

# Developing Shiny Applications: Using Leaflet in R

May 5, 2016

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# Overview

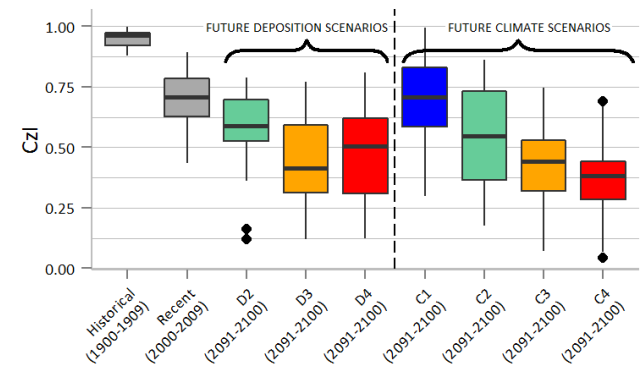
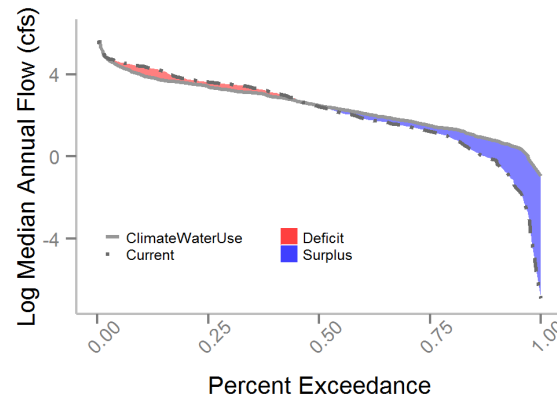
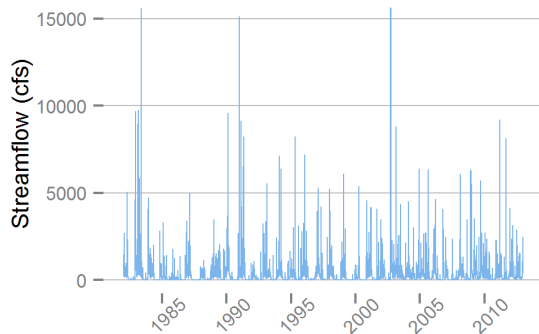
- R
- Leaflet
- Shiny
  - Basics
  - Development
  - Deployment
  
- Example 1: Wake County Food Violations Explorer
- Example 2: Toxics and Climate Change Tool
- Example 3: Water Quality Portal Data Discovery Tool

## The R Project for Statistical Computing

- Open source
- Based on S
- Statistical programming language
  - an effective data handling and storage facility,
  - a suite of operators for calculations on arrays, in particular matrices,
  - a large, coherent, integrated collection of intermediate tools for data analysis,
  - graphical facilities for data analysis and display either on-screen or on hardcopy, and
  - a well-developed, simple and effective programming language which includes conditionals, loops, user-defined recursive functions and input and output facilities.
- Highly flexible and expandable with the use and development of a wide variety of packages

# Using R

- Great for data display and complex statistical analysis
- Command line vs IDE
  - <https://www.rstudio.com/>
- Awesome Packages and Resources
  - data.table: Manipulate data FAST and access as if it were in a database
  - [ggplot2](#): better than base graphics and very intuitive
  - dplyr & tidyr – Data wrangling with R cheat sheet

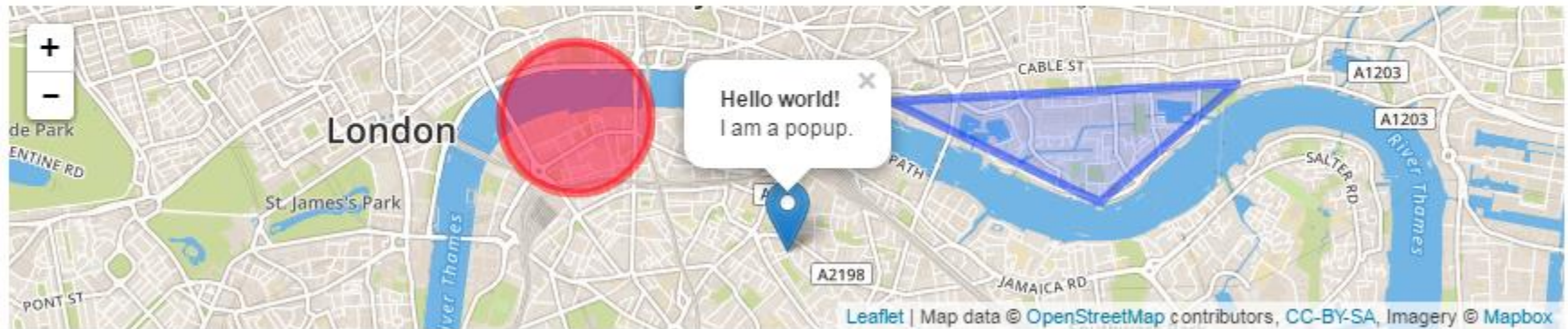


- [leafletjs.com](http://leafletjs.com)
- an open-source JavaScript library for mobile-friendly interactive maps

[← Tutorials](#)

## Leaflet Quick Start Guide

This step-by-step guide will quickly get you started on Leaflet basics, including setting up a Leaflet map, working with markers, polylines and popups, and dealing with events.



[View example on a separate page →](#)

# Leaflet for R

- <https://rstudio.github.io/leaflet/>
- Package built by Rstudio
- R functions generate the javascript & html for leaflet maps
- Can install the stable fully documented version or go with the development version.
- DEMO:
  - Basic map + markers and popups

- shiny.rstudio.com
- A web application framework for R, built by Rstudio
- Shiny functions translate R code into html, css, and javascript
- Lots of tutorials and examples available on the website:
  - Tutorials: <http://shiny.rstudio.com/tutorial/>
  - Gallery: <http://shiny.rstudio.com/gallery/>
- Very simple framework that can be easily expanded:
  - Every Shiny App is two files:
    - ui.R
    - Server.R
- DEMO
  - Example 1: kmeans clustering

# Add Leaflet to Shiny

- Take the map from the leaflet examples and add it to a shiny app.

```
# load the shapefile
zips <- readOGR("ZipCodes3.shp", layer="ZipCodes3")
# create the map object
map<-leaflet(data = zips) %>%
  setView(lng = -78.641074, lat =35.778035, zoom = 8)%>%
  addTiles( "://{s}.tiles.mapbox.com/v3/jcheng.map-5ebohr46/{z}/{x}/{y}.png")%>%
  addPolygons(fillColor = topo.colors(10, alpha = NULL))
```



```
# Define the server function
server <- function(input, output) {
  output$distPlot <- renderPlot({
    hist(rnorm(input$obs), col = 'darkgray', border = 'white')
  })
}
# Define the user interface (HTML)
ui <- fluidPage(
  sidebarLayout(
    sidebarPanel(
      sliderInput("obs", "Number of observations:", min = 10, max = 500, value = 100)
    ),
    mainPanel(plotOutput("distPlot"))
  )
)
# Run the app
shinyApp(ui = ui, server = server)
```



# Shiny Deployment

- <http://shiny.rstudio.com/deploy/>
- Web deployment
  - Shiny Server (open source vs. pro)
  - Shinyapps.io (free cloud account)
  - Example 1: Wake County Food Code Violations Explorer
  - Example 2: Toxics and Climate Change
- Develop a desktop tool
  - Package up the app and share with anyone who has R installed
  - Example 3: WQP Data Discovery Tool

# Example 1: Wake County Food Code Violations Explorer

- [https://ssifleet.shinyapps.io/NC\\_Retail\\_Risk/](https://ssifleet.shinyapps.io/NC_Retail_Risk/)
- Very simple app still in the preliminary development stages
  - ~ 50 lines of code
- Demo web version
- Demo Code
  - Note the drop down menu
  - Passing input to map object

# Example 2: Toxics and Climate Change

- <https://ssifleet.shinyapps.io/CC-App/>
- More complex and complete app
  - Still only a couple hundred lines of code
- Demo web version
- Walk through Code

# Example 3: WQP Data Discovery Tool

- Local App – deployed in a web browser on any computer with R installed
  - <https://www.epa.gov/waterdata/water-quality-portal-data-discovery-tool>
- Highly complex app
  - Server file has just over 1000 lines of code
  - Multiple files to build ui.R
  - Several external helper functions (files)
- Pulls in data from WQP webservice:
  - <http://waterqualitydata.us/>
  - Using the USGS dataRetrieval package
    - <https://github.com/USGS-R/dataRetrieval>
- Demo App
- Walk through code

# Thank you!

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- Helpful links:
  - <https://www.r-project.org/>
  - <https://s3.amazonaws.com/assets.datacamp.com/img/blog/data+table+cheat+sheet.pdf>
  - <https://www.rstudio.com/wp-content/uploads/2015/03/ggplot2-cheatsheet.pdf>
  - <http://www.rstudio.com/wp-content/uploads/2015/02/data-wrangling-cheatsheet.pdf>
  - <https://rstudio.github.io/leaflet/>