Data Analytics

Lecture Series: Part 1

Welcome!

Welcome!

In the course, we will:

Welcome!

In the course, we will:

- Apply data analytics to real estate using R

Welcome!

In the course, we will:

- Apply data analytics to real estate using R
- Create reproducible working environments

Welcome!

In the course, we will:

- Apply data analytics to real estate using R
- Create reproducible working environments
- Visualize insight and information

Overview

In this section, we will:

Overview

In this section, we will:

- Learn R Studio and R Markdown basics

Overview

In this section, we will:

- Learn R Studio and R Markdown basics
- Packages and API Keys

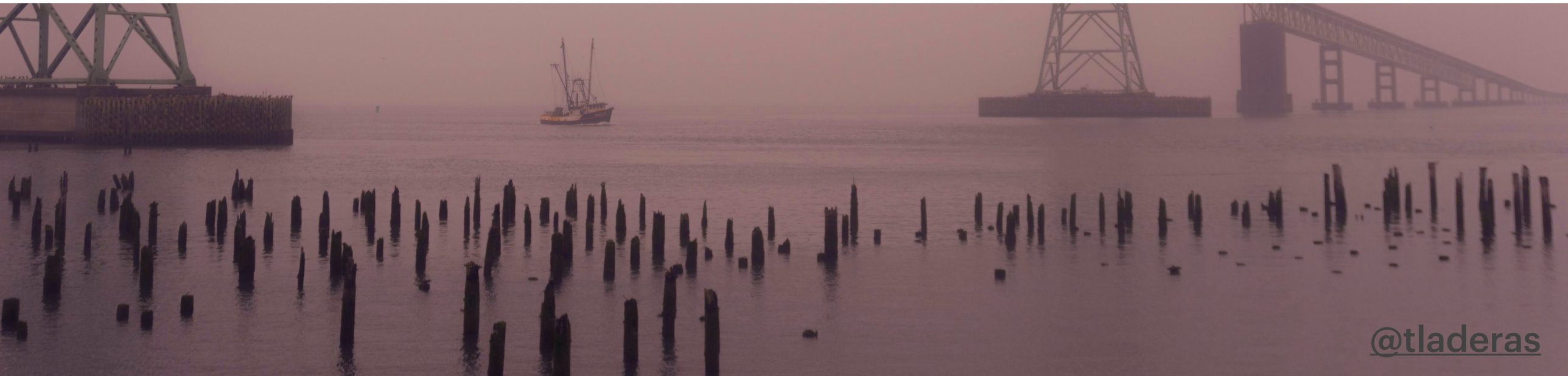
Overview

In this section, we will:

- Learn R Studio and R Markdown basics
- Packages and API Keys
- Data wrangling concepts


@tladeras

RStudio®



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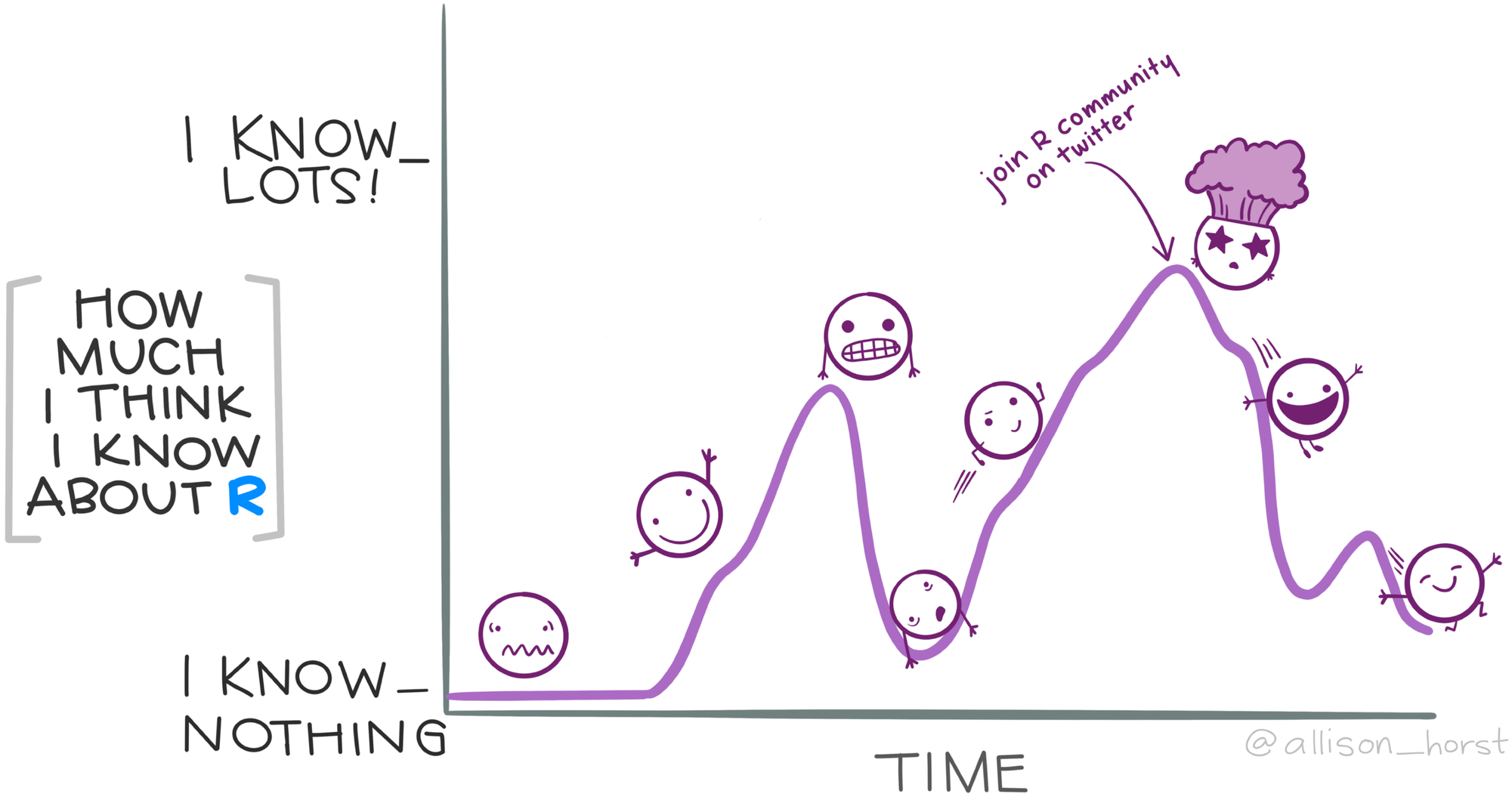
I KNOW_ LOTS!
HOW MUCH I THINK I KNOW ABOUT R
I KNOW_ NOTHING
join R community on twitter
TIME
@allison_horst


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Terms

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Terms
Packages
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Terms

Packages :

- Imported and reusable

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Terms

Packages :

- Bundled functions for cleaning, wrangling, and visualizing data

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Packages
tidyverse
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Packages
tidyverse
devtools
@tladeras

Packages

tidyverse

devtools

fredr

@tladeras

Packages

tidyverse

devtools

fredr

tidycensus

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Terms
API Keys
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Terms

API Keys :

- fredr

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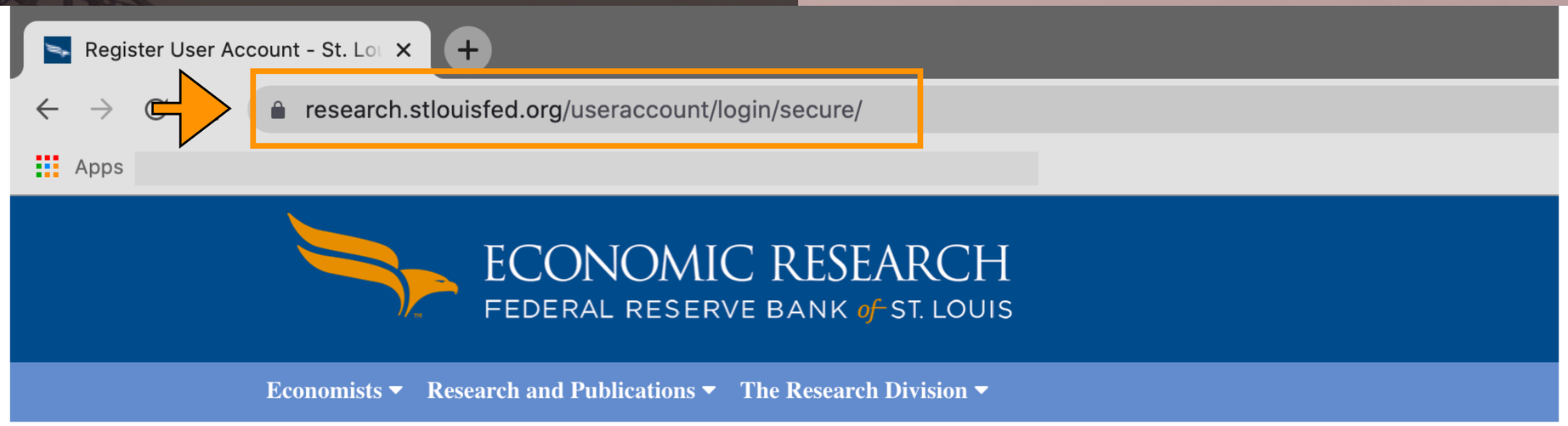

Already have an account?
Sign In
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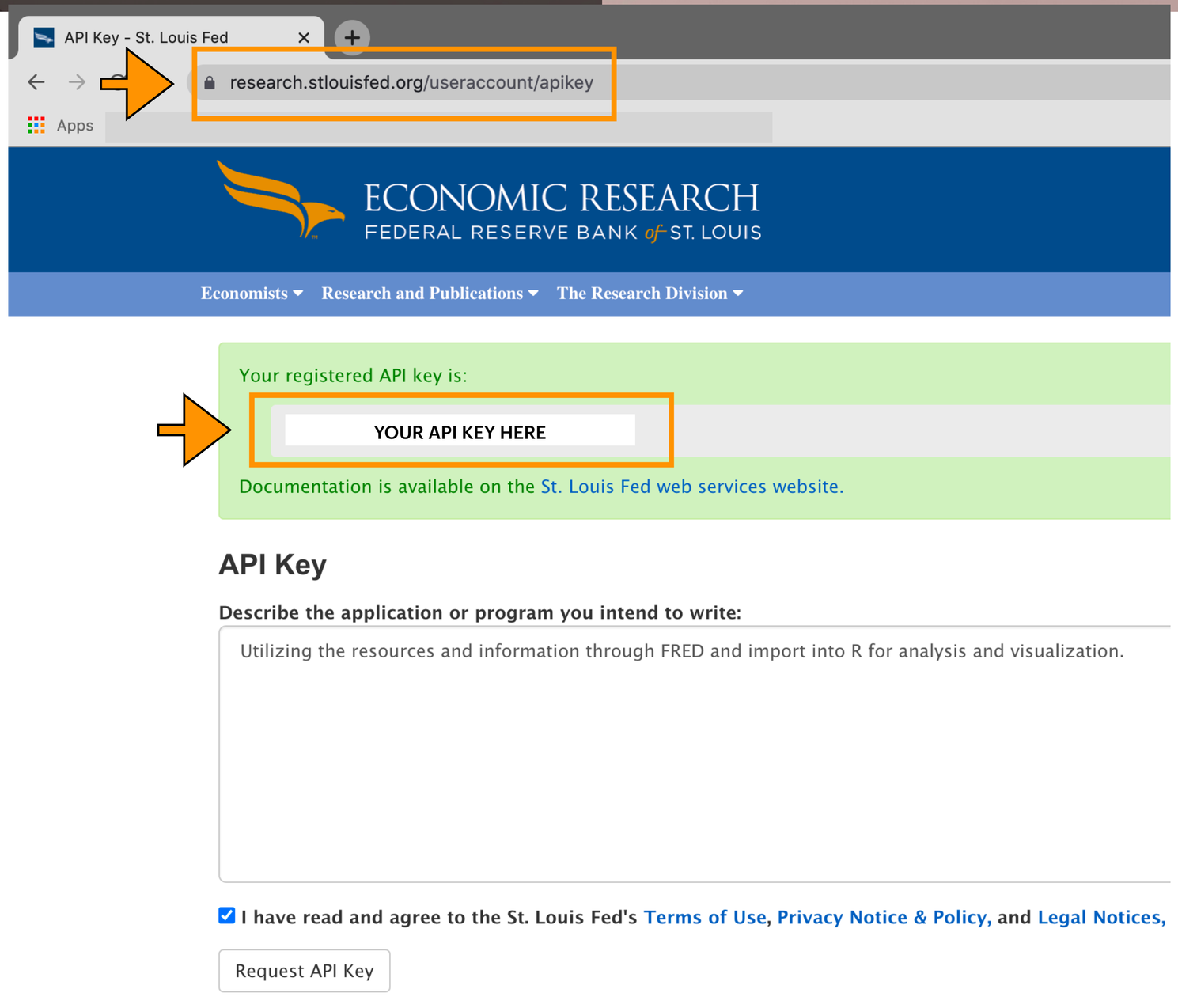
Register

Why Register?

- Subscribe to email updates for economic data series.
- Create personalized lists of economic data series.
- Save customized graphs and maps for later use.
- Build and share personalized dashboards with series that interest you.
- Access the FRED API to integrate data with your favorite software packages.
- Play FREDcast™.

Learn more about user accounts


API Key - St. Louis Fed
research.stlouisfed.org/useraccount/apikey
Apps
ECONOMIC RESEARCH
FEDERAL RESERVE BANK of ST. LOUIS
Economists
Research and Publications
The Research Division
Your registered API key is:
YOUR API KEY HERE
Documentation is available on the St. Louis Fed web services website.
API Key
Describe the application or program you intend to write:
Utilizing the resources and information through FRED and import into R for analysis and visualization.
I have read and agree to the St. Louis Fed's Terms of Use, Privacy Notice & Policy, and Legal Notices,
Request API Key

Terms

API Keys :

- tidycensus

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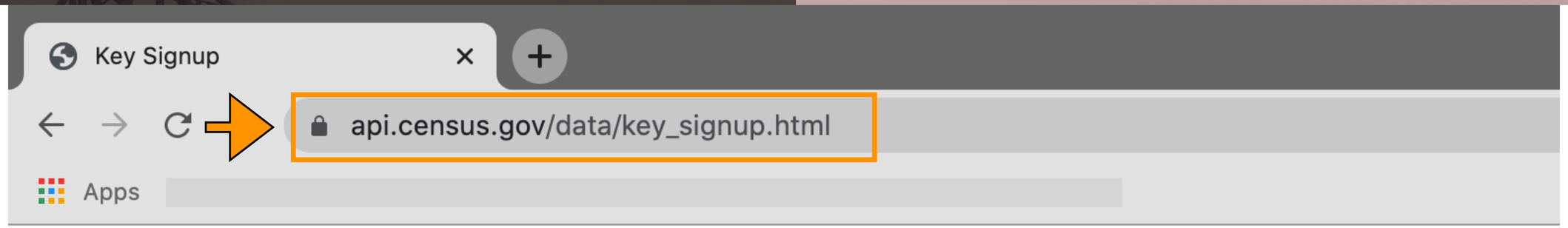

Request A Key

Organization Name:

Email Address:

I agree to the terms of service

Submit Key Request

Terms

R Studio

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GreatRecession.Rmd | MEC_0412.Rmd | floodzone_censustract.Rmd | R Tutorial.Rmd | outlook_housing.Rmd | R Tutorial Par

Knit | Insert | Run

```
---
title: "R Tutorial"
author: "Mattingly"
date: "2/10/2020"
output: pdf_document
---

getwd()
setwd("/Users/petermattingly/Desktop/")

### creating a notebook chunk
'control' + 'option', then 'i'

```{r}

```

running individual lines of code
mac: 'command' then 'return'
pc: 'control' then 'enter'

assignment operator <-

creating pipe operator %>%
'command' 'shift' 'm' =

libraries and packages

```{r}
install.packages('data.table', 'tidyverse')
library(data.table)
library(tidyverse)
```
```

11:30 creating a notebook chunk | R Markdown

Console | Terminal | R Markdown

```
+      xlab=TeX("3 Month Yields"), ylab=TeX("10 Year Yields"),
+      main="Daily Interest Rates Since 2000", pch=16, col='blue')
Error in (function (formula, data = NULL, subset = NULL, na.action = na.fail,  :
  invalid type (list) for variable 'strptime(threemonth$value, "%Y-%m-%d")'
> plot(strptime(threemonth$value,"%Y-%m-%d"), strptime(tenyear$value,"%Y-%m-%d"),
+      xlab=TeX("3 Month Yields"), ylab=TeX("10 Year Yields"),
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Error in plot.window(...) : need finite 'xlim' values
In addition: Warning messages:
1: In min(x) : no non-missing arguments to min; returning Inf
2: In max(x) : no non-missing arguments to max; returning -Inf
3: In min(x) : no non-missing arguments to min; returning Inf
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> cor(tenyear$value ~ threemonth$value)
Error in cor(tenyear$value ~ threemonth$value) :
  supply both 'x' and 'y' or a matrix-like 'x'
> cor(tenyear$value, threemonth$value)
[1] 0.7608
> threemonth = drop_na(fredr(series_id = "DGS3MO", observation_start = as.Date("2000-01-01")))
> tenyear = drop_na(fredr(series_id = "DGS10", observation_start = as.Date("2000-01-01")))
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```

Environment | History | Connections

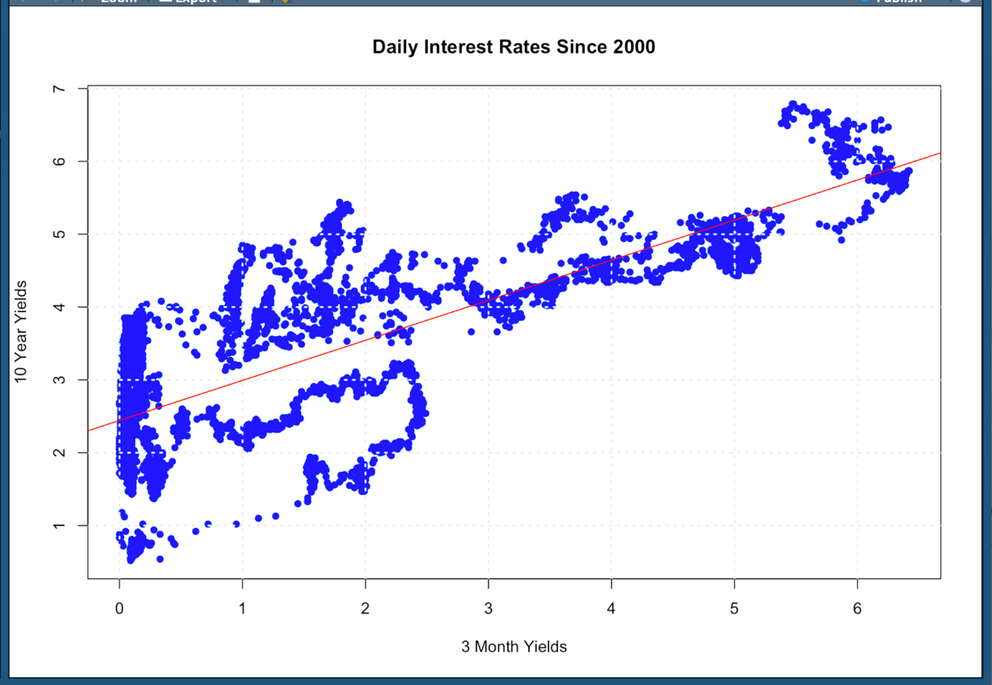
Import Dataset | Grid

Global Environment

Name	Type	Length	Size	Value
dailyavg_table	tbl_df	7	2 KB	3 obs. of 7 variables
dailyavg_wtmeans	grouped_df	4	66.4 KB	1095 obs. of 4 variables
data1990	tbl_df	6	22 KB	373 obs. of 6 variables
data1990_2018_race_total	data.frame	5	8.7 KB	174 obs. of 5 variables
data1990_hisp	tbl_df	6	7 KB	62 obs. of 6 variables
data1990_main	tbl_df	6	19.1 KB	311 obs. of 6 variables
data1999_2000	grouped_df	5	4.4 KB	12 obs. of 5 variables
data1999_2000_total	data.frame	5	4.3 KB	66 obs. of 5 variables
data1999_2018_race_total	matrix	10	7.9 KB	List of 10
data1999_2018_total	data.frame	5	8.6 KB	174 obs. of 5 variables
f1	function	1	10.1 KB	function (x, y, p = 0)
geo_northern	data.table	9	30.6 KB	97 obs. of 9 variables
geospatial	data.table	9	73.7 KB	246 obs. of 9 variables
il	sf	6	1.4 MB	408 obs. of 6 variables
labTheme	function	1	18 KB	function (base_size = 48)
logo	rastergrob	12	1.8 MB	Large rastergrob (12 elements, 1.8 Mb)
model1	lm	12	1.3 MB	Large lm (12 elements, 1.3 Mb)
monthlyavg_countries	grouped_df	7	47 KB	730 obs. of 7 variables
name_region	data.table	5	38.5 KB	246 obs. of 5 variables
numbers	integer	10	96 B	int [1:10] 1 2 3 4 5 6 7 8 9 10
numlist	numeric	10	176 B	num [1:10] 1 2 3 4 5 6 7 8 9 10

Files | Plots | Packages | Help | Viewer

Zoom | Export | Publish



Script

GreatRecession.Rmd | MEC_0412.Rmd | floodzone_censustract.Rmd | R Tutorial.Rmd | outlook_housing.Rmd | R Tutorial Par

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Project: (None)

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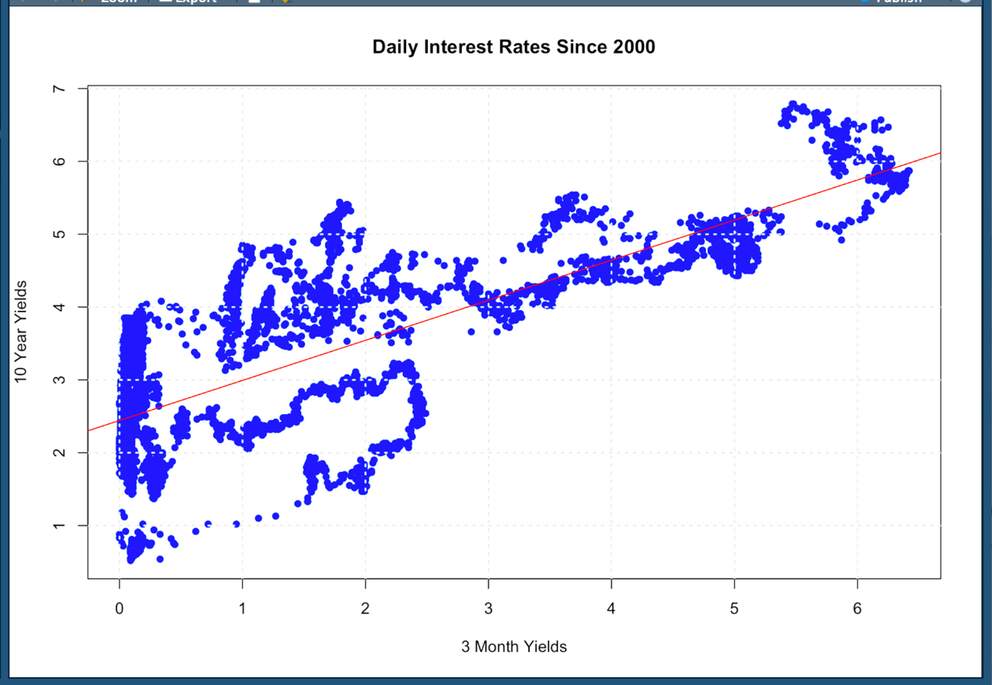
Zoom | Export | Publish



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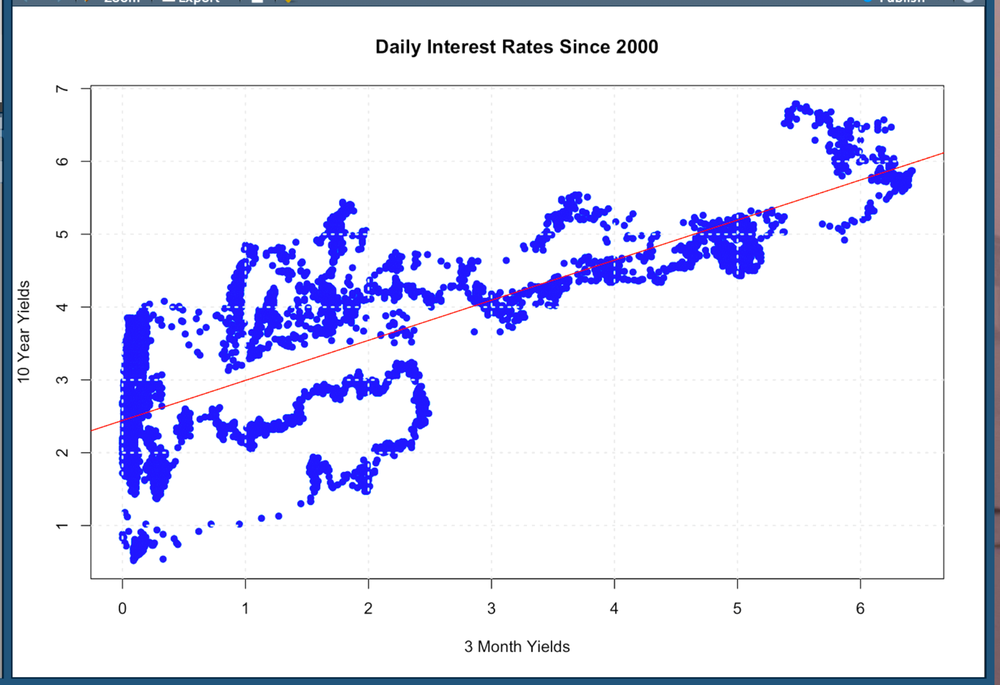
Script

Console



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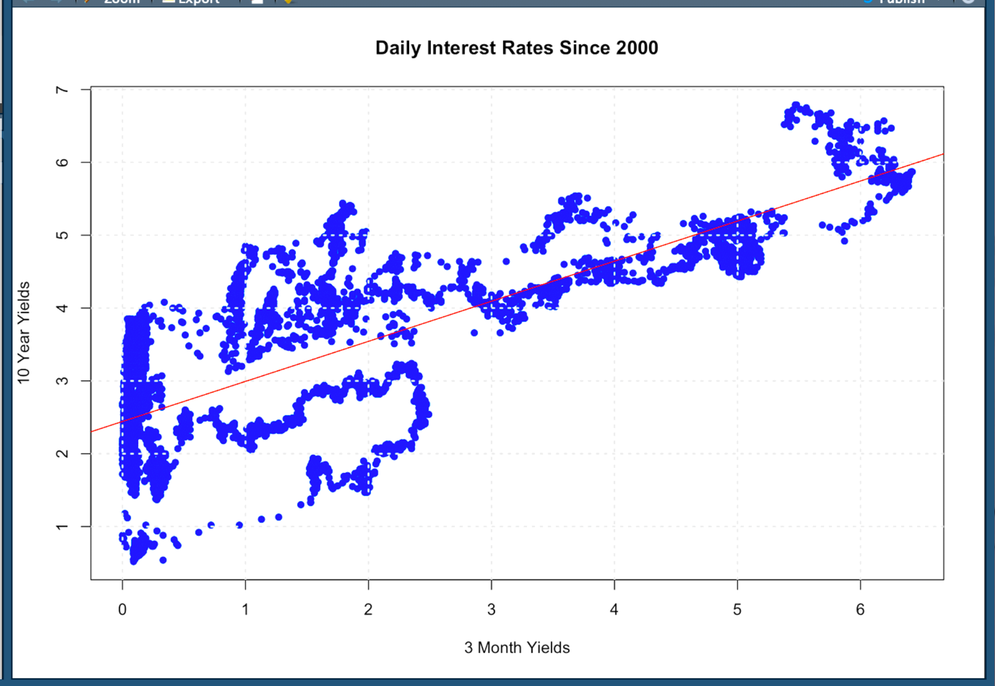
Script

Console

Environ-ment



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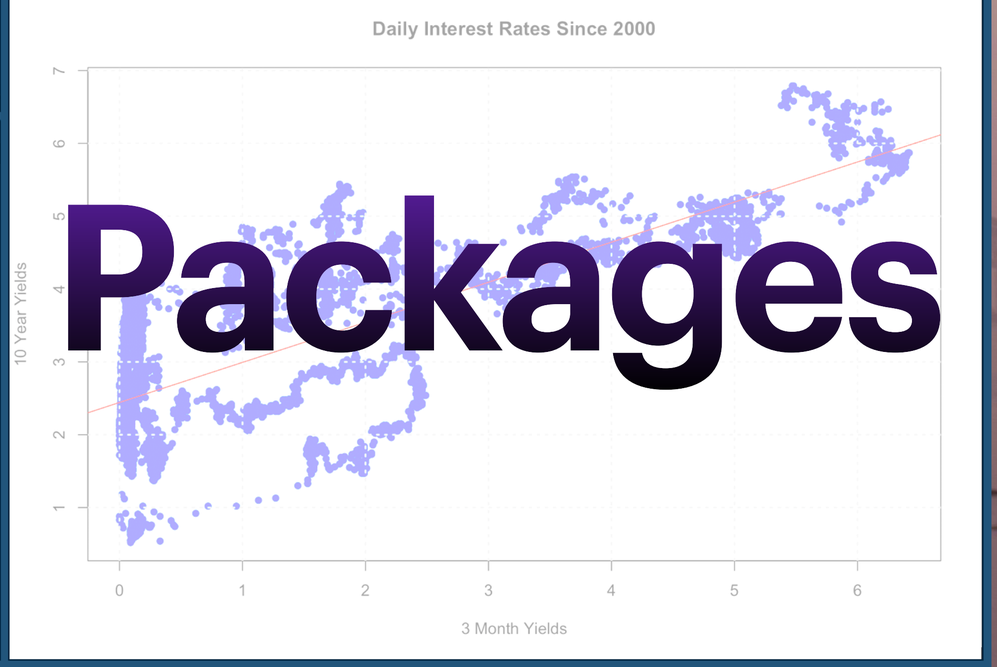
Script

Console

Environ-ment

Packages



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Terms

R Studio :

- R Markdown

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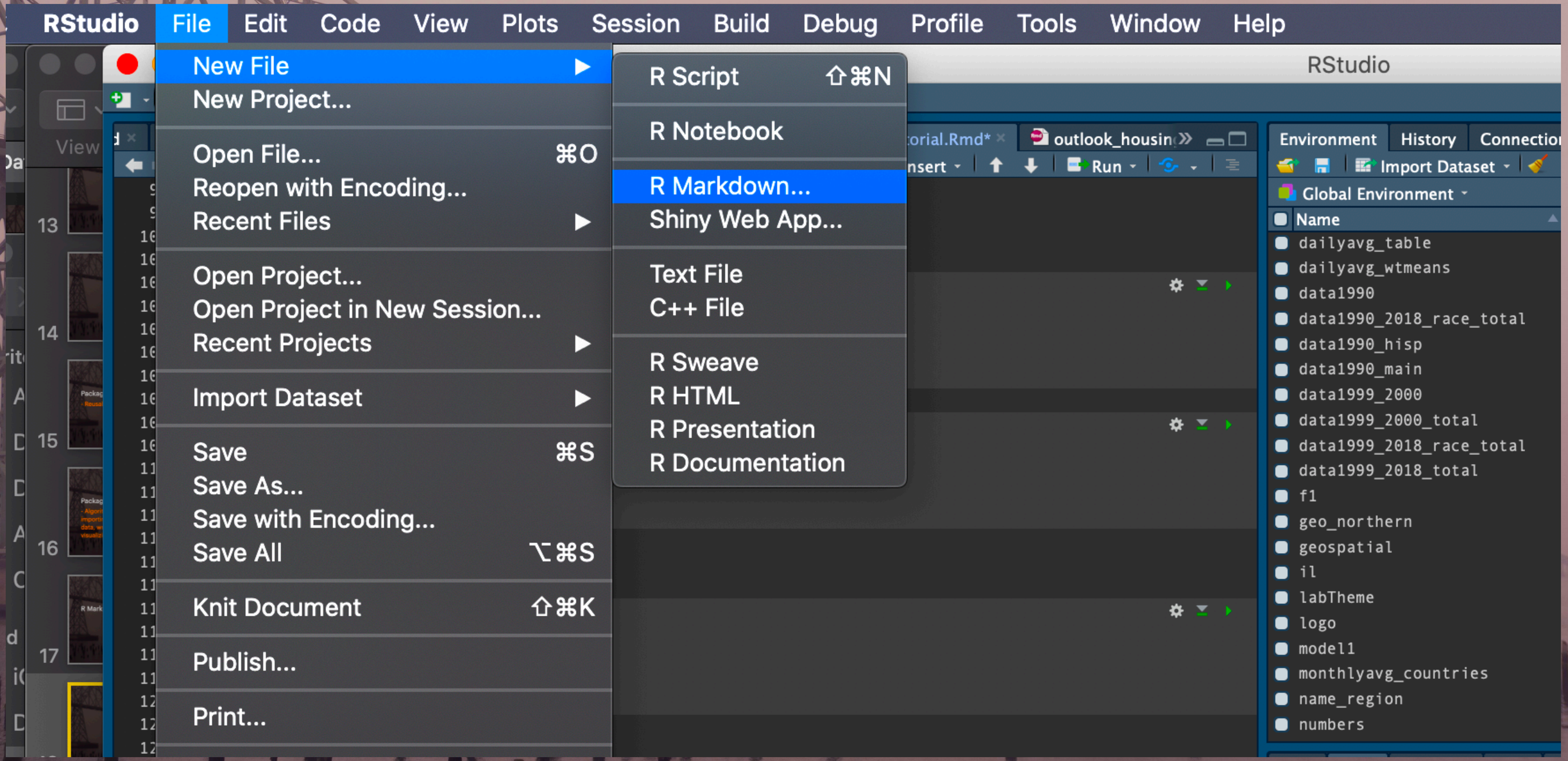
RStudio
File
Edit
Code
View
Plots
Session
Build
Debug
Profile
Tools
Window
Help
New File
New Project...
Open File... ⌘O
Reopen with Encoding...
Recent Files
Open Project...
Open Project in New Session...
Recent Projects
Import Dataset
Save ⌘S
Save As...
Save with Encoding...
Save All ⌥⌘S
Knit Document ⇧⌘K
Publish...
Print...
R Script ⇧⌘N
R Notebook
R Markdown...
Shiny Web App...
Text File
C++ File
R Sweave
R HTML
R Presentation
R Documentation
RStudio
Environment
History
Import Dataset
Global Environment
Name
dailyavg_table
dailyavg_wtmeans
data1990
data1990_2018_race_total
data1990_hisp
data1990_main
data1999_2000
data1999_2000_total
data1999_2018_race_total
data1999_2018_total
f1
geo_northern
geospatial
il
labTheme
logo
model1
monthlyavg_countries
name_region
numbers

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Terms

R Markdown :

- Code chunks

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````
99
100 ##### subsetting by value
101
102 ```{r}
103 ### base r
104 setosa <- iris[iris$Species == "setosa",]
105 glimpse(setosa)
106 ```
107
108 ```{r}
109 ### dplyr
110 setosa_tidy <- iris %>% filter(Species = "setosa")
111 glimpse(setosa_tidy)
112 ```
113
114 ##### subsetting by columns
115
116 ```{r}
117 ### base r
118 iris_length <- iris[, c(1,3,5,9)]
119 glimpse(iris_length)
120 ```
121
122
123 ```{r}
124 ### dplyr
125 iris_length_dplyr <- iris %>% dplyr::select(matches("(Length|Species)"))
126 glimpse(iris_length_dplyr)
127 ```
128
````

Terms

R Studio :

- Working directory

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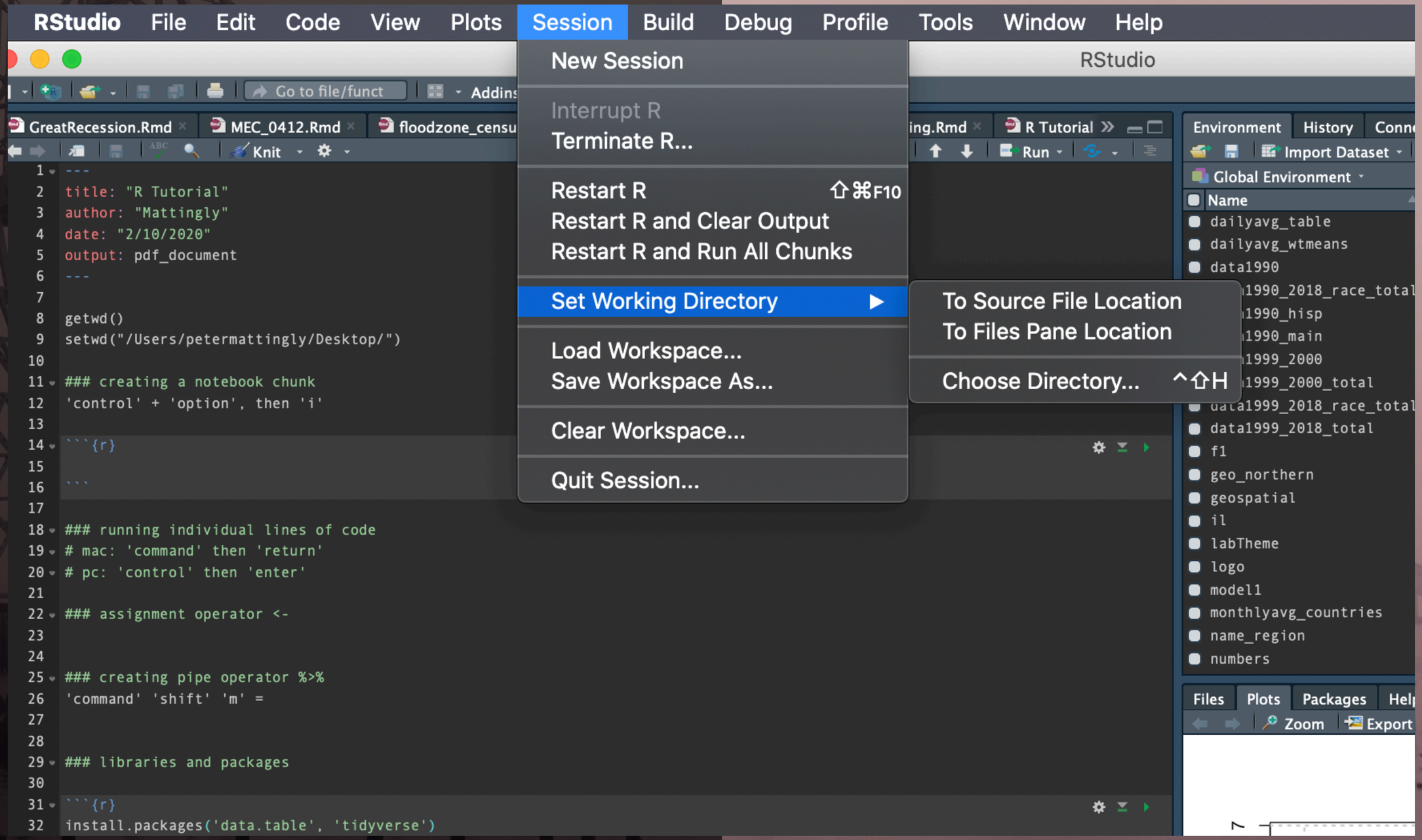
RStudio File Edit Code View Plots Session Build Debug Profile Tools Window Help
New Session
Interrupt R
Terminate R...
Restart R ⇧⌘F10
Restart R and Clear Output
Restart R and Run All Chunks
Set Working Directory
To Source File Location
To Files Pane Location
Choose Directory... ^⇧H
Load Workspace...
Save Workspace As...
Clear Workspace...
Quit Session...
RStudio
GreatRecession.Rmd
MEC_0412.Rmd
floodzone_censu
R Tutorial
Knit
Run
Environment
History
Import Dataset
Global Environment
Name
dailyavg_table
dailyavg_wtmeans
data1990
data1990_2018_race_total
data1990_hisp
data1990_main
data1999_2000
data1999_2000_total
data1999_2018_race_total
data1999_2018_total
f1
geo_northern
geospatial
il
labTheme
logo
model1
monthlyavg_countries
name_region
numbers
Files
Plots
Packages
Zoom
Export
1 ---
2 title: "R Tutorial"
3 author: "Mattingly"
4 date: "2/10/2020"
5 output: pdf_document
6 ---
7
8 getwd()
9 setwd("/Users/petermattingly/Desktop/")
10
11 ### creating a notebook chunk
12 'control' + 'option', then 'i'
13
14 ```{r}
15
16 ```
17
18 ### running individual lines of code
19 # mac: 'command' then 'return'
20 # pc: 'control' then 'enter'
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22 ### assignment operator <-
23
24
25 ### creating pipe operator %>%
26 'command' 'shift' 'm' =
27
28
29 ### libraries and packages
30
31 ```{r}
32 install.packages('data.table', 'tidyverse')

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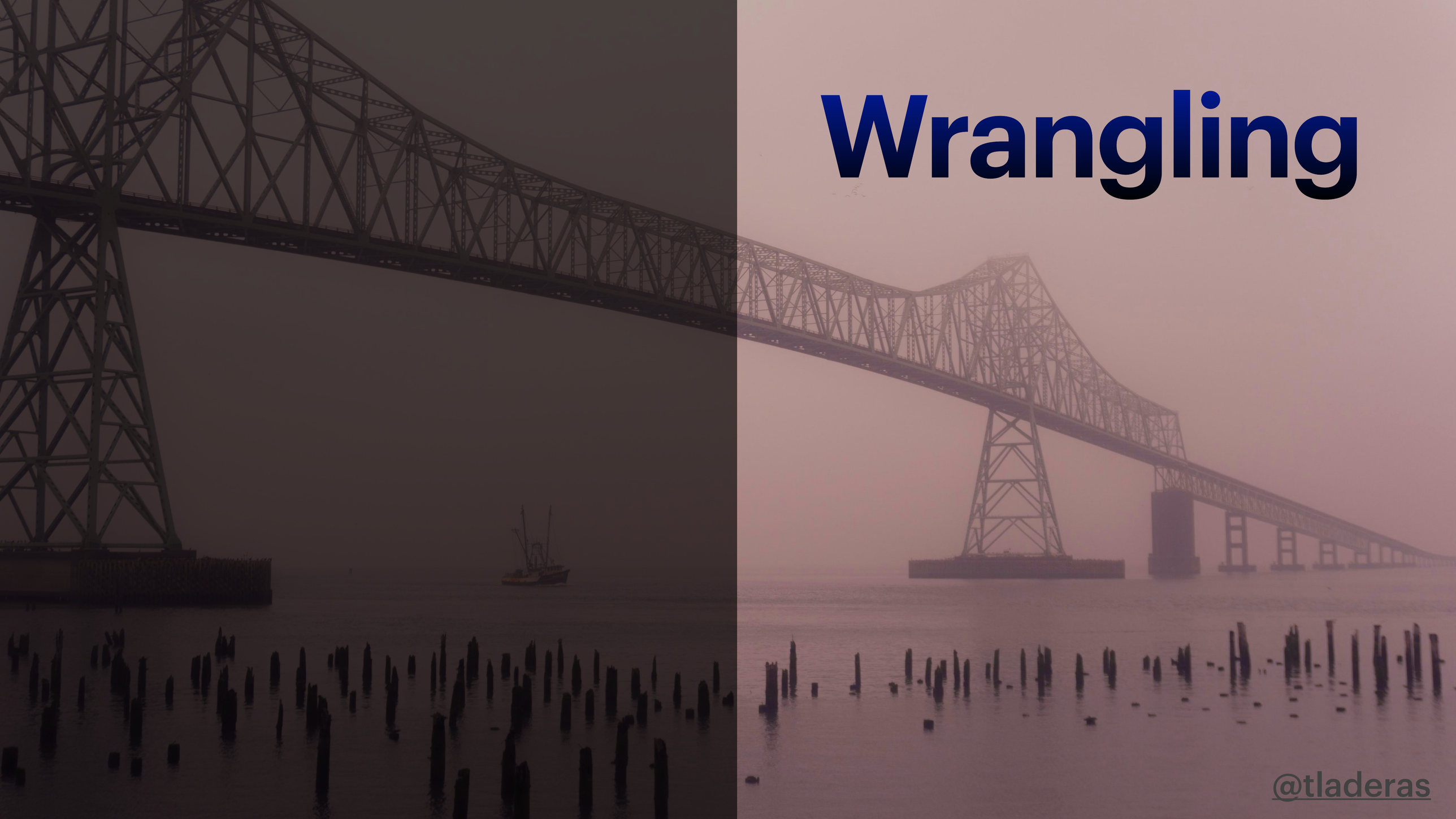

Wrangling

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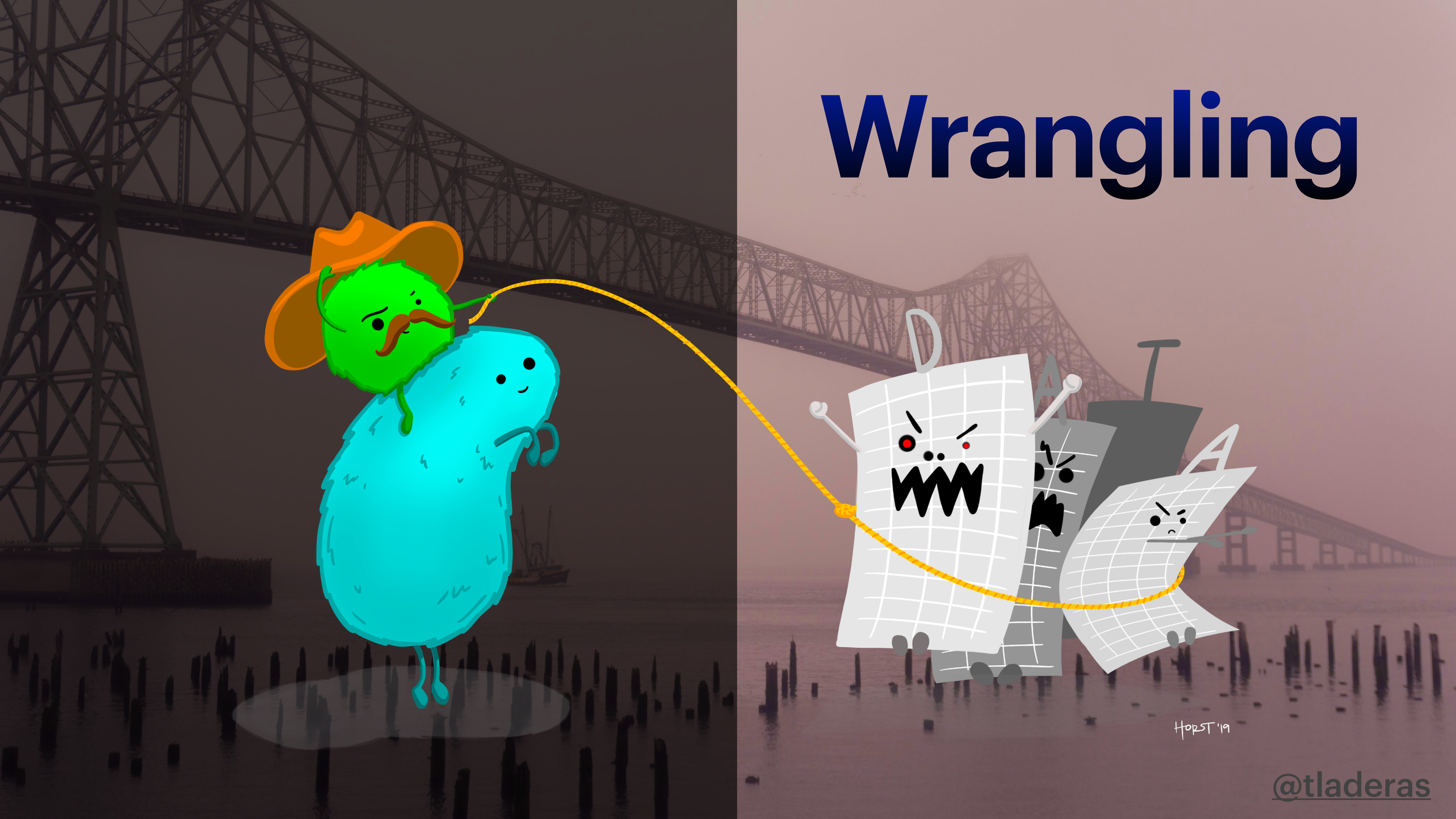
Wrangling



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Terms
Data wrangling
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Terms

Data wrangling :

- Reshaping by lengthening or widening data

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Data
@tladeras

Data

VARIABLE 1	VARIABLE 2	VARIABLE 3	VARIABLE 4	VARIABLE 5

Columns

VARIABLE 1	VARIABLE 2	VARIABLE 3	VARIABLE 4	VARIABLE 5

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Rows

VARIABLE 1	VARIABLE 2	VARIABLE 3	VARIABLE 4	VARIABLE 5

Terms

Data wrangling :

- “Gathering” or lengthening with more rows/ observations

Original

Var 1	Var 2	Date 1	Date 2	Date 3

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Original

Var 1	Var 2	Date 1	Date 2	Date 3

Gathering

Var 1	Var 2	Date	Value
		1	
		2	
		3	

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Terms

Data wrangling :

- “Spreading” or widening with more columns/variables

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Original

Var 1	Var 2	Date	Value
		1	
		2	
		3	

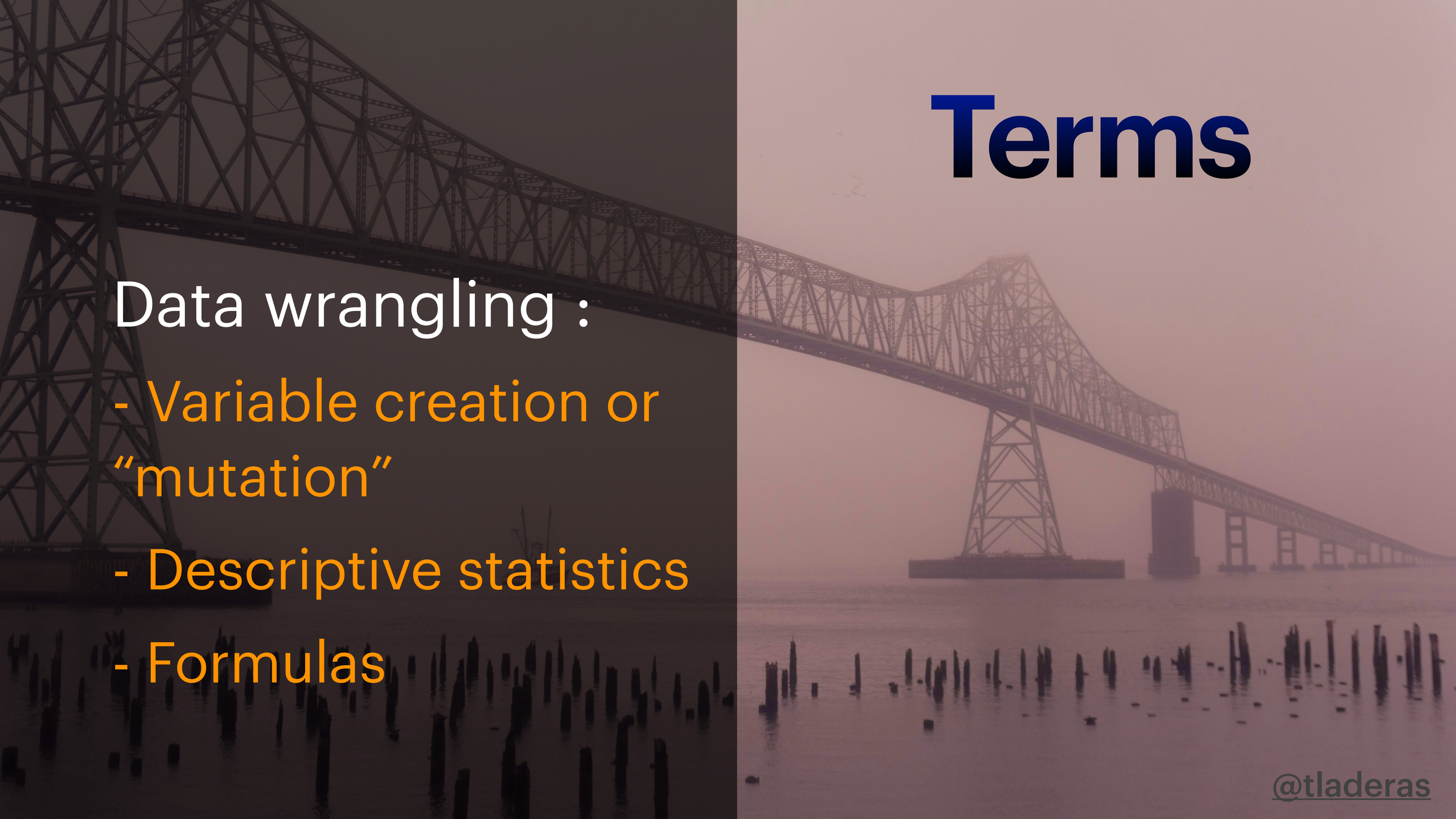
Original

Var 1	Var 2	Date	Value
		1	
		2	
		3	

Spreading

Var 1	Var 2	Date 1	Date 2	Date 3

@tladeras



Terms

Data wrangling :

- Variable creation or “mutation”
- Descriptive statistics
- Formulas


dplyr::mutate
add Column(s),
keep existing.
A
B
C
1
5
10
0
2
-3
4
9
6
3
2
14
9
8
THE PLAN:
A
B
C
+
=
HORST '18

Terms

Data wrangling :

- Working with variables like dates

- Dates in R:

“YYYY-MM-DD”


LUBRIDATE: wrangle times + dates!
YEARS
MONTHS
DAYS
Horst '18

Terms

Data wrangling :

- Subsetting or filtering

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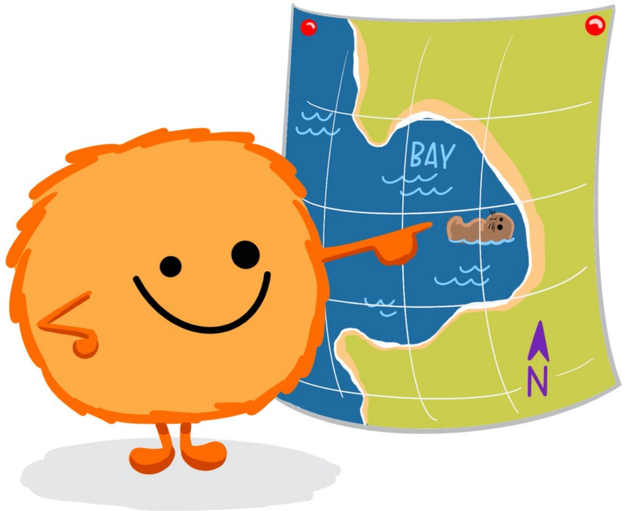
dplyr::filter()

KEEP ROWS THAT s·a·t·i·s·f·y your CONDITIONS

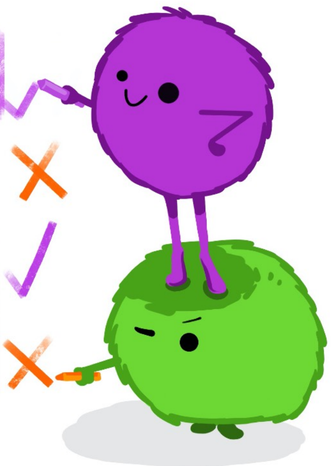
keep rows from... | this data... | ONLY IF... | type is "otter" | AND | site is "bay"

```
filter(df, type == “otter” & site == “bay”)
```



type	food	site
otter	urchin	bay
shark	seal	channel
otter	abalone	bay
otter	crab	wharf

@allison_horst

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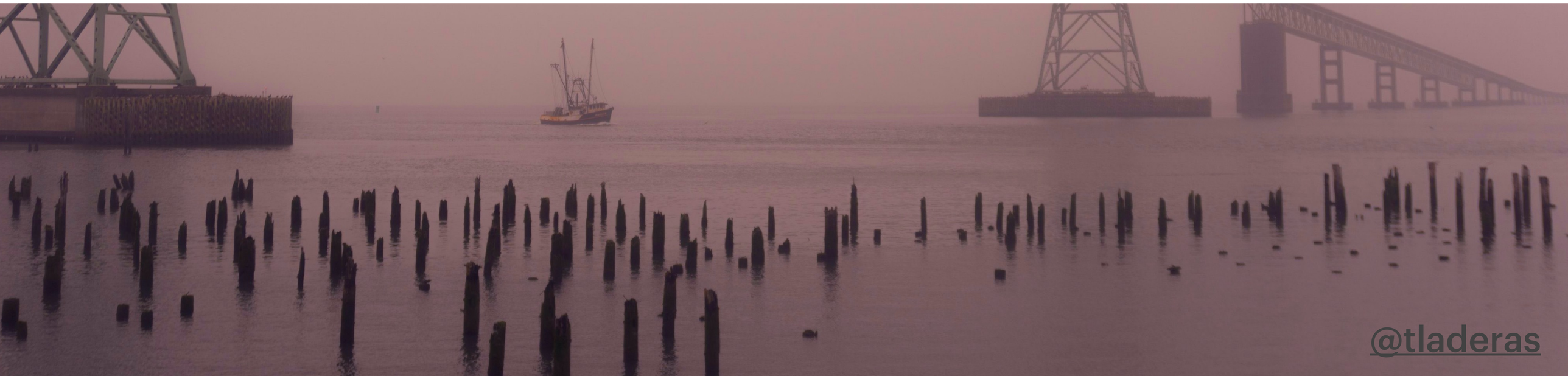
RStudio®



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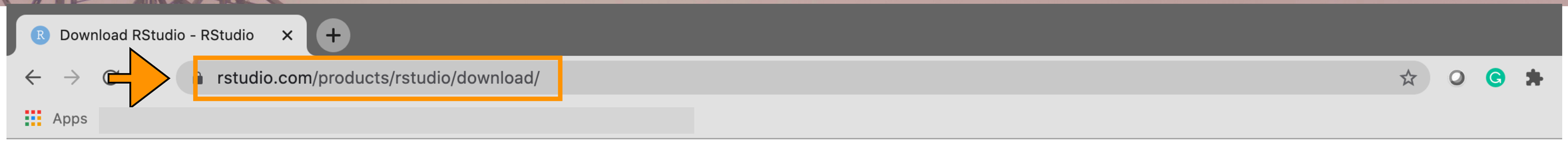

	RStudio Desktop	RStudio Desktop Pro	RStudio Server	RStudio Server Pro
	Open Source License	Commercial License	Open Source License	Commercial License
	Free	**$995** /year	**Free**	**$4,975** /year (5 Named Users)
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Integrated Tools for R	✓	✓	✓	✓
Priority Support		✓		✓
Access via Web Browser			✓	✓
RStudio Professional Drivers		✓		✓
Connect to RStudio Server Pro remotely		✓		

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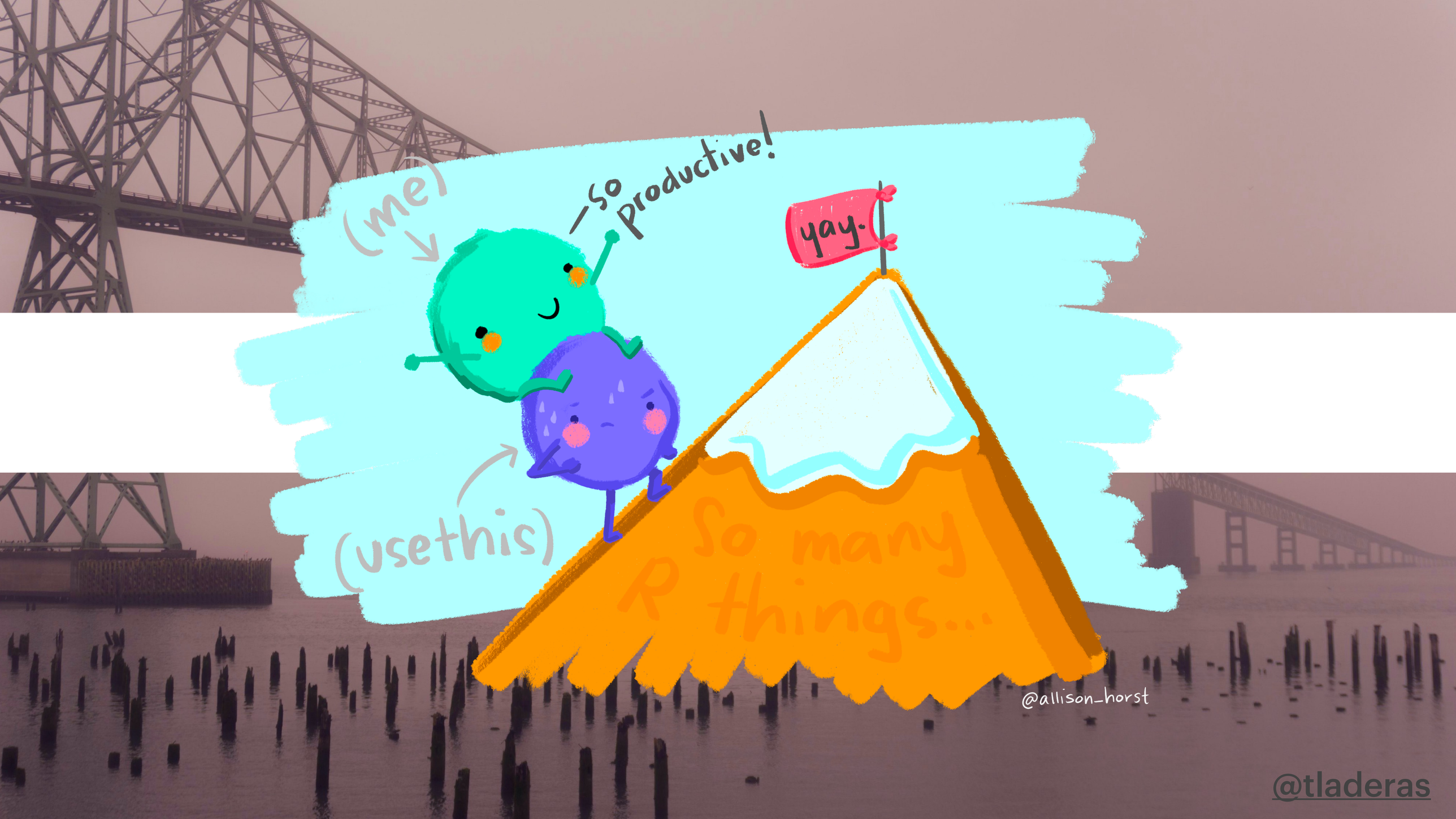

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