Introduction to R, Rmarkdown, and the Tidyverse

2020-07-08

R and the Tidyverse

R Programming Language

- Open-source scripting language developed for statistical analysis
- Was originally known as S
  - S was developed in 1975
  - S was reimplemented as R in 1993
- Heavily used in bioinformatics, with our own archive Bioconductor, for biology-related packages

The Tidyverse

"The tidyverse is an opinionated collection of R packages designed for data science. All packages share an underlying design philosophy, grammar, and data structures."

- Keep everything simple
  - Use **existing** data structures instead of custom, aka, use tidy data
  - Functions should do one thing well
- Glue the simple things together; simple things put together are more powerful than one complex thing
- Design for humans

R Studio®

Rmarkdown

What is markdown (and Rmarkdown)?

- Markdown is just text, with a few optional symbols that allows a markdown interpreter to make it look good. Goal is to have something that still is human readable even without the interpreter.
- Rmarkdown is markdown for R
  - All the features of markdown, with extras
  - Intention is to make documenting data analysis easy
  - Execute code in Rmarkdown files (cannot do this in markdown)
  - Can also knit Rmarkdown files into other files
    - html, pdf, or Microsoft word reports
    - Can make websites and slides with Rmarkdown

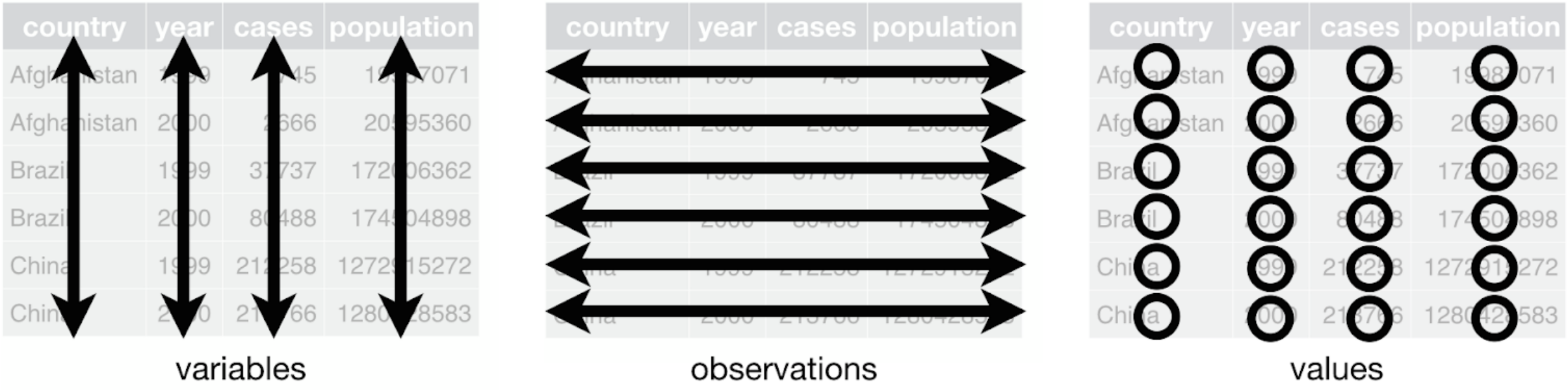
Why use markdown and Rmarkdown?

Bioinformatics is mostly on a Linux machine using the command line terminal. The rest of the universe uses Macs or PCs.

- **This causes a bunch of problems**
  - operating systems don't talk to each other easily
  - files are in proprietary formats (no Microsoft anything on Linux)
  - files are not readable in plain text (and terminal needs them to be!)
- **Markdown solves all the problems**
  - Simple
  - readable by every machine in both GUI and terminal AND humans
  - allows some simple formatting to increase human readability

Data wrangling and `dplyr`

Tidy Data

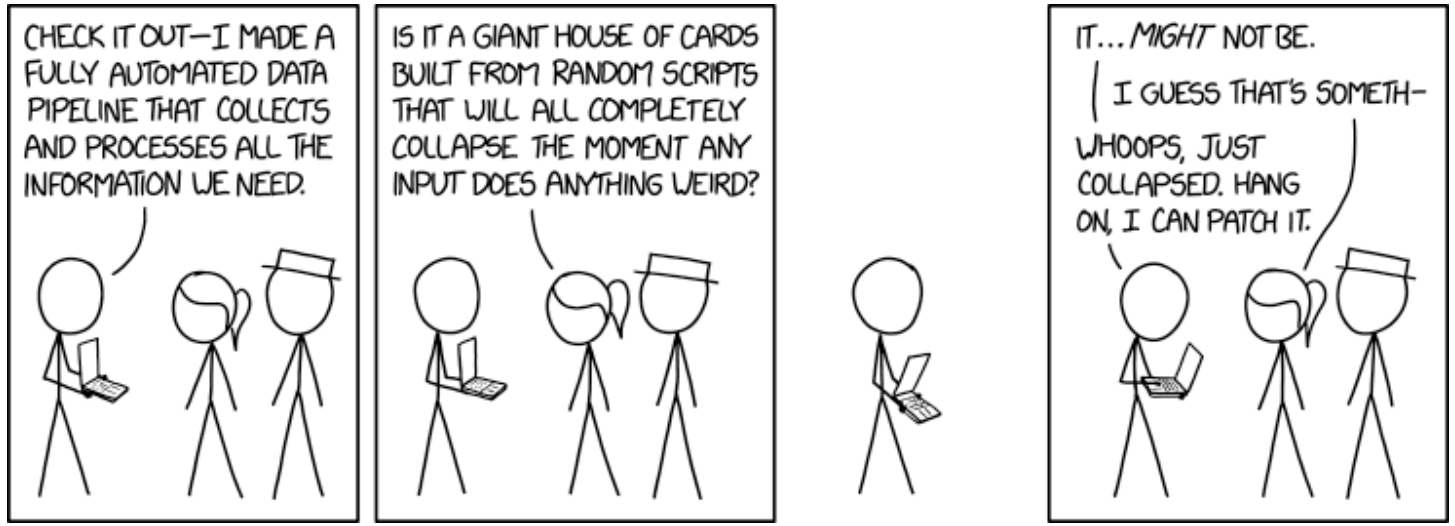


1. Each variable is in a column.
2. Each observation is a row.
3. Each value is a cell.

Data Wrangling

data wrangling – organizing your data into the form you want

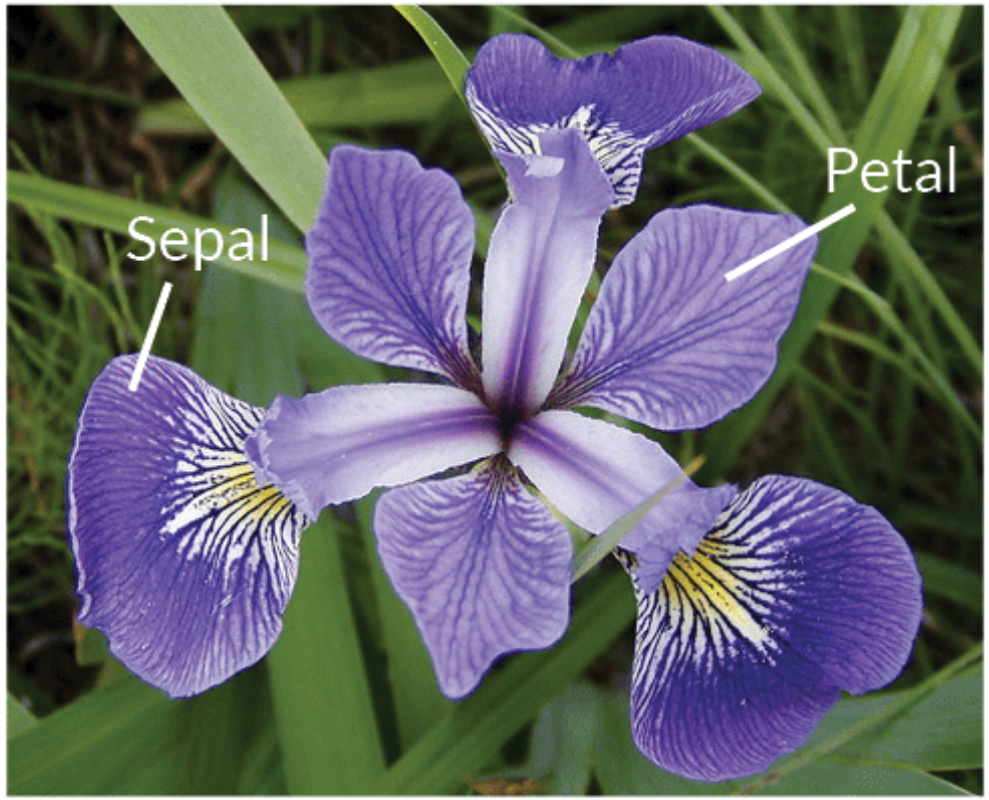
- Everyone spends most of their time on wrangling ! It's hard!
- The tidyverse makes it much easier though; that's it's primary purpose



dplyr

- mutate() adds new variables that are functions of existing variables
- select() picks variables based on their names.
- filter() picks cases based on their values.
- summarise() reduces multiple values down to a single summary.
- arrange() changes the ordering of the rows.
- You also need to know group_by() which allows you do any function by group.

The Data



Iris Versicolor

Iris Setosa

Iris Virginica

DEMO WITH RStudio

Resources

- R https://www.r-project.org/
- Bioconductor https://www.bioconductor.org/
- Tidyverse https://www.tidyverse.org/packages/