinywidgets**: alternative and improved shiny widgets. [More info](#)
- **shinycssloaders**: generates loaders while computing. [More info](#)
- **shinyjs**: to create toggles, hide or show elements, etc. [More info](#)
- **shinyjqui**: to make plots, tables, panels, etc. resizable. [More info](#)
- **shinyFeedback**: create alerts on input widgets when values out of range are introduced. [More info](#)
- **shinythemes**: change the app appearance. [More info](#)

Shiny extensions: available on CRAN

<u>shiny</u>	Web Application Framework for R
<u>shiny.semantic</u>	Semantic UI Support for Shiny
<u>shinyAce</u>	Ace Editor Bindings for Shiny
<u>shinyaframe</u>	'WebVR' Data Visualizations with 'RStudio Shiny' and 'Mozilla A-Frame'
<u>shinybootstrap2</u>	Bootstrap 2 Web Components for Use with Shiny
<u>shinyBS</u>	Twitter Bootstrap Components for Shiny
<u>shinycssloaders</u>	Add CSS Loading Animations to 'shiny' Outputs
<u>shinydashboard</u>	Create Dashboards with 'Shiny'
<u>shinyDND</u>	Shiny Drag-n-Drop
<u>shinyFeedback</u>	Displays User Feedback Next to Shiny Inputs
<u>shinyFiles</u>	A Server-Side File System Viewer for Shiny
<u>shinyHeatmaply</u>	Deploy 'heatmaply' using 'shiny'
<u>ShinyImage</u>	Image Manipulation, with an Emphasis on Journaling
<u>ShinyItemAnalysis</u>	Test and Item Analysis via Shiny
<u>shinyjquery</u>	'jQuery UI' Interactions and Effects for Shiny
<u>shinyjs</u>	Easily Improve the User Experience of Your Shiny Apps in Seconds
<u>shinyKCode</u>	An Interactive Application for ODE Parameter Inference Using Gradient Matching
<u>shinyLP</u>	Bootstrap Landing Home Pages for Shiny Applications
<u>shinymaterial</u>	Implement Material Design in Shiny Applications
<u>shinyRGL</u>	Shiny Wrappers for RGL
<u>shinyShortcut</u>	Creates an Executable Shortcut for Shiny Applications
<u>shinystan</u>	Interactive Visual and Numerical Diagnostics and Posterior Analysis for Bayesian Models
<u>ShinyTester</u>	Functions to Minimize Bonehead Moves While Working with 'shiny'
<u>shinythemes</u>	Themes for Shiny
<u>shinyTime</u>	A Time Input Widget for Shiny
<u>shinytoastr</u>	Notifications from 'Shiny'

"Homemade" examples

Contrast d'hipòtesi sobre una població normal

Mostra

$\bar{X} \sim N(\mu, \sigma)$

Grandària mostral, n

Com vols obtenir la mostra

Mitjana poblacional, μ

Desviació típica poblacional, σ

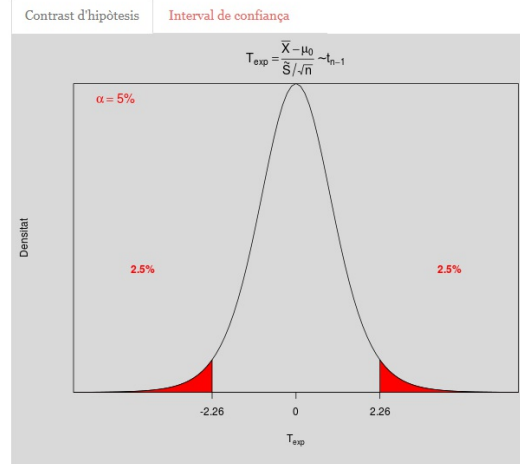
☐ Genera mostres automàticament

Calcula

Reinicia

Contrast d'hipòtesis

Sobre quin paràmetre



File

Variables

Response

Type of response variable

time-to-event

time-to-event

status

Event

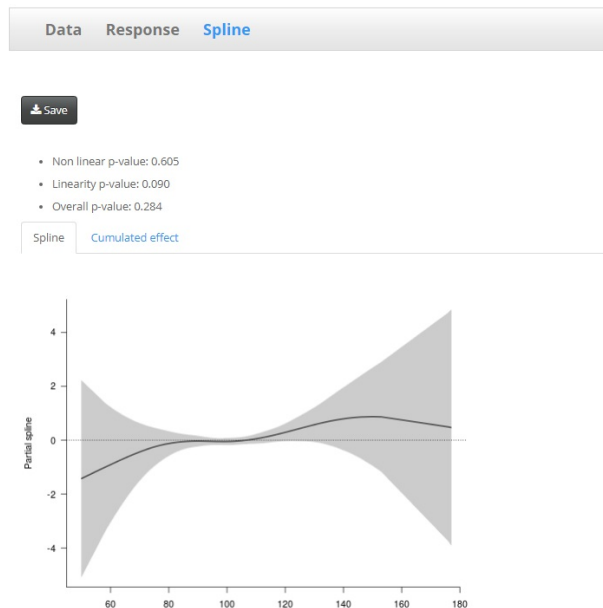
Exposure

Select exposure variable

Confounders (optional)

Select confounding variables

Options



Início / Ayuda
Distribución según grupo de riesgo
Riesgos y NNT según percentiles
Percentiles y NNT según Riesgos

Introduce la palabra clave

Correcto

Objetivos:

Este aplicativo permite comparar los percentiles de población correspondientes cualquier punto de corte en el nivel de riesgo a 10 años estimado con las ecuaciones para el riesgo coronario y cardiovascular más utilizadas en nuestro entorno. Para ello se aplica y compara la distribución de cada una de las ecuaciones en una muestra amplia y razonablemente representativa de la población Española [Ref1]

En pantalla se muestran distintas figuras que ilustran cada uno de los aspectos (percentiles, grupos de riesgo, etc.). El usuario puede fácilmente interactuar cambiando la población (hombres, mujeres, todos) y los puntos de corte en el nivel de riesgo, etc. y automáticamente los resultados se actualizan.

Esta herramienta facilita la elección de los puntos de corte más apropiados en cada ecuación para optimizar su sensibilidad y especificidad.

Población:

Los resultados de este aplicativo están calculados sobre la muestra razonablemente representativa de la población española (estudio FRESCO), sobre la que derivó y validó una ecuación para el cálculo del riesgo coronario y que se presenta en este aplicativo como ecuación FRESCO [Ref1]

Los participantes fueron individuos sin antecedentes de enfermedad cardiovascular, de 35 a 80 años sin tratamiento para el colesterol. En esta aplicación los participantes del estudio FRESCO de 35 a 74 años.

Ecuaciones:

Las ecuaciones que se comparan en este aplicativo son:

Carotid Local Arterial Stiffness Percentile and Vascular Age Calculator

Select gender
Enter the age
55

Distensibility
PWV

Distensibility Coefficient: $DC = \frac{2\Delta D \cdot DD + \Delta D^2}{18 \cdot DP}$

Systolic diameter (mm)
left
right

Diastolic diameter (mm)

Delta (mm)

Systolic blood pressure (mmHg)
140

Diastolic blood pressure (mmHg)
90

Pulse pressure (mmHg)
50

Population reference
General
Healthy

Enter
Report
Erase

Left
Right

The distensibility values is: 42.8
The value is in the top 2.5th percentile
The vascular age is: "Out of range"

Distensibility ($\times 10^{-3} \text{ kPa}^{-1}$)

Age

click on this button to view and download percentiles

Catalan elections 2017

Choose province

all ▼

What do you want to do?

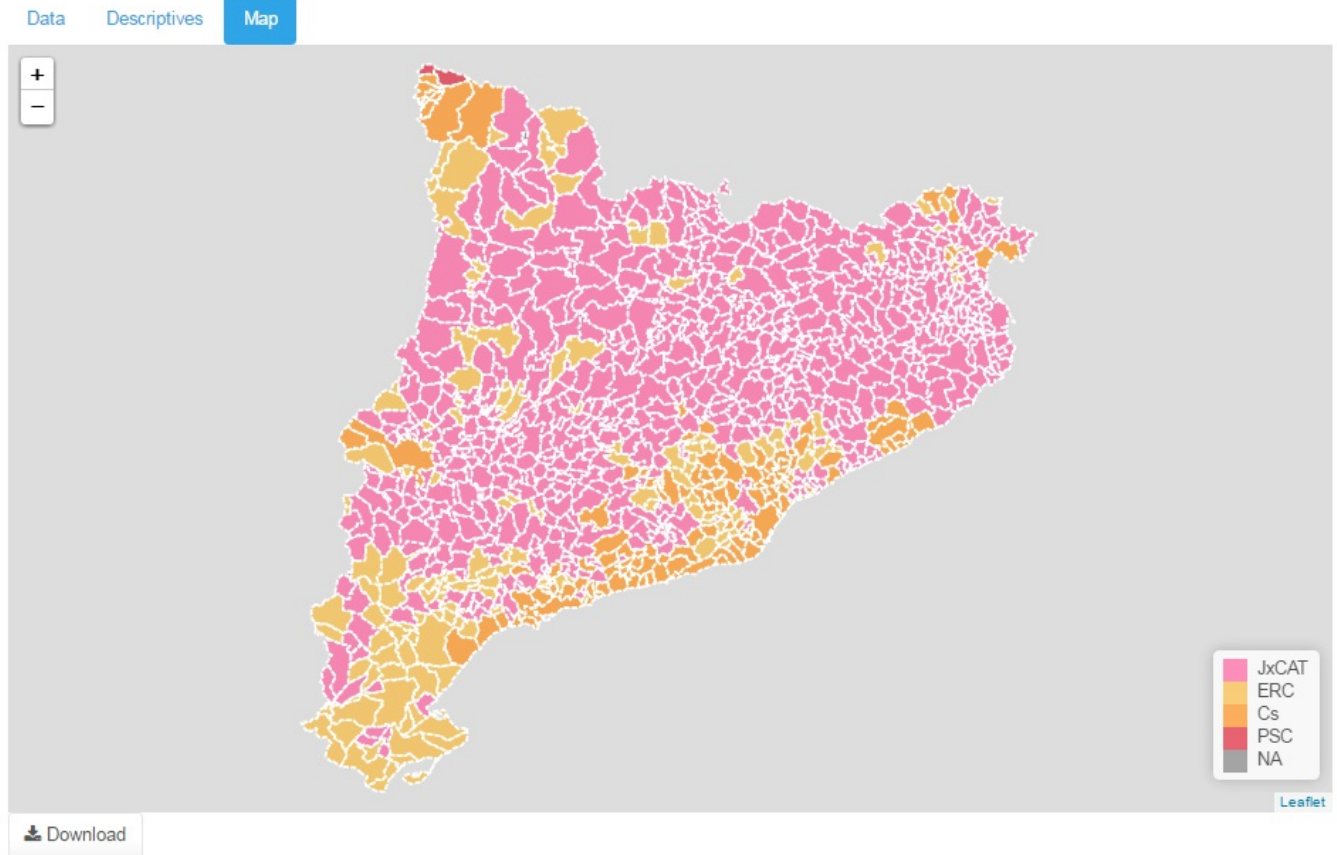
☐ Party percentage

☒ Winner

☐ Compare parties

☐ Population

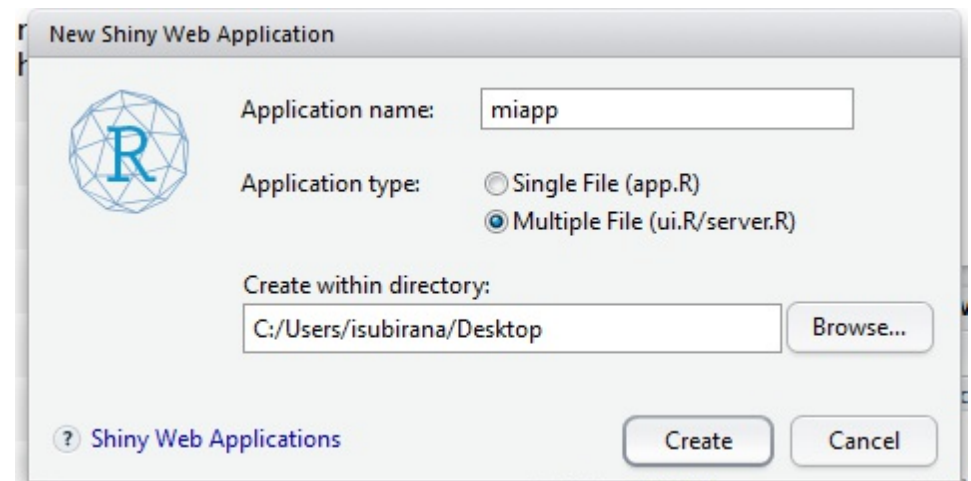
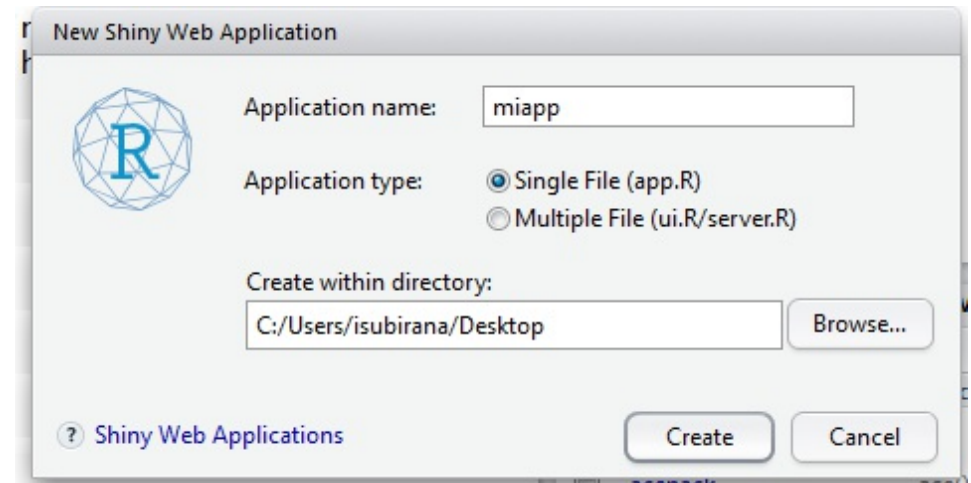
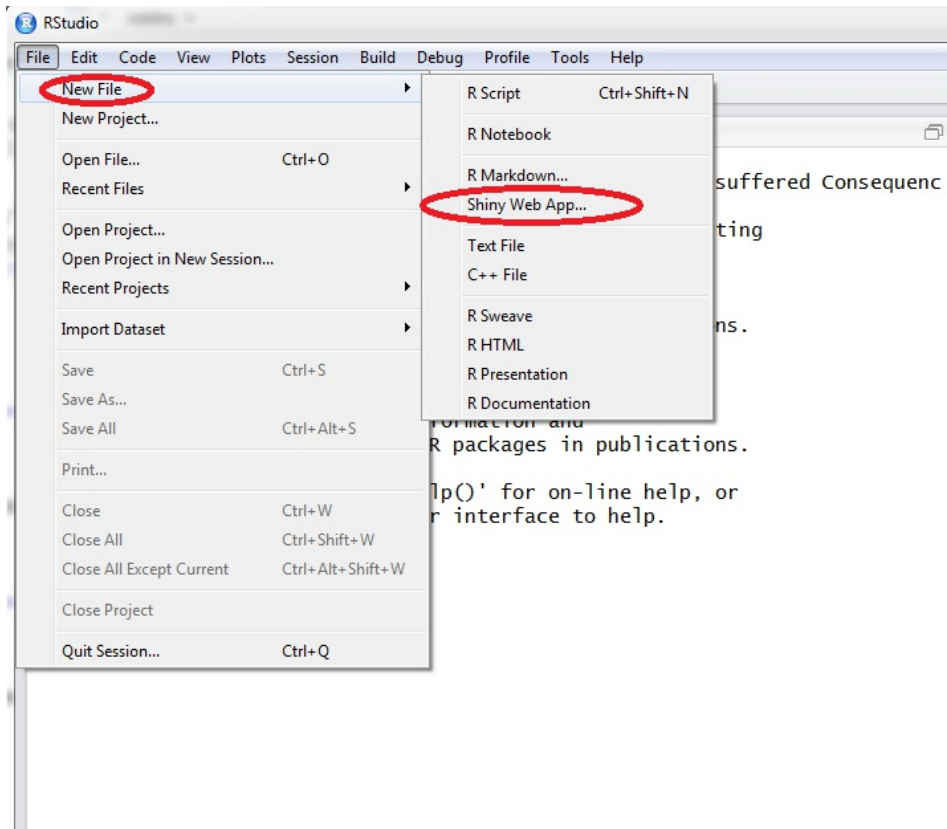
Compute

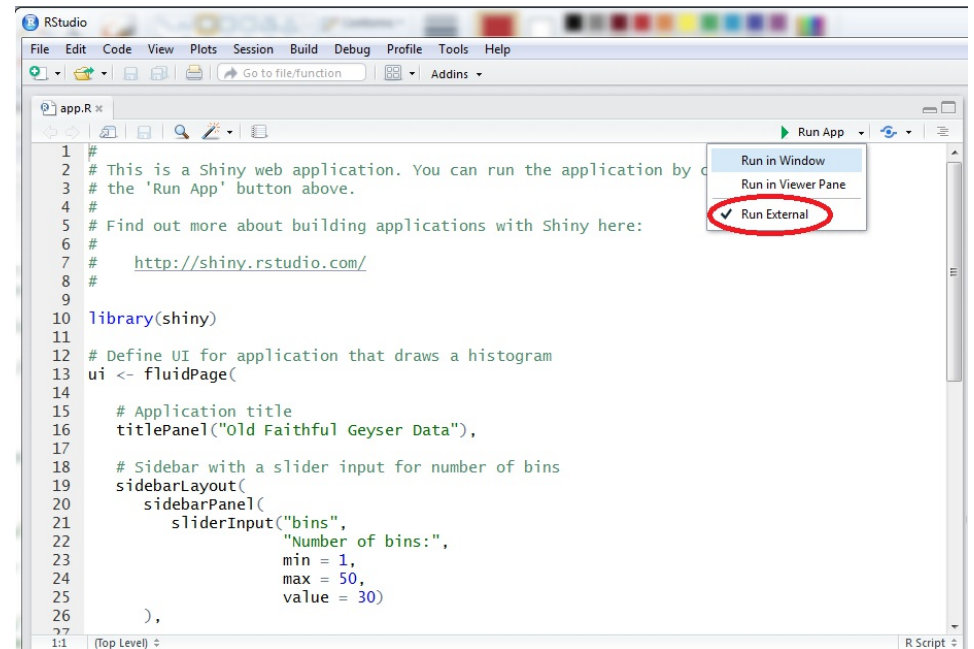
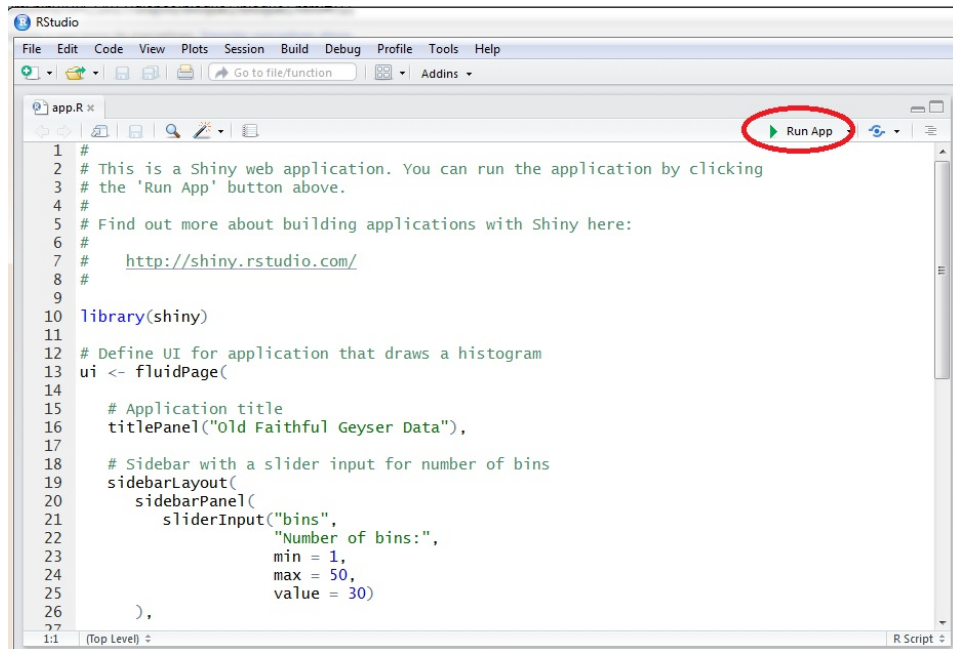


Exercise:

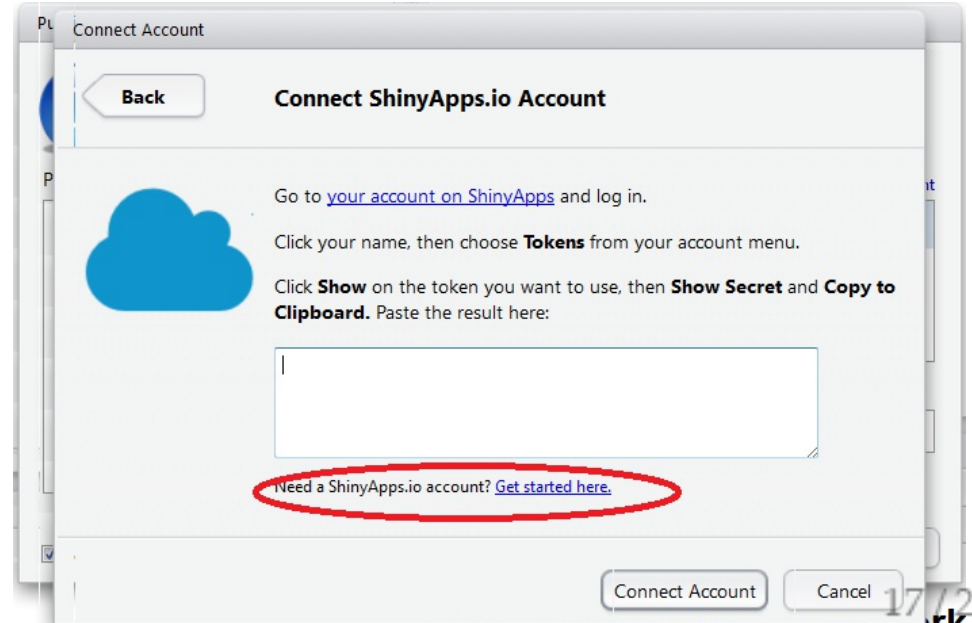
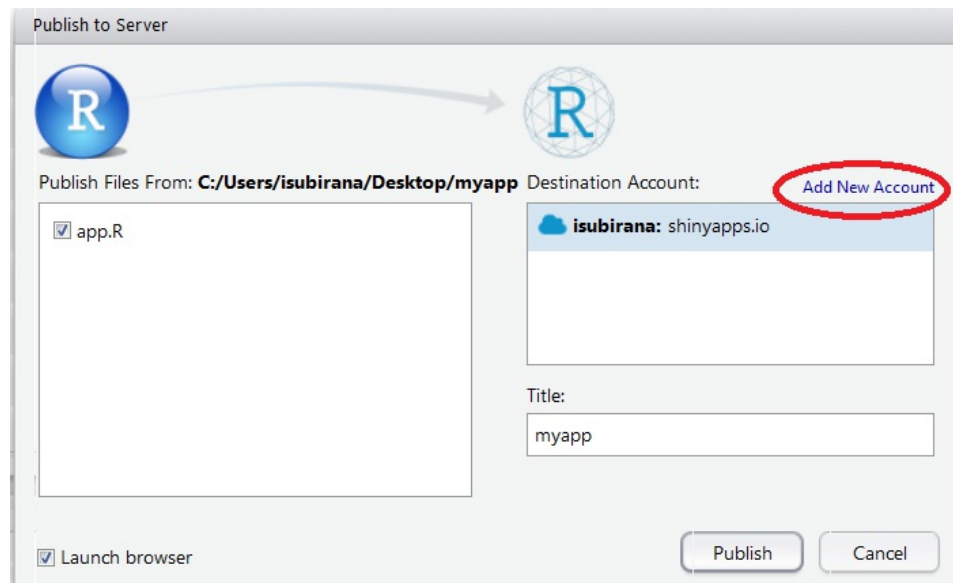
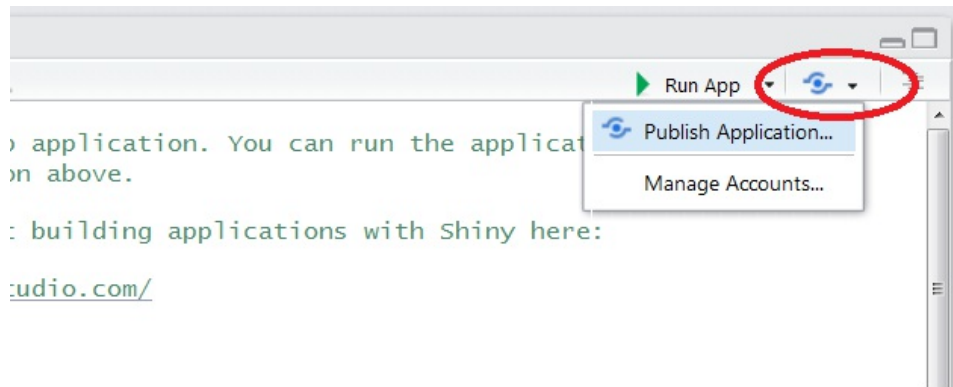
Create and deploy your first app

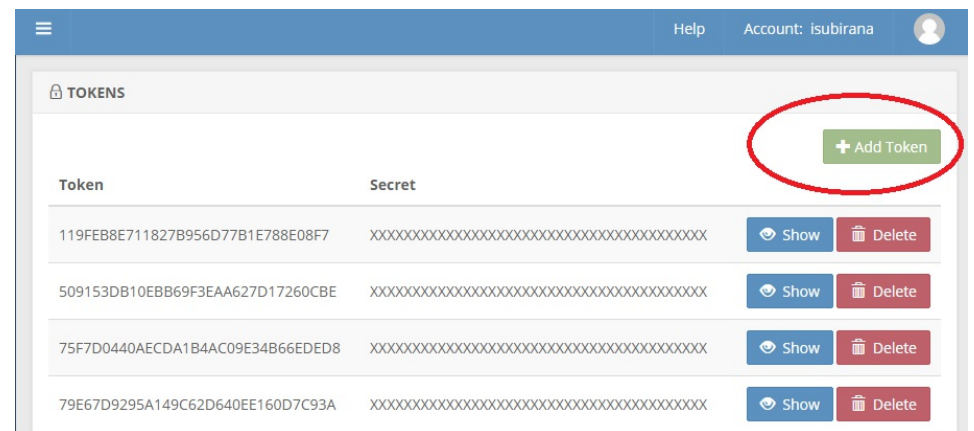
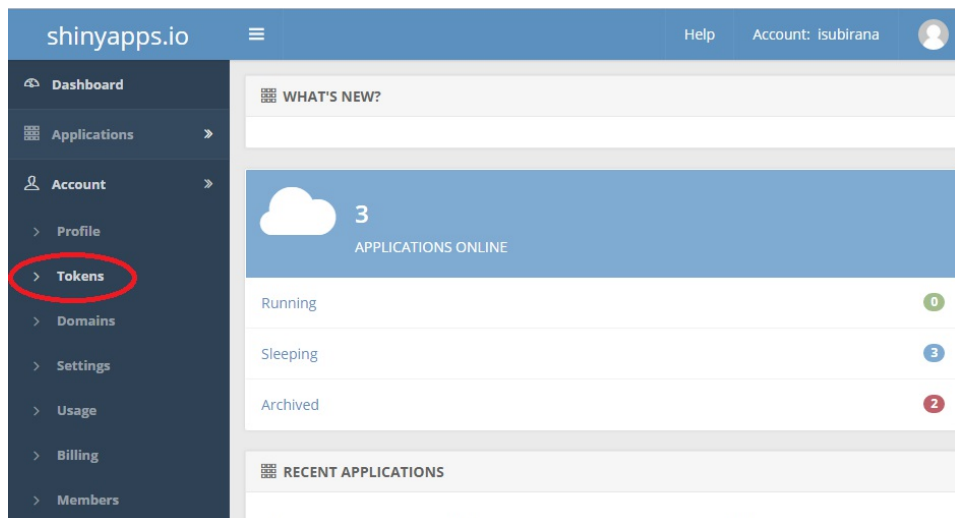
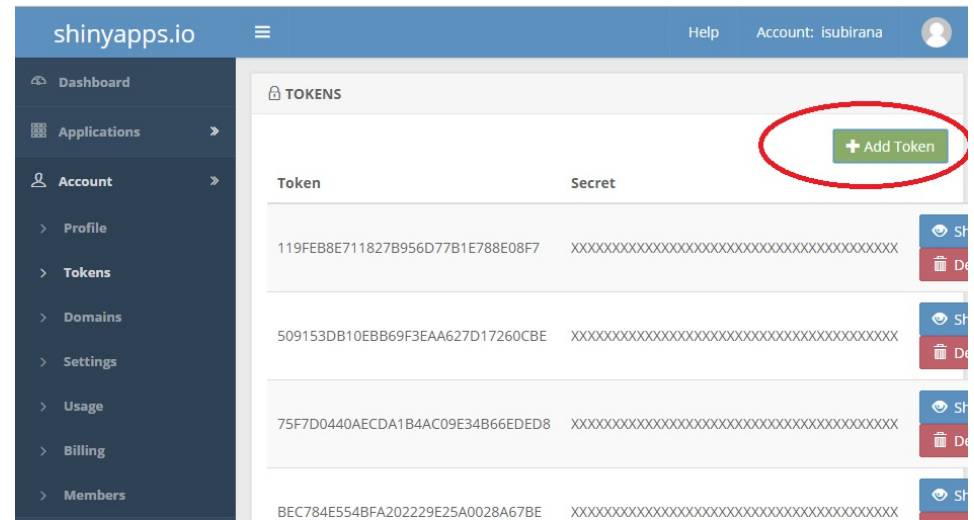
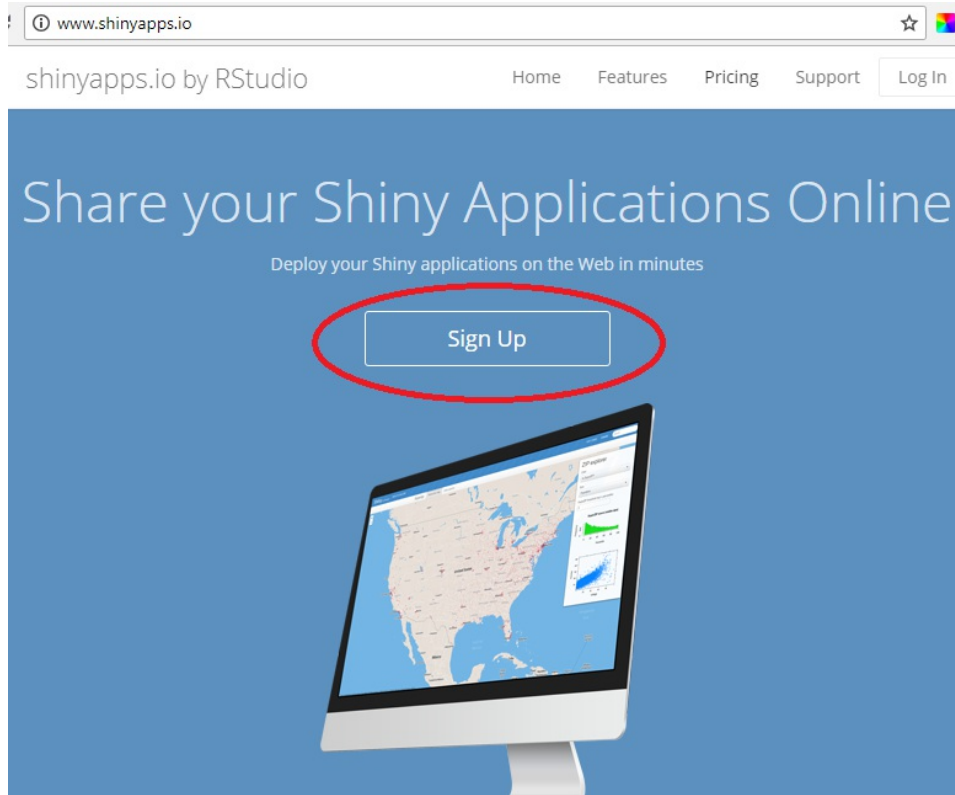
My first app (RStudio)

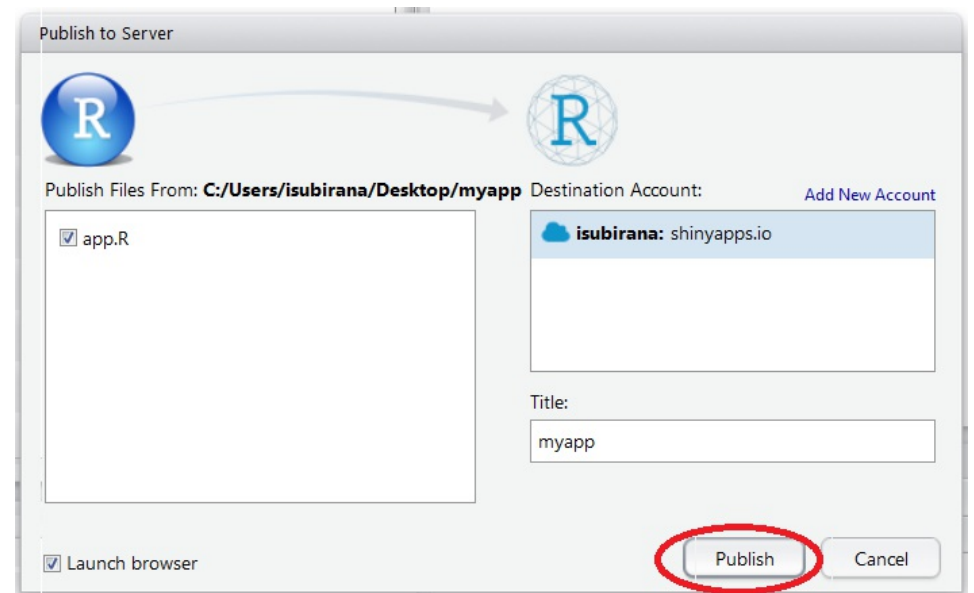
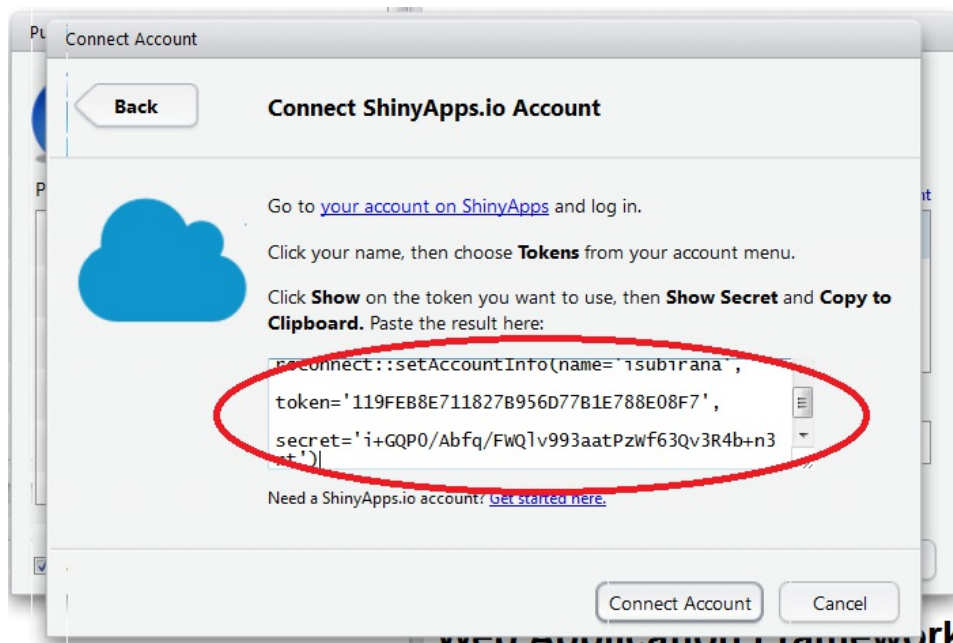
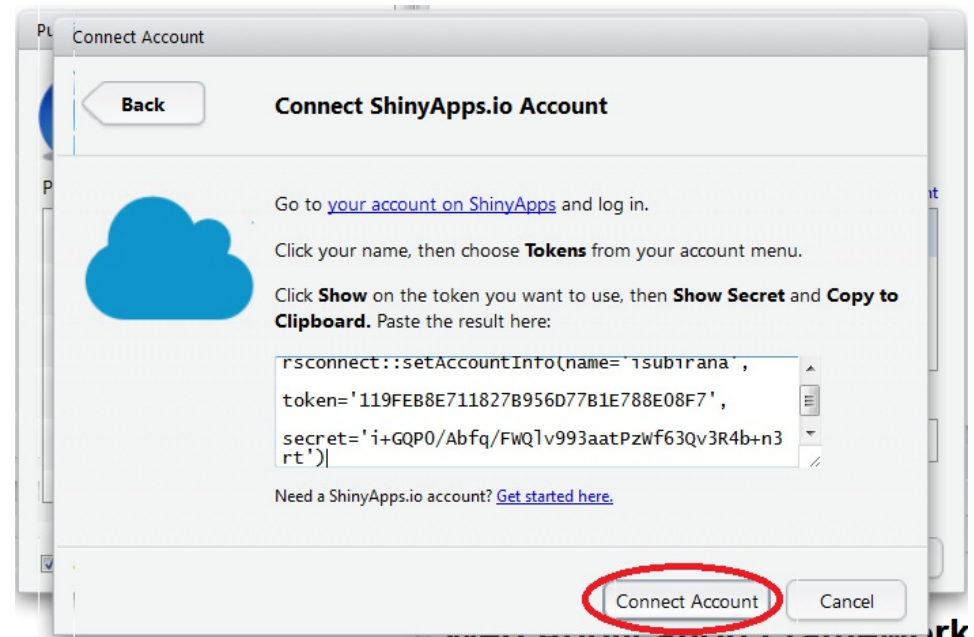
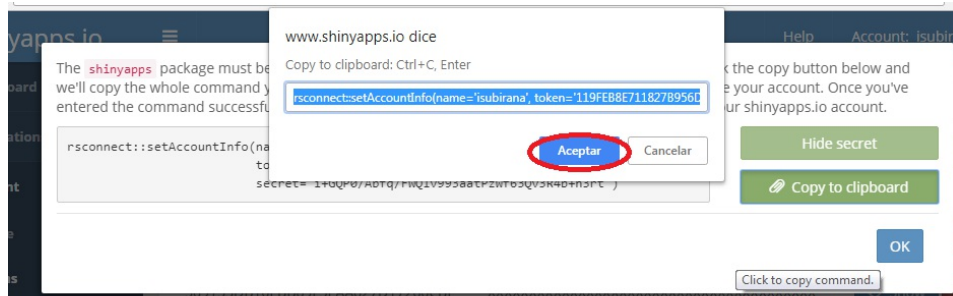




Deploy my first app on Shiny server







```
9
10 library(shiny)
11
12 # Define UI for application that draws a histogram
13 ui <- fluidPage(
14
15   # Application title
16   titlePanel("Old Faithful Geyser Data"),
17
18   # Sidebar with a slider input for number of bins
19   sidebarLayout(
20     sidebarPanel(
21       sliderInput("bins",
22         "Number of bins:",
23         min = 1,
24         max = 50,
25         value = 30)
26     )
27   )
28
29 # Server logic
30 server <- function(input, output, session) {
31   # Example server logic
32 }
33
34 # Run the application
35 shinyApp(ui, server)
```

1:1 (Top Level) R Script

Files Plots Packages

R: Web Application Framework

Web Application

Console Deploy

C:/Users/isubirana/Desktop/myapp

Preparing to deploy application...DONE
Uploading bundle for application: 364329...

