Development of web applications with R Shiny and Docker

Software engineer applied to data solutions

inloco

$whoami

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Overview

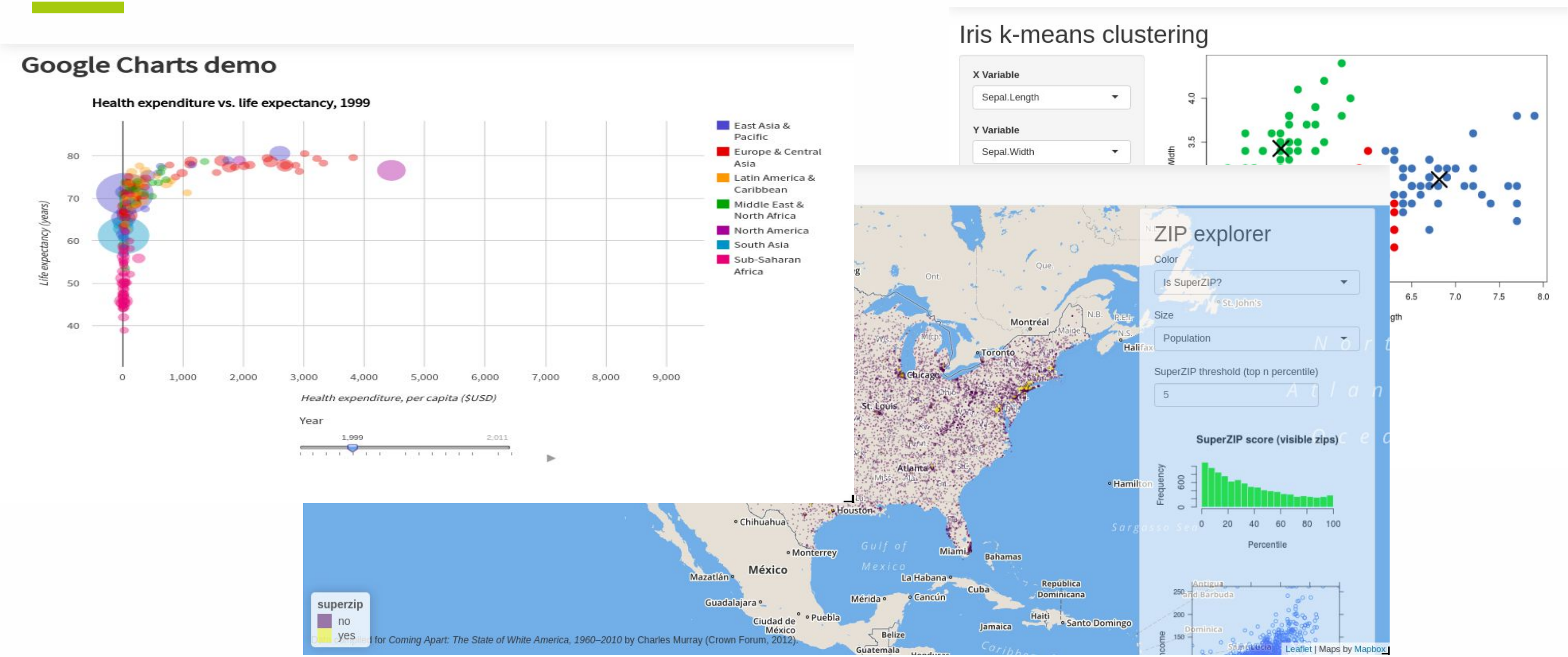
- Applications using Shiny
- Docker
- Code reproducibility

Web Applications using Shiny

What is Shiny?

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.

Some examples



Google Charts demo

Iris k-means clustering

X Variable

Sepal.Length

Y Variable

Sepal.Width

ZIP explorer

Color

Is SuperZIP?

Size

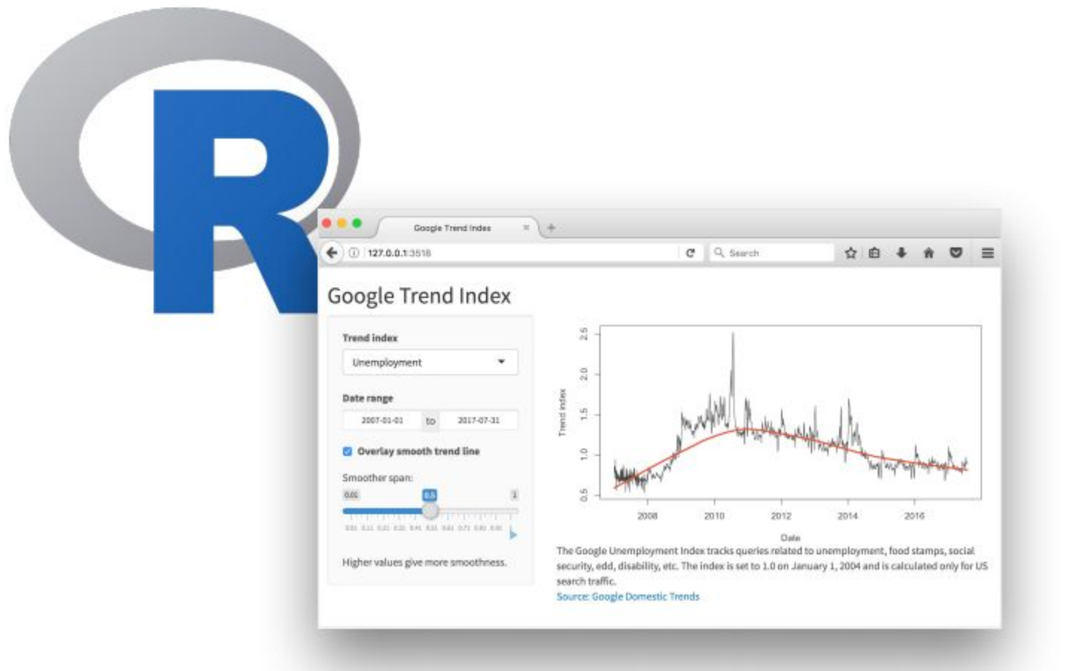
Population

SuperZIP threshold (top n percentile)

5

For more, see Shiny gallery.

Every Shiny app has a webpage that the user visits, and behind this webpage there is a computer that serves this webpage by running R.



Google Trend Index

Trend index: Unemployment

Date range: 2007-01-01 to 2017-07-31

☑ Overlay smooth trend line

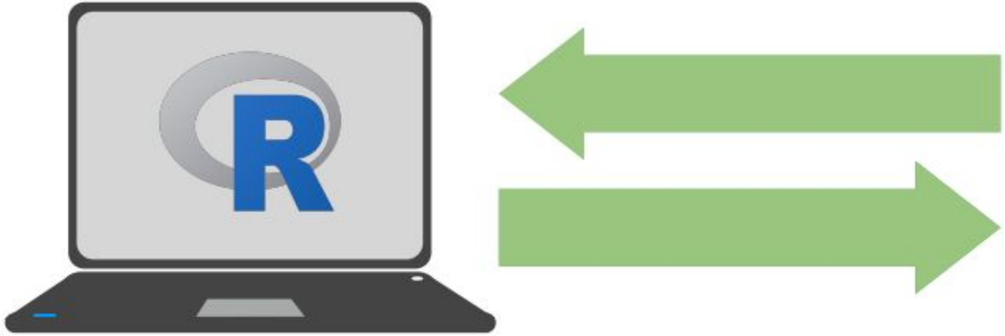
Smoother span: 0.01 0.5 1

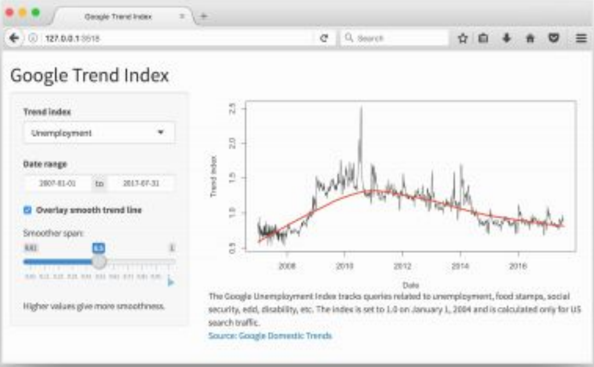
Higher values give more smoothness.

The Google Unemployment Index tracks queries related to unemployment, food stamps, social security, edd, disability, etc. The index is set to 1.0 on January 1, 2004 and is calculated only for US search traffic.

Source: Google Domestic Trends

When running your app locally, the computer serving your app is your computer.





Google Trend Index

Trend index

Unemployment

Date range

2007-01-01 to 2017-07-31

☑ Overlay smooth trend line

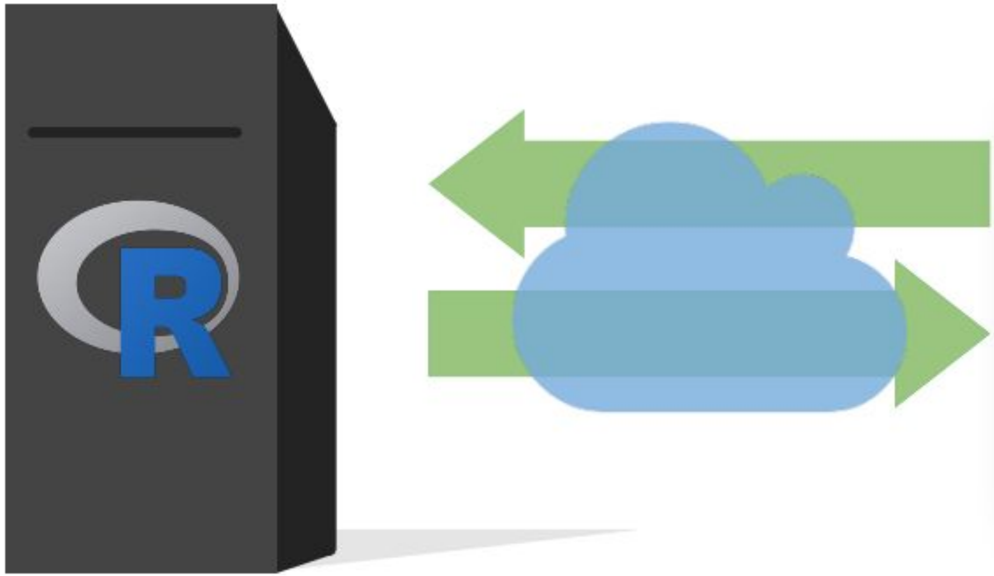
Smoother span:

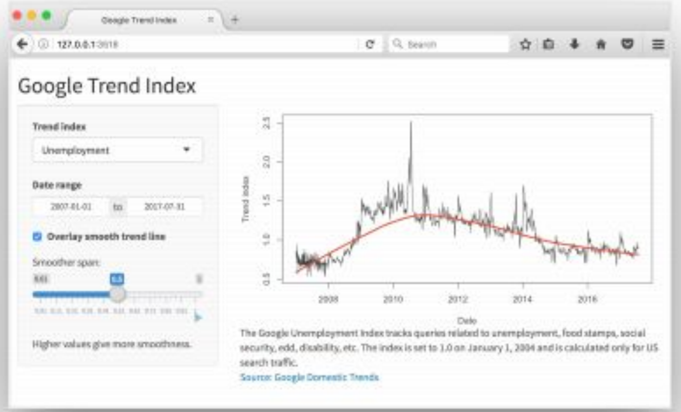
Higher values give more smoothness.

The Google Unemployment Index tracks queries related to unemployment, food stamps, social security, edd, disability, etc. The index is set to 1.0 on January 1, 2004 and is calculated only for US search traffic.

Source: Google Domestic Trends

When your app is deployed, the computer serving your app is a web server.





Google Trend Index

Trend index

Unemployment ▾

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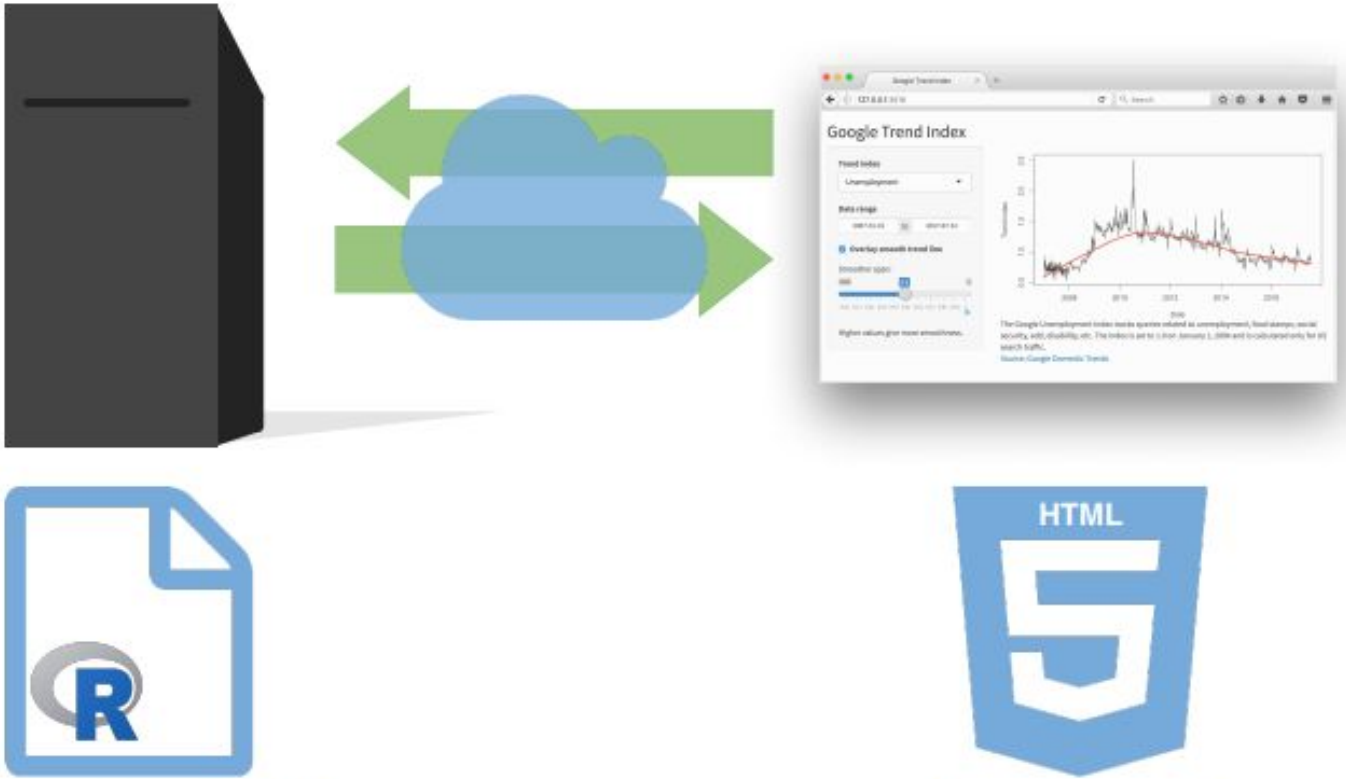
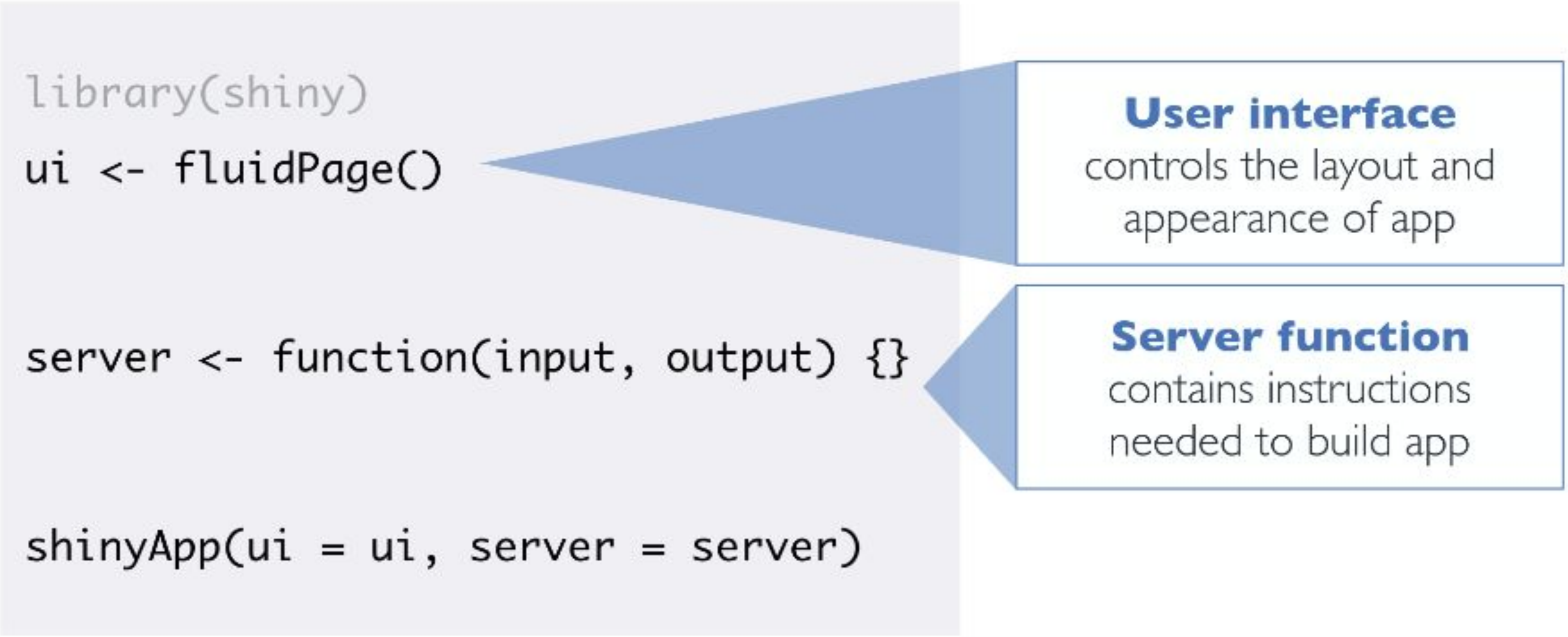


Server instructions

User interface

Anatomy of a Shiny app



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


server <- function(input, output) {}


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

User interface controls the layout and appearance of app

Server function contains instructions needed to build app

Shiny cheat sheet

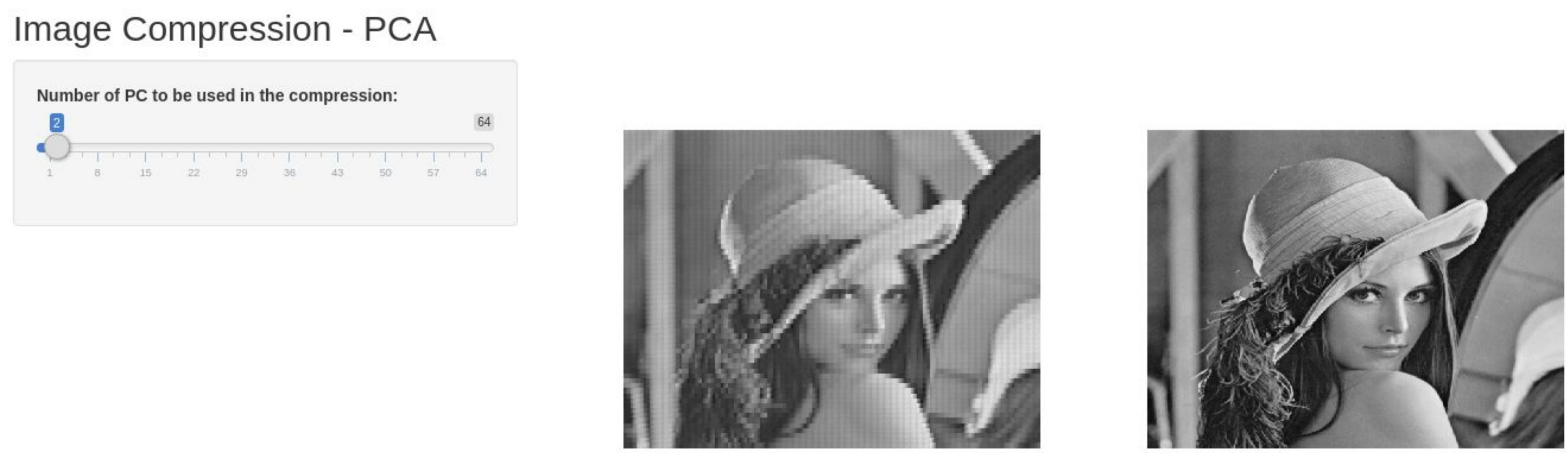
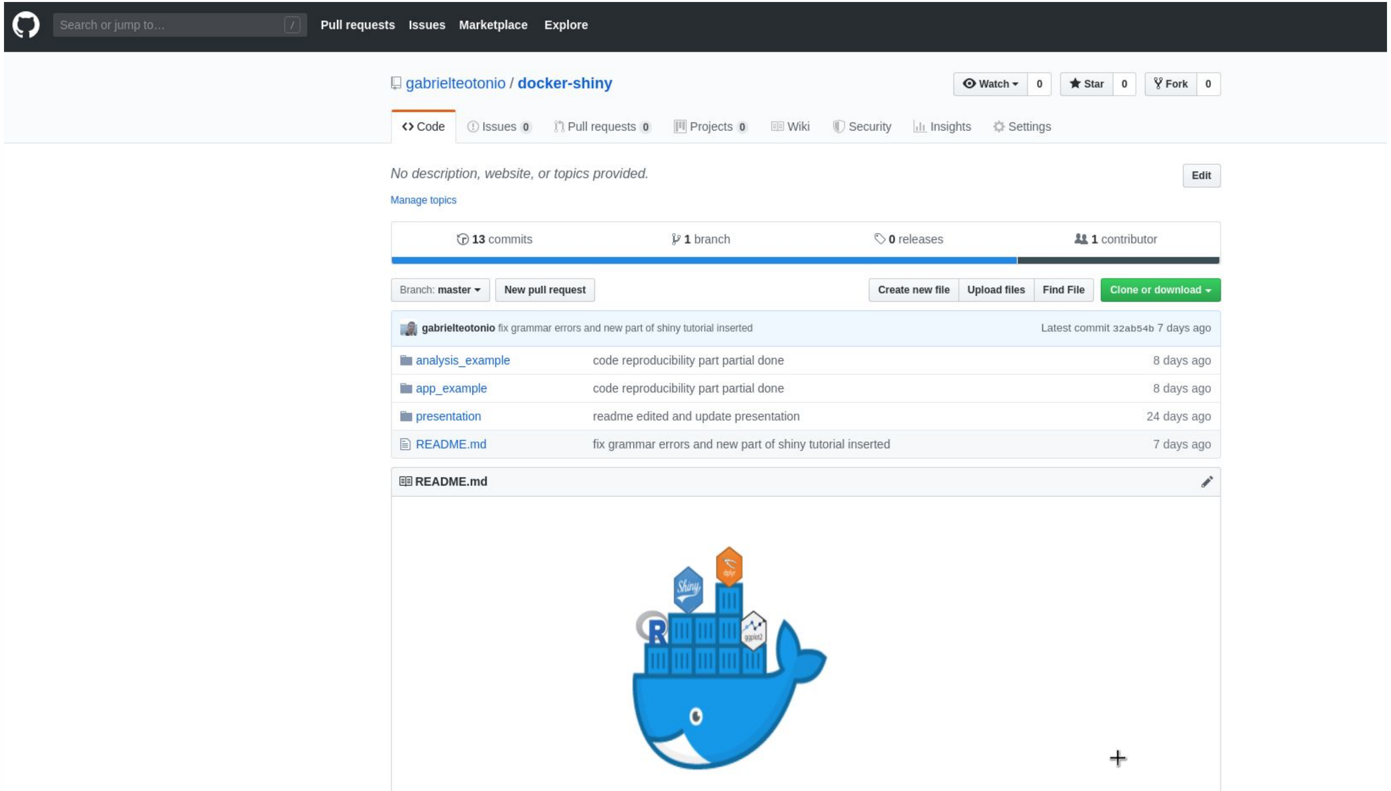


Image Compression - PCA

Number of PC to be used in the compression: 2

Code

Go to **github.com/gabrielteotonio/docker-shiny**



gabrielteotonio / **docker-shiny**

No description, website, or topics provided.

13 commits | **1** branch | **0** releases | **1** contributor

gabrielteotonio fix grammar errors and new part of shiny tutorial inserted — Latest commit 32ab54b 7 days ago

analysis_example	code reproducibility part partial done	8 days ago
app_example	code reproducibility part partial done	8 days ago
presentation	readme edited and update presentation	24 days ago
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README.md

Sharing or deploying your app

Some options:

- Shinyapps.io;
- Shiny server;
- Shiny server pro.

Is it possible to use Shiny apps in production?

What is production?

A production environment is used and relied on by real users, with real consequences if things go wrong.

NIKE

inloco

McKinsey & Company

YES!

airbnb

AIR®
AMERICAN INSTITUTES FOR RESEARCH®

T · ·Mobile

New Zealand Government
Te Kāwanatanga o Aotearoa

Focus

Database

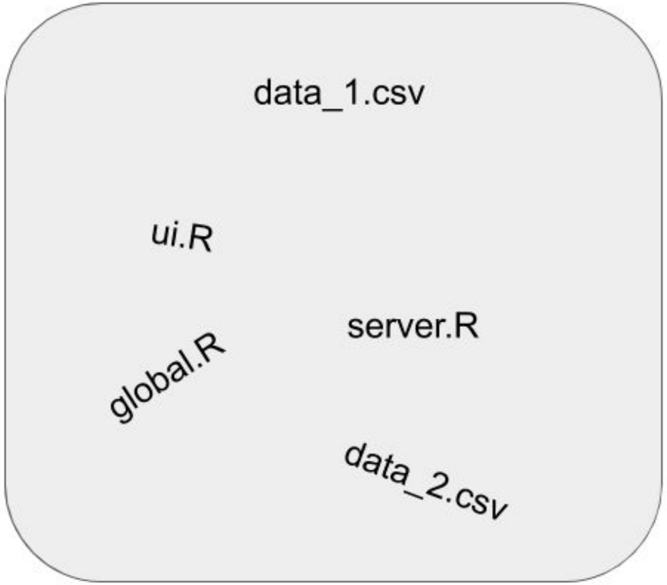
Deploy

Database

It is plausible to say that the core of a R Shiny application is data. The way the data is stored and we access it is a key point in the performance of Shiny app.

Database

Shiny app



data_1.csv

ui.R

server.R

global.R

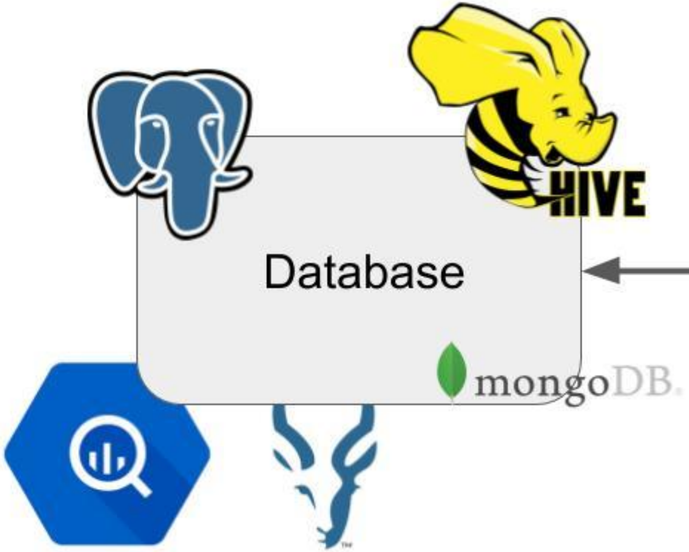
data_2.csv

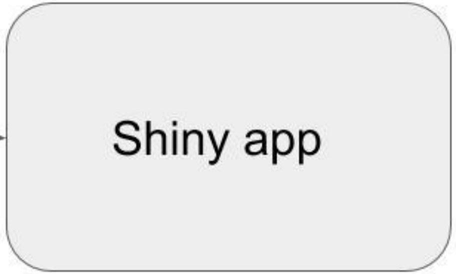
Database

These formats compact your file in a manner that you’ll have a high reading performance inside your application:

- .feather
- .RDS

Database





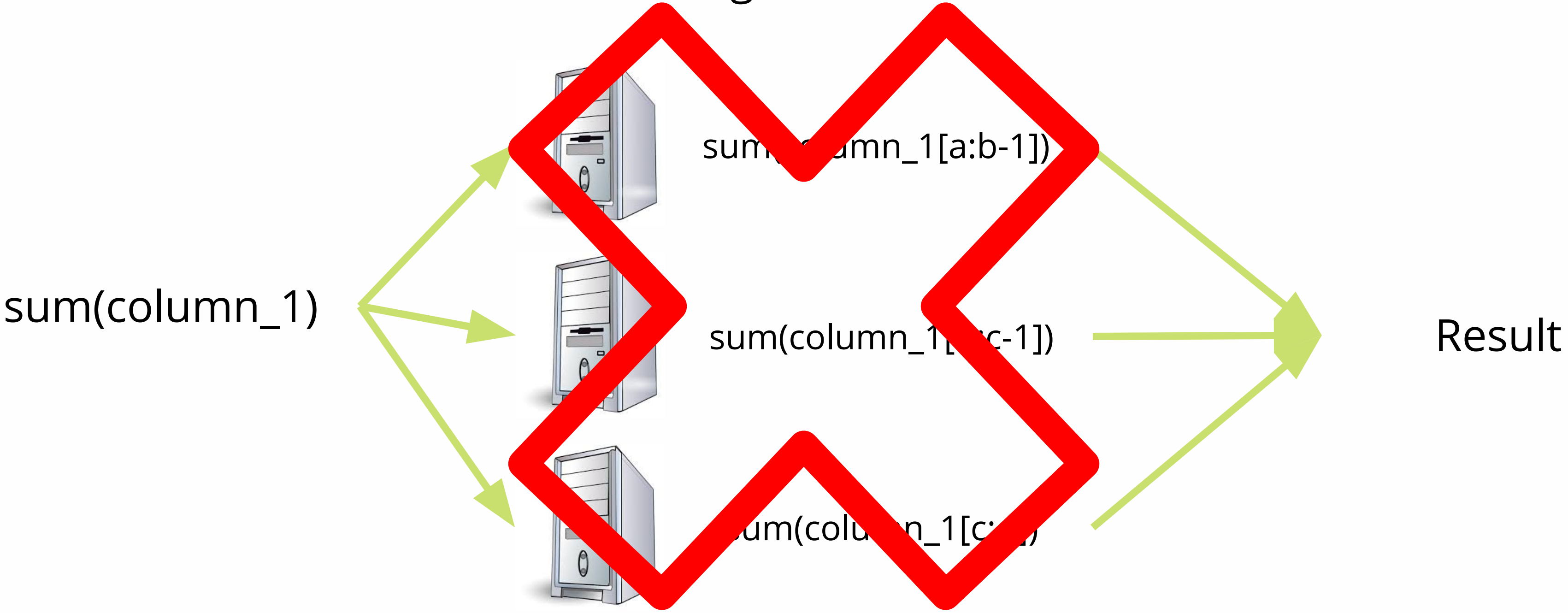
Database

Preprocessed data

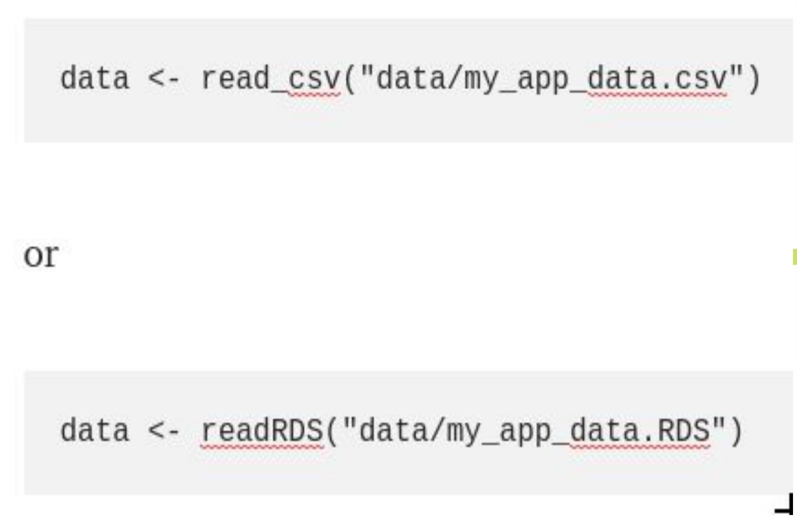
Query

Database

R is single-threaded



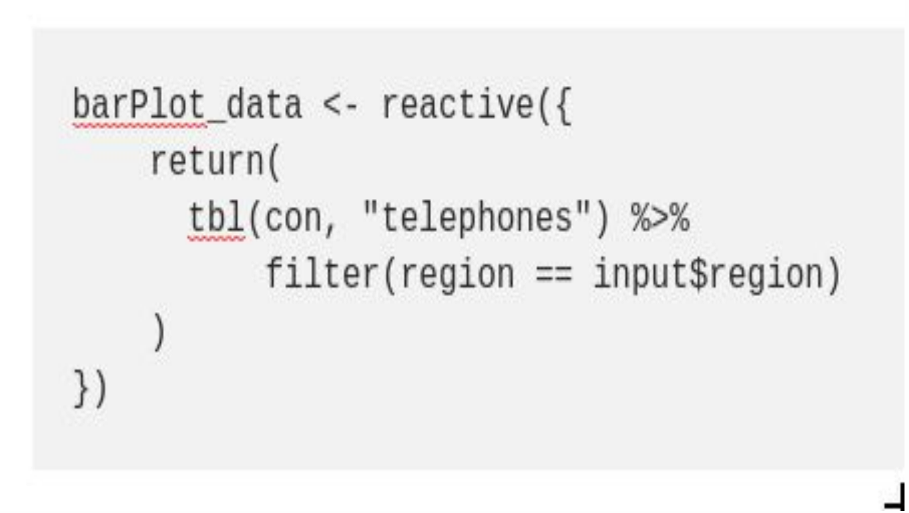
Database



```
data <- read_csv("data/my_app_data.csv")
```

or

```
data <- readRDS("data/my_app_data.RDS")
```

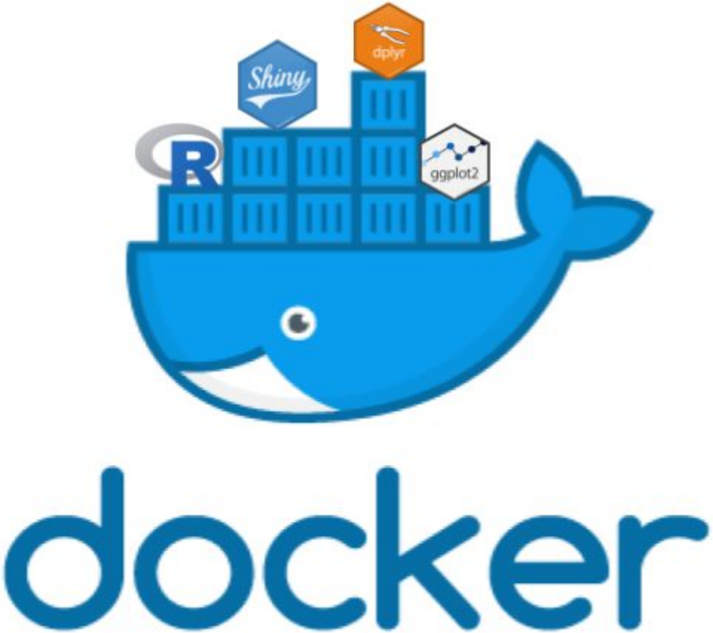


```
barPlot_data <- reactive({
    return(
      tbl(con, "telephones") %>%
          filter(region == input$region)
    )
})
```

Deploy

The machine where your application will run is quite different from yours.

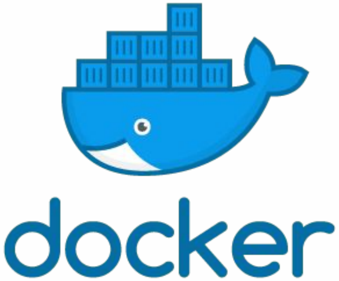
Deploy



Docker

What is Docker?

Docker is a tool designed to make it easier to create, deploy, and run applications by using containers. In a way, Docker is a bit like a virtual machine. Docker seems a great way for us to deploy a Shiny application.



What is a Docker container?

A Docker container is a loosely isolated environment running within a host machine’s kernel that allows us to run application-specific code.

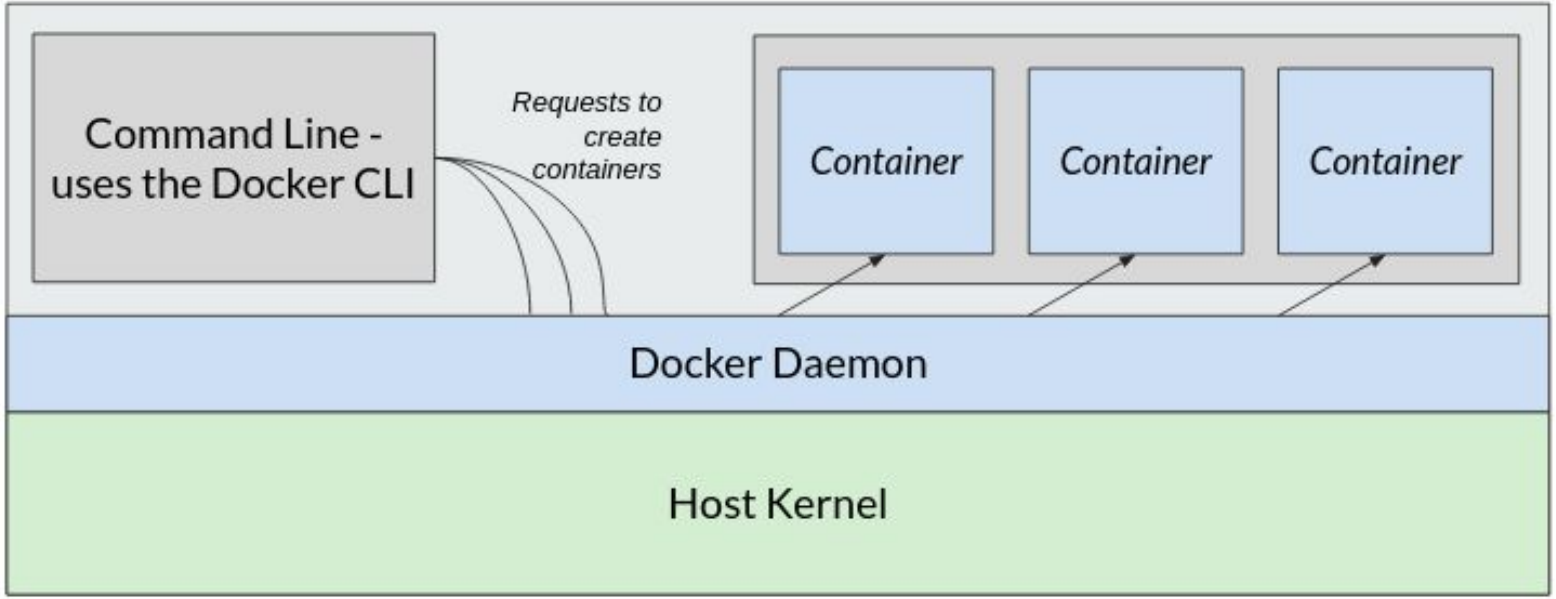
The Kernel

- The kernel is the software at the core of an operating system, with complete control;
- The CPU is the core circuitry which executes program instructions;
- Docker runs on top of original machine’s kernel - making it the *host machine*.

The Docker Engine

- Consists of the Docker server, an API, and command line interface.
- The server is also called the Docker daemon.
  - daemon - background processes on an operating system.
- Docker daemon is like a construction team on the host machine.

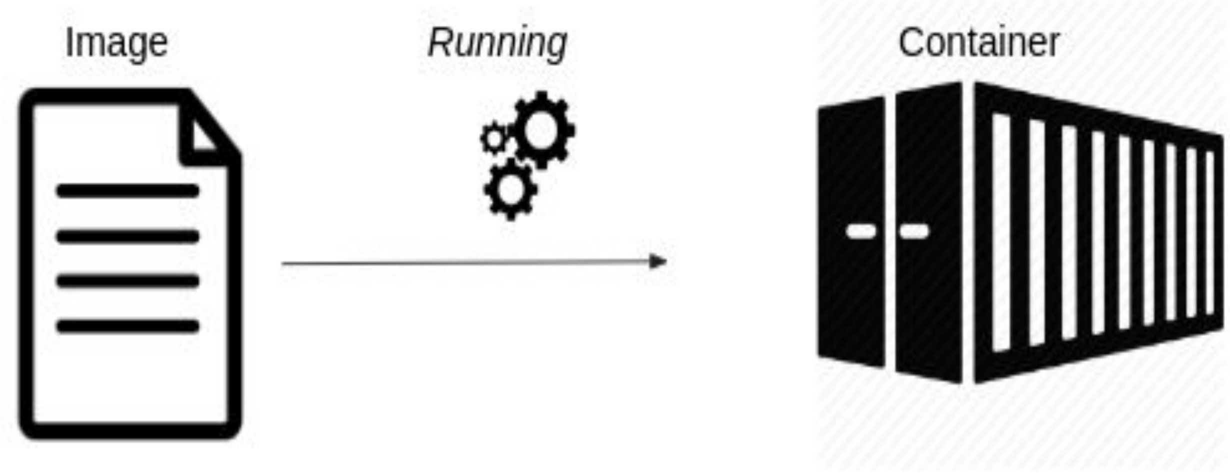
The Docker Engine on an Operating System



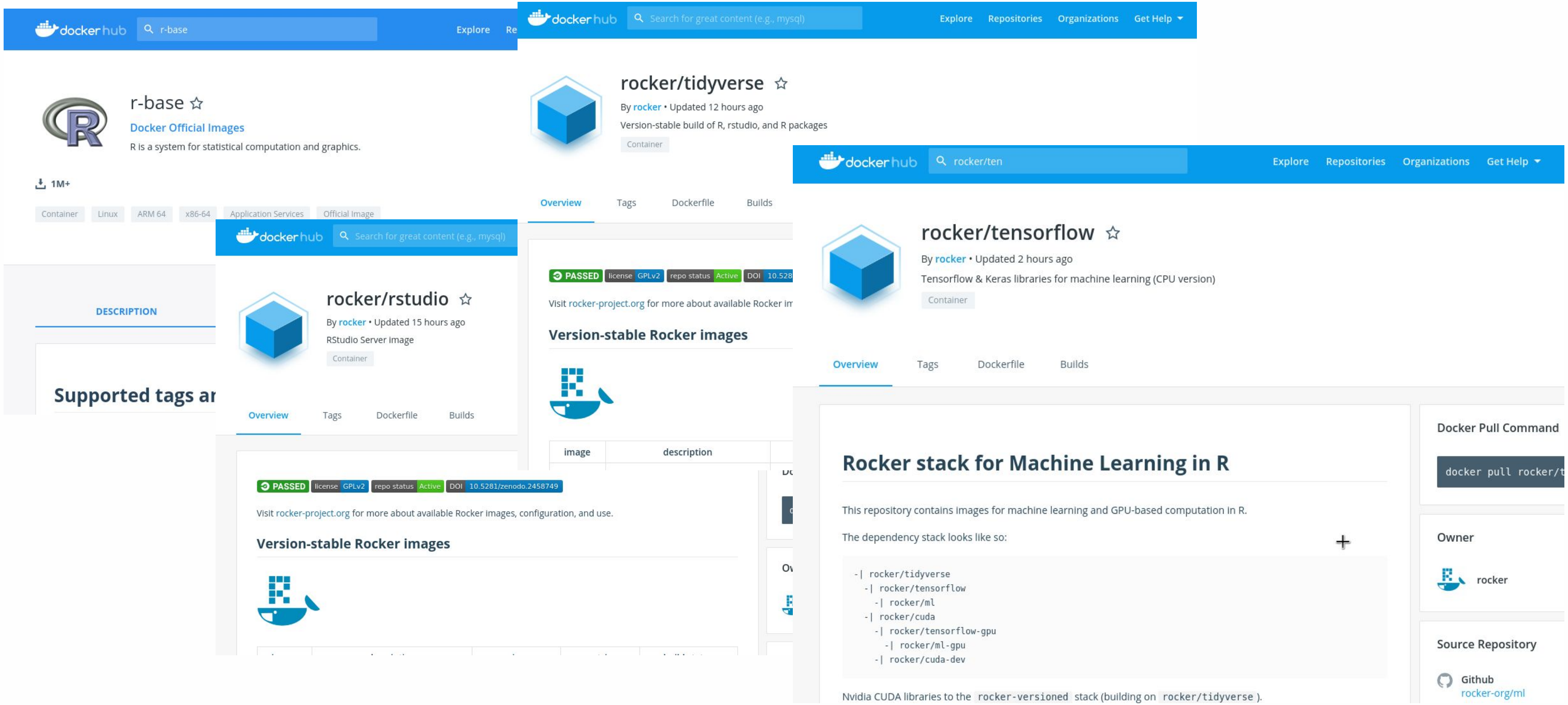
Docker images

- They are “ready-only templates with instructions for creating a Docker container.”
- Define the container code, libraries, environment variables, configuration files, and more.

Image to container relationship



Dockerhub



r-base ☆

Docker Official Images

R is a system for statistical computation and graphics.

Supported tags ar

rocker/rstudio ☆

By rocker • Updated 15 hours ago

RStudio Server image

Visit rocker-project.org for more about available Rocker images, configuration, and use.

Version-stable Rocker images

rocker/tidyverse ☆

By rocker • Updated 12 hours ago

Version-stable build of R, rstudio, and R packages

Visit rocker-project.org for more about available Rocker im

Version-stable Rocker images

rocker/tensorflow ☆

By rocker • Updated 2 hours ago

Tensorflow & Keras libraries for machine learning (CPU version)

Rocker stack for Machine Learning in R

This repository contains images for machine learning and GPU-based computation in R.

The dependency stack looks like so:

```
-| rocker/tidyverse
  -| rocker/tensorflow
    -| rocker/ml
  -| rocker/cuda
    -| rocker/tensorflow-gpu
      -| rocker/ml-gpu
    -| rocker/cuda-dev
```

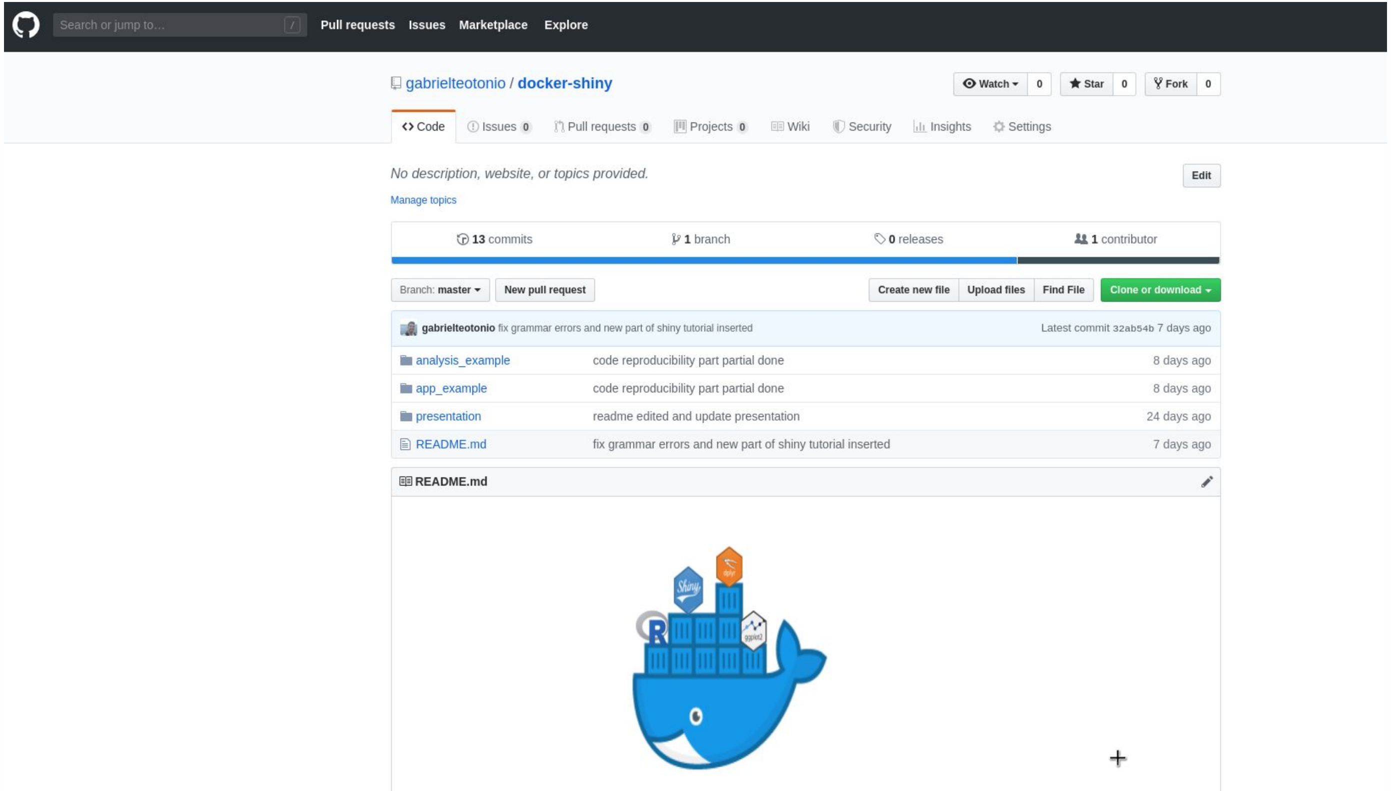
Nvidia CUDA libraries to the `rocker-versioned` stack (building on `rocker/tidyverse`).

```
docker pull rocker/t
```

Code

Go to

github.com/gabrielteotonio/docker-shiny



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