

# Conhecendo o



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in pollyannaogoncalves

## Um pouco sobre mim...



- Graduação em Ciência da Computação @ UFOP
- Mestrado em Ciência da Computação @ UFMG
  - Linha de pesquisa: Análise de Sentimentos na Web
- Especialização em Estatística @ UFMG
- Cientista de Dados & Analista de BI @ Hotmart
  - Construção de dashboards para monitoramento de KPIs
  - Implementação de modelos estatísticos para forecast (R e Python)
  - Implementação de modelos de ML para classificação, recomendação, predição (R e Python)

# Agenda

- História do R
- Por que aprender R?
- Download & Instalação do R
- Download & Instalação do Rstudio
- Características
  - Variáveis
  - Vetores
  - Listas
  - Matrizes
  - Funções / Funções de Grupos
  - Importação de dados / Gráficos
  - Packages
- Problemas reais resolvidos com R

# História do R

# História do R

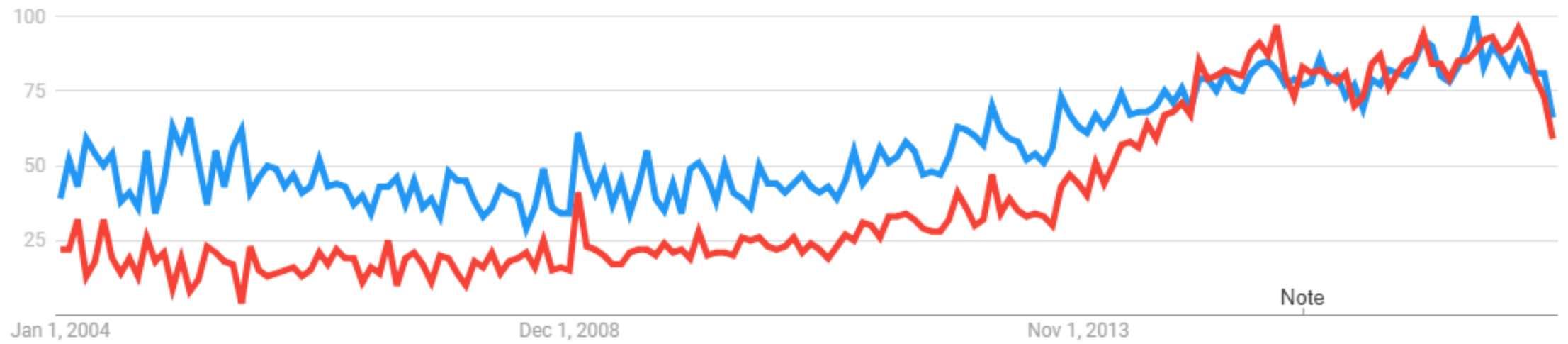
- Criação em 1993
  - Professores de estatística: Ross Ihaka e Robert Gentleman
  - Universidade de Auckland / Nova Zelândia
  - Problema: bons softwares de estatística eram pagos
  - Baseada na linguagem de programação S
- Objetivo: facilitar análises estatísticas e visualização de dados
- Inicialmente foi adotada por acadêmicos
- Open source (desde 1995)

**Por que  
aprender R?**

● r language  
Search term

● r programming  
Search term

Interest over time ?



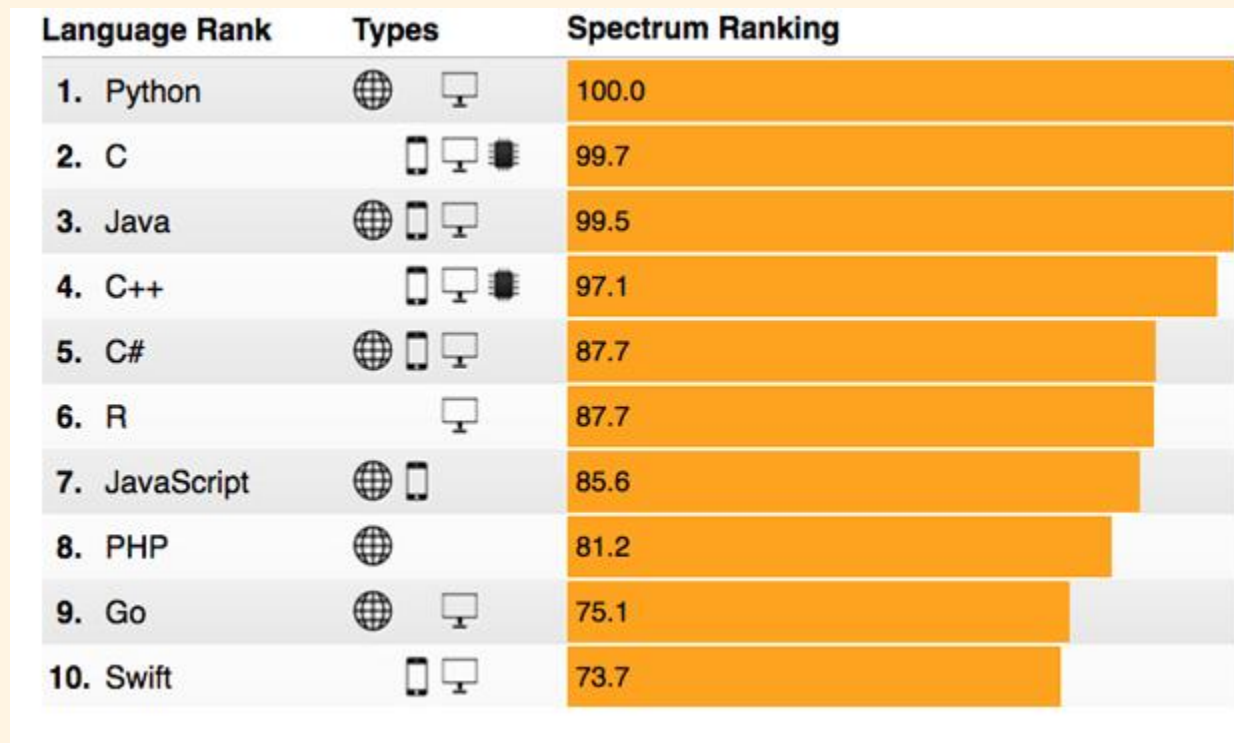
# Por que aprender R?

- R vem se tornando principal linguagem utilizada por profissionais de Analytics, Big Data e Data Science
- A linguagem é mantida por uma comunidade colaborativa com grupos de contribuidores formados por pesquisadores de renome internacional
- Tem pacote para tudo! (E se achar, então alguém já está desenvolvendo!)
- Integrações recentes com diversos players de mercado (Oracle, Microsoft, etc.)



# Por que aprender R?

- Top 5 no ranking de 2017 da IEEE

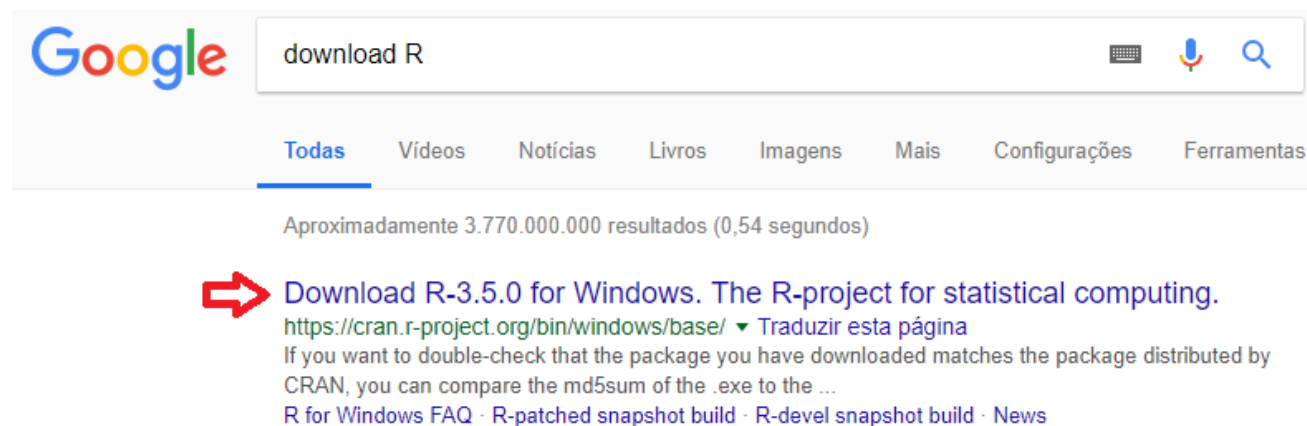




# Download & Instalação

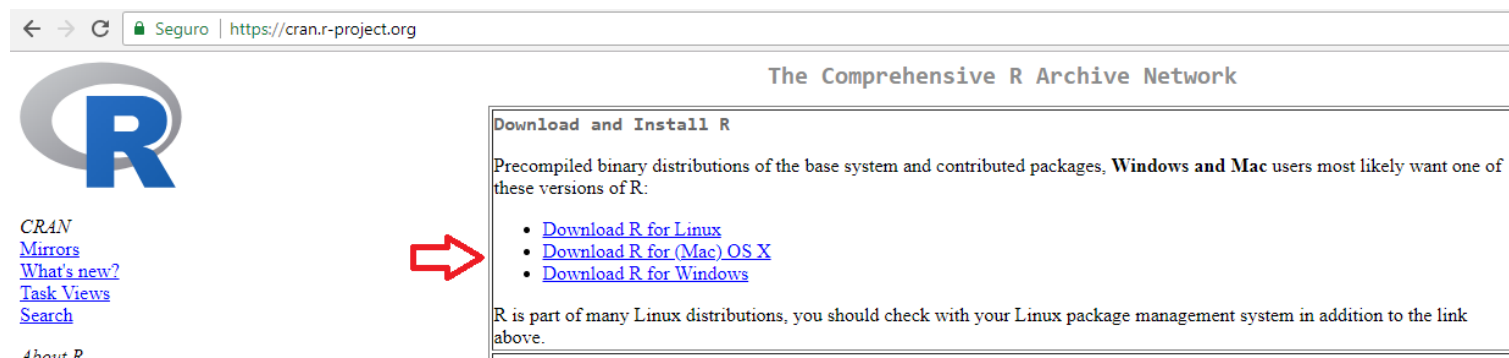
# Download e Instalação do R

- CRAN: Rede de FTP e Web servers mundiais que armazena versões atualizadas da linguagem, libraries e documentações.



# Download e Instalação do R

- Multiplataforma.
- Após a instalação, já será possível começar a desenvolver na linguagem R.

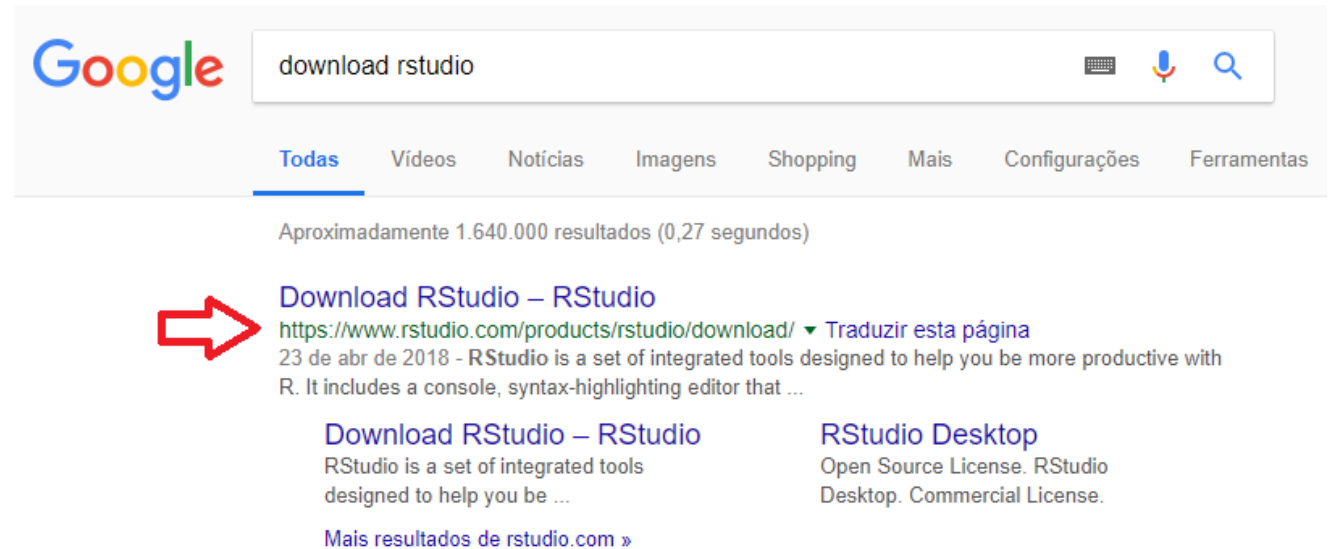




# **Download & Instalação**

# Download e Instalação do RStudio

- IDE que facilita e auxilia a programação
- Open Source



# Download e Instalação do RStudio

- Versões:
  - Rstudio Desktop (Free)
  - Rstudio Server (possibilidade de criar schedules de scripts, etc.)

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## Choose Your Version of RStudio

RStudio is a set of integrated tools designed to help you be more productive with R. It includes a console, syntax-highlighting editor that supports direct code execution, and a variety of robust tools for plotting, viewing history, debugging and managing your workspace. [Learn More](#) about RStudio features.



RStudio Desktop  
Open Source License

FREE

DOWNLOAD

[Learn More](#)

RStudio Desktop  
Commercial License

\$995 per year

BUY

[Learn More](#)

RStudio Server  
Open Source License

FREE

DOWNLOAD

[Learn More](#)

RStudio Server Pro  
Commercial License

\$9,995 per year

DOWNLOAD

[Learn More](#)

RStudio Server Pro +  
RStudio Connect  
Commercial License

\$29,995 per  
year

TALK

[Learn More](#)

# Download e Instalação do RStudio

- Multiplataforma

[Products](#)[Resources](#)[Pricing](#)[About Us](#)[Blogs](#)

## Installers for Supported Platforms

| Installers   | Size    | Date       | MD5                              |
|--|---------|------------|----------------------------------|
| RStudio 1.1.453 - Windows Vista/7/8/10                         | 85.8 MB | 2018-05-16 | bf287e385aef53829204023087e98735 |
| RStudio 1.1.453 - Mac OS X 10.6+ (64-bit)                      | 74.5 MB | 2018-05-16 | 00a0088424ed06ac434f7a966f602b9c |
| RStudio 1.1.453 - Ubuntu 12.04-15.10/Debian 8 (32-bit)         | 89.3 MB | 2018-05-16 | 6cfd86770c7b6dbc13e66f4f59c299ce |
| RStudio 1.1.453 - Ubuntu 12.04-15.10/Debian 8 (64-bit)         | 97.4 MB | 2018-05-16 | 63e36e8138e369d19f9aaf4b0e995bbc |
| RStudio 1.1.453 - Ubuntu 16.04+/Debian 9+ (64-bit)             | 64.4 MB | 2018-05-16 | 85b3e76c9fad4613bc9cf0de1f34b183 |
| RStudio 1.1.453 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit) | 88.1 MB | 2018-05-16 | 37cade7e162eab62483e6556e39dedee |
| RStudio 1.1.453 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit) | 90.6 MB | 2018-05-16 | 44cddd285bc31c41e4eae1d74b8eebb  |

## Zip/Tarballs

| Zip/tar archives   | Size     | Date       | MD5                              |
|--|----------|------------|----------------------------------|
| RStudio 1.1.453 - Windows Vista/7/8/10                         | 122.9 MB | 2018-05-16 | c933e87a1cf1a4852e67ebabd867c2bb |
| RStudio 1.1.453 - Ubuntu 12.04-15.10/Debian 8 (32-bit)         | 90 MB    | 2018-05-16 | 16e3347064194ed2a27f4f40139329e5 |
| RStudio 1.1.453 - Ubuntu 12.04-15.10/Debian 8 (64-bit)         | 98.3 MB  | 2018-05-16 | db60b00e15d235202466524cd0fbfc25 |
| RStudio 1.1.453 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit) | 88.8 MB  | 2018-05-16 | 546642e1fe826f09082f             |
| RStudio 1.1.453 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit) | 91.4 MB  | 2018-05-16 | 8df70b969a1786d65982             |

[Try RStudio Server Pro for free](#)



Console ~/

```
R version 3.3.2 (2016-10-31) -- "Sincere Pumpkin Patch"
Copyright (C) 2016 The R Foundation for Statistical Computing
Platform: x86_64-w64-mingw32/x64 (64-bit)
```

```
R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.
```

```
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.
```

```
Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.
```

```
[workspace loaded from ~/.RData]
```

```
> 3 + 5
[1] 8
> pi
[1] 3.141593
>
```

# Console

Environment History

Import Dataset

Global Environment

Data

|       |   |
|-------|---|
| d     | 11 obs. of 2 variables                  |
| dados | 3 obs. of 1 variable                    |
| df    | 0 obs. of 1 variable                    |
| m     | num [1:11, 1:3] 1 1 1 1 2 1 1 0 0 0 ... |

values

|                |  |
|----------------|--|
| docs           | List of 3                                  |
| dtm            | List of 6                                  |
| pal1           | chr [1:12] "#A6CEE3" "#1F78B4" "#B2DF8..." |
| pal3           | chr [1:12] "#8DD3C7" "#FFFFB3" "#BEBAD..." |
| td_mtx         | List of 6                                  |
| temp           | List of 0                                  |
| text           | chr [1:3] "Equiparar a política de de ..." |
| toSpace        | function (x, ...)                          |
| unwanted_array | List of 65                                 |
| v              | Named num [1:11] 2 1 1 1 1 1 1 1 1 1 ...   |
| vs             | List of 0                                  |
| wc_corpus      | List of 2                                  |

Functions

|           |                                  |
|-----------|----------------------------------|
| fa        | function (x)                     |
| rm_accent | function (docs, pattern = "all") |

## Objetos criados

Console ~/

R version 3.3.2 (2016-10-31) -- "Sincere Pumpkin Patch"  
Copyright (C) 2016 The R Foundation for Statistical Computing  
Platform: x86\_64-w64-mingw32/x64 (64-bit)

R is free software and comes with ABSOLUTELY NO WARRANTY.  
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'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.

[workspace loaded from ~/.RData]

```
> 3 + 5  
[1] 8  
> pi  
[1] 3.141593  
> |
```

Environment History

Files Plots Packages Help Viewer

Install

Update

# Pacotes instalados

| Name                                | Description  | Version    |
|-------------------------------------|--|------------|
| <b>User Library</b>                 |  |            |
| <input type="checkbox"/> acepack    | ACE and AVAS for Selecting Multiple Regression Transformations | 1.4.1      |
| <input type="checkbox"/> apcluster  | Affinity Propagation Clustering                                | 1.4.4      |
| <input type="checkbox"/> assertthat | Easy pre and post assertions.                                  | 0.1        |
| <input type="checkbox"/> backports  | Reimplementations of Functions Introduced Since R-3.0.0        | 1.0.5      |
| <input type="checkbox"/> base64enc  | Tools for base64 encoding                                      | 0.1-3      |
| <input type="checkbox"/> BH         | Boost C++ Header Files   | 1.62.0-1   |
| <input type="checkbox"/> bindr      | Parametrized Active Bindings                                   | 0.1        |
| <input type="checkbox"/> bindrcpp   | An 'Rcpp' Interface to Active Bindings                         | 0.2        |
| <input type="checkbox"/> bitops     | Bitwise Operations   | 1.0-6      |
| <input type="checkbox"/> bubbles    | d3 Bubble Chart htmlwidget                                     | 0.2        |
| <input type="checkbox"/> callr      | Call R from R  | 1.0.0.9000 |
| <input type="checkbox"/> car        | Companion to Applied Regression                                | 2.1-4      |
| <input type="checkbox"/> caret      | Classification and Regression Training                         | 6.0-73     |
| <input type="checkbox"/> caTools    | Tools: moving window statistics, GIF, Base64, ROC AUC, etc.    | 1.17.1     |
| <input type="checkbox"/> cellranger | Translate Spreadsheet Cell Ranges to Rows and Columns          | 1.1.0      |
| <input type="checkbox"/> checkmate  | Fast and Versatile Argument Checks                             | 1.8.2      |
| <input type="checkbox"/> colorspace | Color Space Manipulation                                       | 1.3-1      |
| <input type="checkbox"/> corrplot   | Visualization of a Correlation Matrix                          | 0.77       |
| <input type="checkbox"/> crayon     | Colored Terminal Output  | 1.3.4      |
| <input type="checkbox"/> csv        | Read and Write CSV Files with Selected Conventions             | 0.5        |
| <input type="checkbox"/> curl       | A Modern and Flexible Web Client for R                         | 2.2        |

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

New File ▶

- New Project...
- Open File... Ctrl+O
- Reopen with Encoding...
- Recent Files ▶
- Open Project...
- Open Project in New Session...
- Recent Projects ▶
- Import Dataset ▶
- Save Ctrl+S
- Save As...
- Save with Encoding...
- Save All Ctrl+Alt+S
- Knit Document Ctrl+Shift+K
- Compile Report...
- Print...
- Close Ctrl+W
- Close All Ctrl+Shift+W
- Close All Except Current Ctrl+Alt+Shift+W
- Close Project
- Quit Session... Ctrl+Q

R Script Ctrl+Shift+N

- R Notebook
- R Markdown...
- Shiny Web App...
- Text File
- C++ File
- R Sweave
- R HTML
- R Presentation
- R Documentation

Run Source

Environment History

Global Environment

Data

|       |   |
|-------|---|
| d     | 11 obs. of 2 variables                  |
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| df    | 0 obs. of 1 variable                    |
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values

|                |  |
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| pal3           | chr [1:12] "#8DD3C7" "#FFFFB3" "#BEBAD..." |
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[workspace loaded from ~/.RData]

```
> 3 + 5
[1] 8
> pi
[1] 3.141593
>
```

# Características


# Variáveis

- Linguagem não fortemente tipada
- Não há necessidade de definir variáveis previamente
- *Case sensitive* (minúsculas e maiúsculas são consideradas diferentes)

```
Console ~/   
> A = 5  
> a = 2  
> A  
[1] 5  
> 2  
[1] 2  
>
```


# Variáveis

- Atribuições podem ser feitas de mais de uma forma

```
Console ~/   
> a = 5  
> a  
[1] 5  
> a <- 5  
> a  
[1] 5  
> 5 -> a  
> a  
[1] 5  
> assign("a", 5)  
> a  
[1] 5
```


# Variáveis

- Atribuições múltiplas

```
Console ~/   
> x <- y <- z <- 15  
> x  
[1] 15  
> y  
[1] 15  
> z  
[1] 15
```

# Vetores


- Uso da função `c()`
- Primeira posição é 1, e não 0
- Armazena objetos de tipos iguais

```
Console ~/   
> v = c ( 1, 3, 5, 9, 11 )  
> v  
[1] 1 3 5 9 11
```




# Vetores

- Permite acesso consecutivo a elementos (assim como NumPy)

```
Console ~/   
> v = c ( 1, 3, 5, 9, 11 )  
> v [1 : 3]  
[1] 1 3 5
```


# Vetores

- Permite concatenação de vetores (já criados ou não)

```
Console ~/   
> v = c ( 1, 3, 5, 9, 11 )  
> z = c ( v , c ( 21 , 30 ) )  
> z  
[1] 1 3 5 9 11 21 30
```


# Matrizes

- Uso da função *matrix()*
- Parâmetros:
  - Vetor que será transformado em matriz
  - Quantidade de linhas ou colunas
  - Identifica se matriz será de linha ou coluna

```
Console ~/   
> vec <- c(1, 2, 3, 4, 5, 6, 7, 8, 9)  
> M <- matrix(vec, nrow=3)  
> M  
      [,1] [,2] [,3]  
[1,]    1    4    7  
[2,]    2    5    8  
[3,]    3    6    9
```


# Matrizes

- Acesso a posição da matriz
- Todas as operações matriciais em R são *element-wise*, ou seja, elemento por elemento

```
Console ~/   
> vec <- c(1, 2, 3, 4, 5, 6, 7, 8, 9)  
> M <- matrix(vec, nrow=3)  
> M  
      [,1] [,2] [,3]  
[1,]    1    4    7  
[2,]    2    5    8  
[3,]    3    6    9  
> M[1:2,2:3]  
      [,1] [,2]  
[1,]    4    7  
[2,]    5    8
```


# Listas

- Permitem armazenar objetos de tipos diferentes
- Inicializadas com função *list()*

```
Console ~/   
> obj1 = c(1,2) #objeto de vetor  
> obj1  
[1] 1 2  
> obj2 = matrix(c(4,5,6)) # objeto de matrix  
> obj2  
      [,1]  
[1,]    4  
[2,]    5  
[3,]    6  
> lista = list(obj1, obj2)  
> lista  
[[1]]  
[1] 1 2  
  
[[2]]  
      [,1]  
[1,]    4  
[2,]    5  
[3,]    6
```

# Listas

- Acesso a uma posição específica da lista

```
Console ~/   
> obj1 = c(1,2) #objeto de vetor  
> obj2 = matrix(c(4,5,6)) # objeto de matrix  
> lista = list(obj1, obj2)  
> lista  
[[1]]  
[1] 1 2  
  
[[2]]  
      [,1]  
[1,]    4  
[2,]    5  
[3,]    6  
  
> lista[[2]]  
      [,1]  
[1,]    4  
[2,]    5  
[3,]    6
```

# Funções

- Bastante útil em qualquer linguagem de programação

Sintaxe:


nome\_da\_função <- function(parâmetros)

Console ~/ ↗

```
> soma_dois_valores <- function(a,b) {  
+   return(a+b) }  
> soma_dois_valores(5,7)  
[1] 12
```

# Funções de Grupo

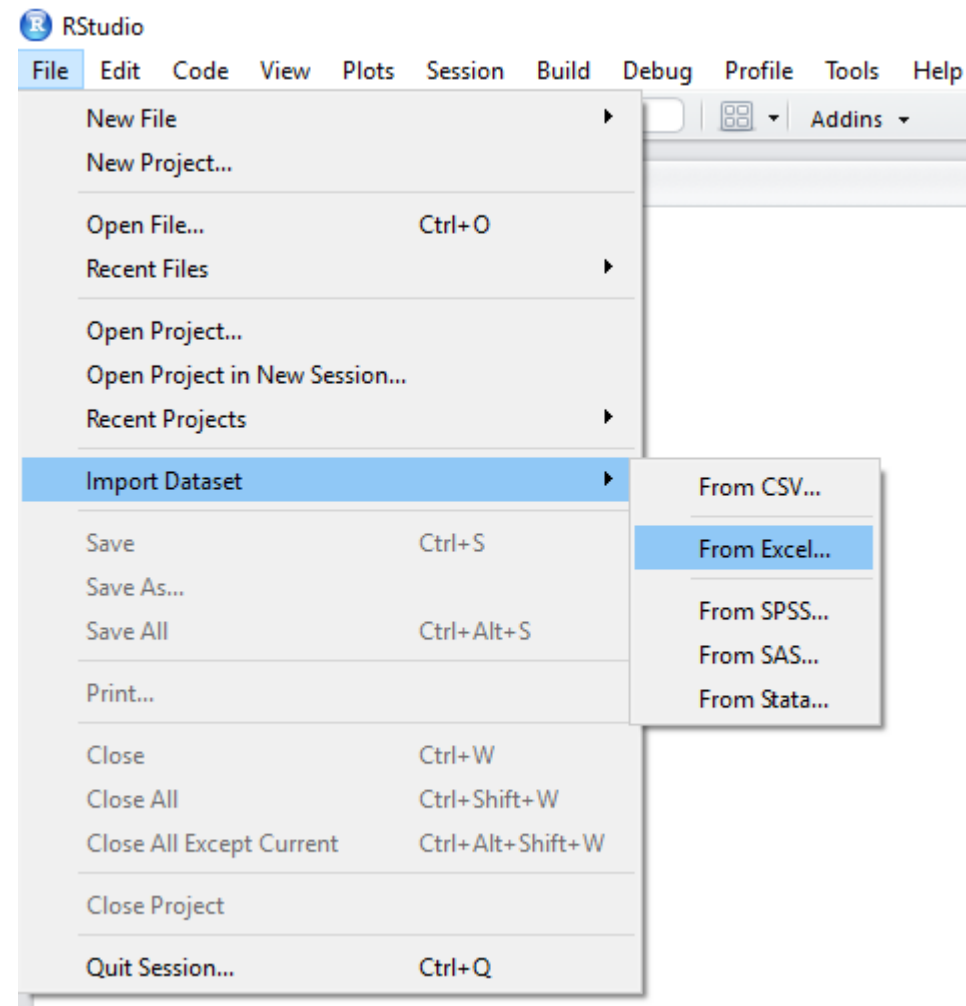
- Sum()
- Mean()
- Sd()

```
Console ~/   
> v <- c(1,2,3,4,5,6,7,8,9)  
> sum(v)  
[1] 45  
> mean(v)  
[1] 5  
> sd(v)  
[1] 2.738613
```



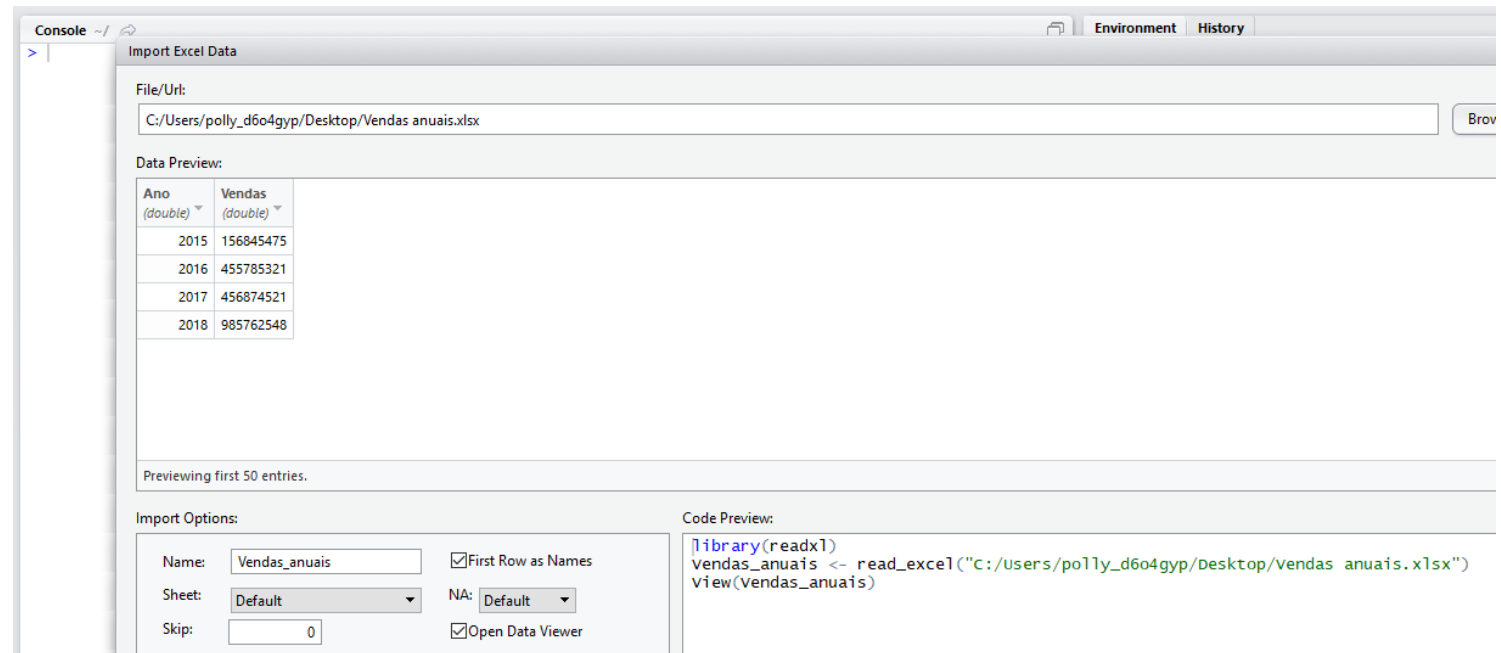
# Importação de dados

- Via assistente do RStudio
  - Utilização da biblioteca readr por padrão
- Via código
  - Escolha de biblioteca que mais te agrade



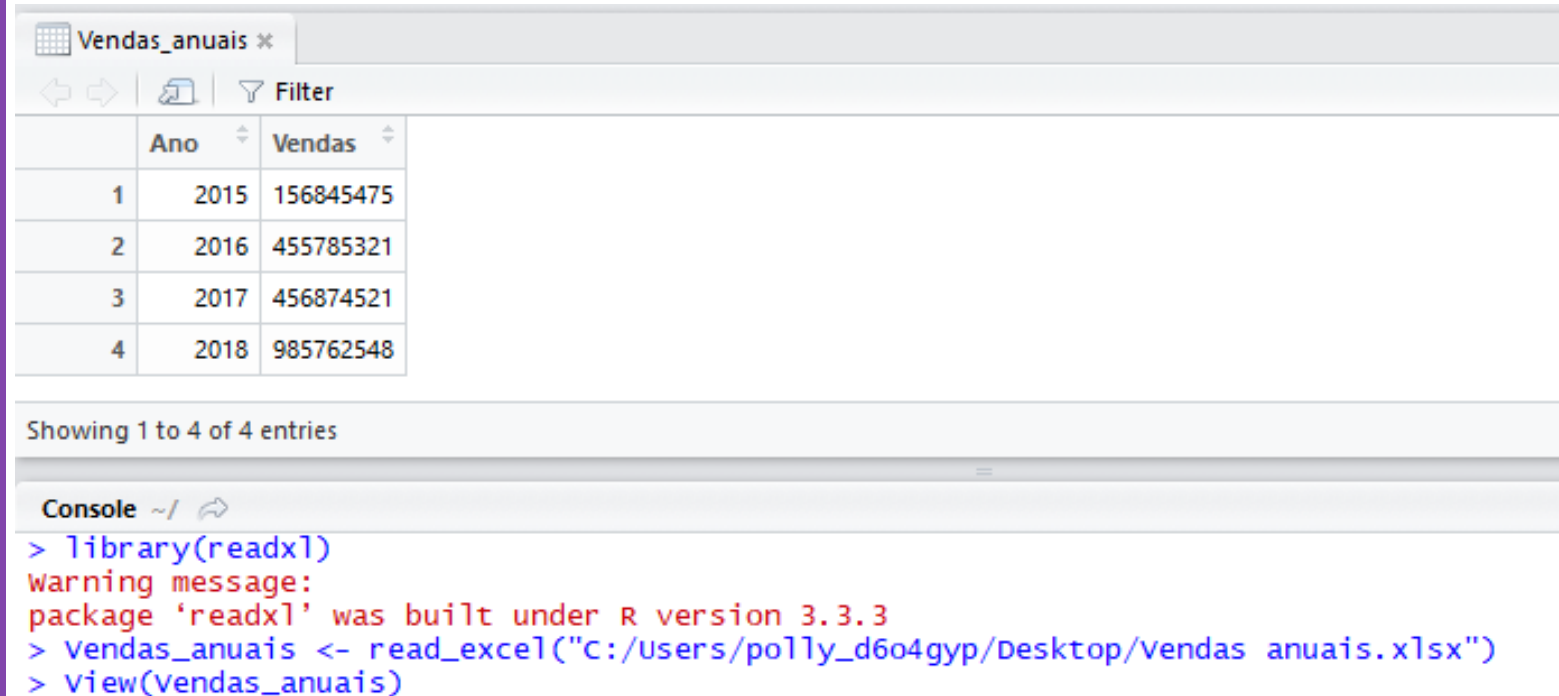
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- Via assistente do RStudio
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# Importação de dados

- Via assistente do RStudio
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- Via código
  - Escolha de biblioteca que mais te agrade



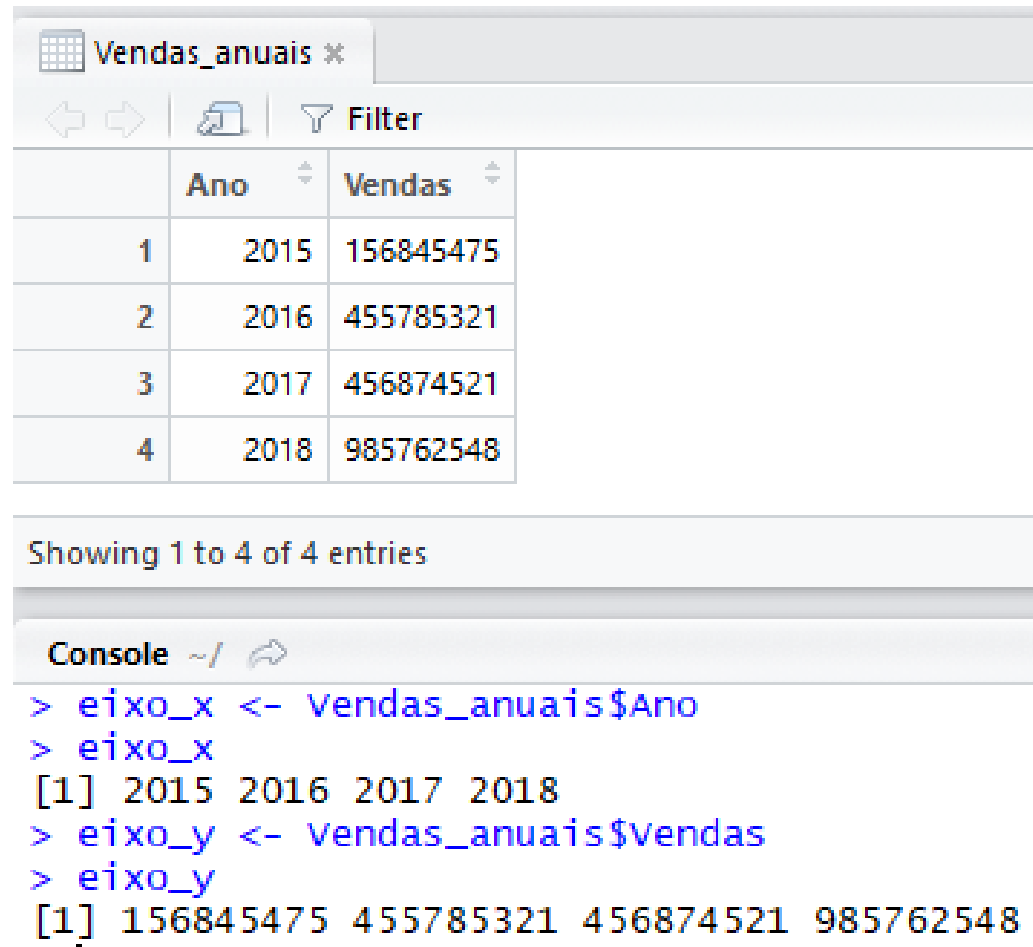
The screenshot shows the RStudio interface. At the top, a tab labeled 'Vendas\_anuais' is open. Below it, a table with 3 columns (Index, Ano, Vendas) displays 4 rows of data. Below the table, it says 'Showing 1 to 4 of 4 entries'. At the bottom, the 'Console' pane shows the following R code and output:

```
> library(readxl)
Warning message:
package 'readxl' was built under R version 3.3.3
> vendas_anuais <- read_excel("C:/Users/polly_d6o4gyp/Desktop/Vendas_anuais.xlsx")
> View(vendas_anuais)
```

|   | Ano  | Vendas    |
|---|------|-----------|
| 1 | 2015 | 156845475 |
| 2 | 2016 | 455785321 |
| 3 | 2017 | 456874521 |
| 4 | 2018 | 985762548 |

# Importação de dados


- Permite acessar dados de colunas específicas



The screenshot displays a data table titled 'Vendas\_anuais' with two columns: 'Ano' (Year) and 'Vendas' (Sales). The table contains four rows of data for the years 2015, 2016, 2017, and 2018. Below the table, a status bar indicates 'Showing 1 to 4 of 4 entries'. At the bottom, an R console window shows the commands used to extract the 'Ano' and 'Vendas' columns into separate vectors named 'eixo\_x' and 'eixo\_y' respectively.

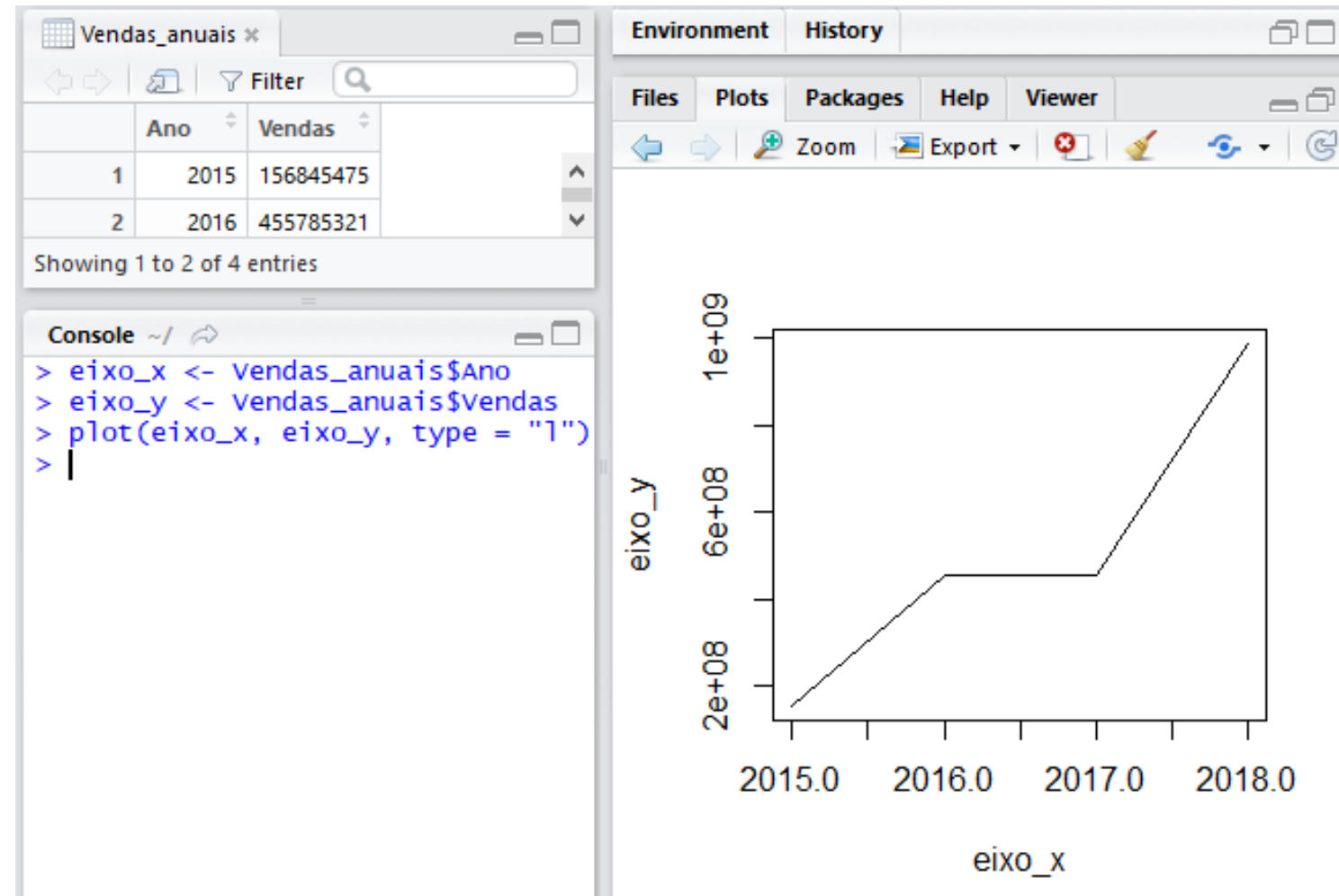
|   | Ano  | Vendas    |
|---|------|-----------|
| 1 | 2015 | 156845475 |
| 2 | 2016 | 455785321 |
| 3 | 2017 | 456874521 |
| 4 | 2018 | 985762548 |

Showing 1 to 4 of 4 entries

```
Console ~/   
> eixo_x <- Vendas_anuais$Ano  
> eixo_x  
[1] 2015 2016 2017 2018  
> eixo_y <- Vendas_anuais$Vendas  
> eixo_y  
[1] 156845475 455785321 456874521 985762548
```

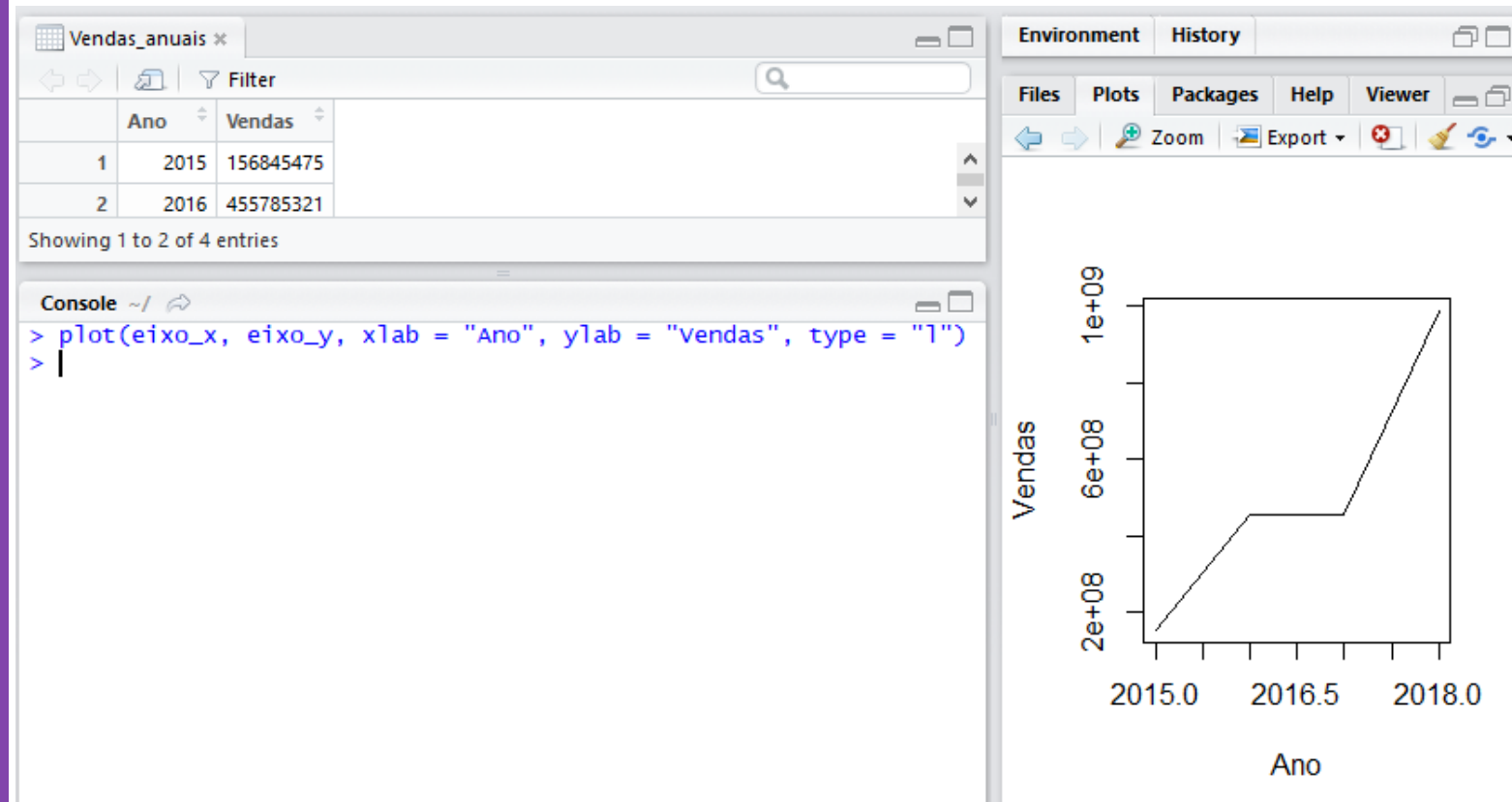
# Gráficos

- Resultados dentro da aba *Plots*



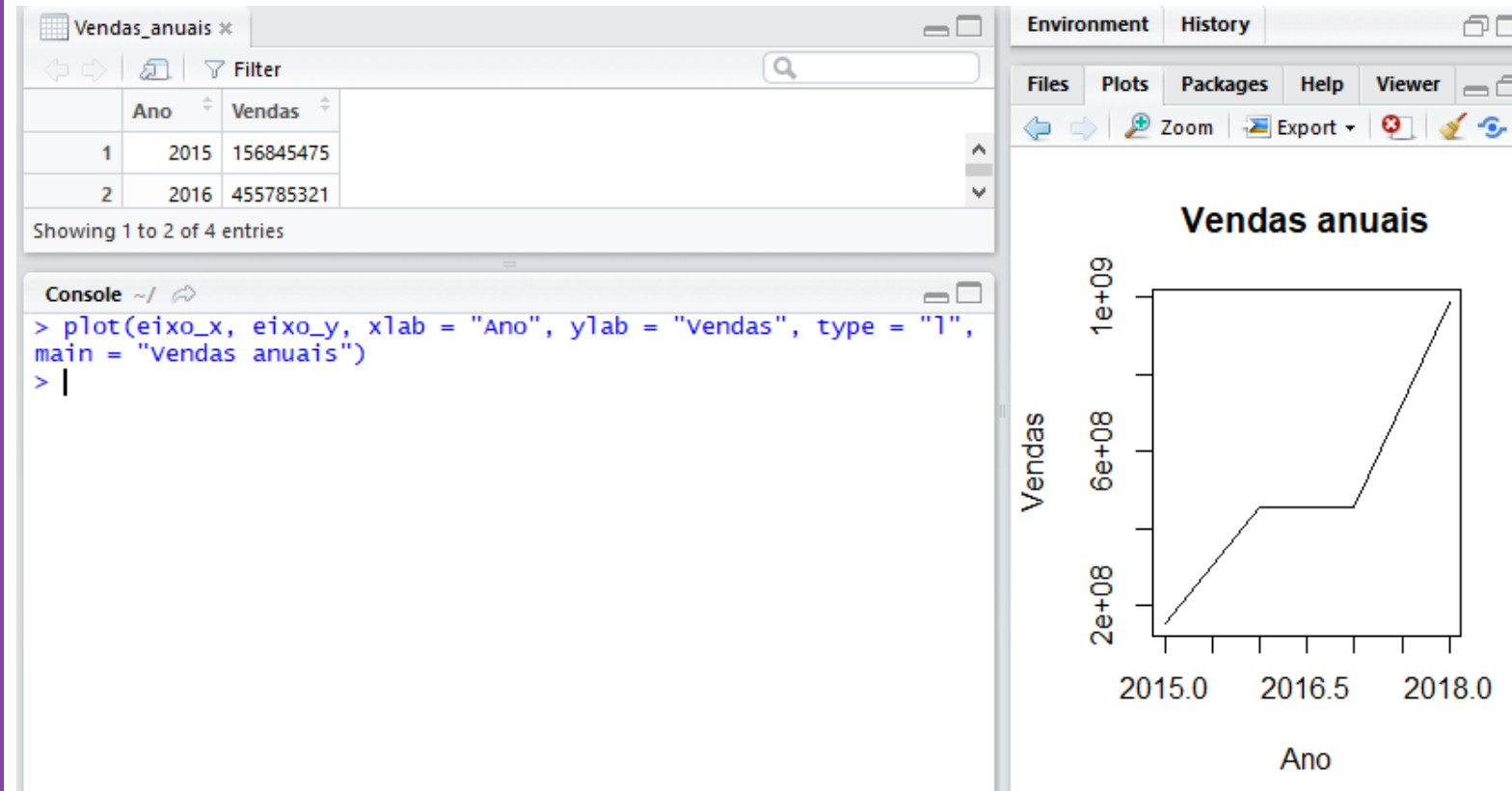
# Gráficos

- Alteração de nomes dos eixos



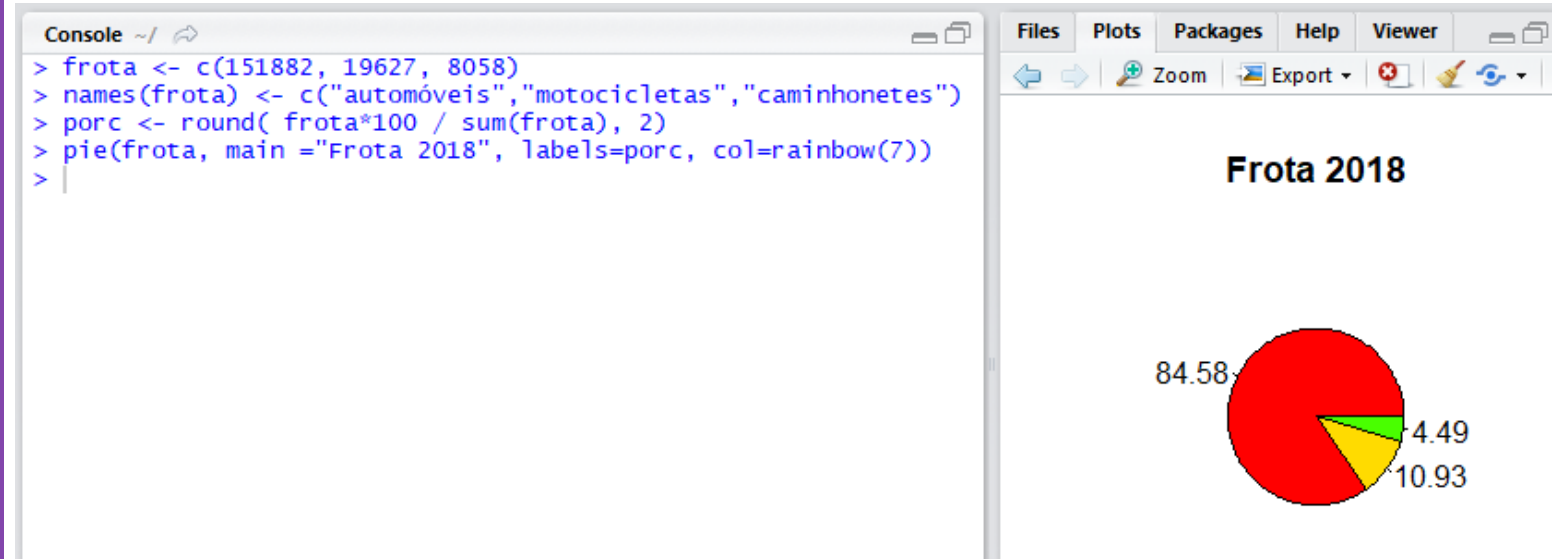
# Gráficos

- Adição de título



# Gráficos

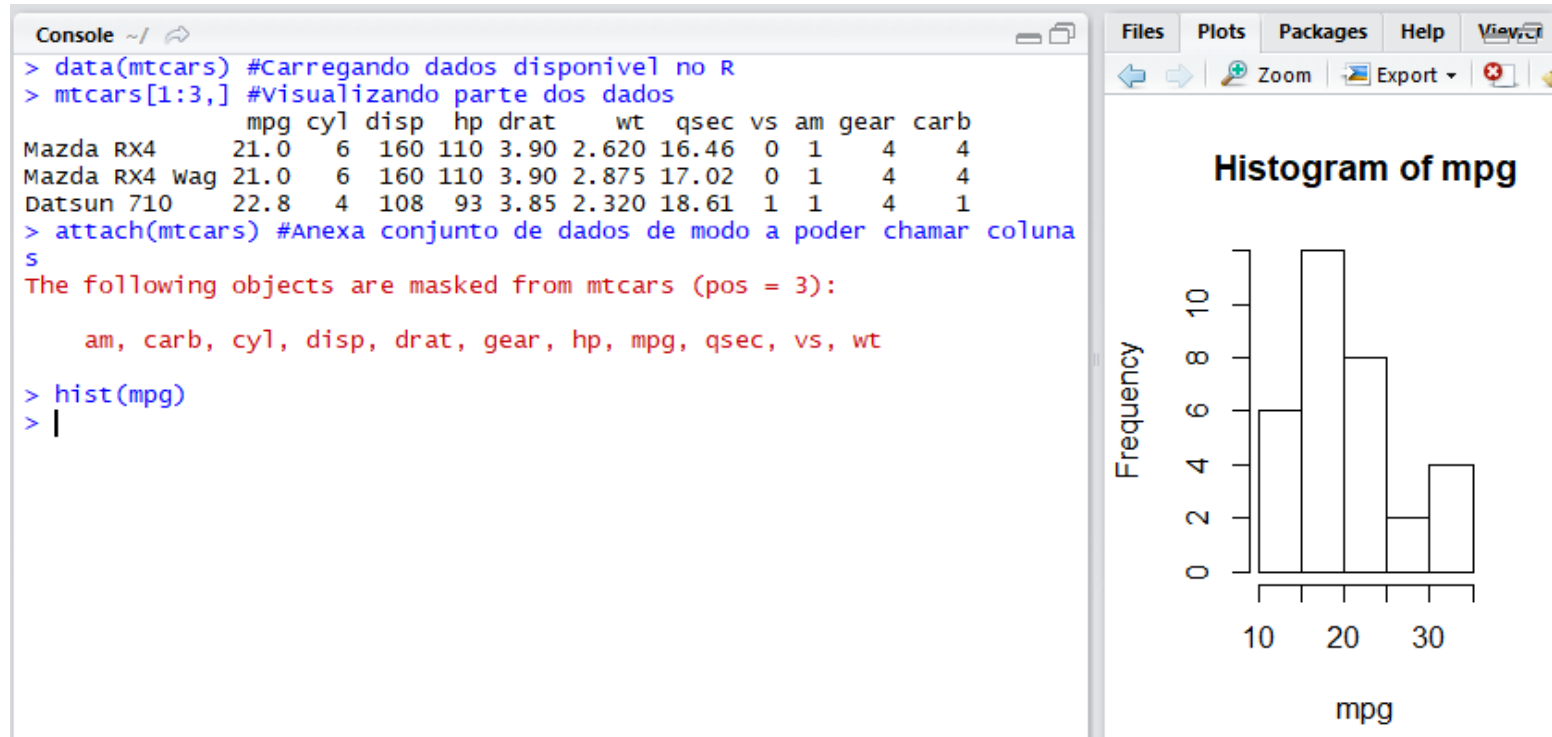
- Gráfico de Pizza





# Gráficos

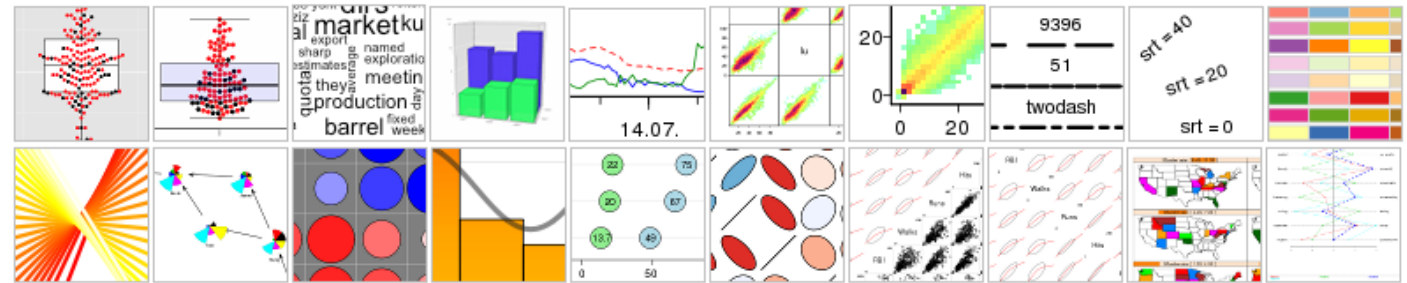
- Gráfico de Histograma



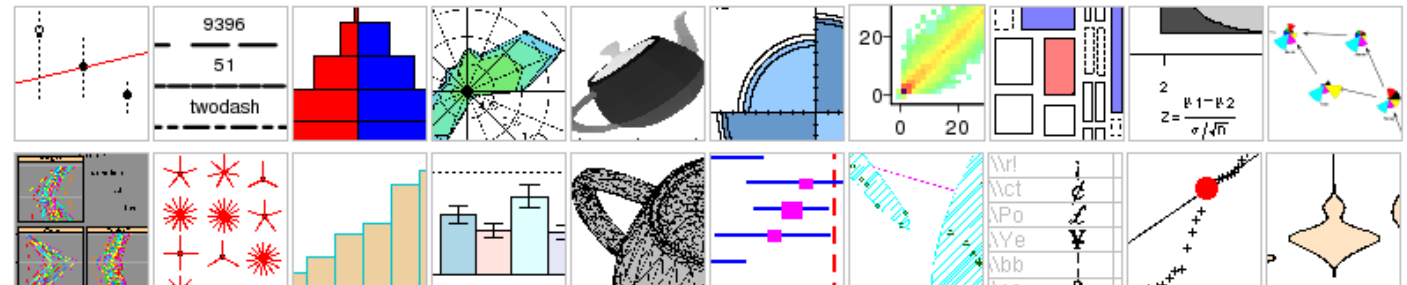
# Gráficos

- Bibliotecas:
  - PlotLy
  - HighCharter
  - Dygraphs
  - Ggiraph
  - rBokeh
  - chart.js
  - rChart

» Last entries ...



» Random entries



# Shiny

- Desenvolvido para aplicações Web
- Permite construir páginas Web interativas diretamente do R

<http://shiny.rstudio.com>

Shiny from R Studio

[Get Started](#)

[Gallery](#)

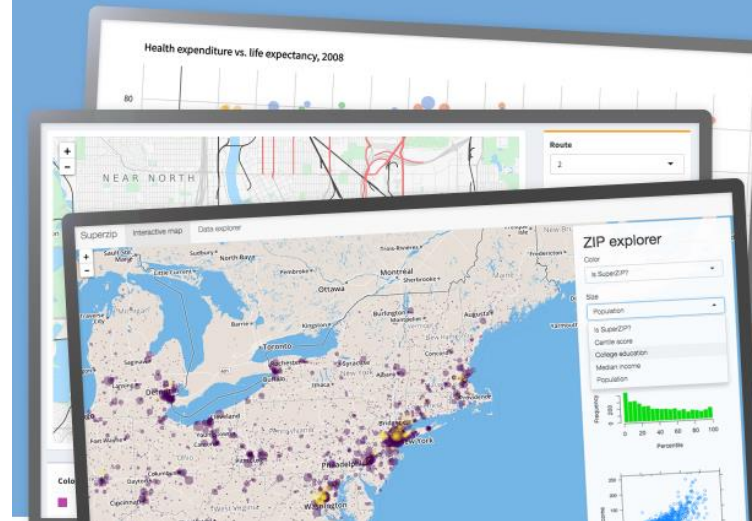
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# Pacotes

- Desenvolvidos por uma comunidade fortemente ativa

```
Console ~/   
> install.packages("the package's name")
```

```
Console ~/   
> library("the package's name")
```



Awesome R

Trending

Posts

More

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## AWESOME R

2018

2017

Integrated Development  
Environments

Syntax

Data Manipulation

Graphic Displays

HTML Widgets

Reproducible Research

Web Technologies and  
Services

Parallel Computing

High Performance

Language API

Database Management

Machine Learning

Natural Language Processing

Bayesian

## AWESOME R



awesome

A curated list of awesome R packages and tools. Inspired by [awesome-machine-learning](#).

For better navigation, see <https://awesome-r.com>

💛 for **Top 50** CRAN downloaded packages or repos with 400+ ⭐

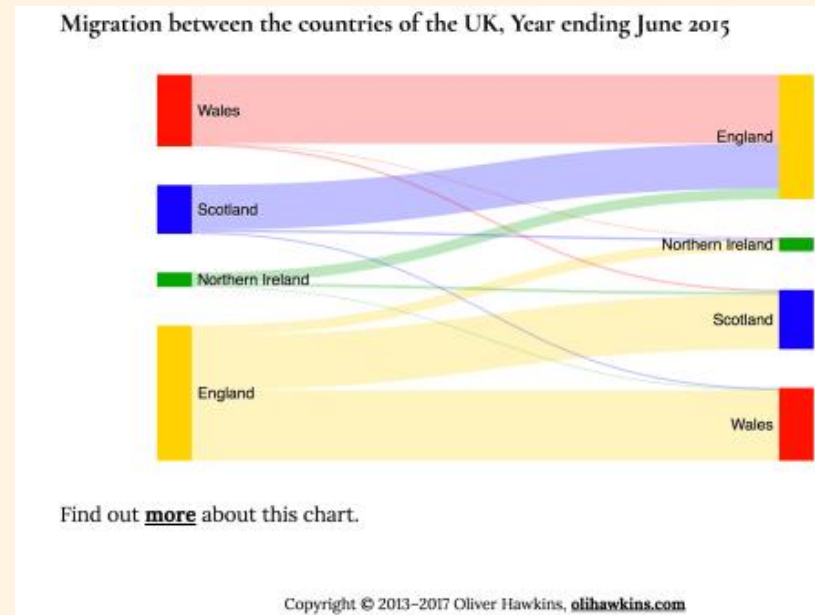
## 2018

- [Readings in Applied Data Science](#) - These readings reflect Hadley's personal thoughts about applied data science.
- [promises](#) - Abstractions for Promise-Based Asynchronous Programming
- [tinytex](#) - A lightweight and easy-to-maintain LaTeX distribution

# **Problemas reais resolvidos com R**

# Problema 1 – Entender como era o caminho dos visitantes de um site até o momento da compra

- Solução:
  1. Gerar dataset no formato de “fluxo” (grafo com peso nas arestas)
  2. Importar dataset no R
  3. Usar biblioteca d3Network para gerar um gráfico desse tipo:

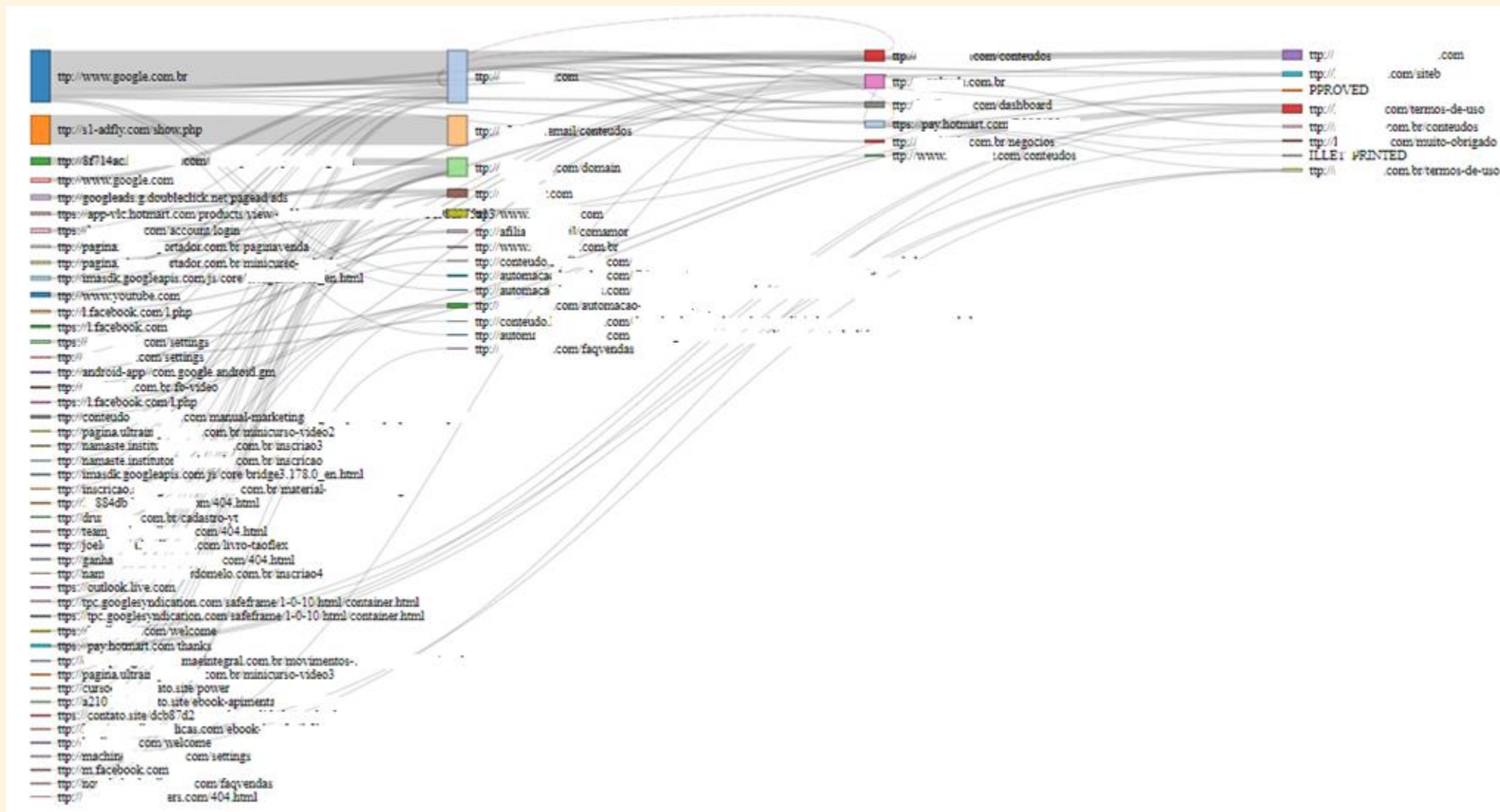


# Problema 1 – Entender como era o caminho dos visitantes de um site até o momento da compra

```
1 library(devtools)
2 library(d3Network)
3 library(networkD3)
4 library(jsonlite)
5 library(plyr)
6
7 nodes <- JSONtoDF(file = paste0('C:/Users/polly_d6o4gyp/Desktop/Problemas reais R/sankey.json'), array = 'nodes')
8 array = 'nodes'
9 MainList <- fromJSON(paste0("C:/Users/polly_d6o4gyp/Desktop/Problemas reais R/sankey.json"))
10 ArrayList <- MainList[[array]]
11 MainDF <- ldply(ArrayList, data.frame)
12 nodes = MainDF
13
14 nodes$id <- substring(nodes$id, 2)
15
16 links <- JSONtoDF(file = paste0('C:/Users/polly_d6o4gyp/Desktop/Problemas reais R/sankey.json'), array = 'links')
17 array = 'links'
18 MainList <- fromJSON(paste0("C:/Users/polly_d6o4gyp/Desktop/Problemas reais R/sankey.json"))
19 ArrayList <- MainList[[array]]
20 MainDF <- ldply(ArrayList, data.frame)
21 links = MainDF
22
23 colnames(nodes)<- c("name")
24 colnames(links)<- c("qtd_users","source","target")
25
26 d3Sankey(Nodes = nodes, Links = links, Source = 'source',Target = 'target', value = 'qtd_users', NodeID = 'id',width = 1000,
27         height = 1000, fontsize = 12,standAlone = FALSE, iframe = FALSE,
28         file = 'C:/Users/polly_d6o4gyp/Desktop/Queries/Analytics/Sankey - Cópia/sankey.html')
```



## Problema 1 – Entender como era o caminho dos visitantes de um site até o momento da compra



## Problema 2 – Predizer o tipo de um produto de acordo com sua performance de vendas

- Solução:
  1. Machine Learning – Classificação
  2. Modelo de Random Forest implementado em R
  3. Criação de dataset com produtos já classificados em tipo E e L

Mostrar código dentro do Rstudio

- Resultado: modelo treinado com taxa de assertividade de 85%

## Problema 3 – Criação modelo de forecast para faturamento mensal

- Solução:
  1. Estatística – ARIMA
  2. Modelo implementado em R

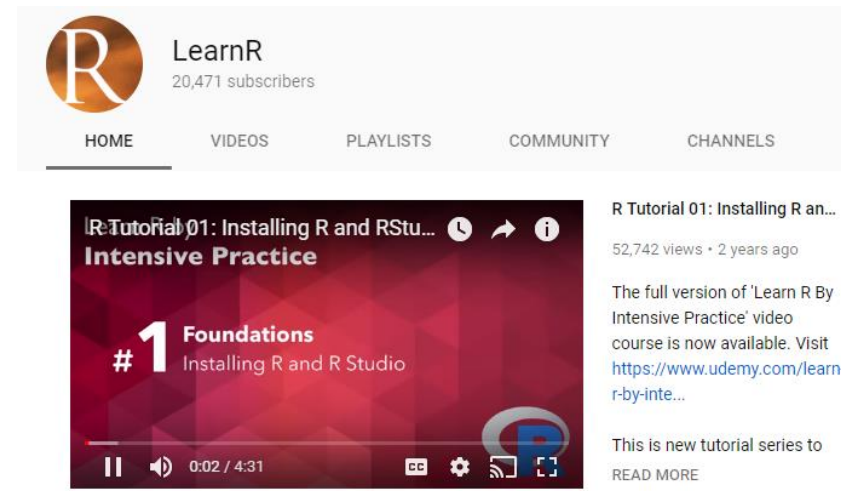
Mostrar código dentro do Rstudio

- Resultado: modelo de forecast mensal com erro médio de ~3%

**Dicas para  
acelerar o  
aprendizado!**

# Canais no Youtube

- LearnR
- Google Developers
- MarinStatsLectures
- ...



**LearnR**  
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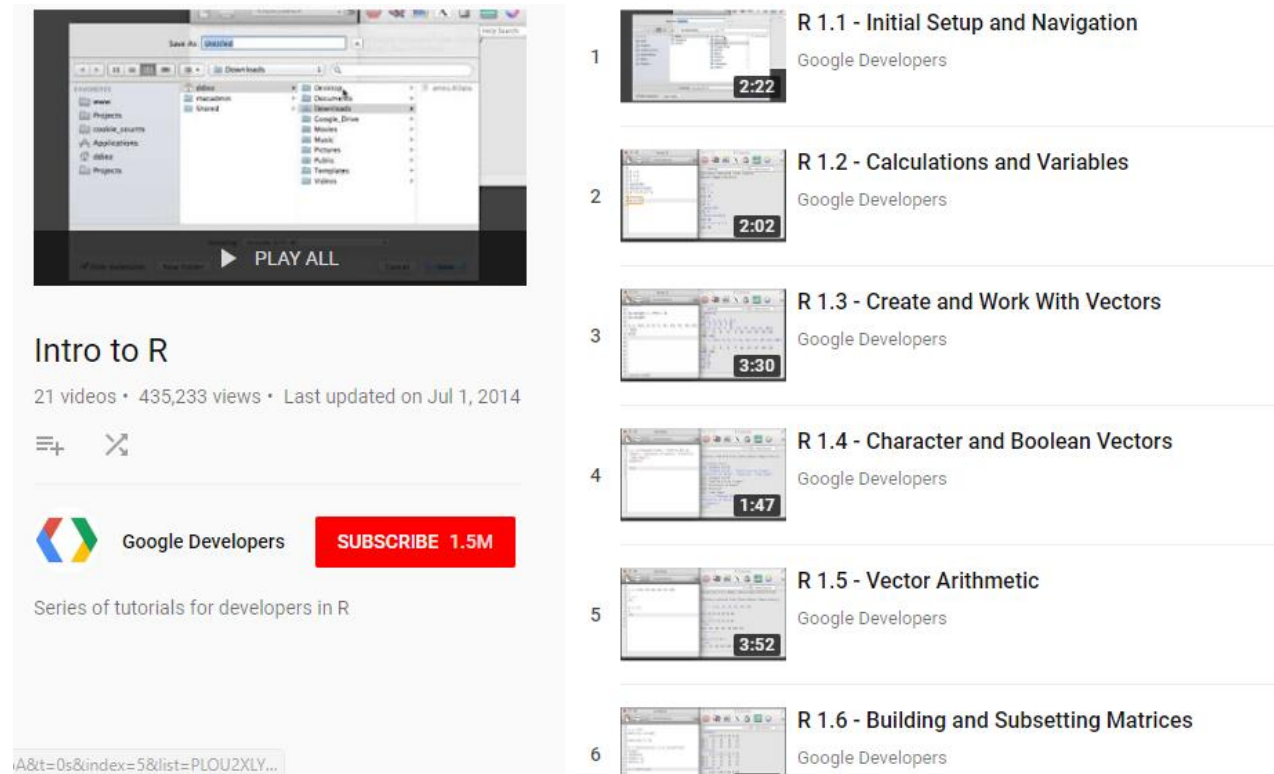
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- R 1.3 - Create and Work With Vectors**  
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3:30
- R 1.4 - Character and Boolean Vectors**  
Google Developers  
1:47
- R 1.5 - Vector Arithmetic**  
Google Developers  
3:52
- R 1.6 - Building and Subsetting Matrices**  
Google Developers

# Blogs

- Revolutions (blog da Microsoft sobre R)
- Civil Statistician
- Flowing Data
- Datazar Blog
- ...

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**xkcd: LeBron James and Stephen Curry pseudo-greatness**

xkcd. Sometimes sports statistics are far-fetched.



... .



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**Sources**

# Cursos Online

- Udemy
- Udacity
- DataCamp
- Coursera
- ...

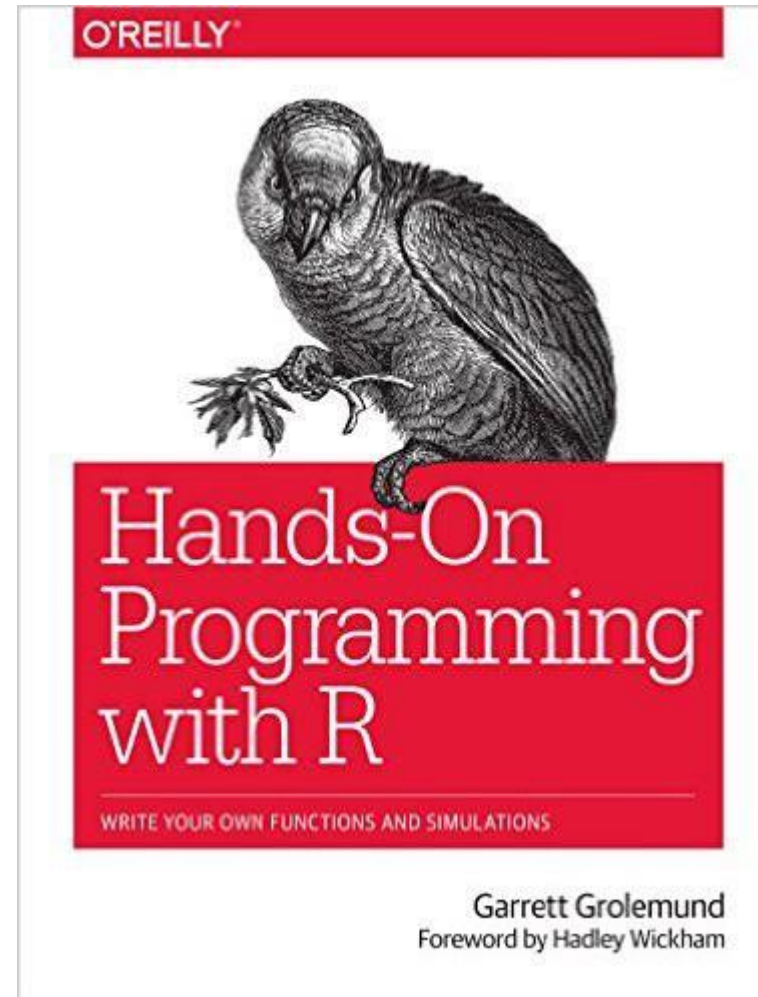
The screenshot displays the DataCamp website dashboard. At the top, the DataCamp logo is on the left, and navigation links for 'Learn', 'For Business', and a user profile with '5,880 XP' are on the right. The main content area is divided into three columns: 'COURSES', 'TRACKS', and 'INSTRUCTORS'. The 'COURSES' column lists 'Intro to Python for Data Science', 'Introduction to R', 'Intro to SQL for Data Science', 'Deep Learning in Python', 'Intermediate R', and 'Joining Data in PostgreSQL', with a link to 'See all courses (126)'. The 'TRACKS' column lists 'Data Scientist with R' (CAREER), 'Data Scientist with Python' (CAREER), 'Quantitative Analyst with R' (CAREER), 'Data Manipulation with Python' (SKILL), 'Data Visualization with R' (SKILL), and 'Importing & Cleaning Data with R' (SKILL), with links to 'See all skill tracks (13)' and 'See all career tracks (7)'. The 'INSTRUCTORS' column lists 'Hadley Wickham', 'Max Kuhn', 'Charlotte Wickham', 'Katharine Jarmul', 'Dhavid Aruliah', and 'Mine Cetinkaya-Rundel', with a link to 'Meet all instructors (91)'. At the bottom, there are links for 'Community', 'Projects', and 'DataChats Episodes (34)'.

| COURSES                          | TRACKS  | INSTRUCTORS               |
|----------------------------------|---|---------------------------|
| Intro to Python for Data Science | Data Scientist with R (CAREER)                        | Hadley Wickham            |
| Introduction to R                | Data Scientist with Python (CAREER)                   | Max Kuhn                  |
| Intro to SQL for Data Science    | Quantitative Analyst with R (CAREER)                  | Charlotte Wickham         |
| Deep Learning in Python          | Data Manipulation with Python (SKILL)                 | Katharine Jarmul          |
| Intermediate R                   | Data Visualization with R (SKILL)                     | Dhavid Aruliah            |
| Joining Data in PostgreSQL       | Importing & Cleaning Data with R (SKILL)              | Mine Cetinkaya-Rundel     |
| See all courses (126)            | See all skill tracks (13)   See all career tracks (7) | Meet all instructors (91) |

Community | Projects | DataChats Episodes (34)

# Livros

- Editora O'Reilly
- R Cookbook]
- R in a Nutshell
- Introduction to Data Science with R
- ...





# Pratique!

- Editora O'Reilly
- R Cookbook]
- R in a Nutshell
- Introduction to Data Science with R
- ...



# Why

## Should I Learn Another Programming Language?



Craig Dennis

Here's the thing: You don't really have a choice.

# Obrigada! Dúvidas?

 pollyannaogoncalves@gmail.com

 pollyannaogoncalves

# Estamos com vagas abertas!



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Front-end Developer

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...