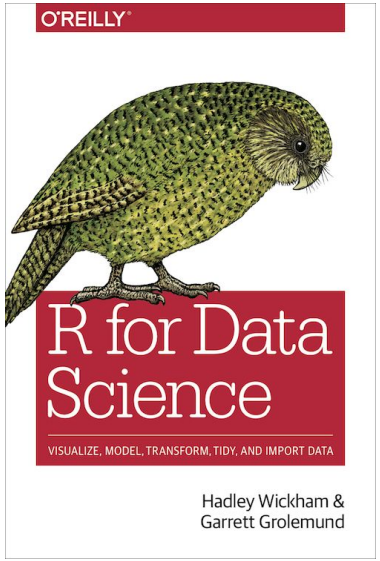
DATA TRANSFORMATION

R & dplyr

CONTENT

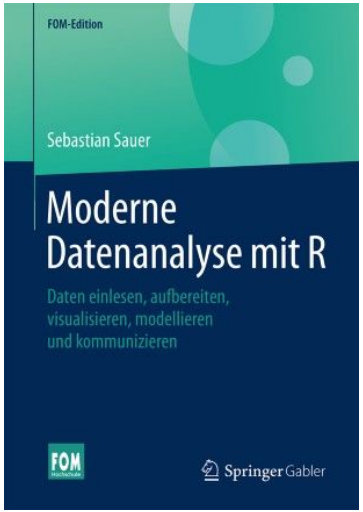
- Steps in Exploratory Data Analysis
- First Steps with R and RStudio
- Our Tool Set
- Data loading with `{readr}` / data management with `{tibble}`
- Data transformation with `{dplyr}`
  - Select columns
  - Filter rows
  - Sort rows
  - Add or change columns
  - Aggregate rows
- Exercise

RECOMMENDED LITERATURE



Wickham, Hadley, and Garrett Grolemund. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data. 2nd edition, O'Reilly, 2023. Online verfügbar: https://r4ds.hadley.nz/

→ Chapter 4 in the online version

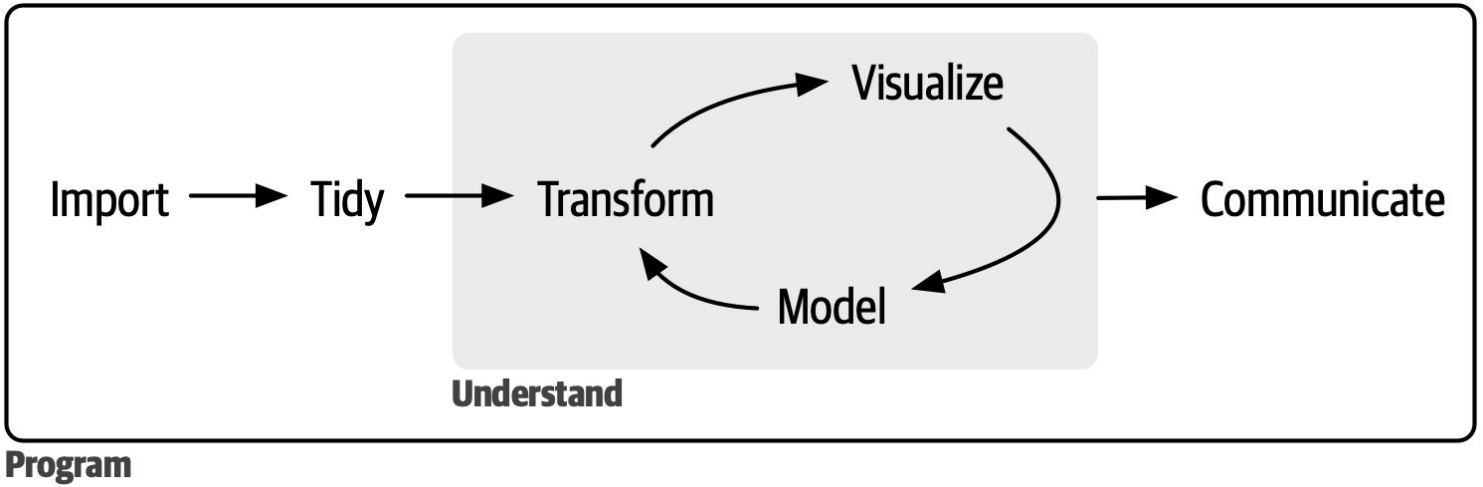


Sauer, Sebastian. Moderne Datenanalyse mit R. Springer Gabler, 2019.

→ Chapter 7

STEPS IN EXPLORATORY DATA ANALYSIS

STEPS IN EXPLORATORY DATA ANALYSIS



Source: Wickham, Hadley, and Garrett Grolemund. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data. First edition, O'Reilly, 2016. URL: https://r4ds.hadley.nz/diagrams/data-science/base.png

FIRST STEPS WITH R & RStudio

FIRST STEPS WITH R AND RSTUDIO

DESKTOP OR CLOUD

Download, Installation R and RStudio

alternatively

Registration and Login RStudio Cloud

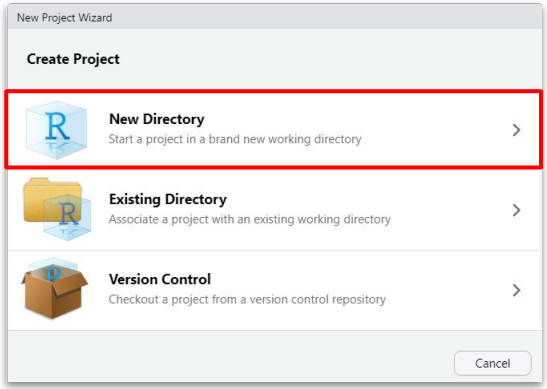
Walkthrough RStudio

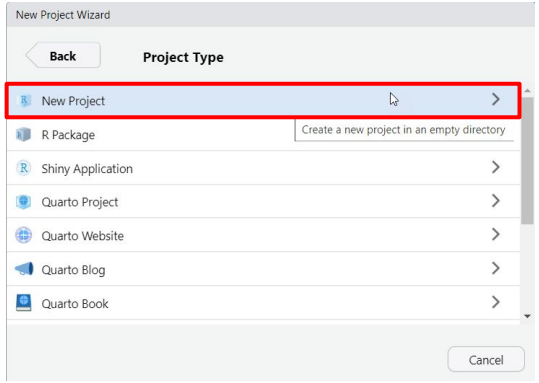
- Console and script editor
- Installing packages
- Projects
- Environment
- Previews
- Getting Help

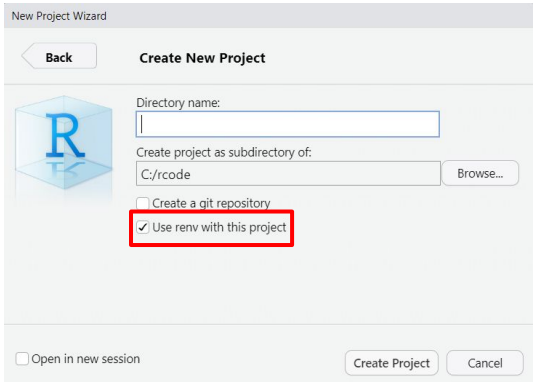
CREATE A NEW PROJECT

All code examples for this course are hosted publicly on GitHub

- File → New Project → New Directory
- Choose a location on your computer and enter the name for the new directory
- Check “Use renv with this project”



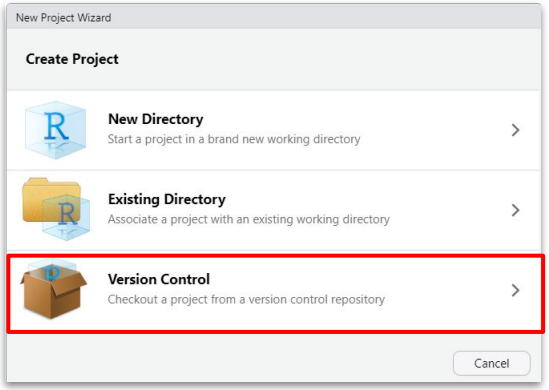


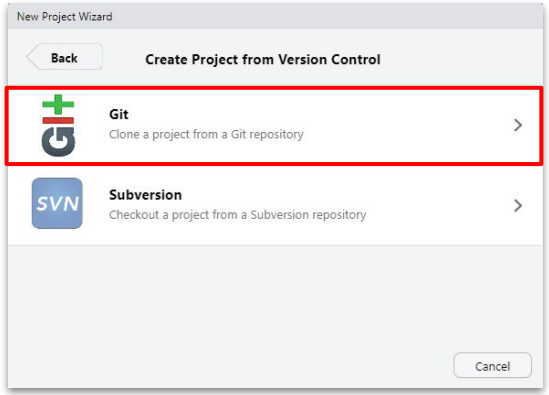


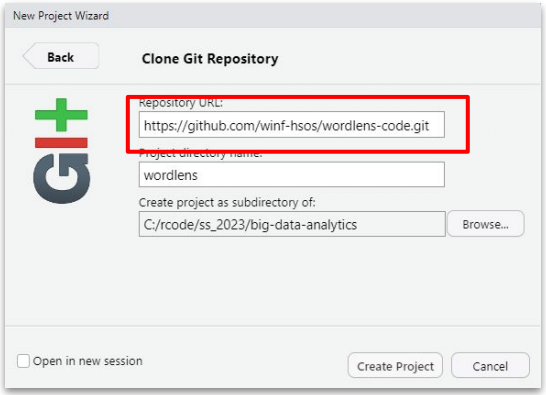
All code examples for this course are hosted publicly on GitHub

- File → New Project → Version Control → Git
- Paste the repository's URL and choose a location on your computer:

  `https://github.com/winf-hsos/<name_of_repo>.git`





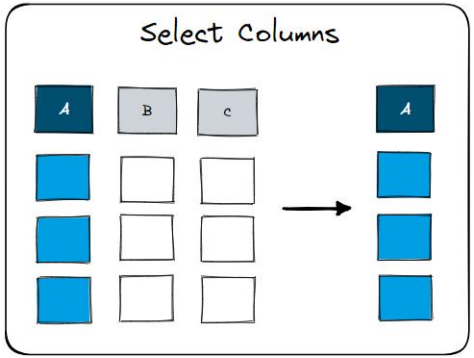


OUR TOOLSET

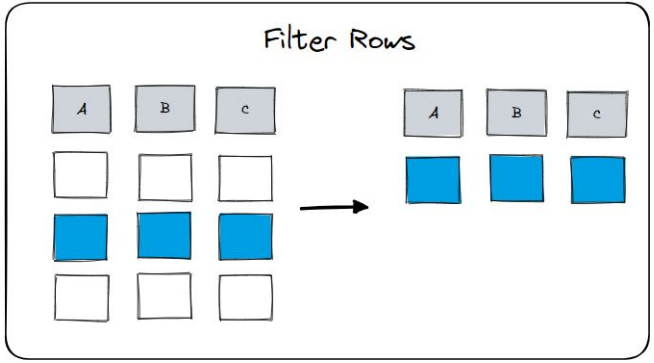
OUR TOOLSET

- Data loading, e.g., with `{readr}` or `{readxl}`
- Data management with `{tibble}`
- Data transformation with `{dplyr}`
  - `select()`
  - `filter()`
  - `arrange()`
  - `mutate()` / `transmute()`
  - `summarise()` / `group_by()`
- Data visualization with `{ggplot2}`
- Working Environment(s)
  - R & Python
  - RStudio
  - Databricks *(for Big Data)*

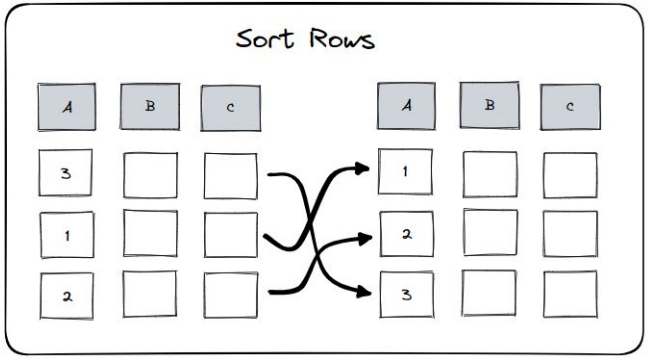
select

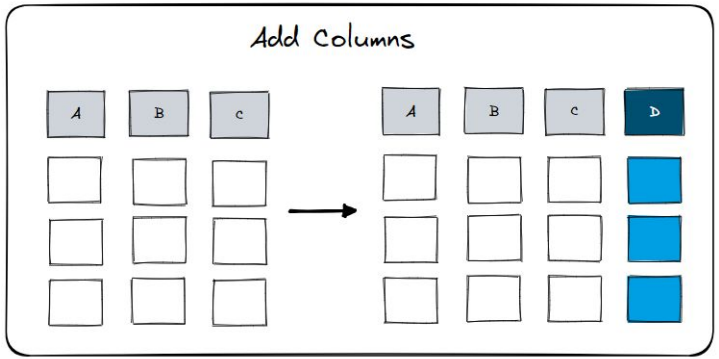


filter

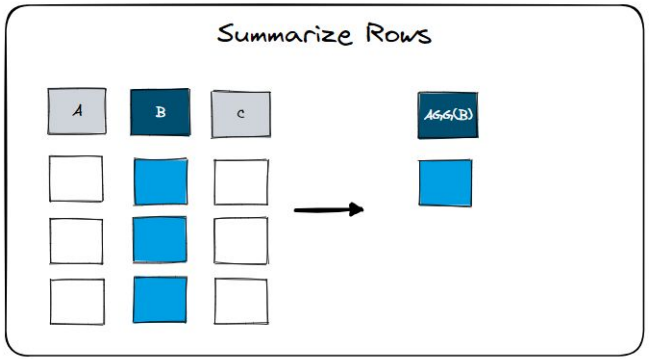


arrange





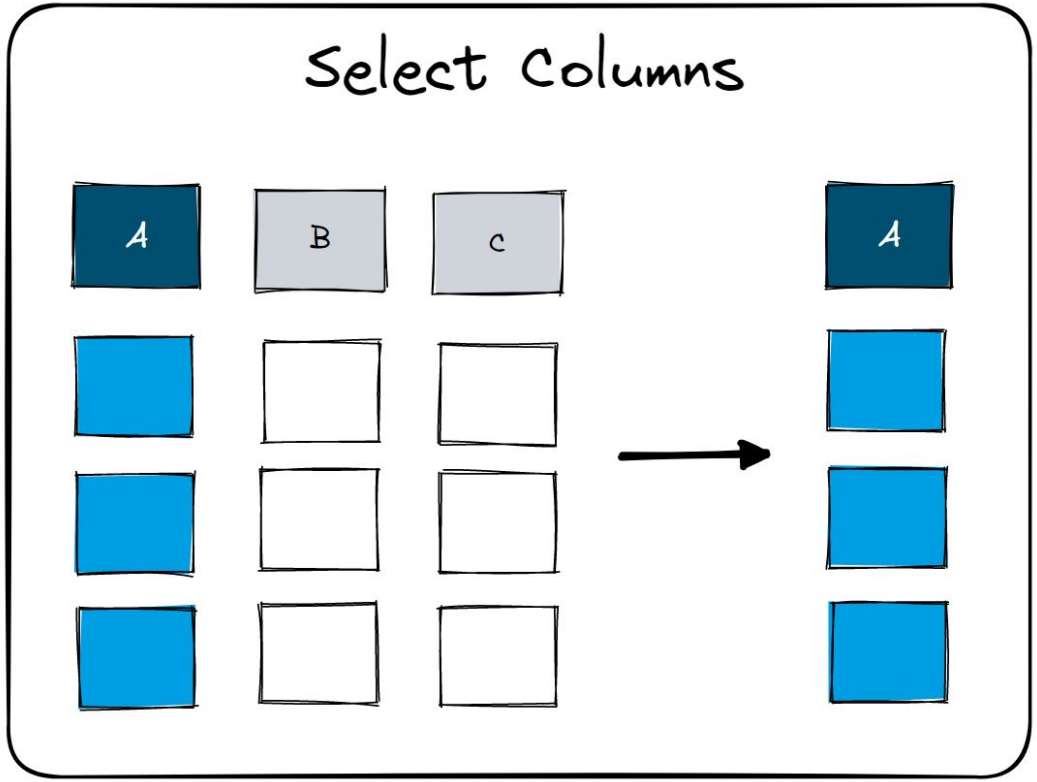
mutate
transmute



group_by
summarize

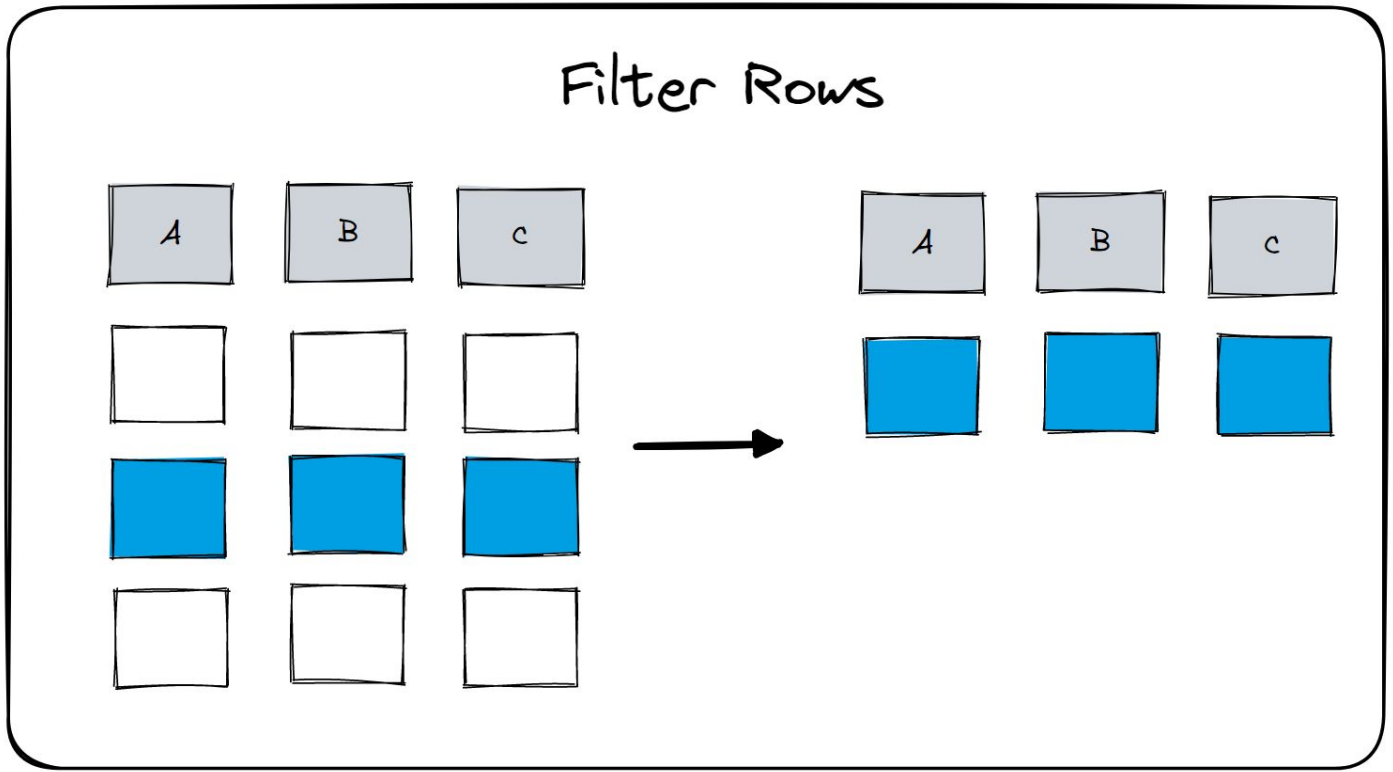
SELECT

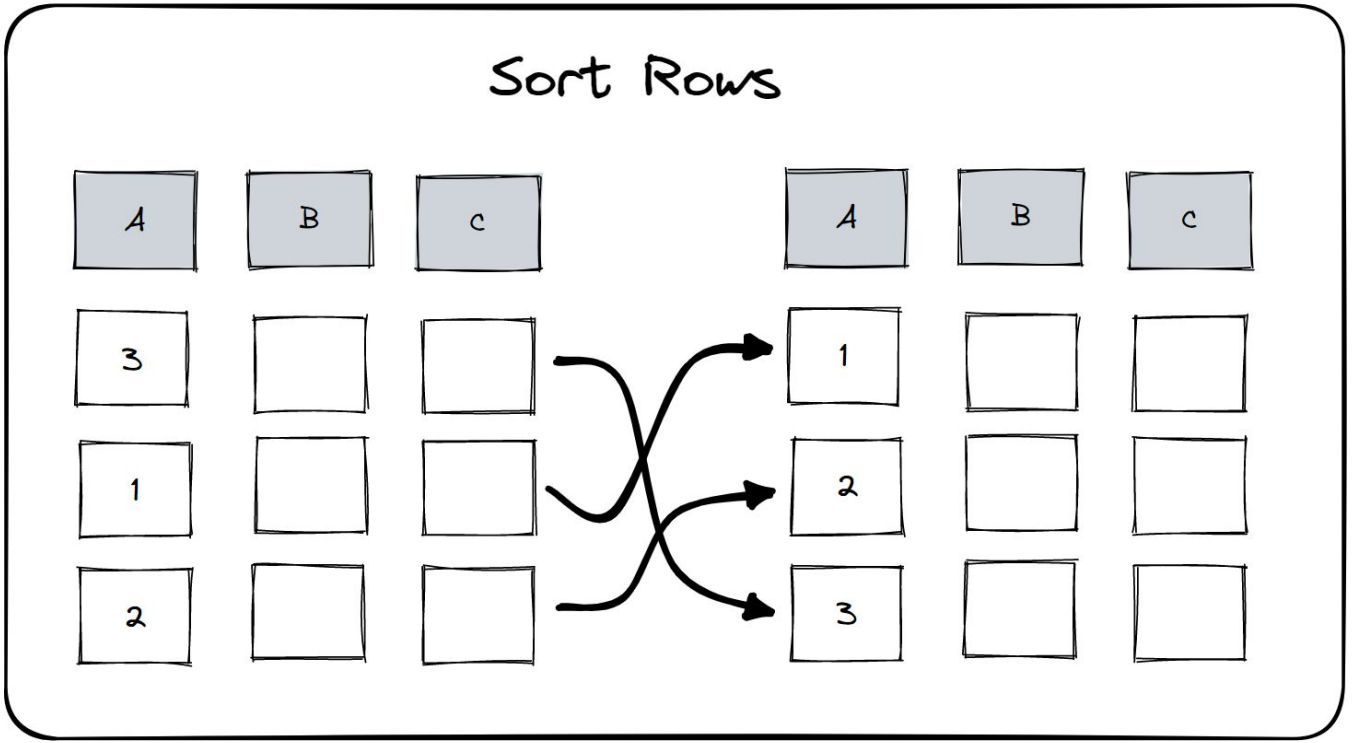
REDUCING COLUMNS



FILTER

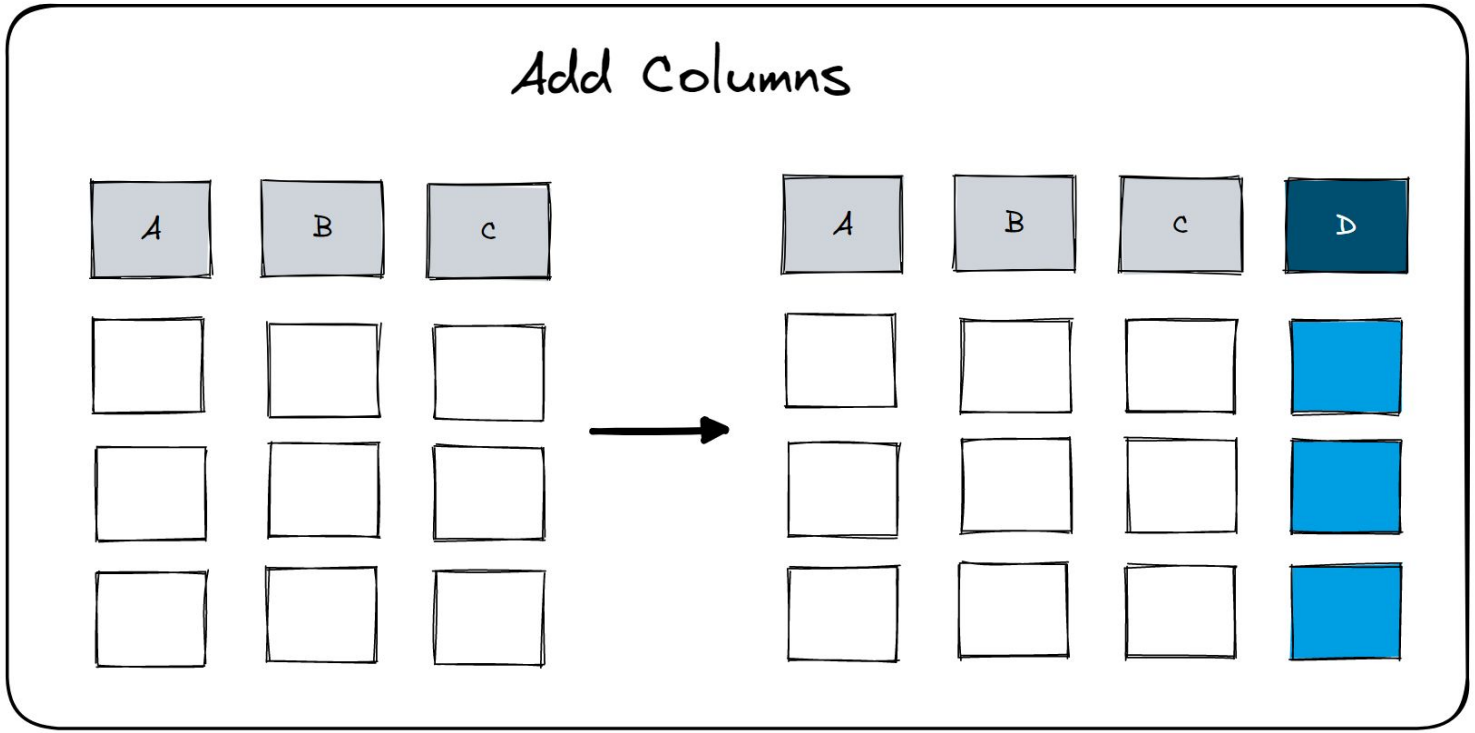
REDUCING ROWS

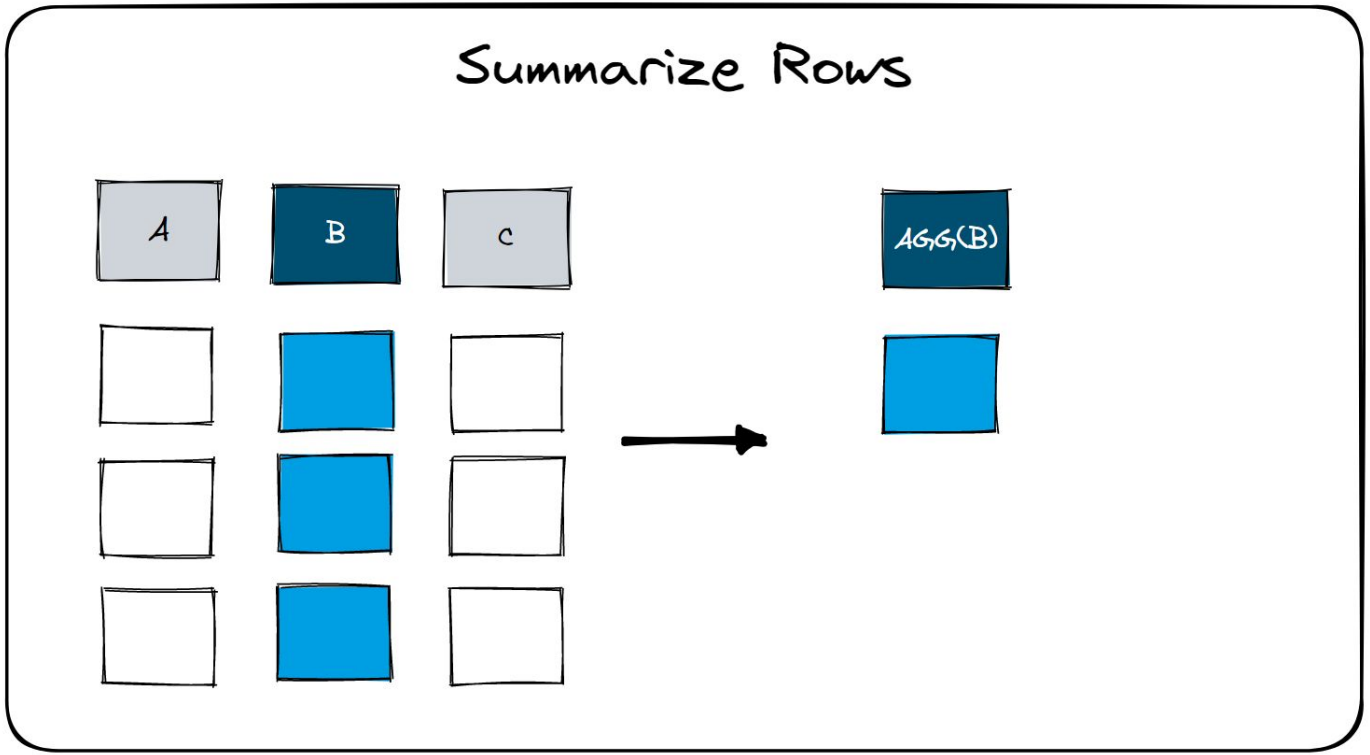



Sort Rows
A
B
C
3
1
2
A
B
C
1
2
3

MUTATE

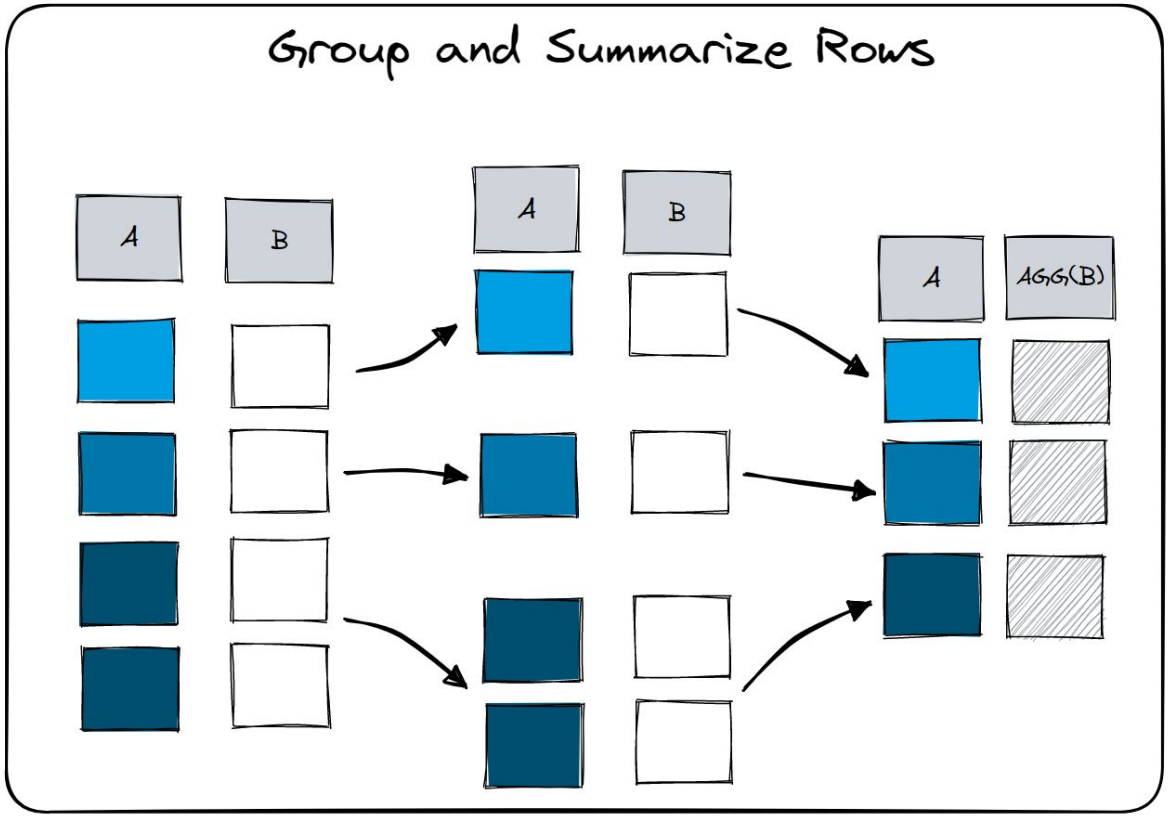
ADD NEW COLUMNS




Summarize Rows
A
B
C
AGG(B)

GROUP & SUMMARIZE

GROUP BY VARIABLE AND SUMMARIZE



DATA LOADING

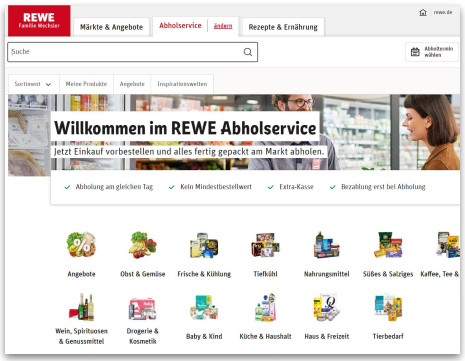
{readr}

DATA LOADING
EXERCISE DATA

- Data loading with `{readr}` and `{readxl}` (Excel, CSV), `{jsonlite}` (JSON), or `readRDS` (R-format)
- `{janitor}` and `clean_names` for better column names
- Introductory data sets:

Campusbier Sales Orders (CSV)

REWE Online Products (CSV)



Politician's Tweets (JSON / RDS)

DATA MANAGEMENT

{tibble}

- Manage data with data frames and `{tibble}`
- Tibbles as modern data frames
  - Better printing
  - No string conversion into factors
  - No `rownames`
  - Original column names are kept when loading a tibble
  - Lazy processing

Tibbles or data frames? Both are like tables in a spreadsheet... just in R

DATA TRANSFORMATION

{dplyr}

DATA TRANSFORMATION

SELECT COLUMNS

- Select specific columns with `{dplyr}`
  - `select`
    - By name
    - By name pattern (`starts_with`, `ends_with`, `contains`)
    - By position or index (`last_col`)
    - By set (`all_of`, `any_of`)
    - By data type (`where(is.numeric)`)
    - White vs. blacklist (`!`)

- Reduce rows with `{dplyr}`
  - `filter`
    - Simple filter conditions (`==`, `!=`, `<`, `>`)
    - Multiple conditions (`&`, `|`, `!`, `xor`)
    - Set operators (`%in%`)
    - Missing values (`NA`, `is.na`)
    - Simple text searches (`str_detect`)

- Sort results with `{dplyr}`
  - `arrange`
    - Ascending order by one or more columns
    - Descending order (`desc` or `-`)

DATA TRANSFORMATION

ADD OR CHANGE COLUMNS

- Add new calculated columns with `{dplyr}`
  - `mutate`
    - Add new calculated columns (`+`, `-`, `/`, `*`, `%%`, `^`, `paste0`)
    - Vectorized calculations (`mean`, `sum`, `max`, `min`, `lag`, `lead`)
    - Keep only used columns (`.keep = "used"`)
    - Determine position of new columns with `.before` and `.after`
  - `transmute`
    - Add new columns and remove all others (sometimes what we want)

- Summarize data with `{dplyr}`
  - `count, tally, distinct` for quick aggregations
  - `summarize`
    - Aggregate data using functions (`mean`, `median`, `quantile`, `sd`, `IQR`, `mad`, `sum`, `max`, `min`, `n`, `n_distinct, first, nth, last`)
  - `group_by`
    - Create groups by which to aggregate
  - The `janitor` package with `tabyl` for quick percentages and cross-tables

EXERCISE

CAMPUSBIER SALES ORDERS

AD-HOC EXERCISE

You are new as a managing director in the Campusbier project and are supposed to get a first impression of the business. All you have are two datasets: `orders.csv` and `line_items.csv`.

- How do you approach this unknown dataset?
- With a partner, come up with at least 3 questions you want to ask the data! Look at the available columns for this!
- Create R commands to answer the questions (without visualization yet)!