

Managing Data Analysis in RStudio using project-oriented workflow

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Health System Impact Fellowship
3rd Annual Training Retreat
2019-11-26-Tuesday
Toronto, Ontario



UNIVERSITY OF
CENTRAL FLORIDA



<https://github.com/andkov/hsif-2019-data-analysis>

About me



- Ph.D. in Quantitative Methods, Psychology (2014)
- Reproducible research enthusiast since 2012
- Graph maker
- See work at <https://github.com/andkov>
- These slides and more at <http://andriy.rbind.io>

**MIDDLE
TENNESSEE**
STATE UNIVERSITY

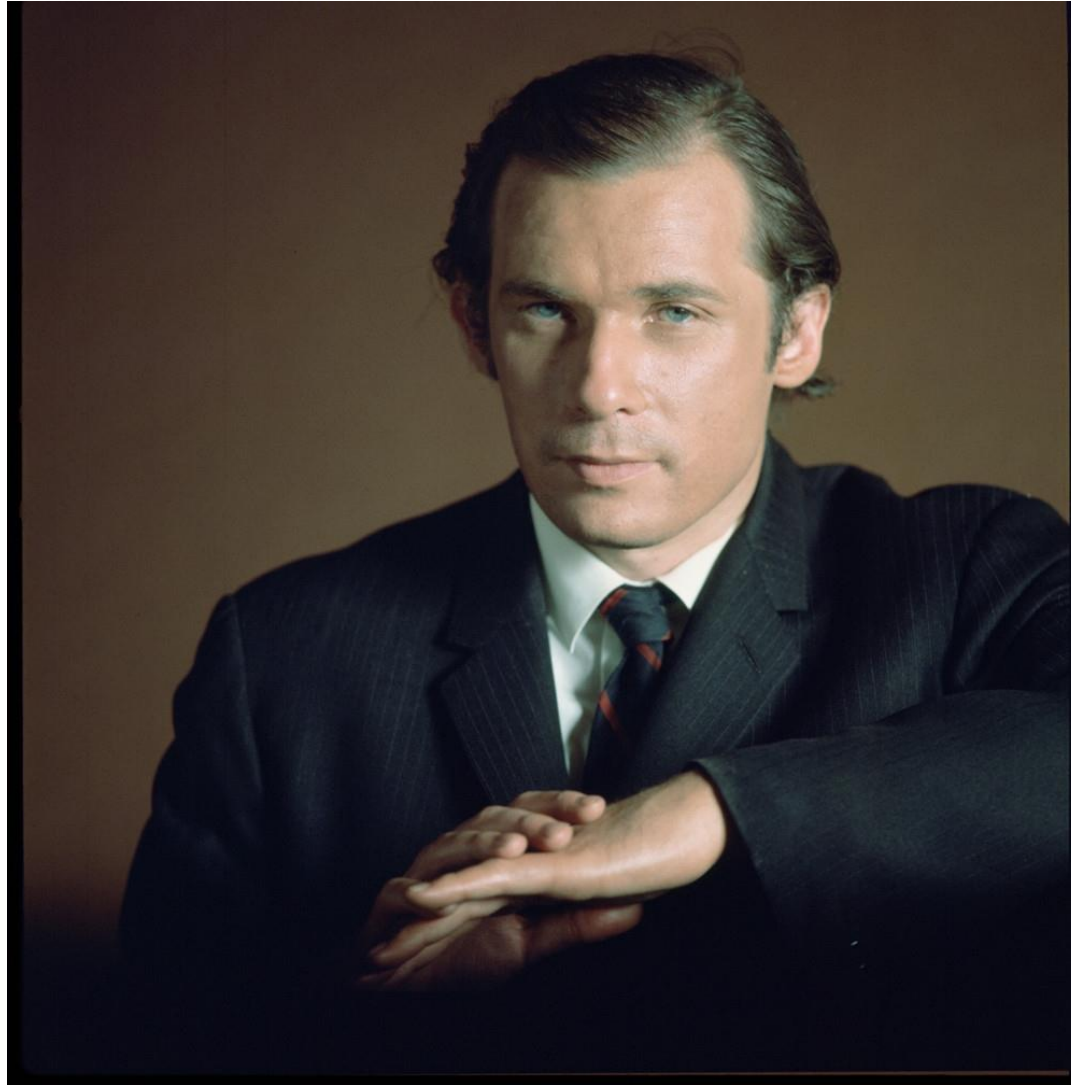




Andreas Vesalius



John Tukey



Glenn Gould



Hadley Wickham



Edward Tufte



Dialects of data expression

Tabular

id	time	attend	model
1	0	1	2.788
1	1	6	2.732
1	2	2	2.675
1	3	1	2.618
1	4	1	2.562
1	5	1	2.505
1	6	1	2.449
1	7	1	2.392
1	8	1	2.335
1	9	1	2.279
1	10	1	2.222
1	11	1	2.166
4	0	2	2.788
4	1	1	2.732

Algebraic

$$y_{it} = \beta_0 + \beta_1 \text{time}_t + \varepsilon_{it}$$

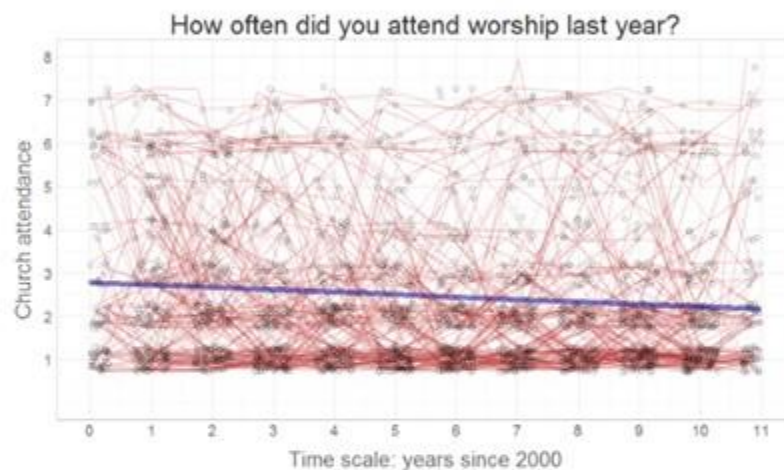
$$\beta_0 = \gamma_{00}$$

$$\beta_1 = \gamma_{10}$$

Semantic

In 2000 respondents attended church less than once a month (2.79) and gradually declined in their attendance since (.06 per year).

Graphical



Syntactic

```
nlme::glms(attend ~ 1 + time, data=dsM)
```

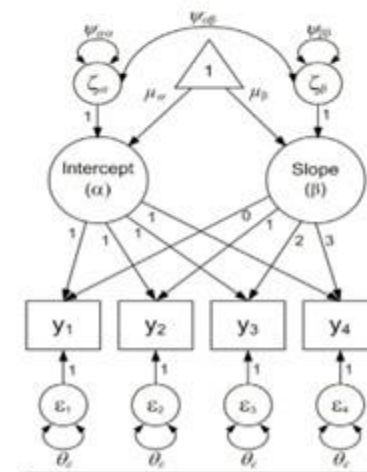
Numeric

Coefficients:

	Value	Std.Error	t-value	p-value
(Intercept)	2.7882	0.07774	35.86	0
time	-0.0566	0.01197	-4.73	0

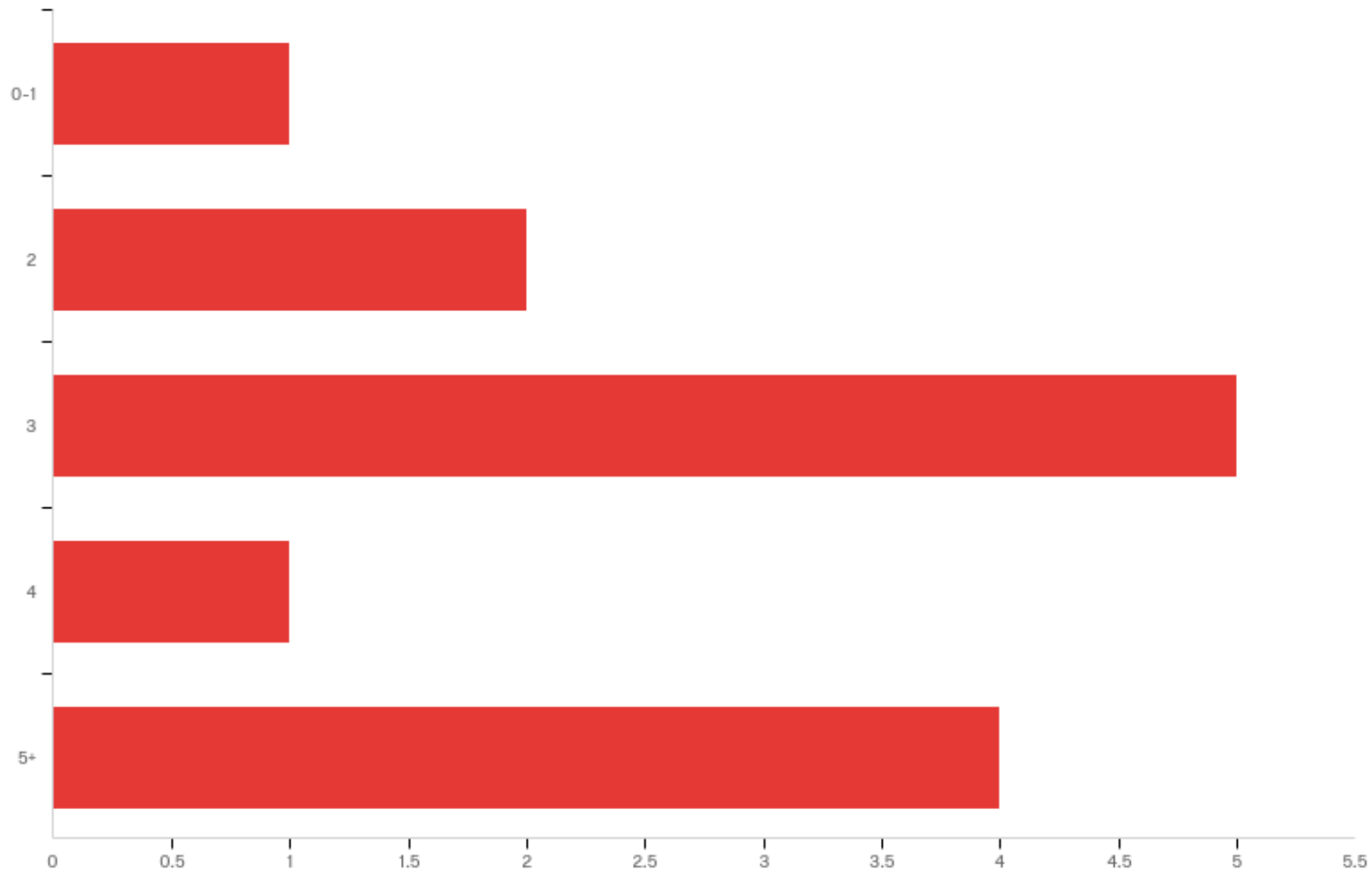
	modelB
logLik	-3719
deviance	7438
AIC	7444
BIC	7461
df.resid	1858
N	1860
p	2
ids	155

Schematic

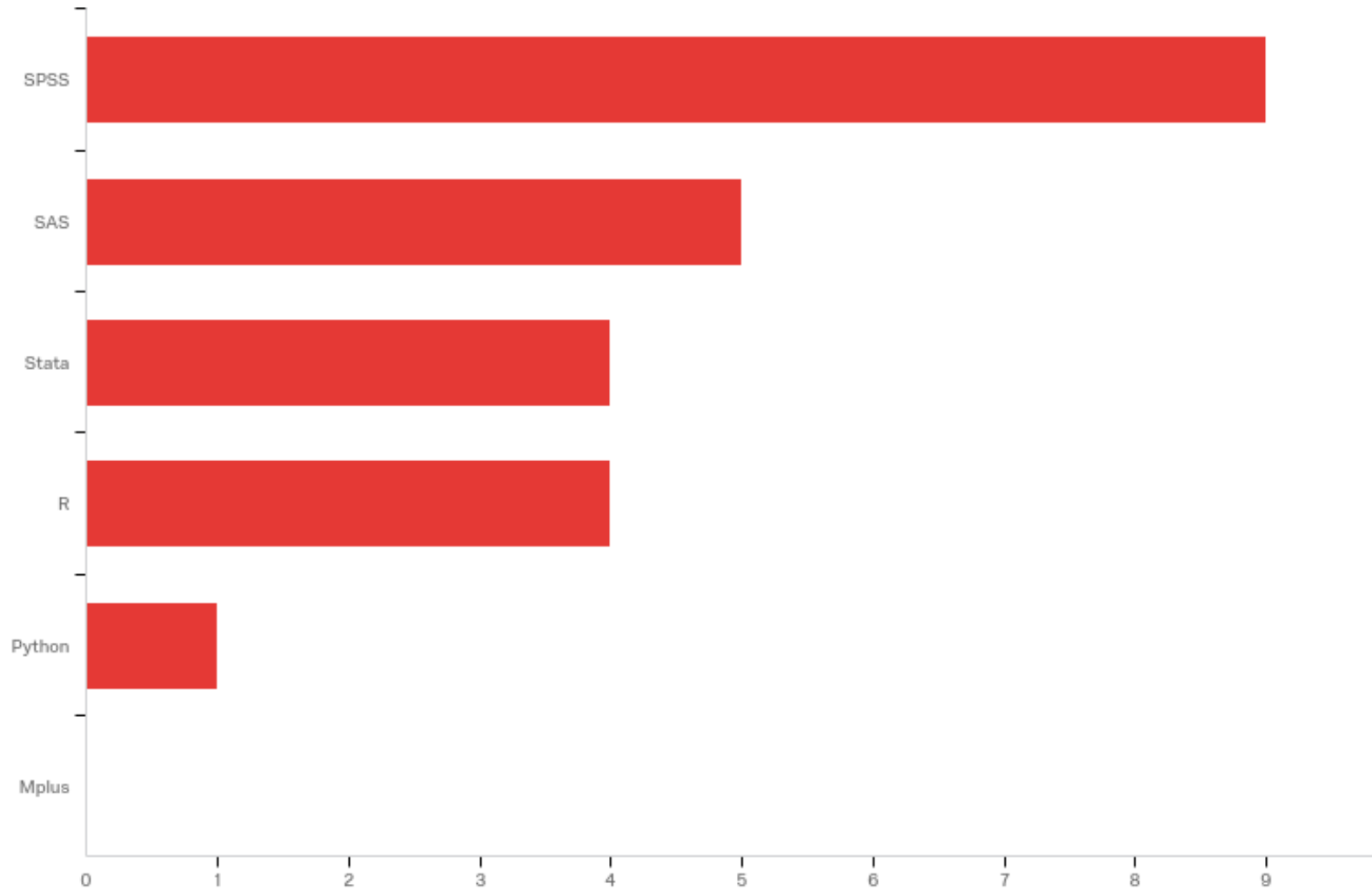


About you

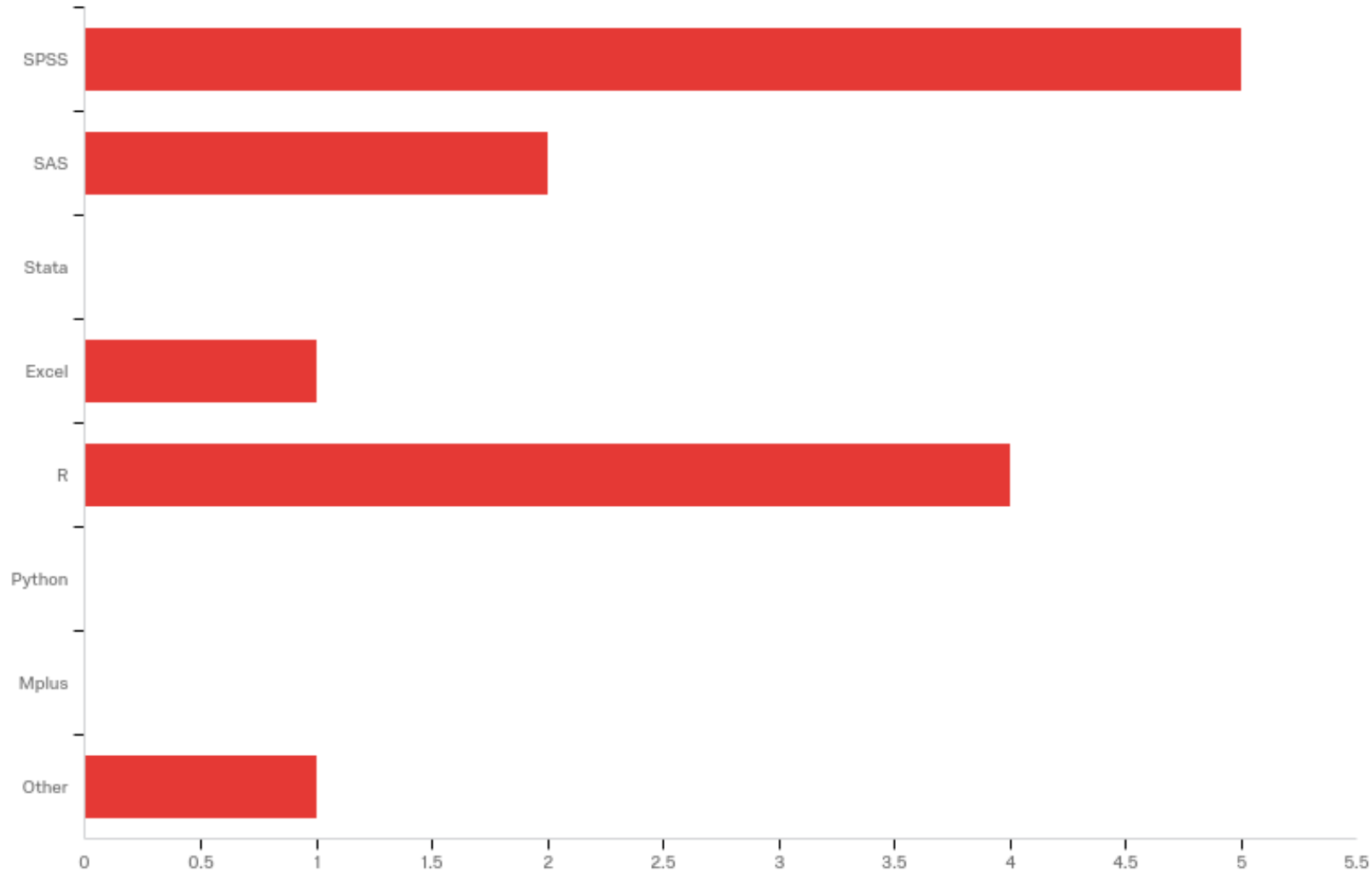
Q1.1 - How many undergraduate or graduate courses in statistics (or related field) have you taken so far?



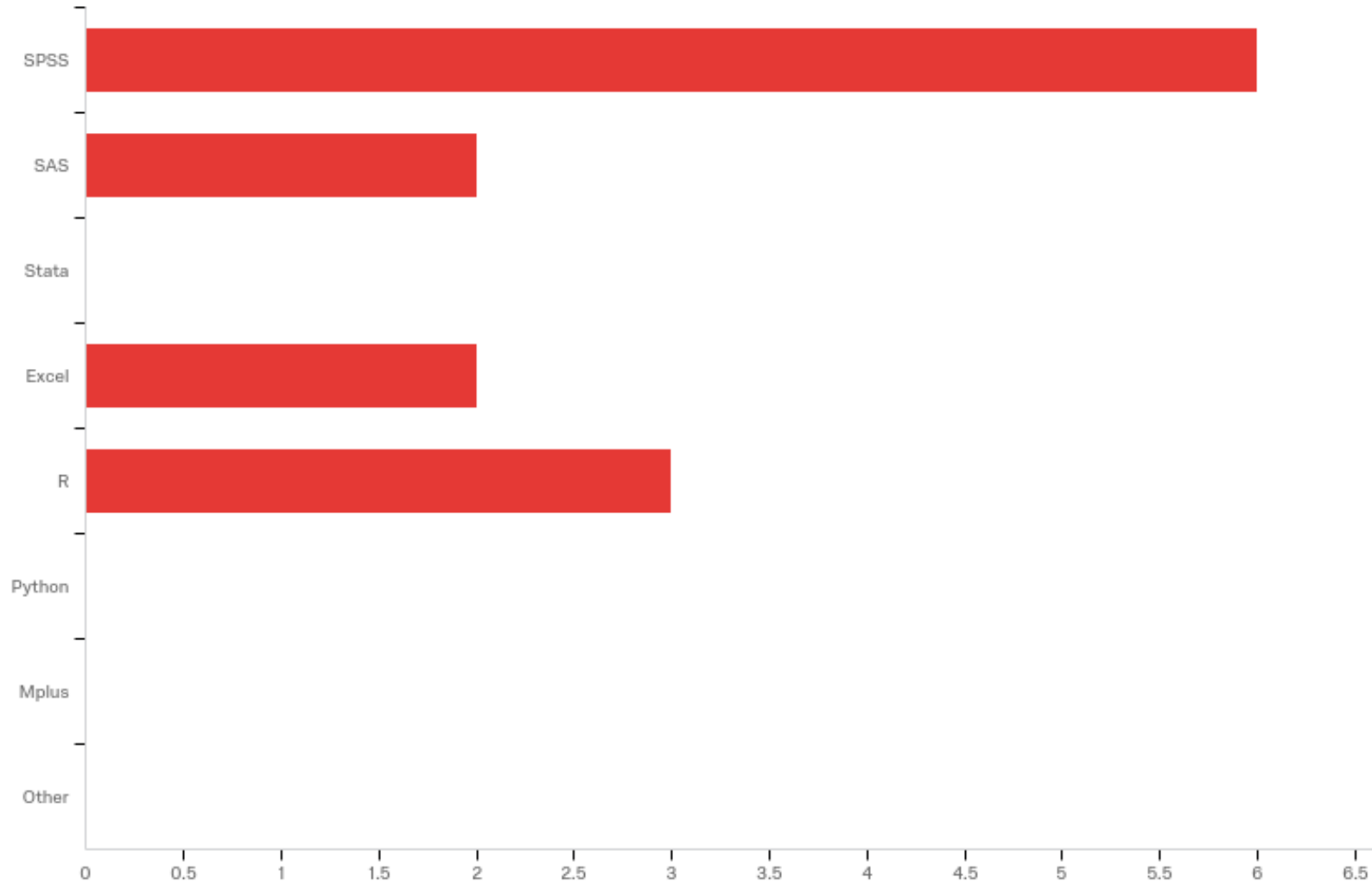
Q1.2 - What statistical software have you used AT LEAST ONCE in the last 3 years? (check all that apply)



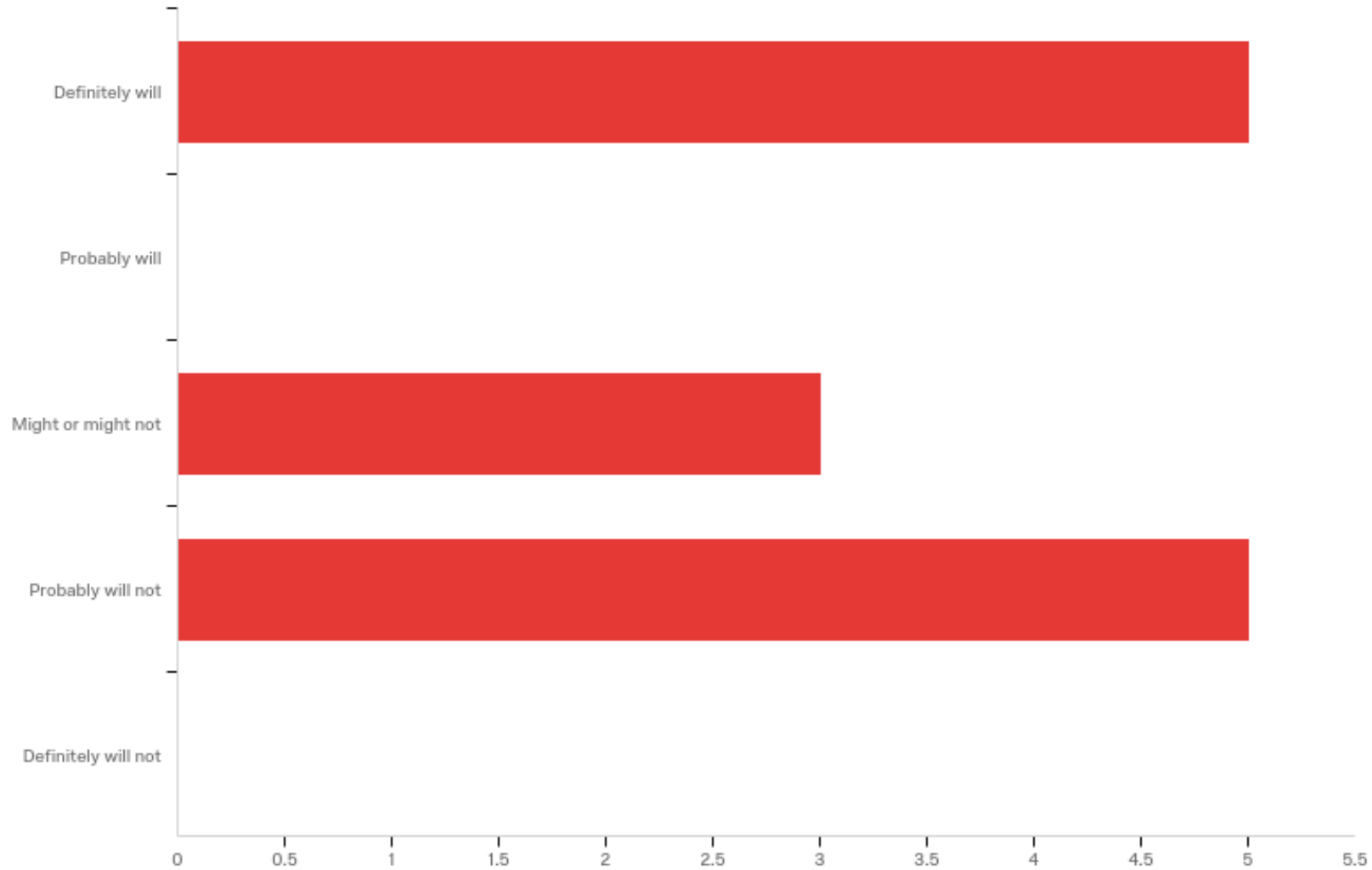
Q1.3 - You are asked to RUN A REGRESSION on an analysis-ready data set. With what software would you be most comfortable performing this task?



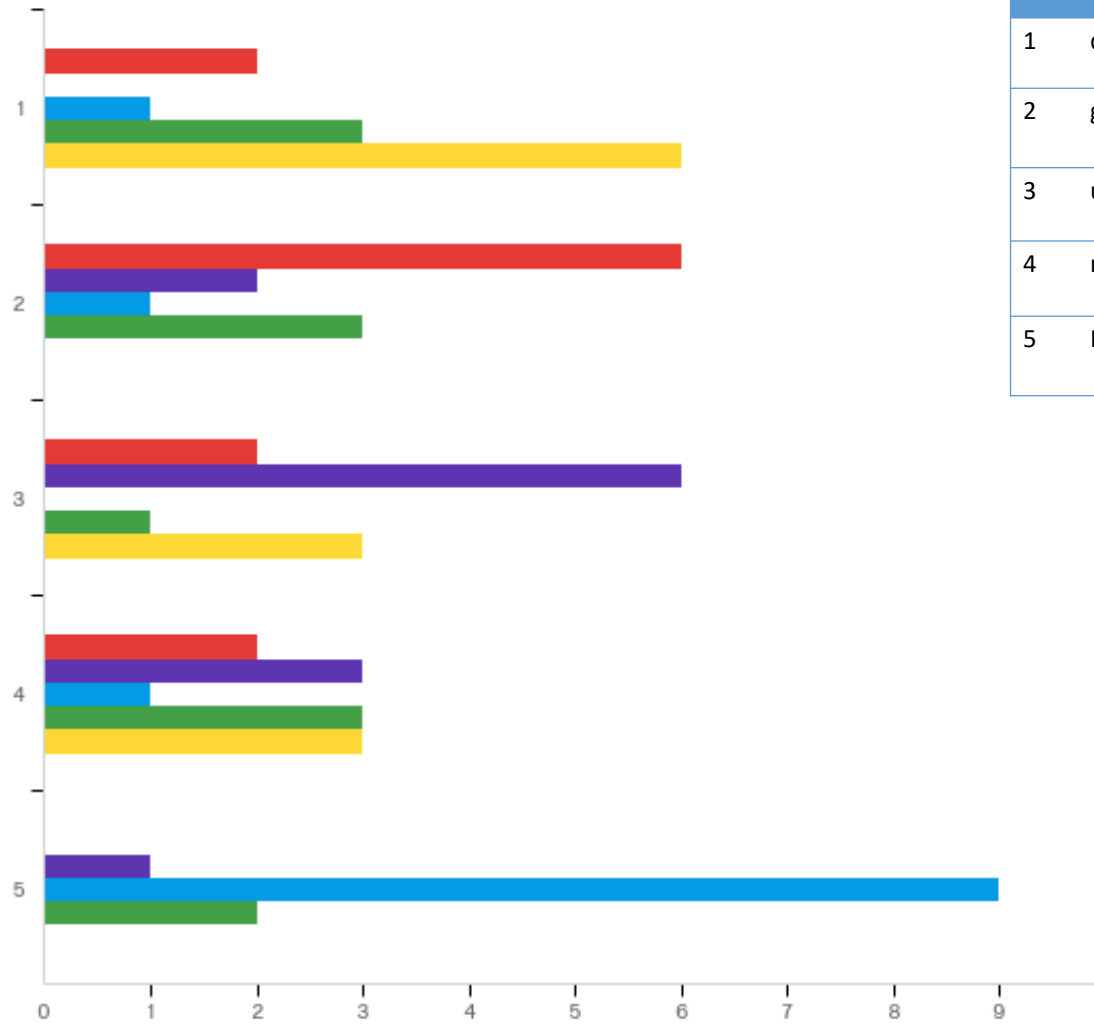
Q1.4 - You are asked to MAKE A GRAPH of a frequency distribution using an analysis-ready data set. With what software would you be most comfortable performing this task?



Q1.5 - Please complete the following sentence "I _____ use R for data analysis in my HSI Fellowship"



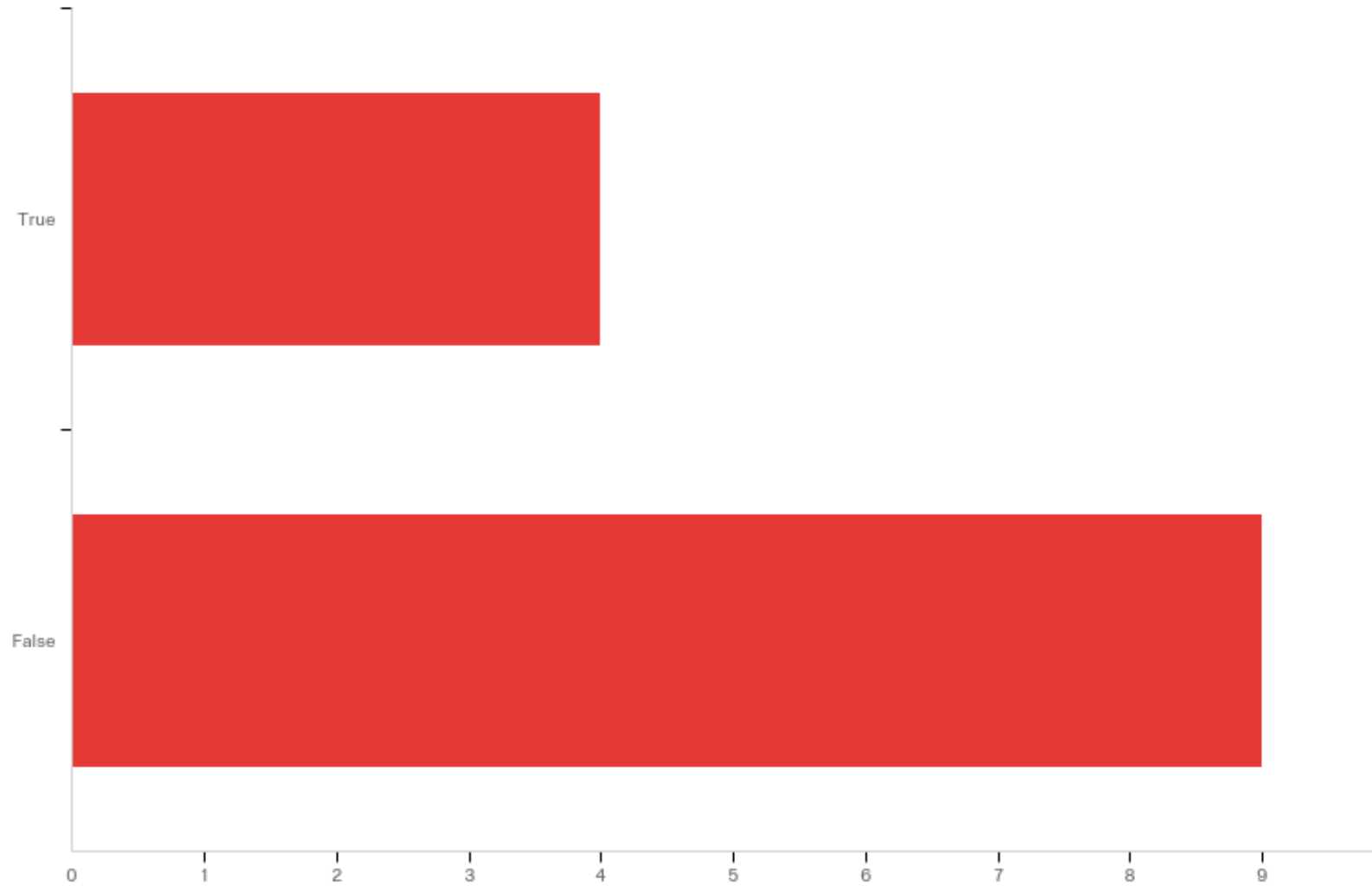
Q1.6 - With respect to learning more about data science with R, please rank your interests in the following learning objectives of this workshop.



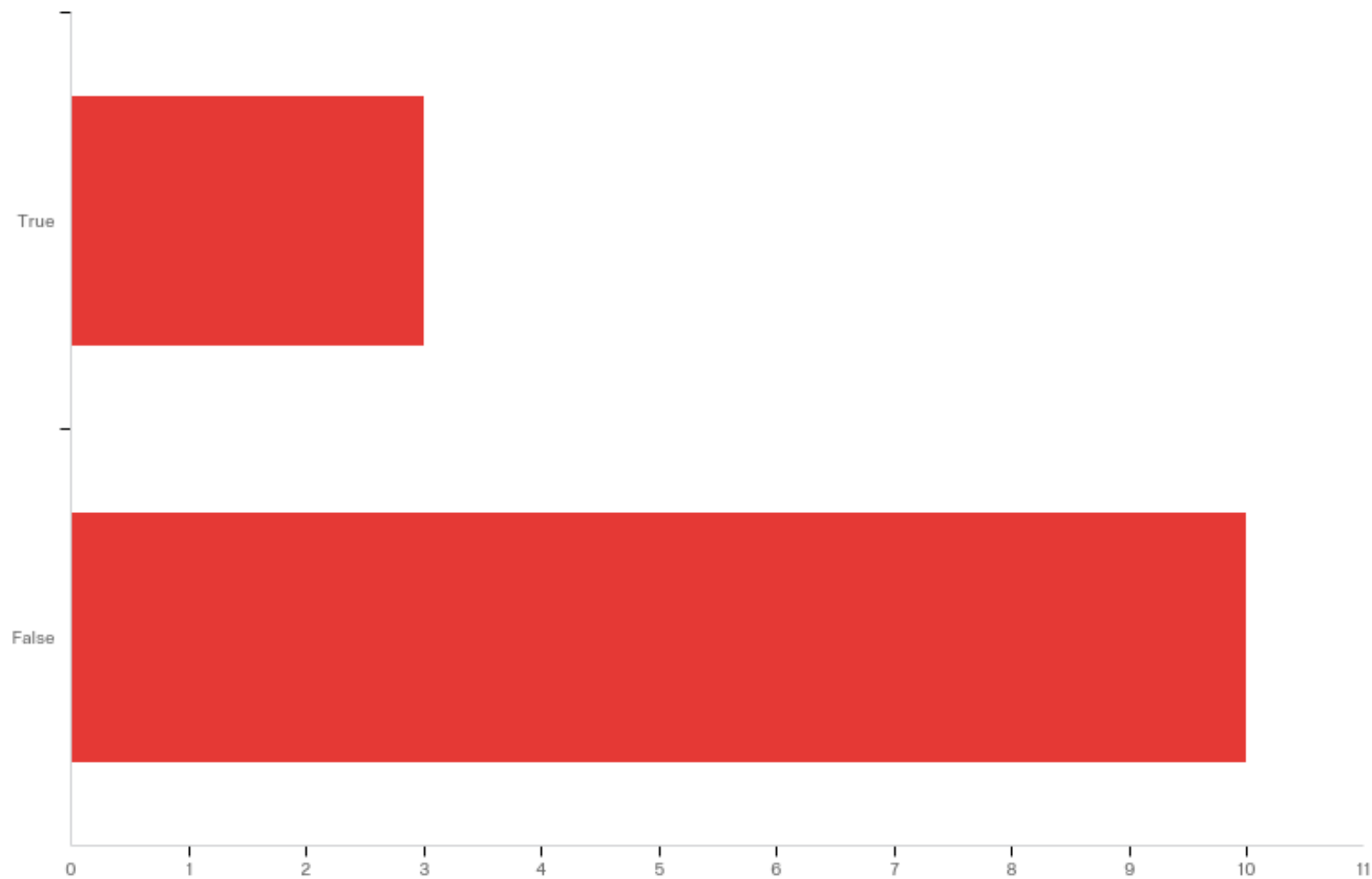
#	Field	Mean
1	data preparation/handing	2.33
2	graph making	3.25
3	understanding logistic regression	4.33
4	management of data analytic projects	2.83
5	R language	2.25

- data preparation/handing
- graph making
- understanding logistic regression
- management of data analytic projects
- R language

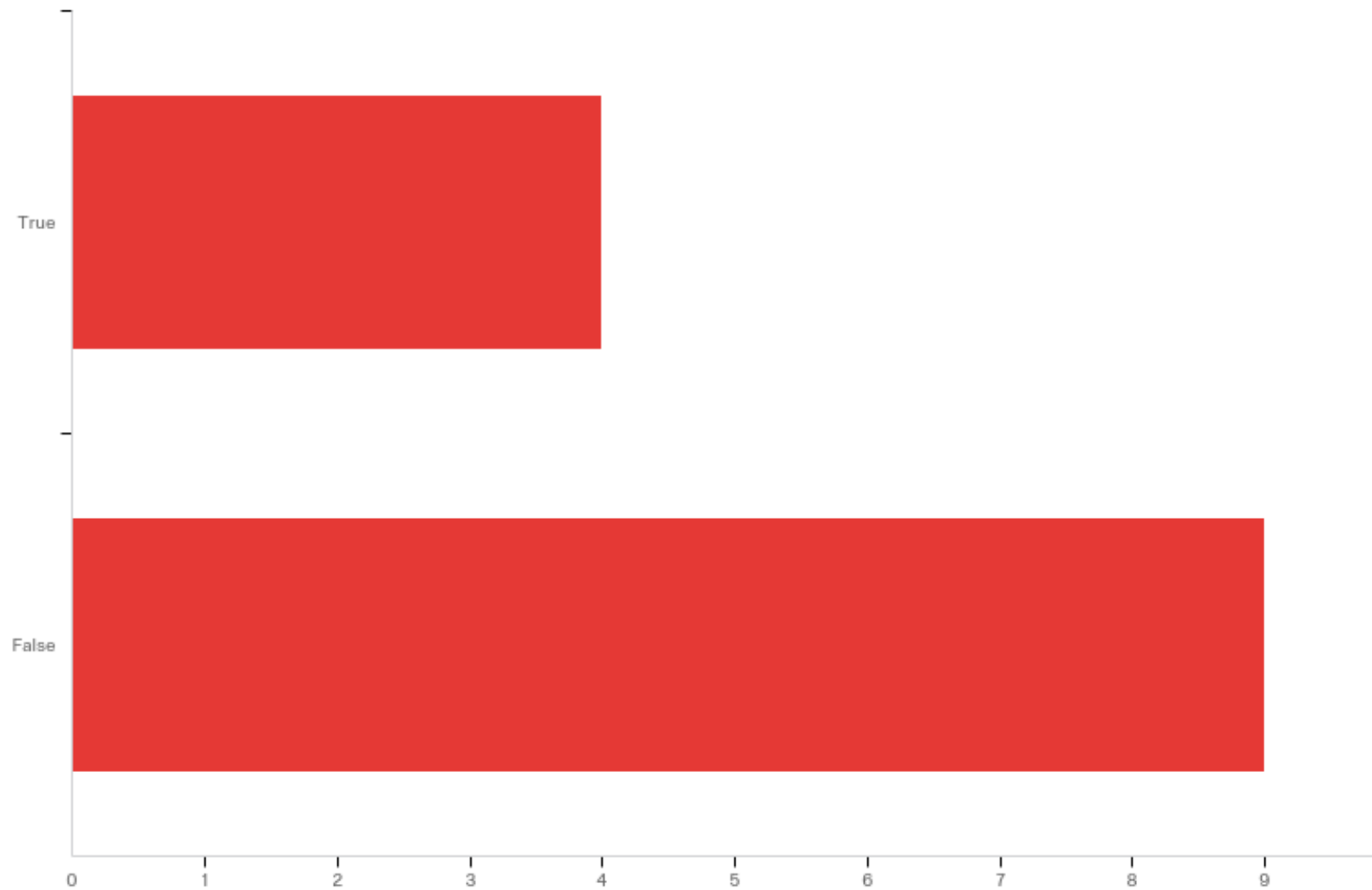
Q2.1 - I have created a graph using ggplot2 package before



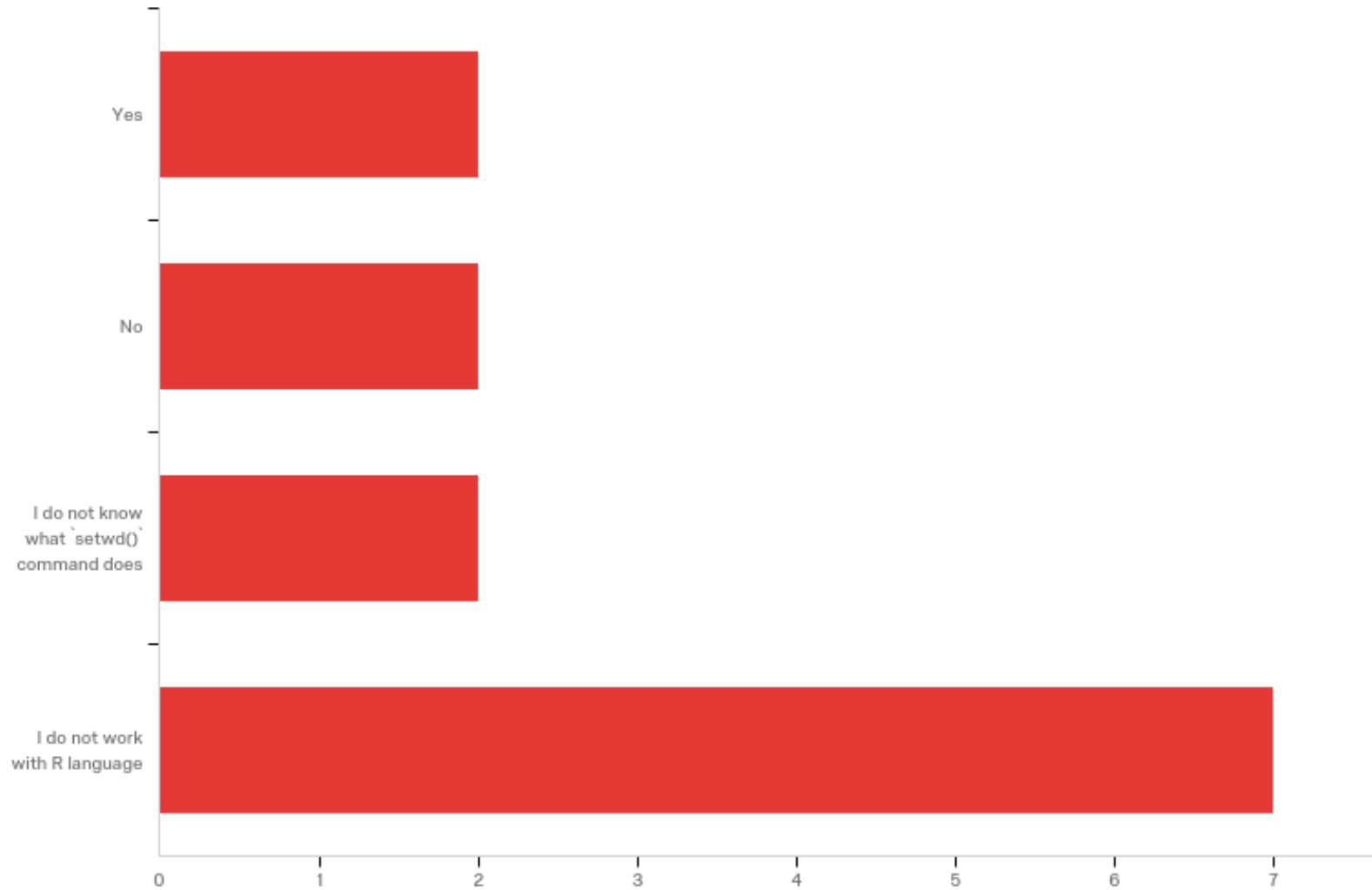
Q2.2 - I have worked with a Rmarkdown notebook before



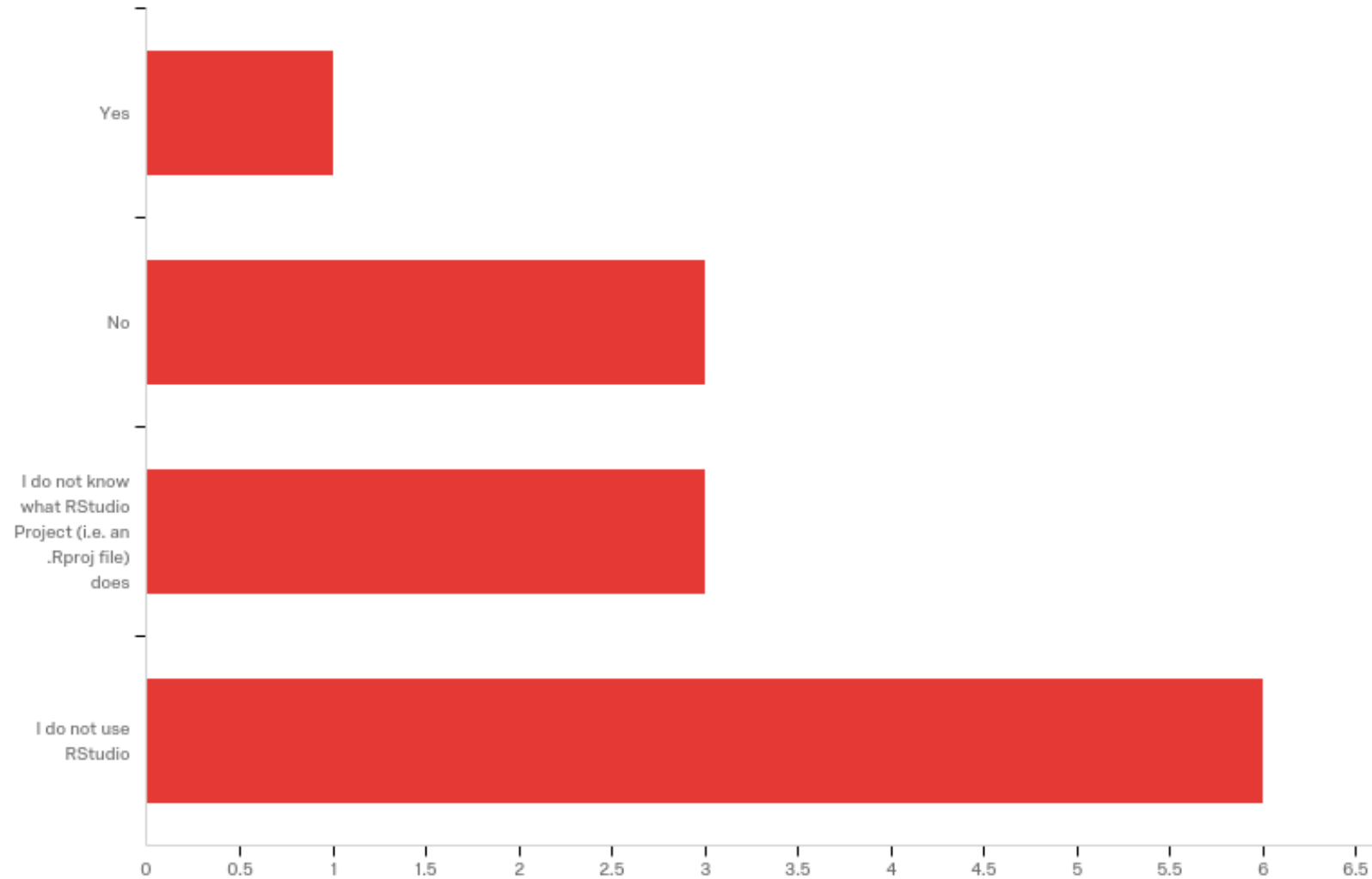
Q2.3 - I have written a custom function in R before



Q2.4 - When working with R language, I use ``setwd()`` command to establish a home directory



Q2.5 - When working in RStudio, I use Projects (i.e. create an .Rproj file)



About today

Today we will learn to use R + RStudio for

- Wrangling
- Tabulating
- Modeling
- Graphing

We will re-create the analytic report posted on

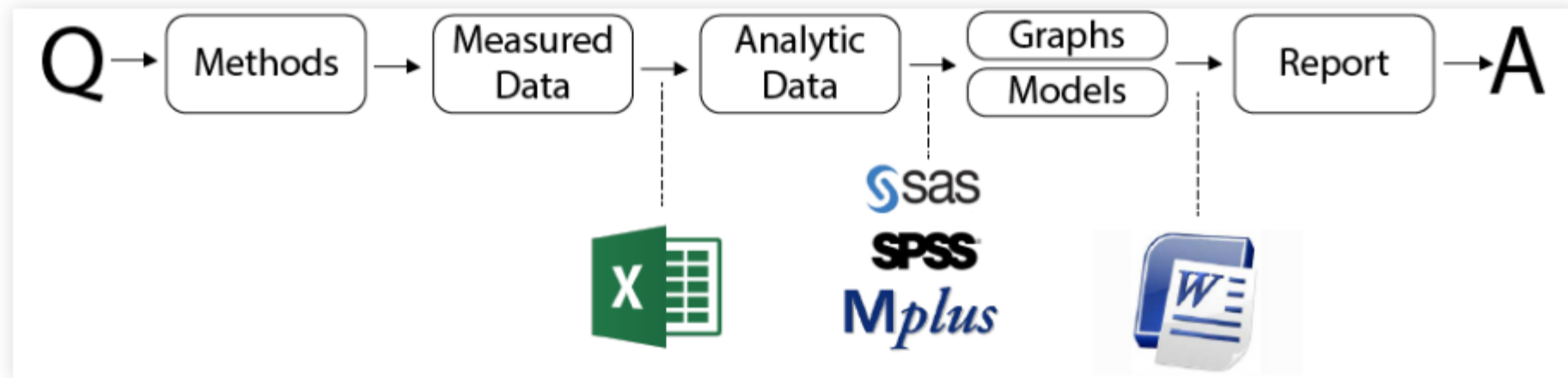
<https://github.com/andkov/hsif-2019-data-analysis>

Things to keep in mind

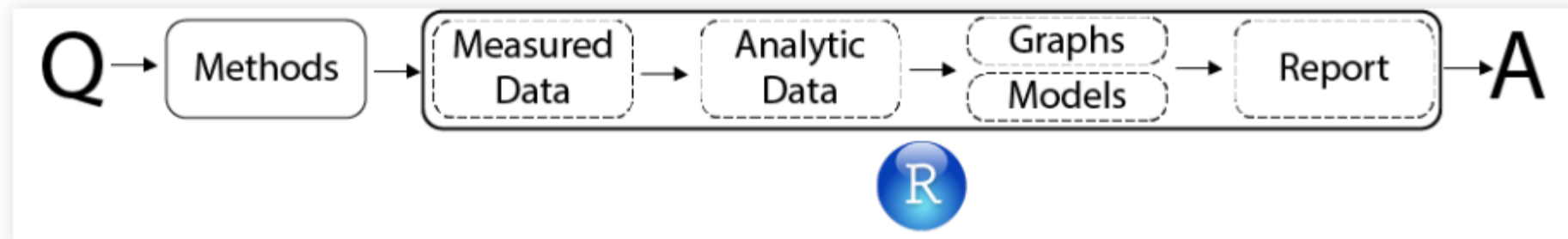
- What makes “data science” a science? **Reproducibility**
- Principles to keep in mind
 - **Scripts** are better than GUIs
 - **Notebooks** are better than scripts
 - **Projects** are better than Notebooks
- “*There are only two hard things in programming: cache validation and naming things*” – Unknown
 - Success in Data Science = Craft + **Imagination**

Approaches to managing data analysis

Traditional

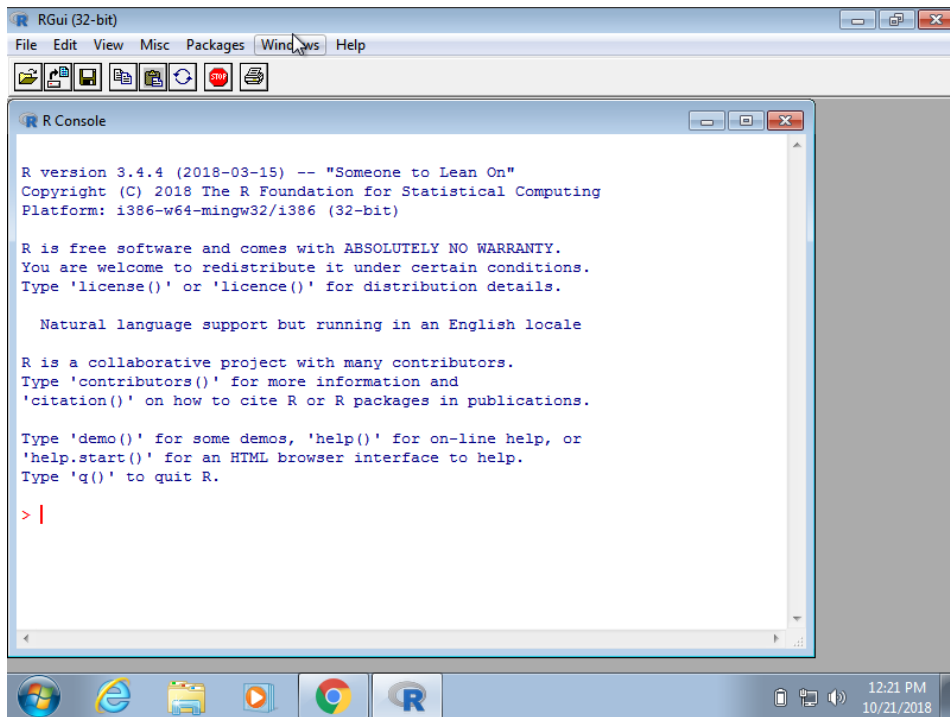


Reproducible

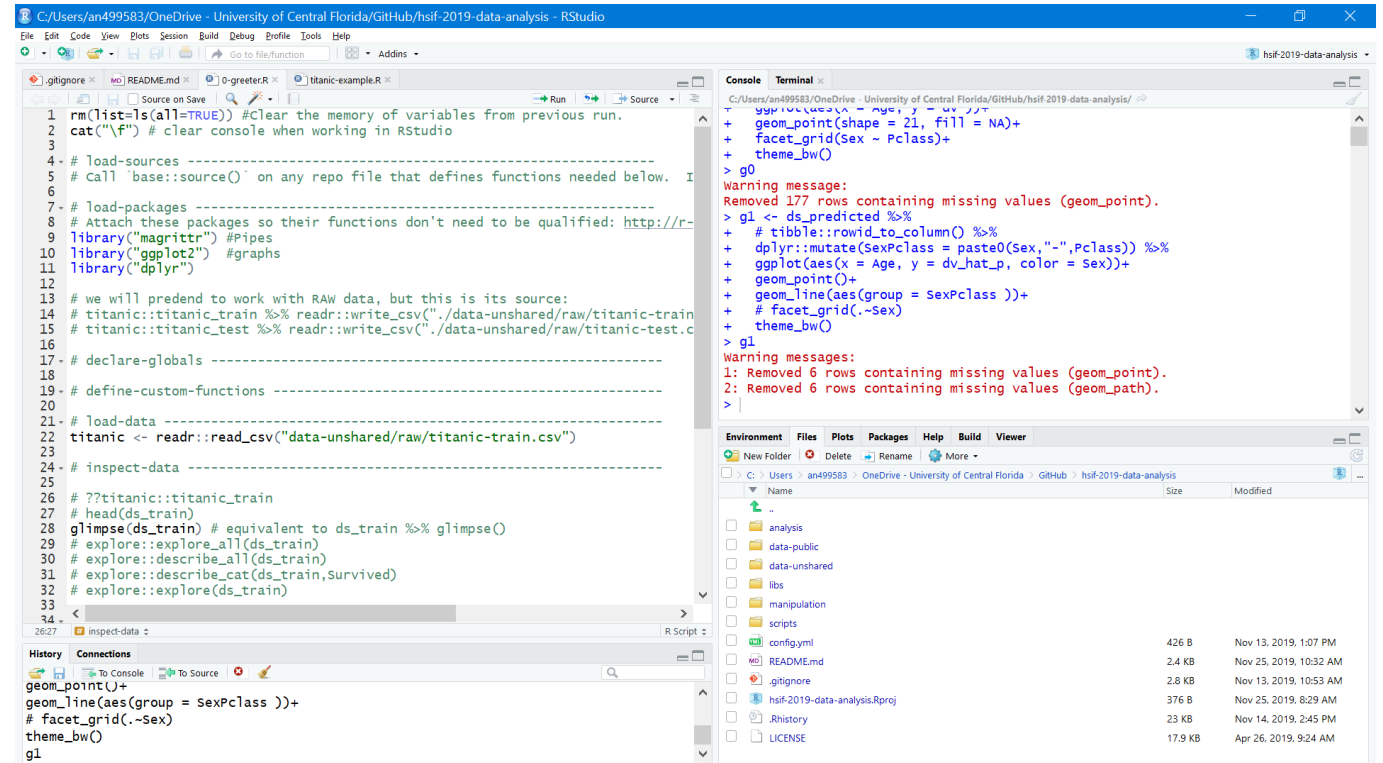


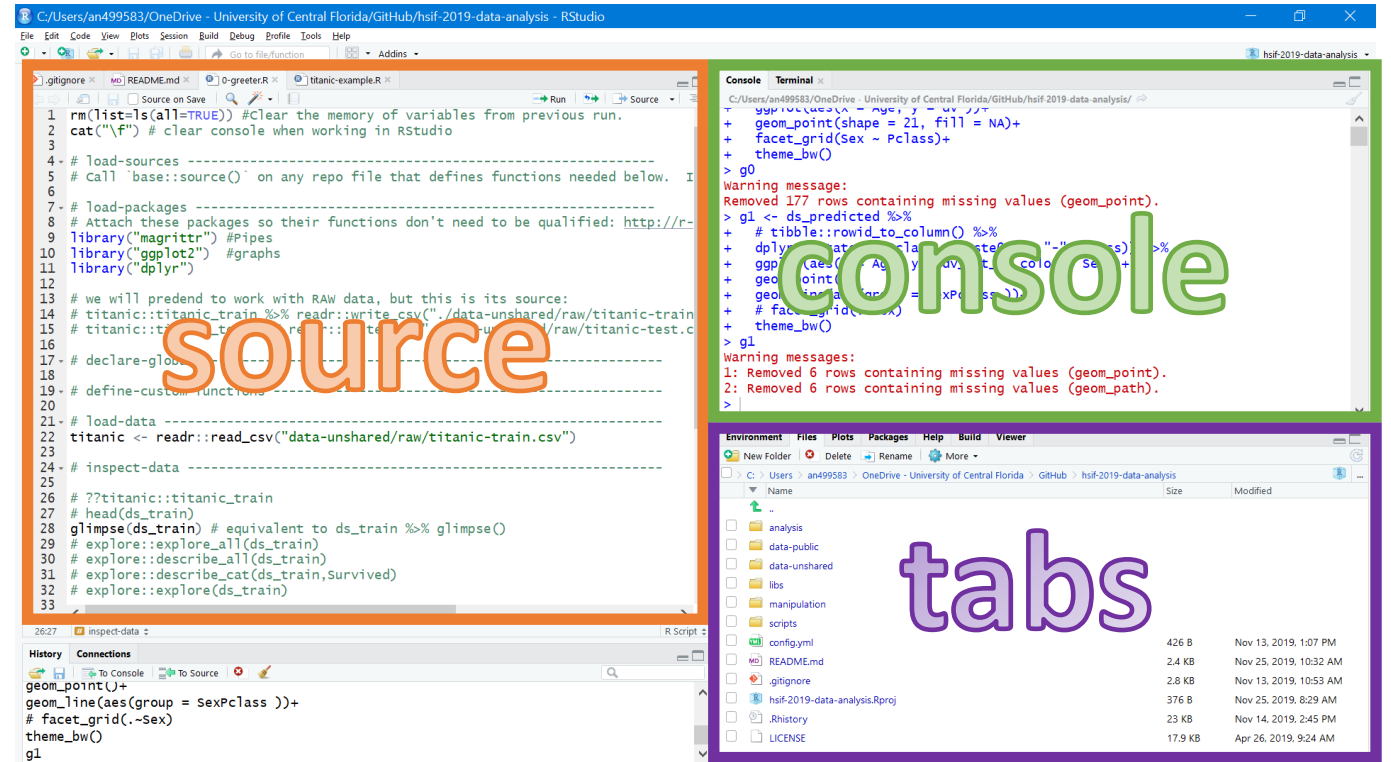


language



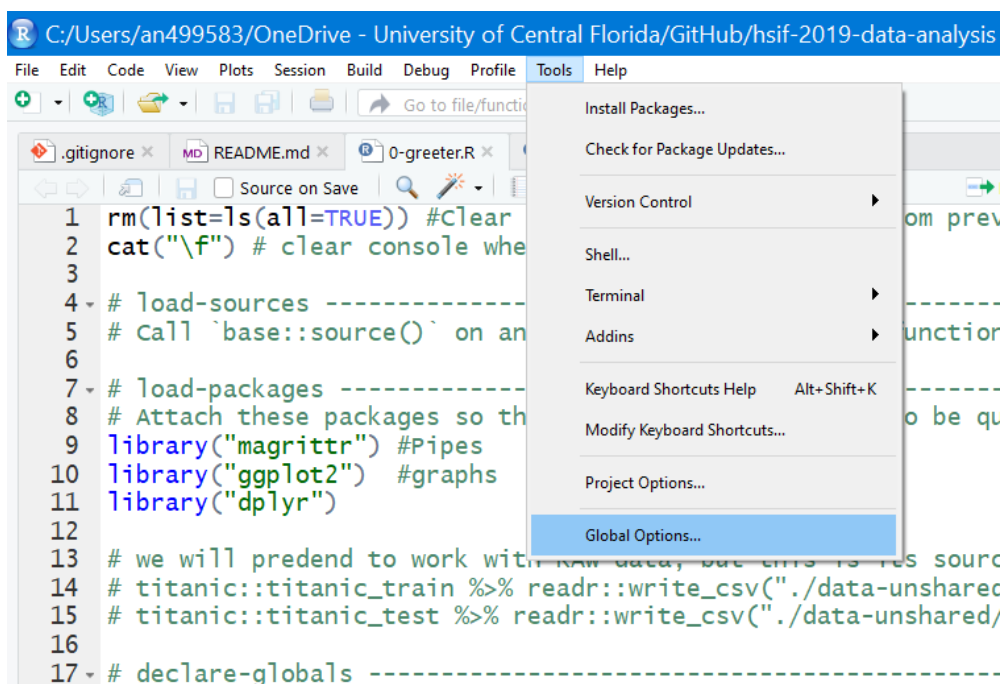
Integrated Development Environment (IDE)





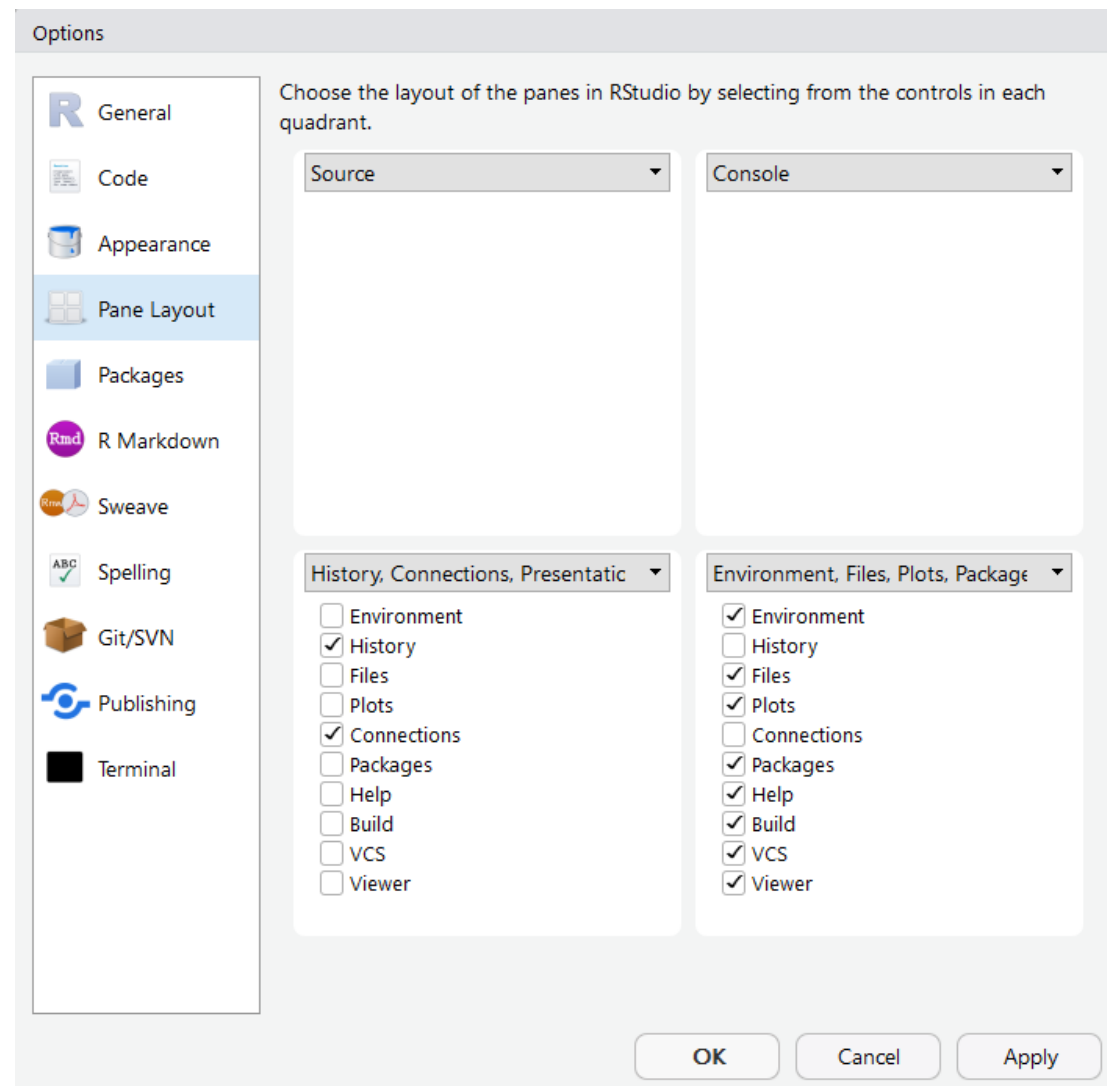
Let us begin!

Setting up RStudio: Suggested Pane Layout



The screenshot shows the RStudio application window. The 'Tools' menu is open, and 'Global Options...' is highlighted at the bottom. The background code in the editor pane is as follows:

```
1 rm(list=ls(all=TRUE)) #clear
2 cat("\f") # clear console whe
3
4 # load-sources -----
5 # call `base::source()` on an
6
7 # load-packages -----
8 # Attach these packages so th
9 library("magrittr") #Pipes
10 library("ggplot2") #graphs
11 library("dplyr")
12
13 # we will pretend to work with raw data, but this is res source
14 # titanic::titanic_train %>% readr::write_csv("./data-unshared/
15 # titanic::titanic_test %>% readr::write_csv("./data-unshared/
16
17 # declare-globals -----
```



In conclusion

Verbs we have learned today

- head()
- dplyr::glimpse()
- explore::describe_all()
- names()
- dplyr::group_by()
- dplyr::summarize()
- tolower()
- dplyr::rename()
- dplyr::mutate()
- factor()
- stats::glm()
- summary()
- predict()
- plogis()
- ggplot()
- geom_bar()
- geom_point()

<https://github.com/andkov/hsif-2019-data-analysis>

Download repository
to view all materials

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Manage topics

9 commits 2 branches 0 packages 0 releases 1 contributor GPL-2.0

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andkov Update README.md

analysis	tabula rasa	
data-public	tabula rasa	
data-unshared	tabula rasa	
libs	tabula rasa	
manipulation	tabula rasa	12 days ago
scripts	tabula rasa	12 days ago
.gitignore	tabula rasa	12 days ago
LICENSE	tabula rasa	12 days ago
README.md	Update README.md	12 days ago
config.yml	tabula rasa	12 days ago
hsif-2019-data-analysis.Rproj	tabula rasa	12 days ago

Clone with HTTPS ⓘ Use SSH

Use Git or checkout with SVN using the web URL.

<https://github.com/andkov/hsif-2019-data>

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Folder Architecture

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Managing Data Analysis in RStudio using Project-Oriented workflow

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andkov Update README.md	
analysis	tabula rasa
data-public	tabula rasa
data-unshared	tabula rasa
libs	tabula rasa
manipulation	tabula rasa
scripts	tabula rasa
.gitignore	tabula rasa
LICENSE	tabula rasa
README.md	Update README.md
config.yml	tabula rasa
hsif-2019-data-analysis.Rproj	tabula rasa

- analysis
- data-public
- data-unshared
- libs
- manipulation
- scripts

R

config.yml

✓ R hsif-2019-data-analysis

LICENSE

R README

Learning Resources

- Rmarkdown guide (<https://rmarkdown.rstudio.com/>)
- Logistic regression (Youtube: StatQuest + Logistic Regression)
- R4DS (<https://r4ds.had.co.nz/>) + swirl (<https://swirlstats.com/>)
- Introduction to ggplot2 (<http://www.cookbook-r.com/Graphs/>)

Lessons & Metaphors

- Handle your data! (Vesalius)



- Look at your data! (Tukey)



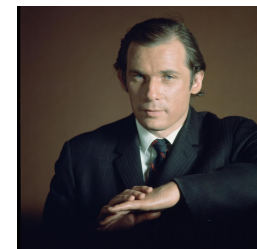
- Graph is art (Tufte)



- Graph is language (Wickham)



- Coding is music (Gould)



Questions? Comments?



Andriy Koval

<https://github.com/andkov>

<http://andriy.rbind.io>