Introduction to Data Wrangling & Visualization in R

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Slides & Code available on Github,

SCAN ⟶

Background

- Humans are collectively outputting 2.5 quintillion bytes of data every day; by 2020, each person will generate ~ 1.7 MB every second (IBM Marketing Cloud, 2017).

- At this scale, intensive longitudinal data about humans' behavior facilitates new discovery about the patterning of thought and action and potentially better prediction and optimization of health and well-being.

A Digital Biomarker Approach

- Digital biomarkers are defined as **objective, quantifiable physiological and behavioral data** that are collected and measured by means of digital devices such as portables, wearables, implantables, or digestibles.

- The data collected are typically used to explain, influence, and/or predict health-related outcomes.
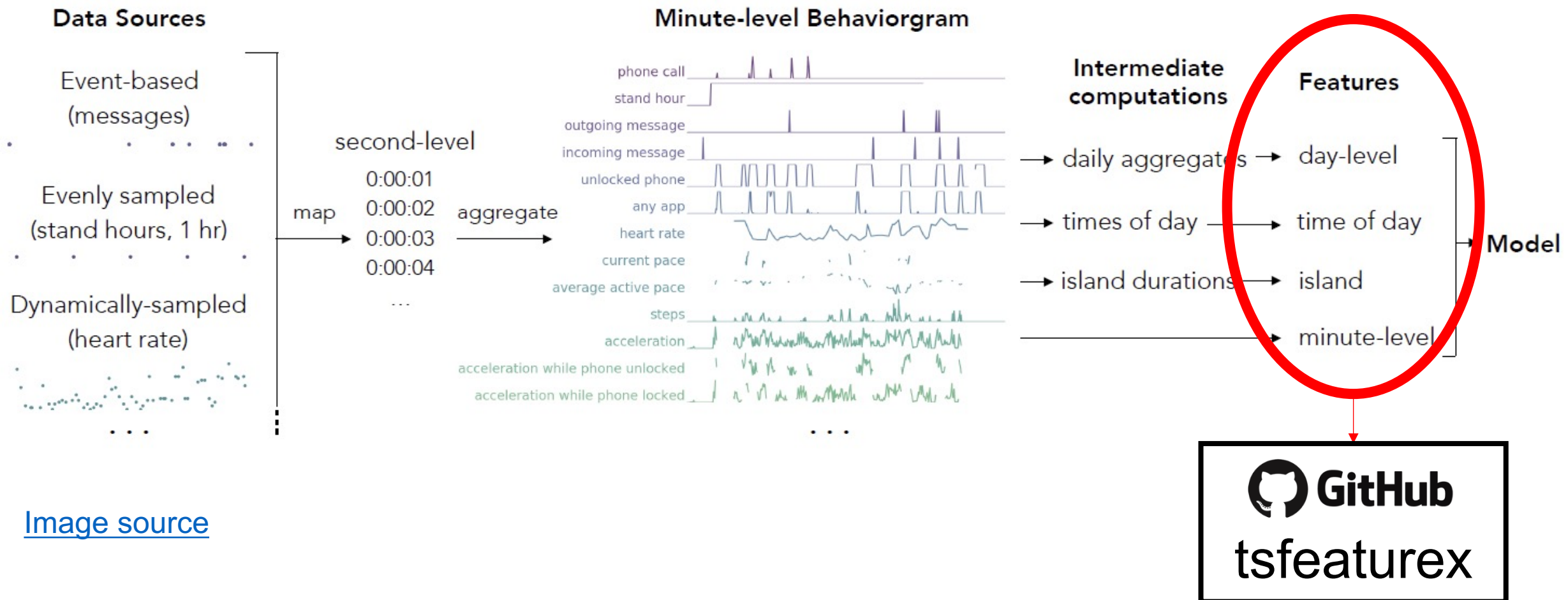
Source

A Digital Biomarker Approach: In the News

A Digital Biomarker Approach: Visualized

Image source

Symptomatic participants tended to type slower, exhibit less routine behavior, receive fewer text messages, and spend more time using helper apps than healthy controls.
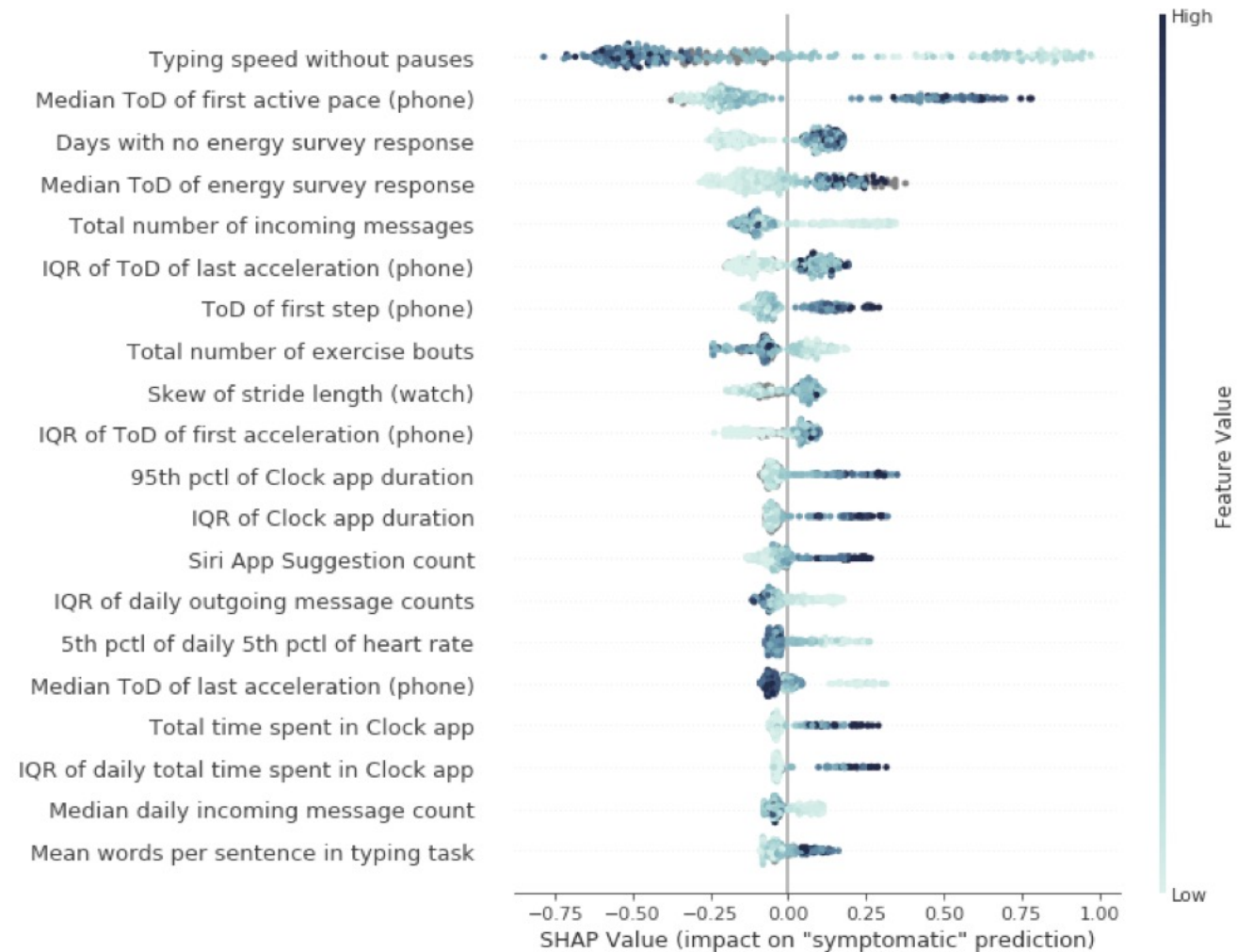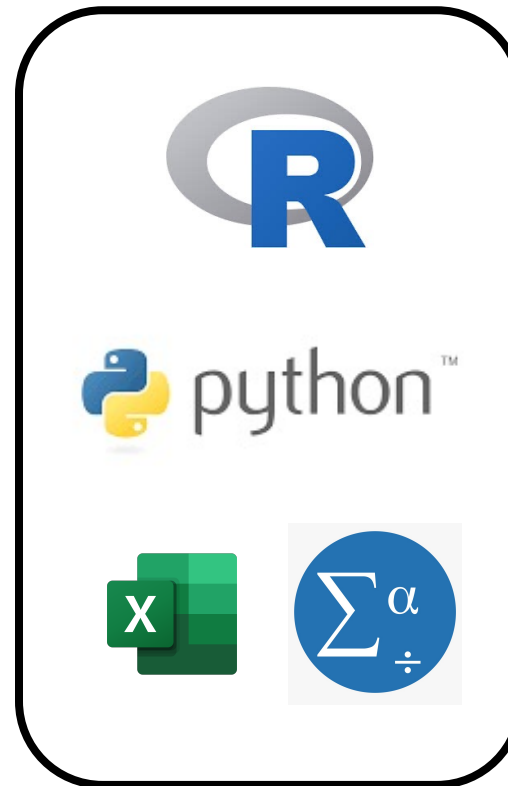
Goals for this Workshop

- Learn about data wrangling principles (e.g., tidy data)
- Import, pre-process & visualize data using R
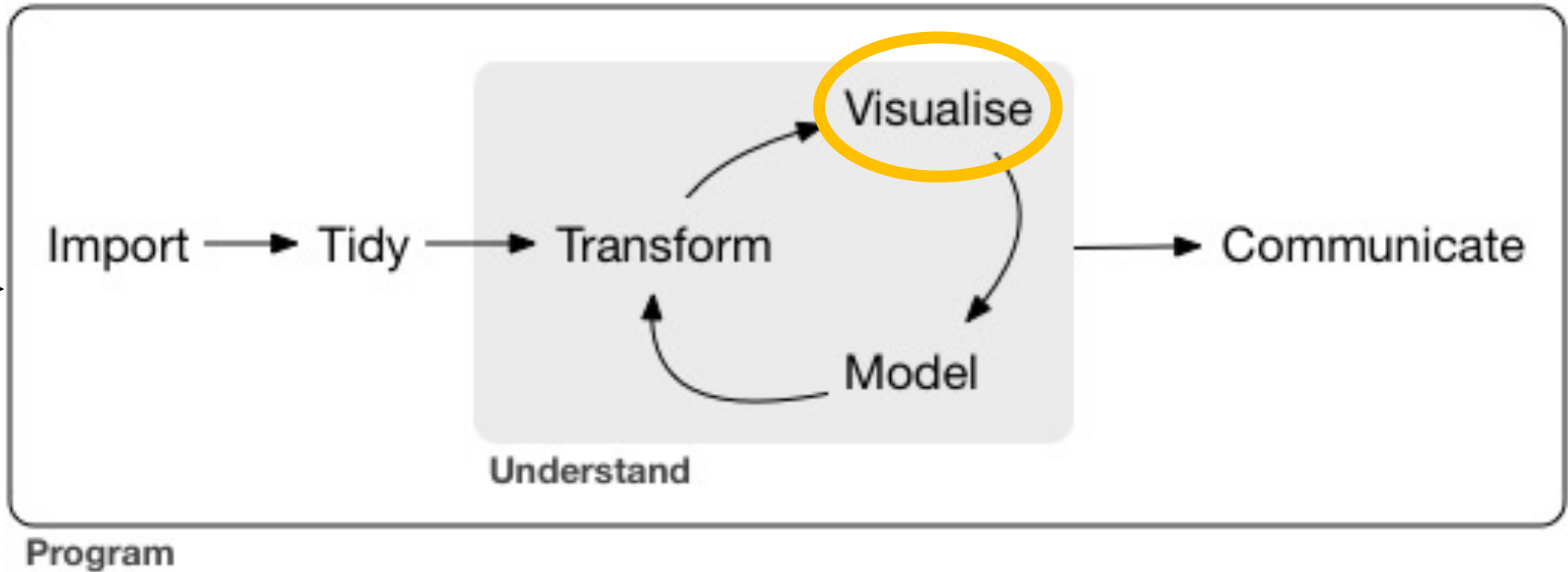- Share recommended readings, activities for continued learning

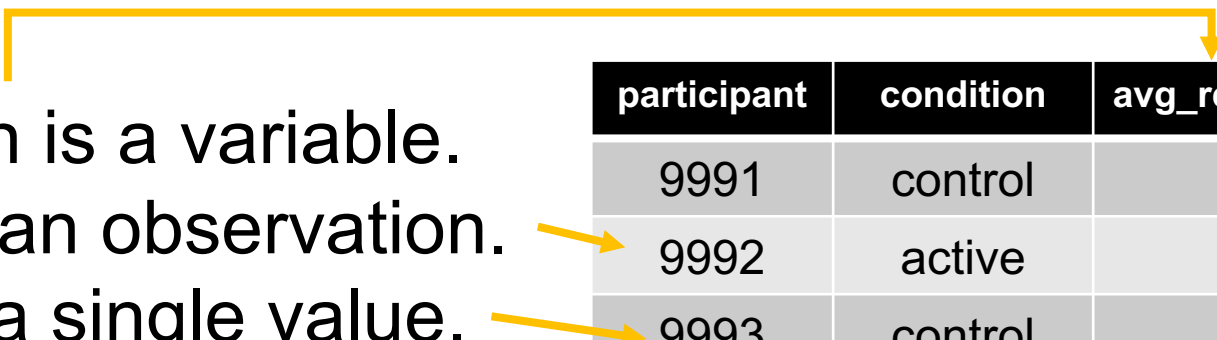# Data Lifecycle

Measurement → **Pre-processing** → **Analyses**

Typical Data Science Workflow

What is tidy data?

1. Every column is a variable.
2. Every row is an observation.
3. Every cell is a single value.

participant	condition	avg_response_time	perc_accuracy
9991	control	506	90
9992	active	516	96
9993	control	526	99

Source: R for Data Science

Uncleaned Data Problems

- In a perfect data-generating system, data are already tidy

- In practice, we must first determine
  - data structure issues, including:
    - Column headers are values, not variable names.
    - Multiple variables are stored in one column.
    - Variables are stored in both rows and columns.
    - Multiple types of observational units are stored in the same table.
    - A single observational unit is stored in multiple tables.
  - Data quality issues
    - Values out of range
    - Improperly/inconsistently coded response options
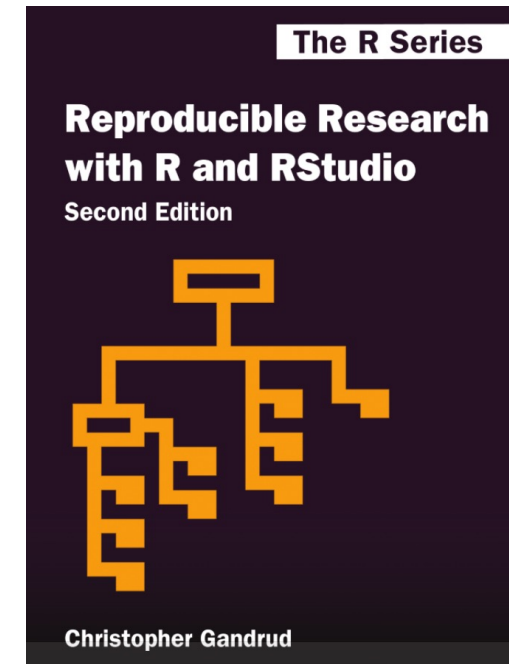   - Inconsistent records counts

Five Qualities of Great Visualizations

1. It is truthful
2. It is functional
3. It is beautiful
4. It is insightful
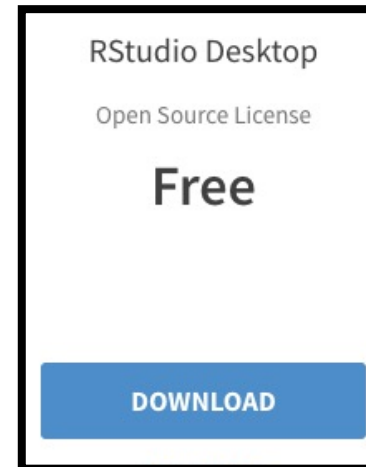5. It is enlightening
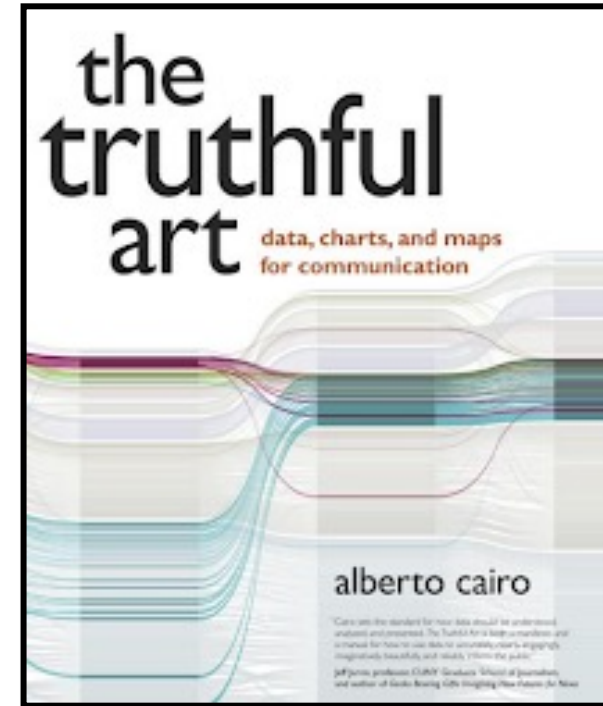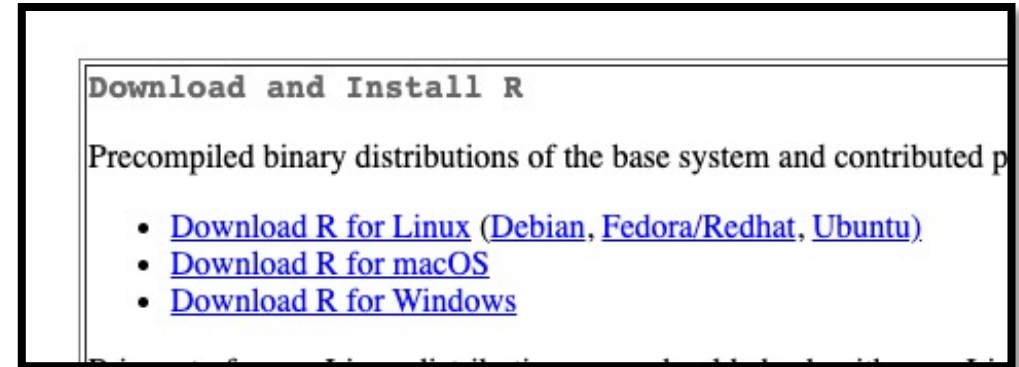
Reproducible Workflows

- Documented, code-based approach to pre-processing and analytics
  - R (RMarkdown), Python (Jupyter notebooks)

- File versioning with clear changelogs
  - Git and Github

https://monashdatafluency.github.io/r-rep-res/

Software Required for Today's Workshop

- R - https://cran.r-project.org/

- RStudio - https://www.rstudio.com/products/rstudio/download/

The Data Source: Google Mobility

Learn more about this data
https://www.google.com/covid19/mobility/data_documentation.html?hl=en
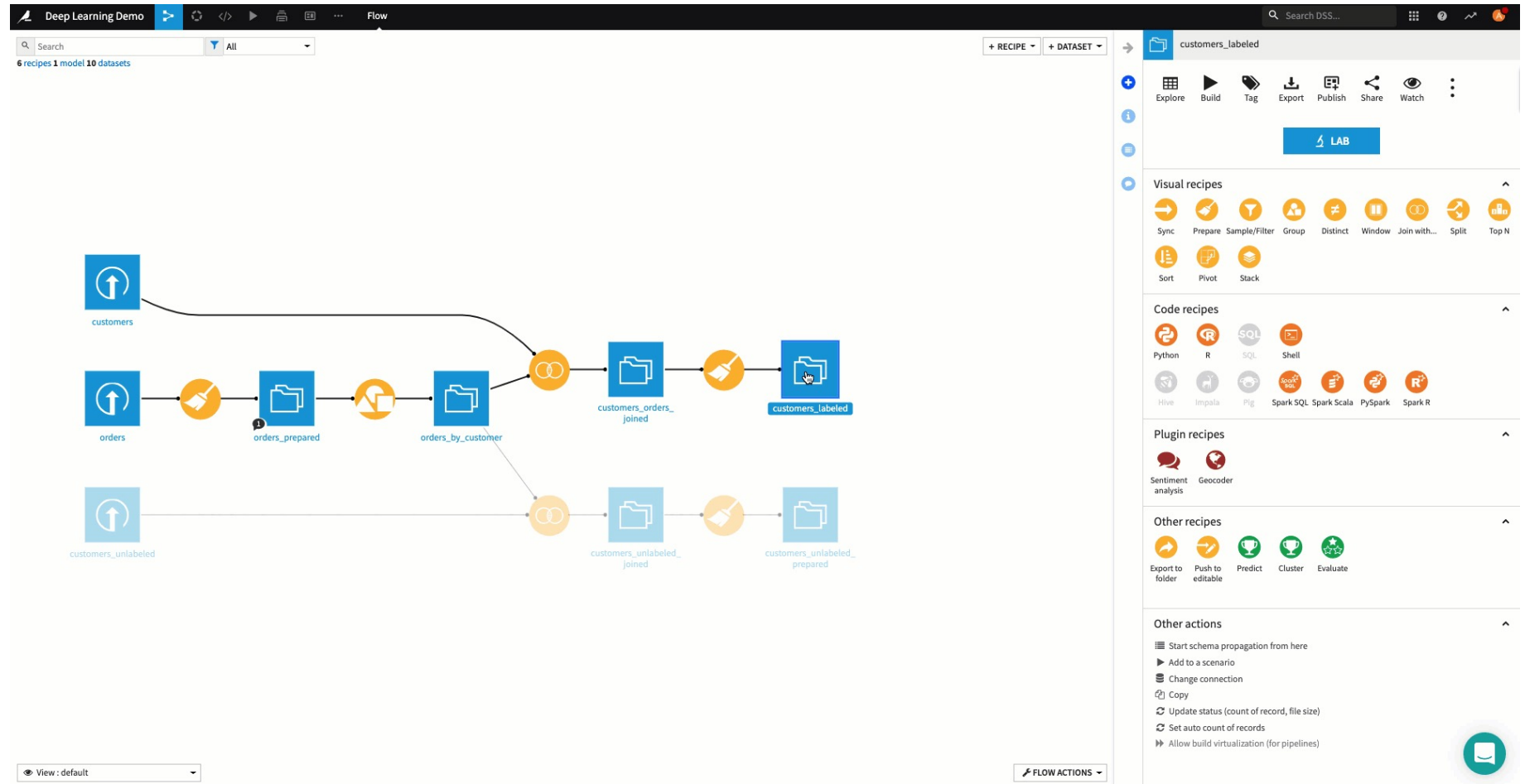
Time for a Demo!

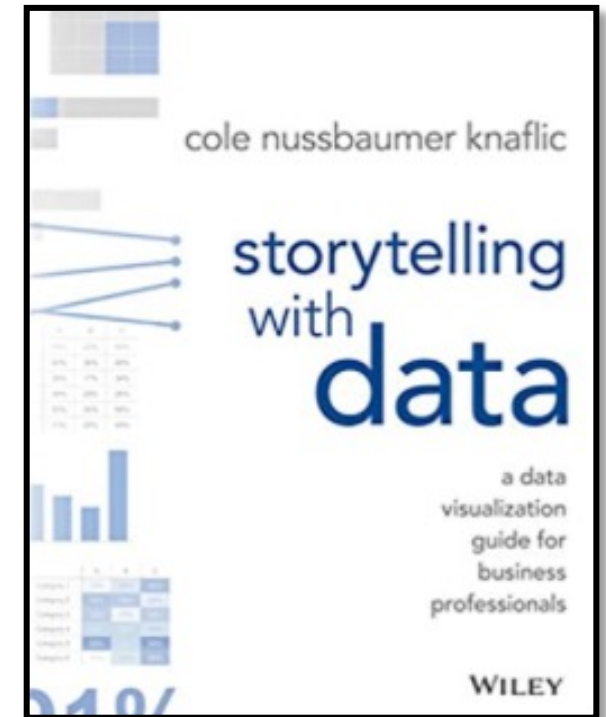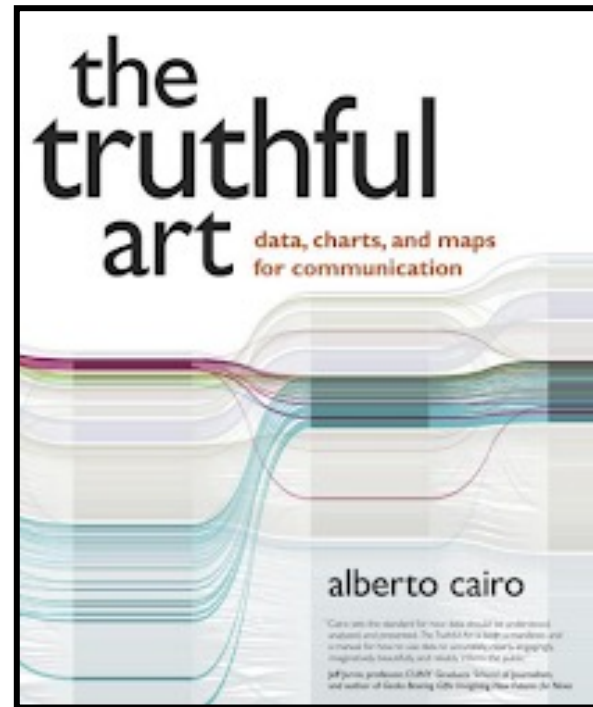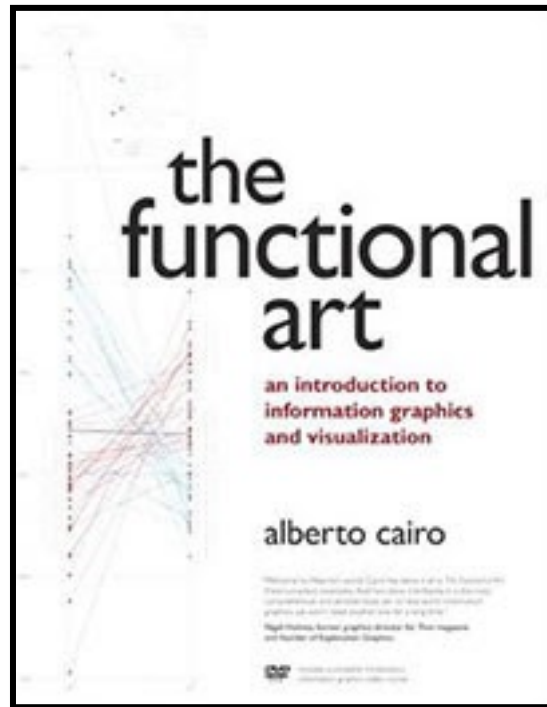Scan the QR code to view the code we will work with

The Future of Data Workflows

Seamless
integration
platforms, for
example:

Reading Recommendations

Tutorial Recommendations

- Anything by Hadley Wickham

- https://www.r-bloggers.com/

- https://www.r-statistics.com/

- https://blog.revolutionanalytics.com/

- https://r-charts.com/

- http://www.cookbook-r.com/Graphs/

- https://plotly.com/r/

Hadley Wickham
hadley

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Chief Scientist at @rstudio
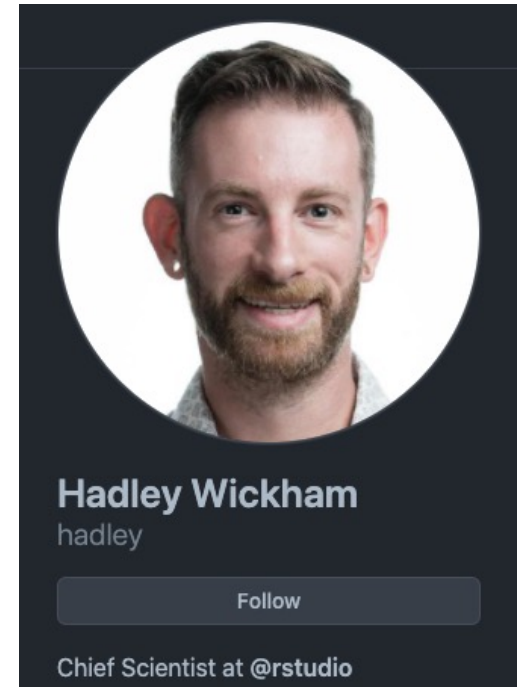
Download Cheatsheets

- Data Import
  - https://github.com/rstudio/cheatsheets/raw/master/data-import.pdf)
- Data Wrangling Cheatsheet
  - https://www.rstudio.com/wp-content/uploads/2015/02/data-wrangling-cheatsheet.pdf)
- Data Transformation with dplyr
  - https://github.com/rstudio/cheatsheets/raw/master/data-visualization.pdf)
- String Manipulation
  - https://github.com/rstudio/cheatsheets/raw/master/strings.pdf)
- Work with dates/times
  - https://github.com/rstudio/cheatsheets/raw/master/lubridate.pdf)
- R Markdown
  - https://github.com/rstudio/cheatsheets/raw/master/rmarkdown.pdf)
- More cheatsheets
  - https://www.rstudio.com/resources/cheatsheets/)

thank
you

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