R과 Shiny를 이용한 Web Application의 제작(I)

문건웅

7-Nov-2017

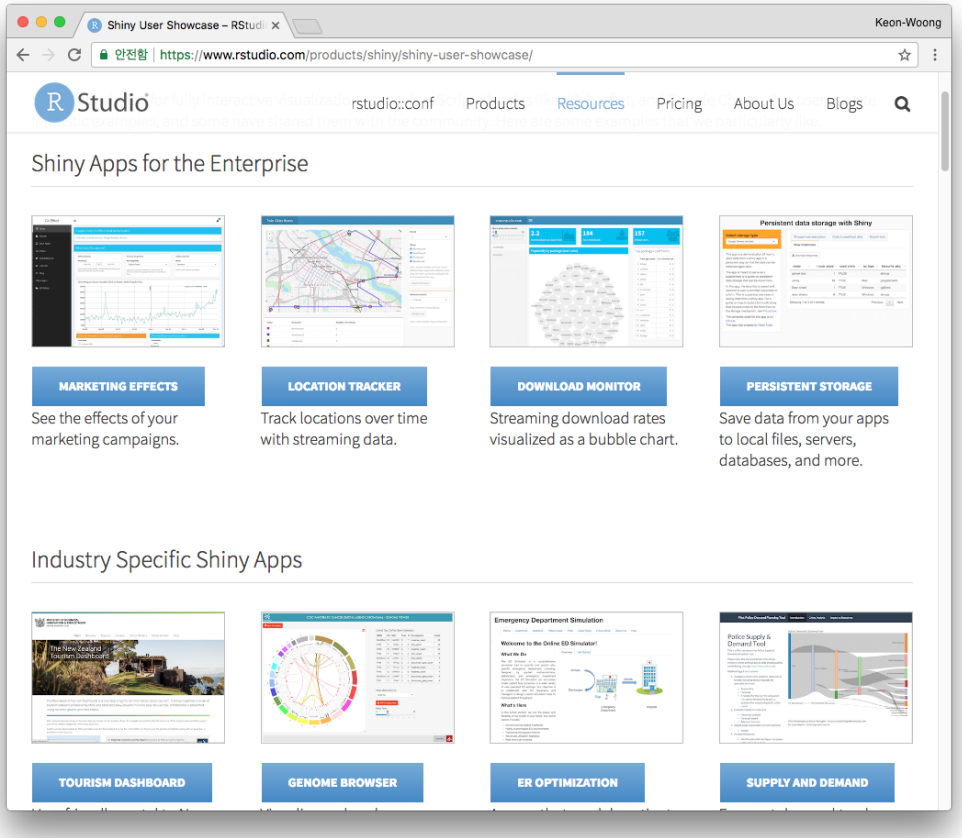
강사소개

문건웅

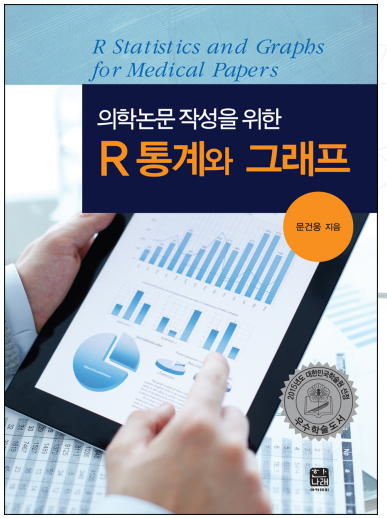
- 가톨릭대학교 의과대학 교수
- 성빈센트병원 순환기내과 재직
- R packages (CRAN)
    - mycor, moonBook, ztable(2015)
    - ggiraphExtra(2016)
    - dplyrAssist, editData, ggplotAssist(2017)
- Books
    - 의학논문 작성을 위한 R통계와 그래프(2015, 한나래)
        - 2015년 대한민국 학술원 우수학술도서
    - 웹에서 클릭만으로 하는 R 통계분석(2015, 한나래)
    - Learn ggplot2 Using Shiny App(2017, Springer)
- Web-R.org 운영

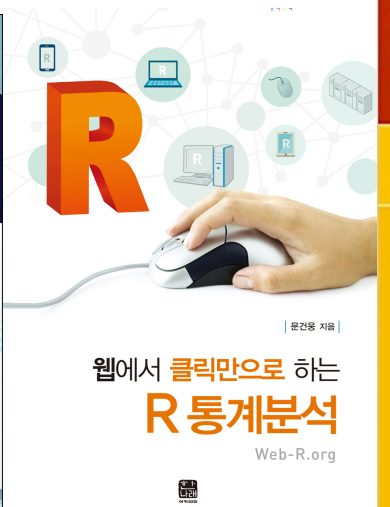
Shiny 로 어떤 앱을 만들 수 있나?

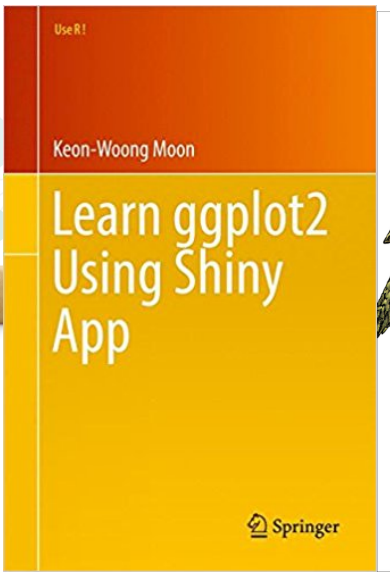
https://www.rstudio.com/products/shiny/shiny-user-showcase/

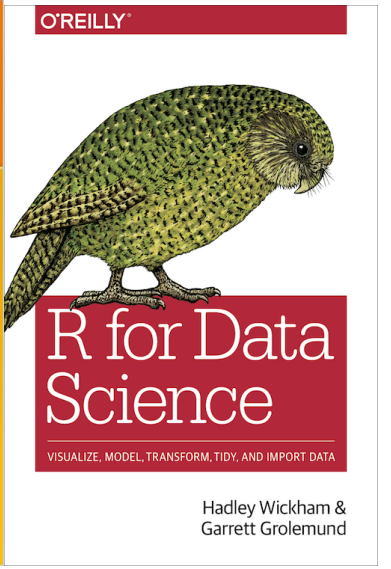


R을 배우자









Shiny를 배울 준비가 되어 있는가?

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

필요사항

- R 설치 (https://cran.r-project.org/)
- RStudio 설치(https://www.rstudio.com/products/rstudio/)
- 필요한 R 패키지 : R console에서 다음 명령어 실행

```
install.packages("knitr","shiny","rmarkdown")
install.packages("tidyverse","DT","moonBook")
```

- 6번째 앱에서 knitr Reports 중 pdf 다운로드를 위하여는 LaTex 설치가 필요하다. (http://ktug.or.kr)
- 9번째 interactive plot 을 위해서는 다음 패키지들의 설치가 필요하다.

```
install.packages("ggiraph","ggiraphExtra")
```

예제 파일 및 앱 소스파일

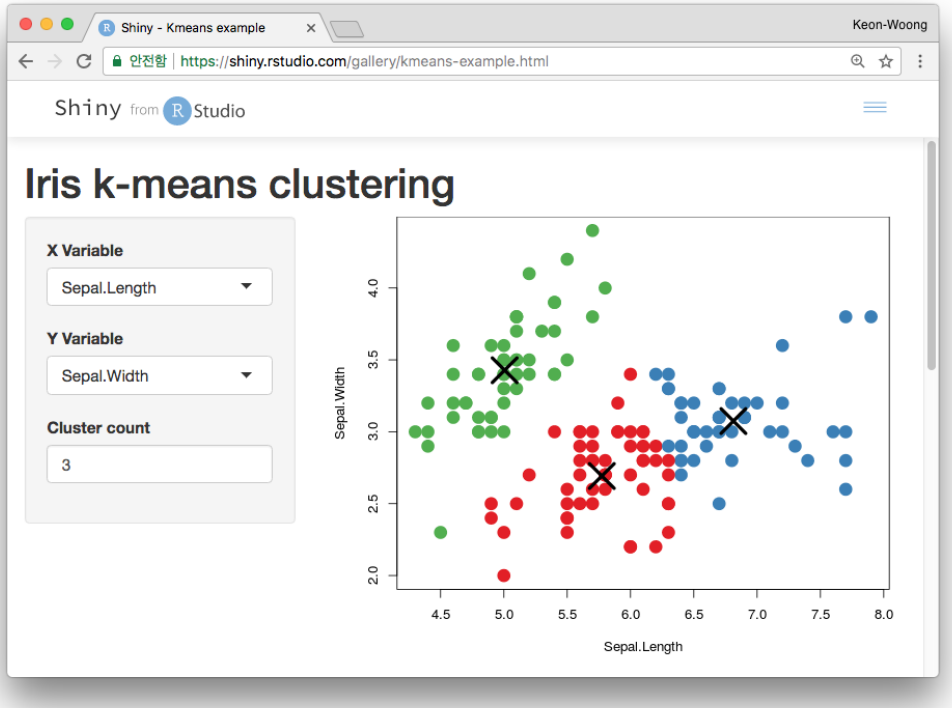
이번 강의에 사용되는 앱 및 소스 파일들은 다음 github에서 다운로드 받을수 있다.

https://github.com/cardiomoon/shinyLecture2

Introduction of Shiny

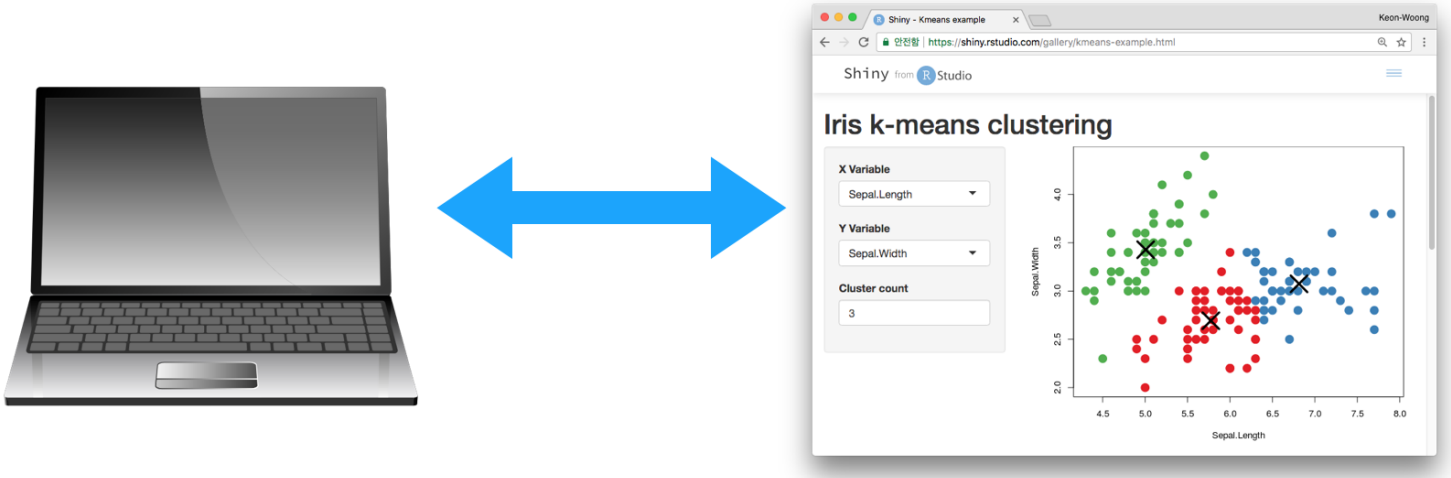
1. The First Shiny App
2. Shiny App Template 사용
3. The 2nd App: Reactivity
4. *Input()
5. *Output()
6. Server function()
7. Share You Shiny App

1. The First Shiny App




```
https://shiny.rstudio.com/gallery/kmeans-example.html
```

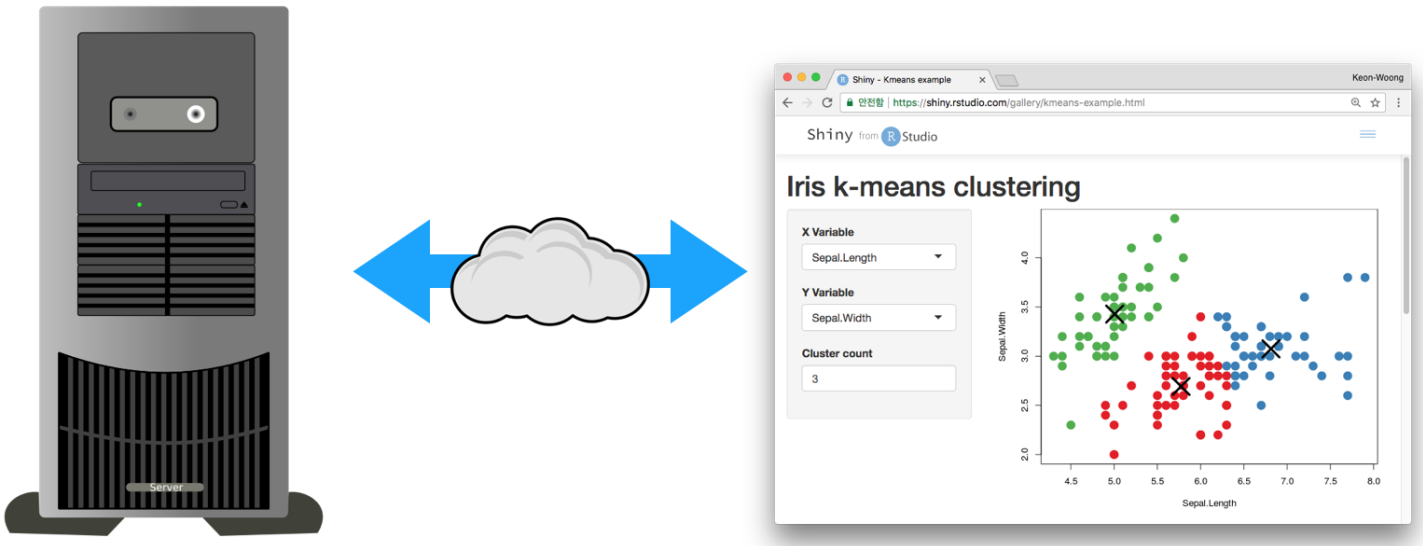
Shiny App은 R을 운영하는 컴퓨터에 의해 유지된다.



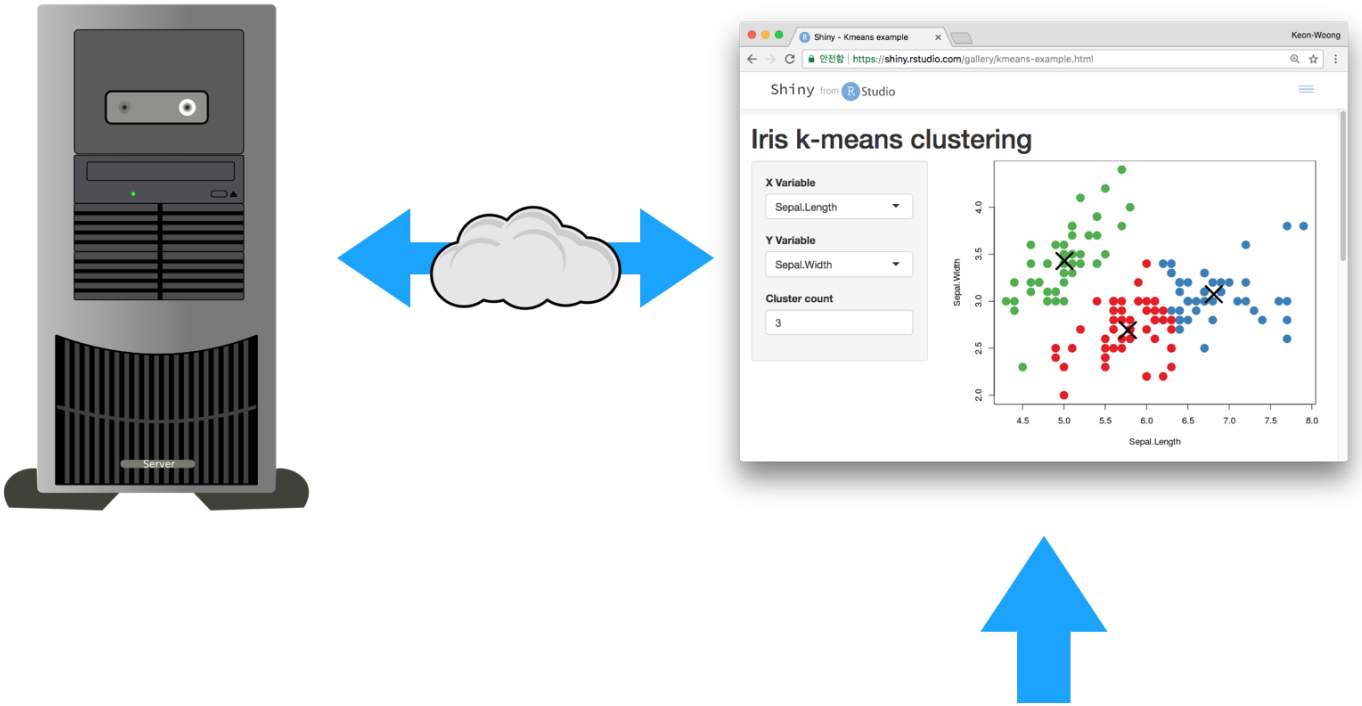
R console에서 다음 R 명령어를 실행시켜 보자

```
shiny::runGitHub('shinyLecture2', 'cardiomoon',subdir='inst/app0')
shiny::runApp("~/Documents/ownCloud/Documents/shinyLecture2/inst/app0
```

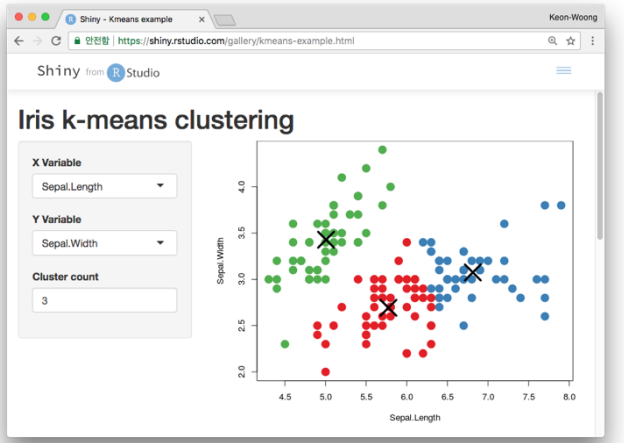
어떤 Shiny App은 R을 운영하는 서버에 의해 유지된다.



https://shiny.rstudio.com/gallery/kmeans-example.html



User Interface



Server Instructions

User Interface

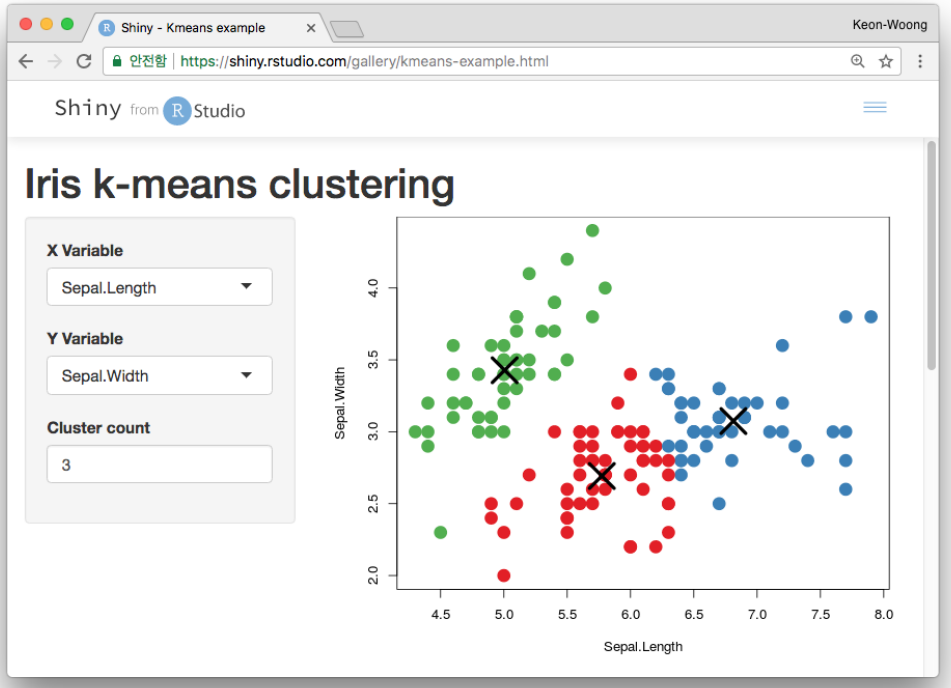
app.R

https://github.com/cardiomoon/shinyLecture2/tree/master/inst/app0

```
library(shiny)

ui<-pageWithSidebar(
  headerPanel('Iris k-means clustering'),
  sidebarPanel(
    selectInput('xcol', 'X Variable', names(iris)),
    selectInput('ycol', 'Y Variable', names(iris),
                selected=names(iris)[[2]]),
    numericInput('clusters', 'Cluster count', 3,
                 min = 1, max = 9)
  ),
  mainPanel(
    plotOutput('plot1')
  )
)
server<-function(input, output, session) {
```

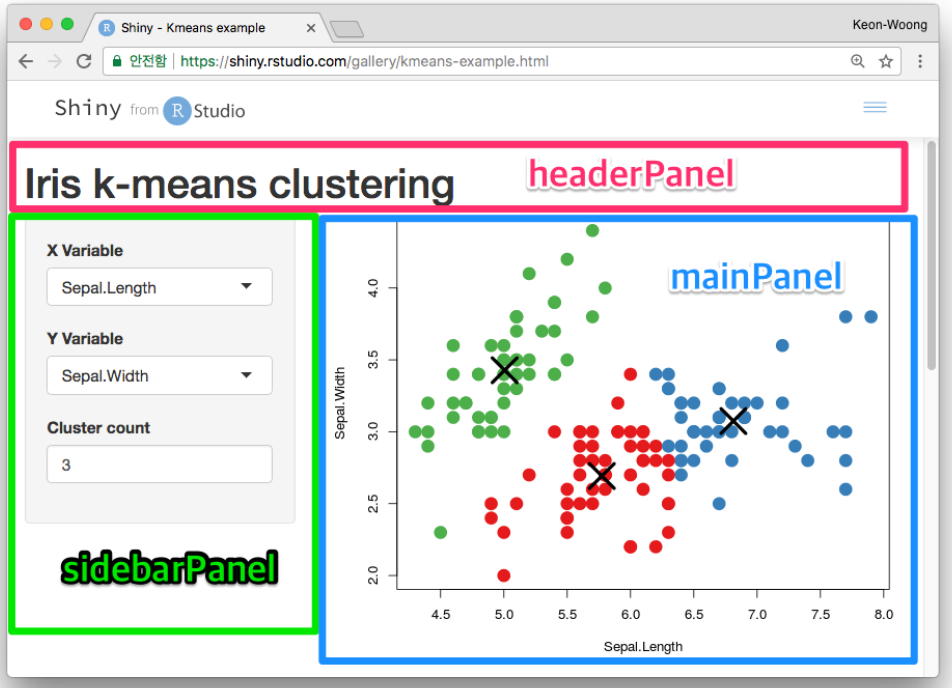
Shiny App


Shiny - Kmeans example
Keon-Woong
안전함 | https://shiny.rstudio.com/gallery/kmeans-example.html
Shiny from RStudio
Iris k-means clustering
X Variable
Sepal.Length
Y Variable
Sepal.Width
Cluster count
3
Sepal.Width
Sepal.Length
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0

User interface

```
ui<-pageWithSidebar(
   headerPanel('Iris k-means clustering'),
   sidebarPanel(
    selectInput('xcol', 'X Variable', names(iris)),
    selectInput('ycol', 'Y Variable', names(iris),
                selected=names(iris)[[2]]),
    numericInput('clusters', 'Cluster count', 3,
                 min = 1, max = 9)
  ),
   mainPanel(
    plotOutput('plot1')
  )
)
```

Panels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4.0
3.5
3.0
2.5
2.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0

Inputs

```
library(shiny)

ui<-pageWithSidebar(
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     selectInput('xcol', 'X Variable', names(iris)),
     selectInput('ycol', 'Y Variable', names(iris),
                 selected=names(iris)[[2]]),
     numericInput('clusters', 'Cluster count', 3,
                  min = 1, max = 9)
  ),
  mainPanel(
    plotOutput('plot1')
  )
)
```
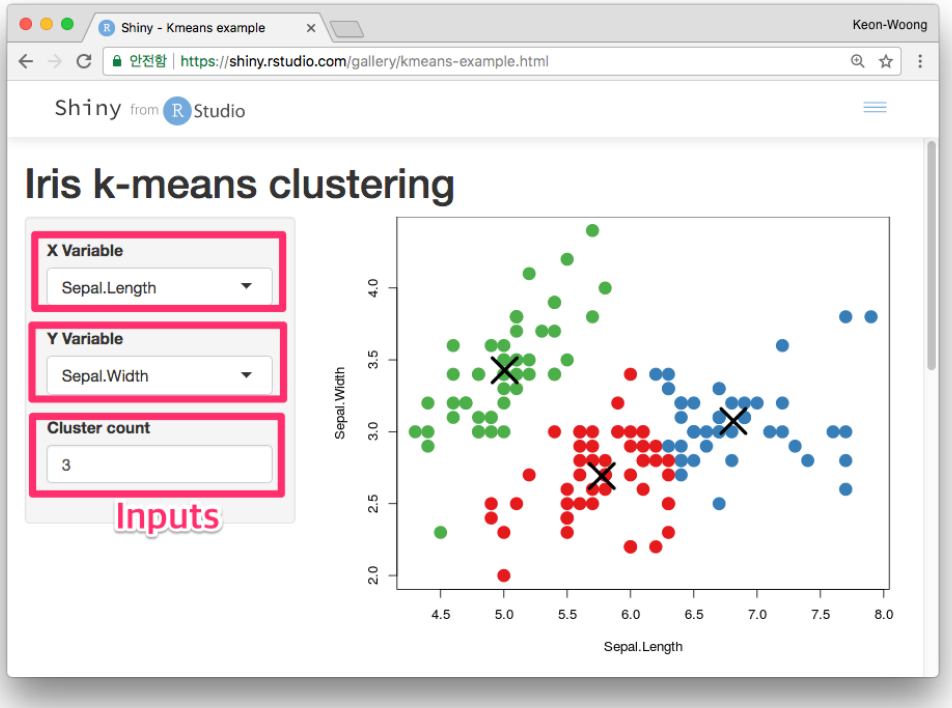

Inputs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Sepal.Width
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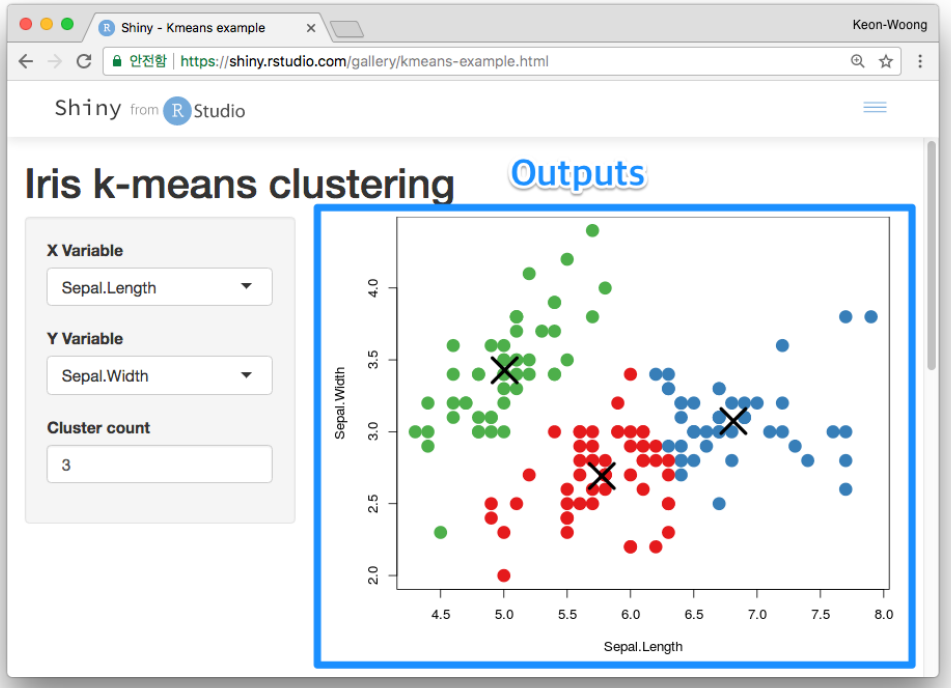
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0

Outputs

```
ui<-pageWithSidebar(
  headerPanel('Iris k-means clustering'),
  sidebarPanel(
    selectInput('xcol', 'X Variable', names(iris)),
    selectInput('ycol', 'Y Variable', names(iris),
                selected=names(iris)[[2]]),
    numericInput('clusters', 'Cluster count', 3,
                 min = 1, max = 9)
  ),
  mainPanel(
     plotOutput('plot1')
  )
)
```

Outputs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3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0

Shiny App Template 사용

Minimal Valid Shiny App

https://github.com/cardiomoon/shinyLecture2/blob/master/app.R

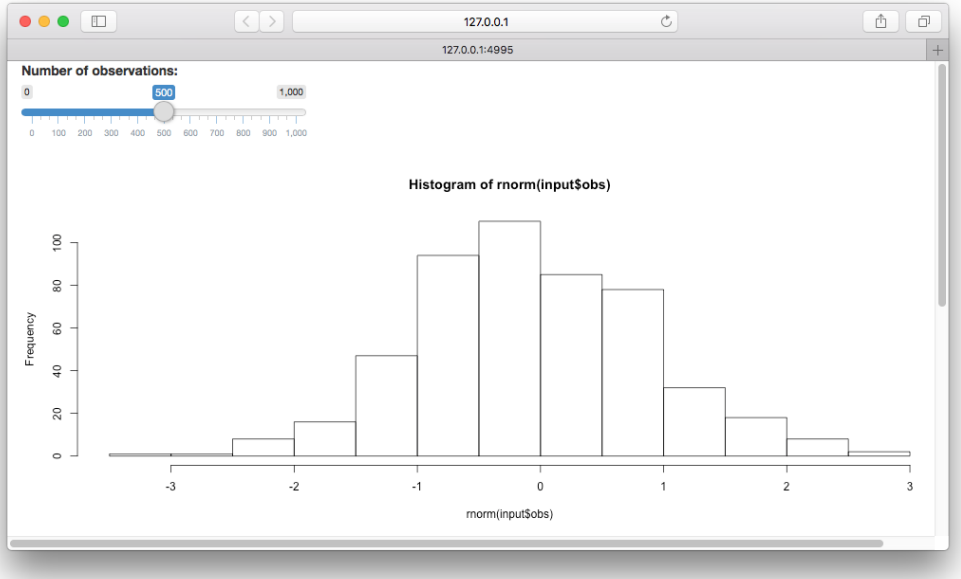
```
library(shiny)

ui <- fluidPage()

server <- function(input,output){}

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

Input과 Output으로 shiny app 만들기

- fluidPage() 함수의 인수로 Input()과 Output()추가

```
ui <- fluidPage(
   # *Input() functions,
   # *Output() functions
)
```

The 2nd App: Reactivity




```
shiny::runGitHub('shinyLecture2', 'cardiomoon',subdir='inst/app1')
```

Input()

*Input() 함수를 사용하여 input 만들기

```
sliderInput("obs", "Number of observations:",
                min = 0, max = 1000, value = 500)
```

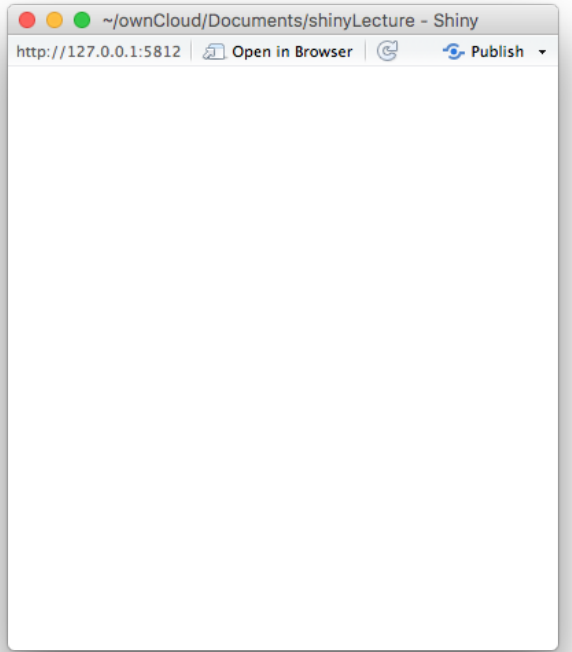
*Input() 함수를 사용하여 input 만들기

```
  sliderInput("obs", "Number of observations:",
                 min = 0, max = 1000, value = 500)
```

```
<div class="form-group shiny-input-container">
  <label class="control-label" for="obs">Number of observations:</label>
  <input class="js-range-slider" id="obs" data-min="0" data-max="1000"
  data-from="500" data-step="1" data-grid="true" data-grid-num="10"
  data-grid-snap="false" data-prettify-separator="," data-prettify-enabled="t
  data-keyboard="true" data-keyboard-step="0.1" data-data-type="number"/>
</div>
```

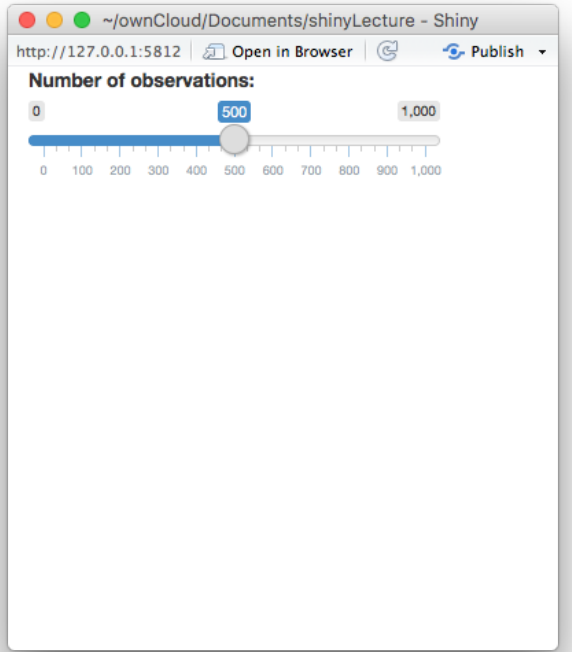
*Input() 함수를 사용하여 input 만들기

```
library(shiny)

ui <- fluidPage(



)

server <- function(input,output)

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



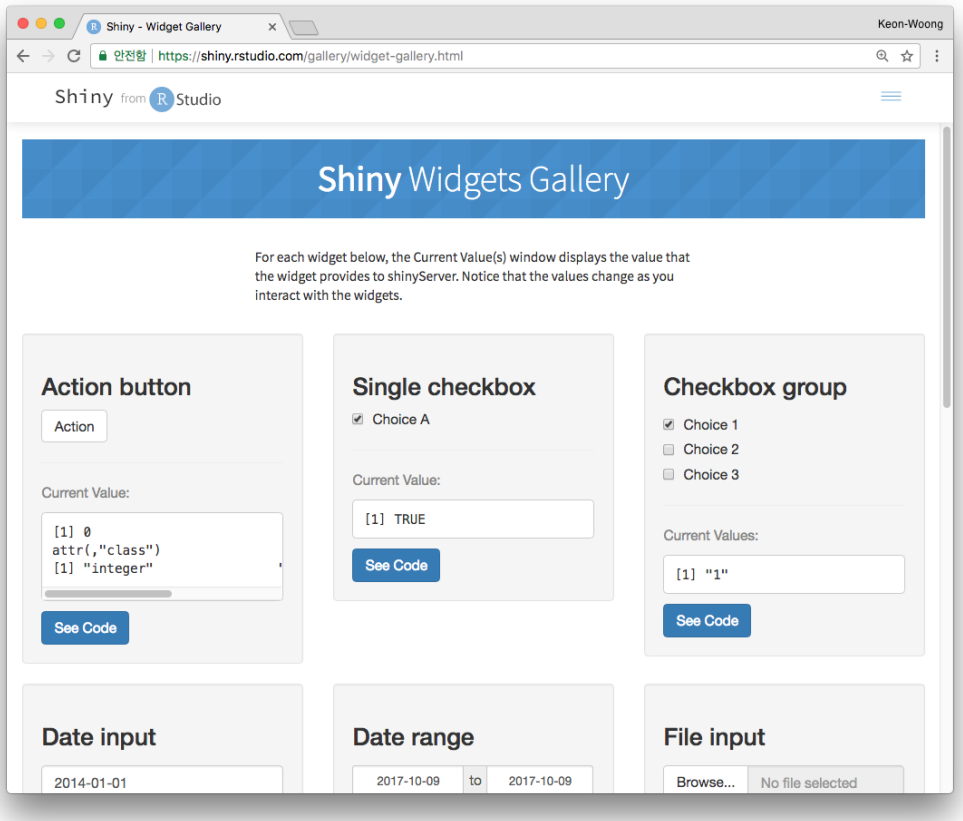
*Input() 함수를 사용하여 input 만들기

```
library(shiny)

ui <- fluidPage(
  sliderInput(inputId = "obs",
    label = "Number of observati
    min = 0, max = 1000, value =

)

server <- function(input,output)

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

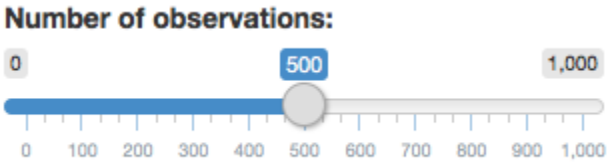


*Input functions

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

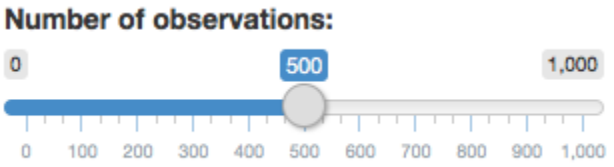


구문(Syntax)




```
sliderInput(inputId = "obs", label = "Number of observations:",...)
```

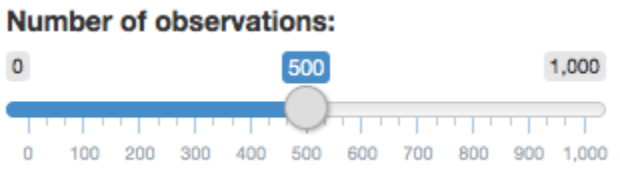
구문(Syntax)




```
sliderInput(inputId = "obs", label = "Number of observations:",...)
```

input name
(for internal use)

구문(Syntax)

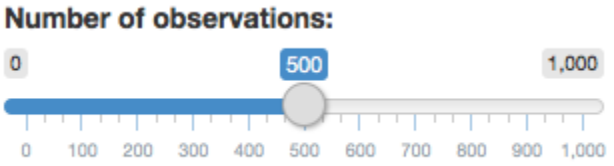



```
sliderInput(inputId = "obs", label = "Number of observations:",...)
```

input name
(for internal use)

label to display

구문(Syntax)




```
sliderInput(inputId = "obs", label = "Number of observations:",...)
```

input name (for internal use)

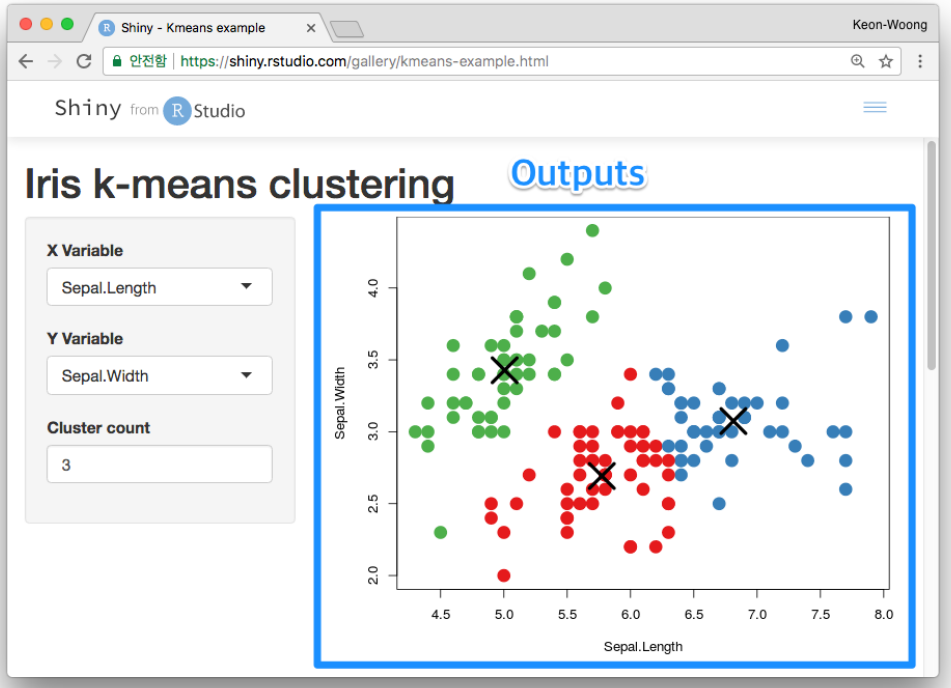
label to display

input-specific argument

?sliderInput

Output()

Outputs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2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0

Outputs

Function	Inserts
dataTableOutput()	an interactive table
htmlOutput()	raw HTML
imageOutput()	image
plotOutput	plot
tableOutput	table
textOutput	text
uiOutput	a Shiny UI element
verbatimTextOutput	text

*Output()

Output을 UI 에 나타내려면 fluidPage() 함수의 인수로 *Output() 함수를 추가

```
plotOutput(outputId = "distPlot")
```

*Output() 함수를 사용하여 Output 만들기

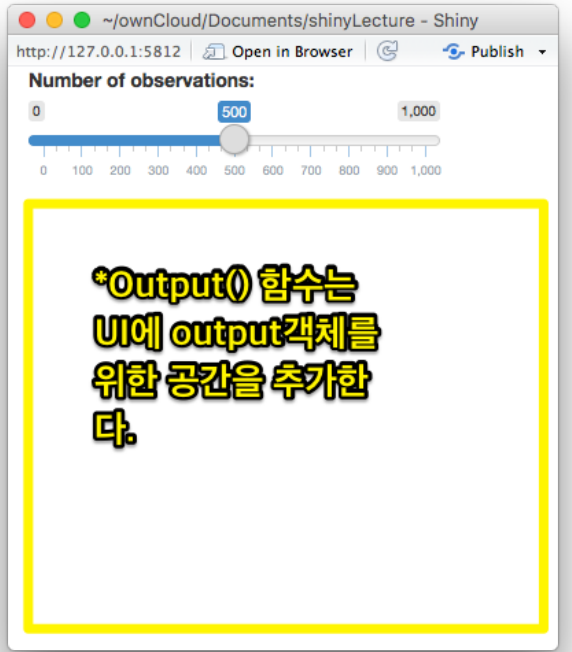
```
library(shiny)

ui <- fluidPage(
  sliderInput(inputId = "obs",
    label = "Number of observati
    min = 0, max = 1000, value =
   plotOutput("distPlot")

)

server <- function(input,output)

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



Server function

Server() 함수의 3가지 규칙

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




}
```

1. UI에 표시할 객체를 output$ 에 저장한다.

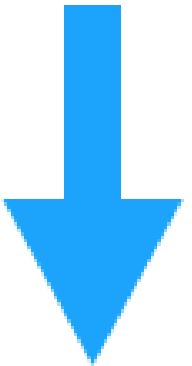
```
server <- function(input,output){

    output$distPlot <- #code


}
```

1. UI에 표시할 객체를 output$ 에 저장한다.

output$distPlot



plotOutput("distPlot")

2. 표시할 객체를 render*() 함수로 만든다.

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

    output$distPlot <- renderPlot({
          hist(rnorm(100))
    })
}
```

render*() functions

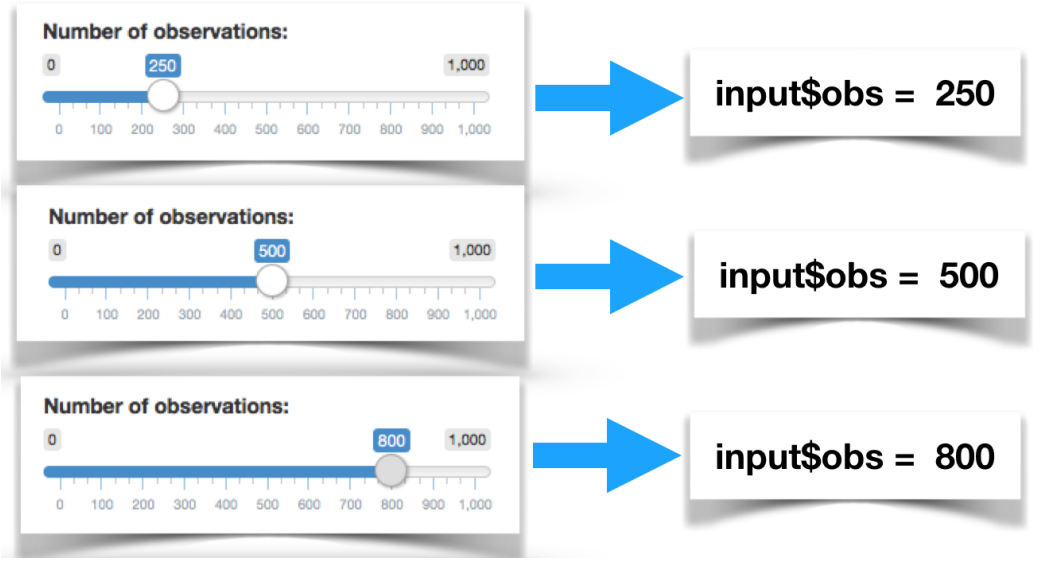
function	creates
renderDataTable()	An interactive table
renderImage	An image(save as a link to a source file)
renderPlot	A plot
renderPrint()	A code block of printed output
renderTable()	A table
renderText()	A characer string
renderUI()	a shiny UI element

3. Input의 값을 input$ 로 사용한다.

sliderInput(inputId="obs",...)

input$obs

input values



3. Input의 값을 input$ 로 사용한다.

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

    output$distPlot <- renderPlot({
          hist(rnorm(input$obs))
    })
}
```

Reactivity

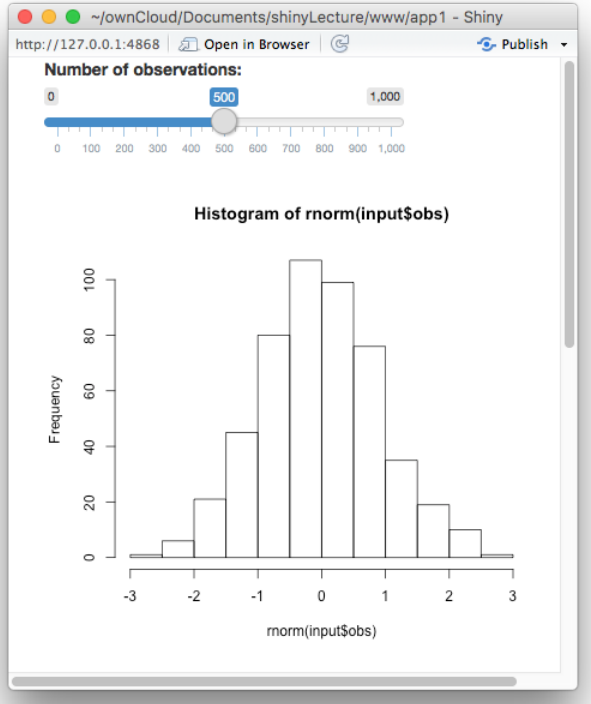
- output 객체를 rendering 하기 위해 input의 값을 사용할 때마다 reactivity가 자동으로 발생한다.

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

     output$distPlot <- renderPlot({
          hist(rnorm(input$obs))
    })
}
```

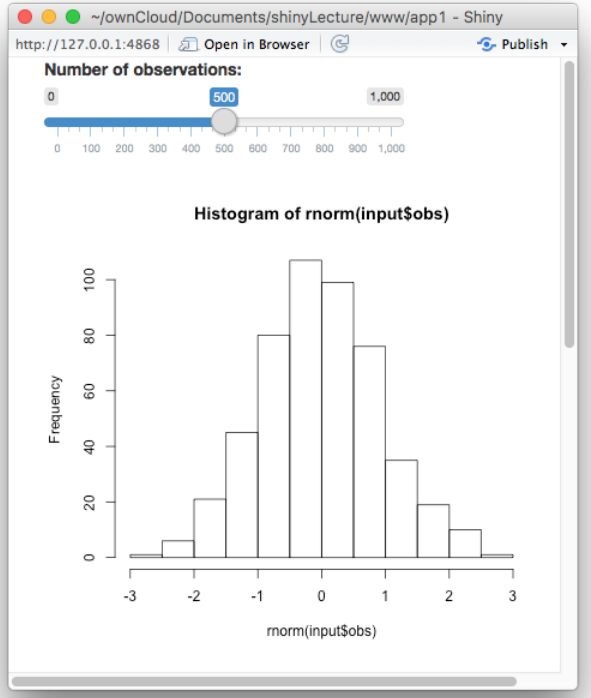
input$obs

```
renderPlot({
  hist(rnorm(input$num))
})
```



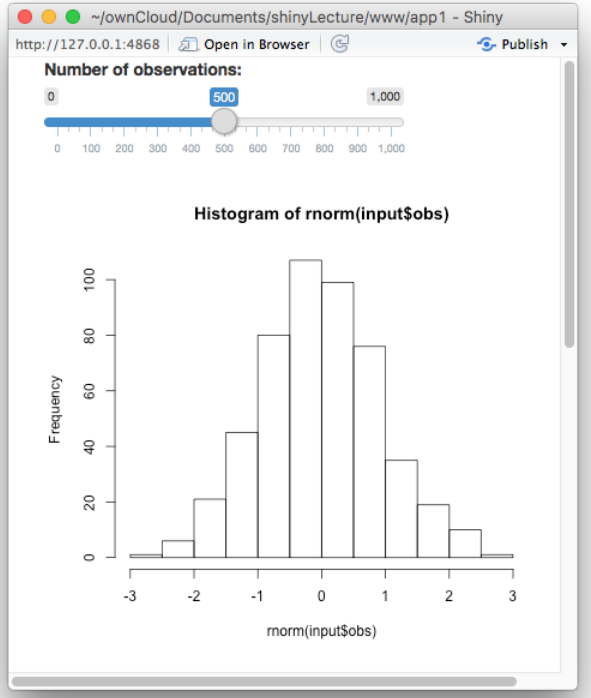
input$obs

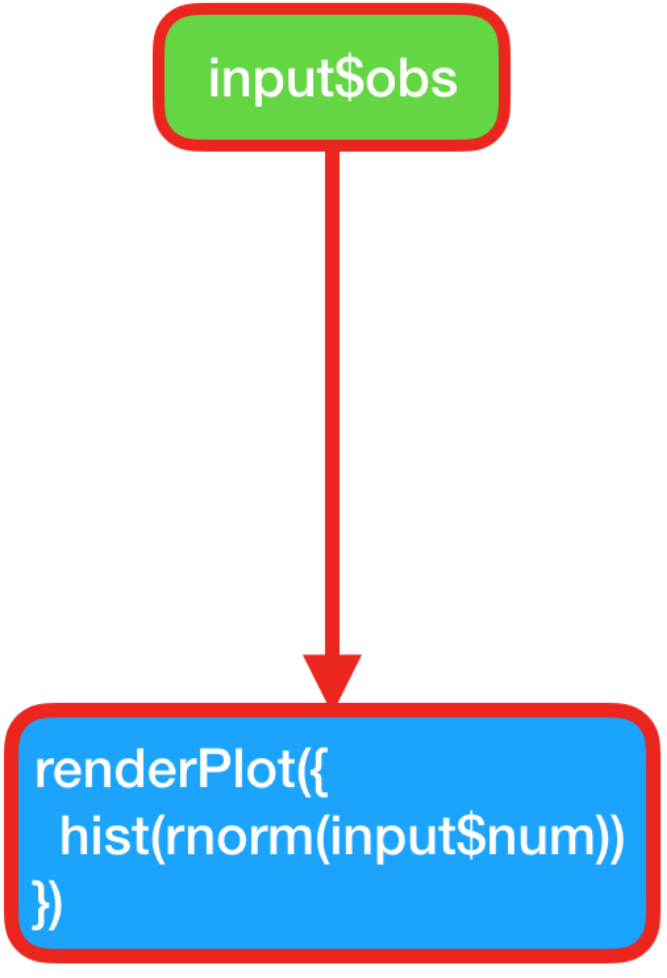
```
renderPlot({
  hist(rnorm(input$num))
})
```

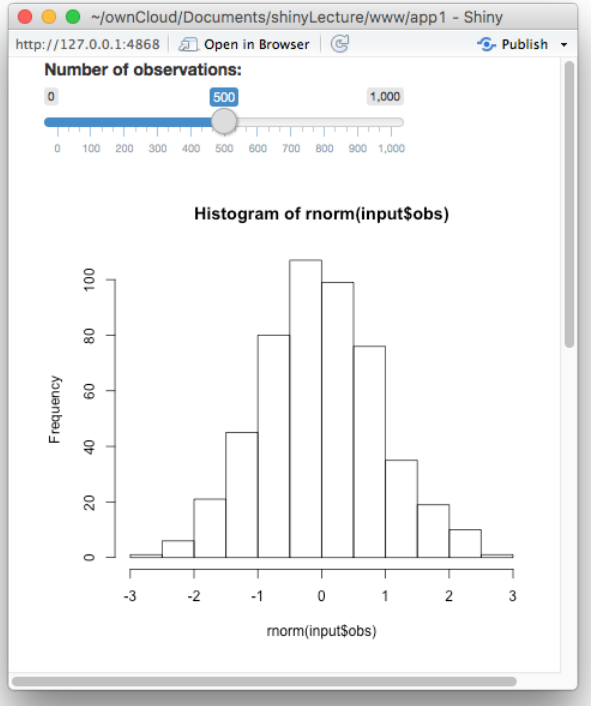


input$obs

```
renderPlot({
  hist(rnorm(input$num))
})
```

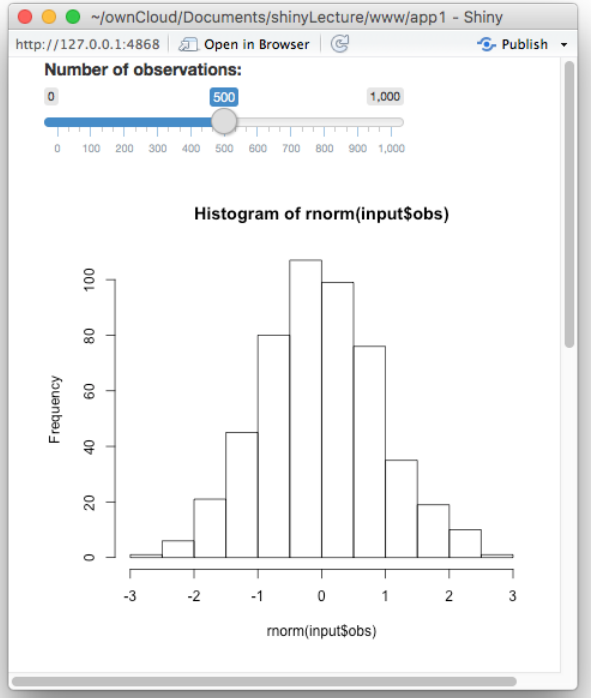



input$obs
renderPlot({
hist(rnorm(input$num))
})


~/ownCloud/Documents/shinyLecture/www/app1 - Shiny
http://127.0.0.1:4868
Open in Browser
Publish
Number of observations:
0
500
1,000
0 100 200 300 400 500 600 700 800 900 1,000
Histogram of rnorm(input$obs)
Frequency
0 20 40 60 80 100
-3 -2 -1 0 1 2 3
rnorm(input$obs)

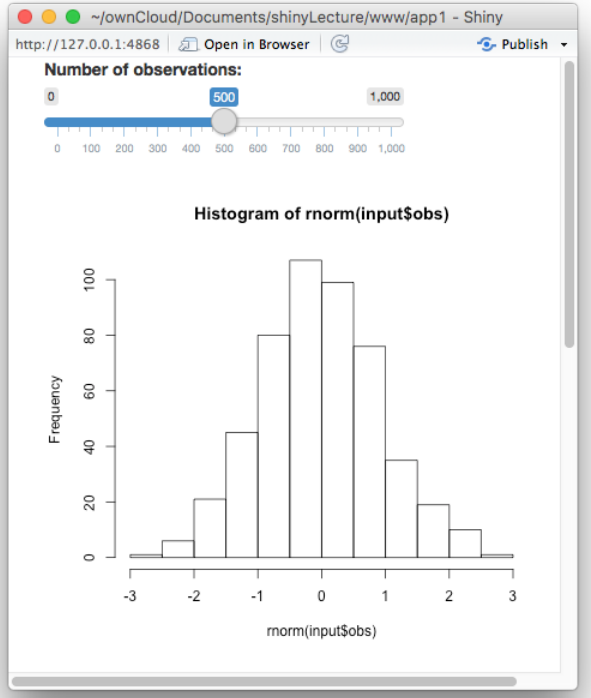
input$obs

```
renderPlot({
  hist(rnorm(input$num))
})
```



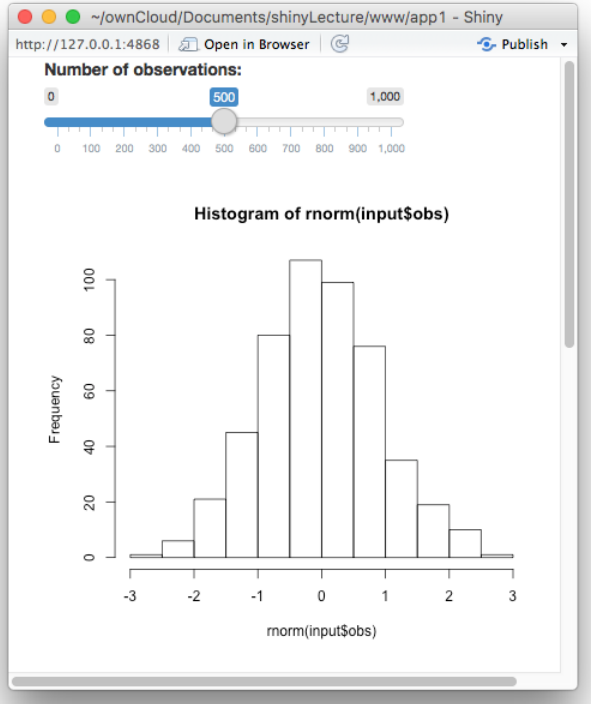
input$obs

```
renderPlot({
  hist(rnorm(input$num))
})
```



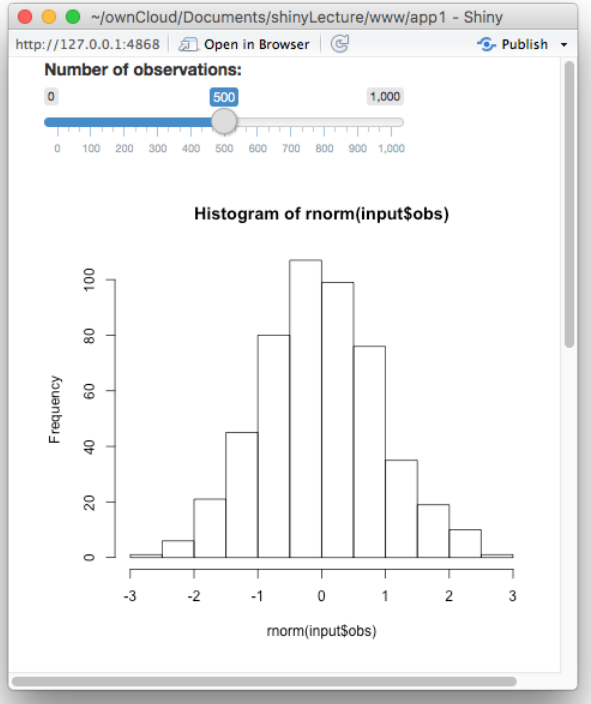
input$obs

```
renderPlot({
  hist(rnorm(input$num))
})
```



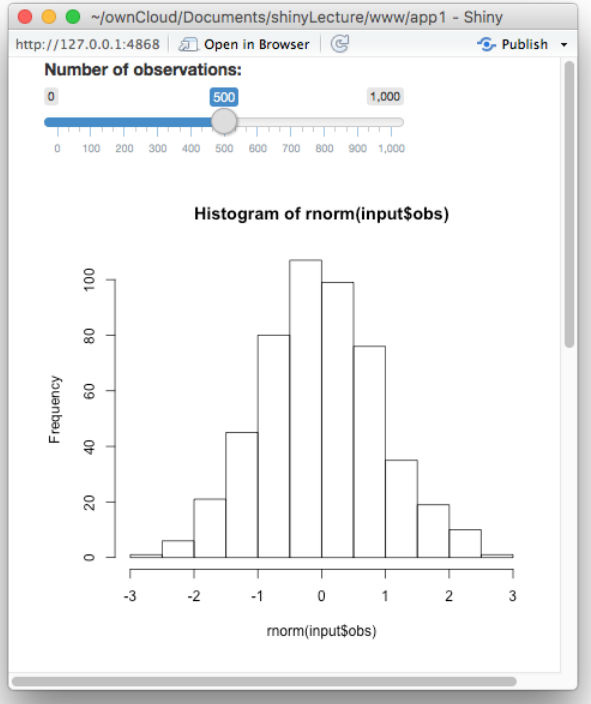
input$obs

```
renderPlot({
  hist(rnorm(input$num))
})
```



input$obs

```
renderPlot({
  hist(rnorm(input$num))
})
```



Server function

server 함수내에서 input의 값들을 output으로 전달하기 위해서는

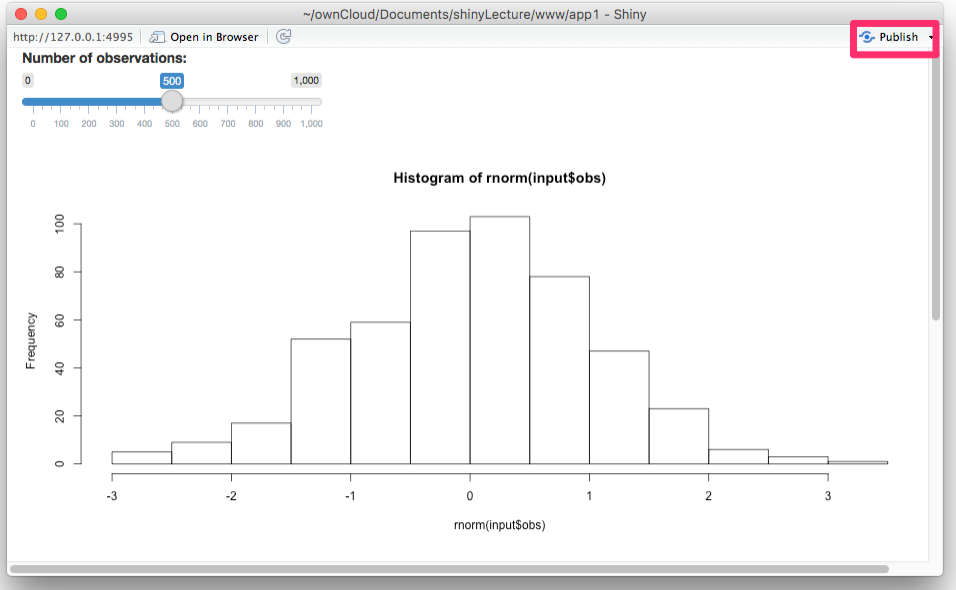
1. output의 객체를 저장할 때 **output$** : output$distPlot
2. output 의 객체를 만들때 **render*()** : renderPlot({})
3. input의 값을 접근할 때는 **input$** : input$obs

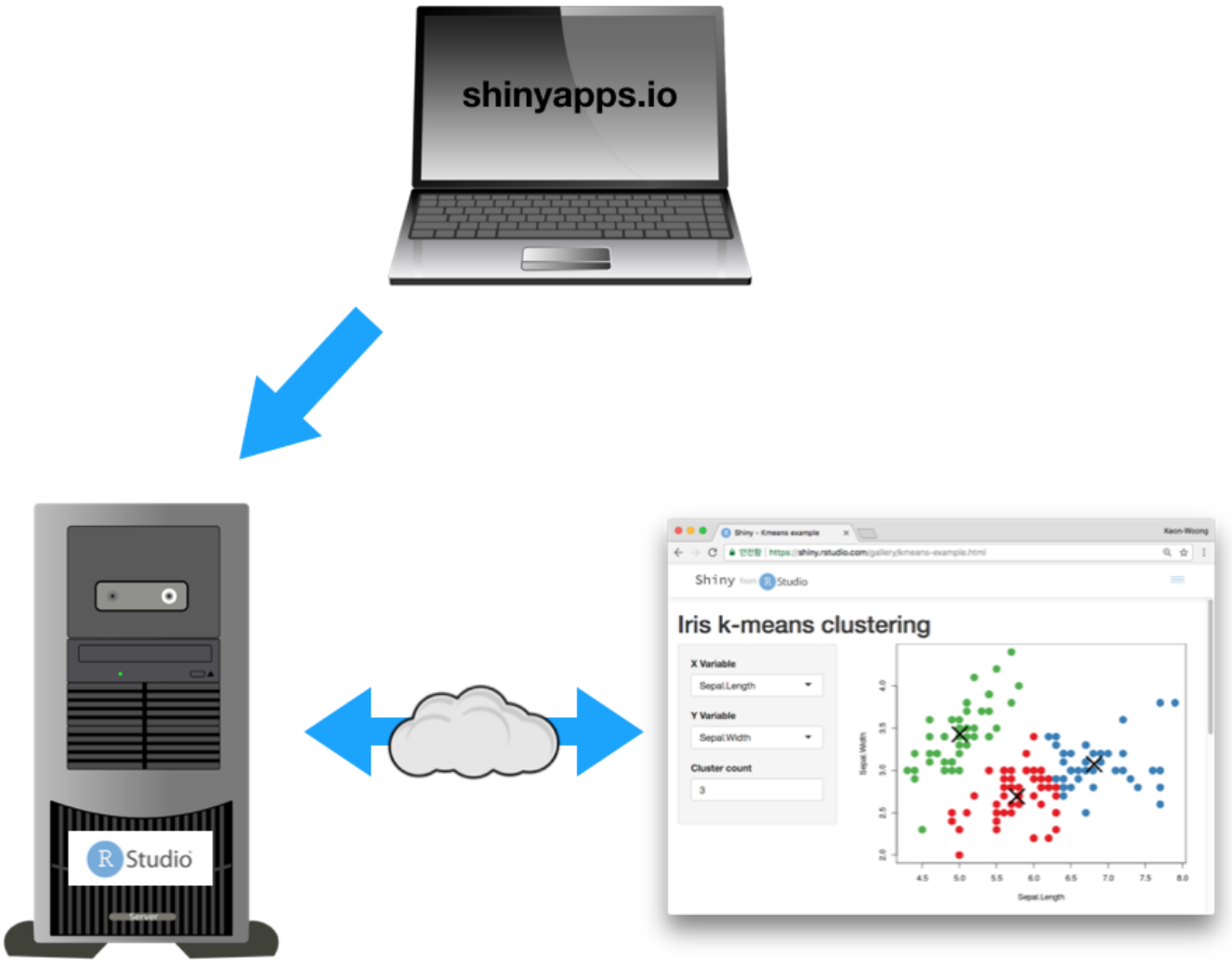
==> input의 값이 변할 때마다 reactivity 가 발생하여 output 객체를 rendering 한다

Share Your Shiny App

- shinyapps.io
- Shiny Server

shinyapps.io

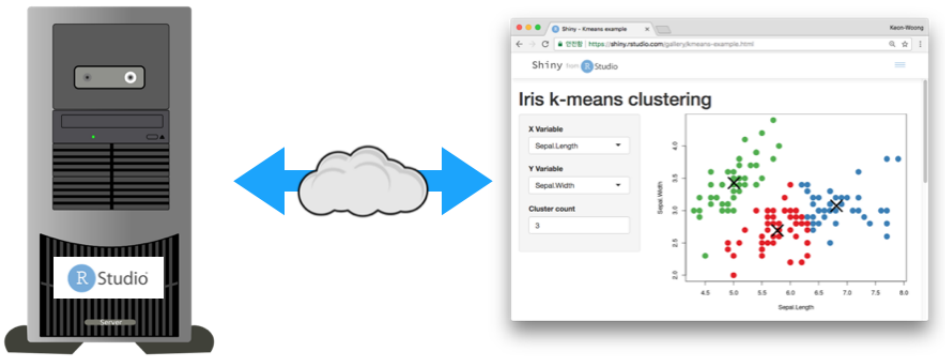



shinyapps.io
RStudio
Server
Shiny - Kmeans example
Shiny from RStudio
Iris k-means clustering
X Variable
Sepal.Length
Y Variable
Sepal.Width
Cluster count
3
Sepal.Width
Sepal.Length

shinyapps.io

A server maintained by RStudio

- free
- easy to use
- secure
- scalable



shinyapps.io

A server maintained by RStudio

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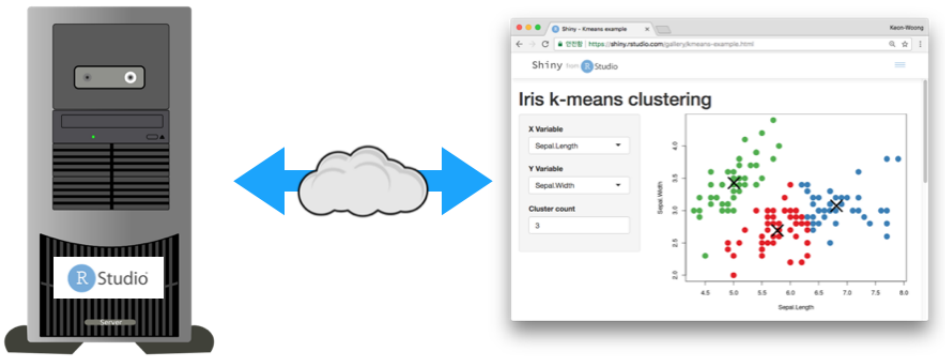
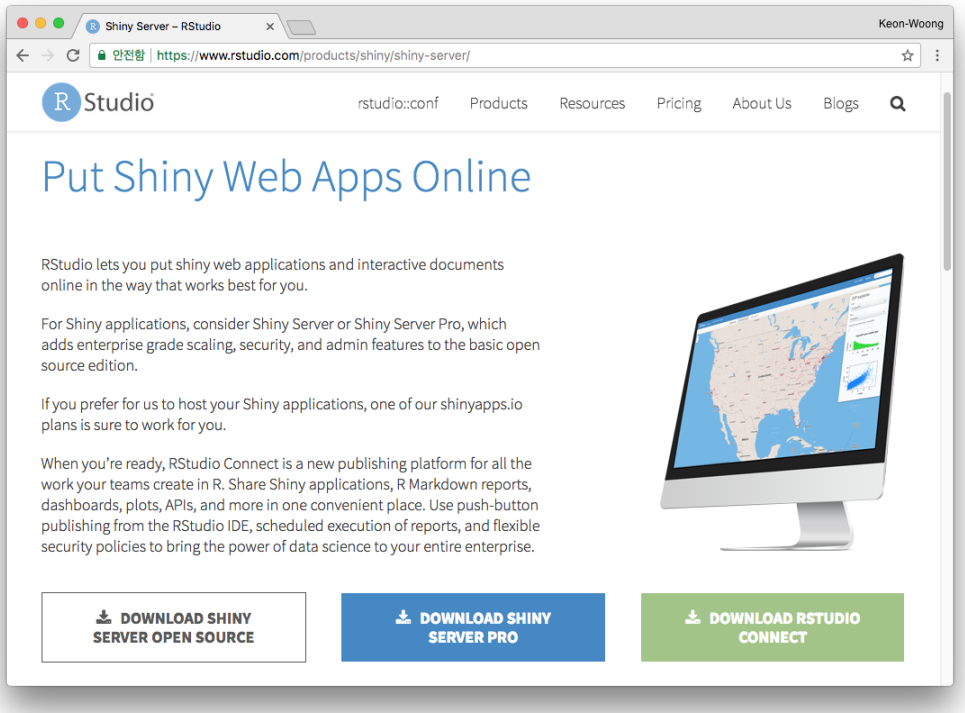


서버 세팅이 불가능 : 한글 LaTex 환경 구축 불가

Build Your Own Server : Shiny Server

https://www.rstudio.com/products/shiny/shiny-server/



Shiny Server Pro

https://www.rstudio.com/products/shiny-server-pro/

- Secure Acess - LDAP, GoogleAuth, SSL and more
- Performance - fine tune at app and server level
- Management - monitor and control resource use
- Support - direct priority support