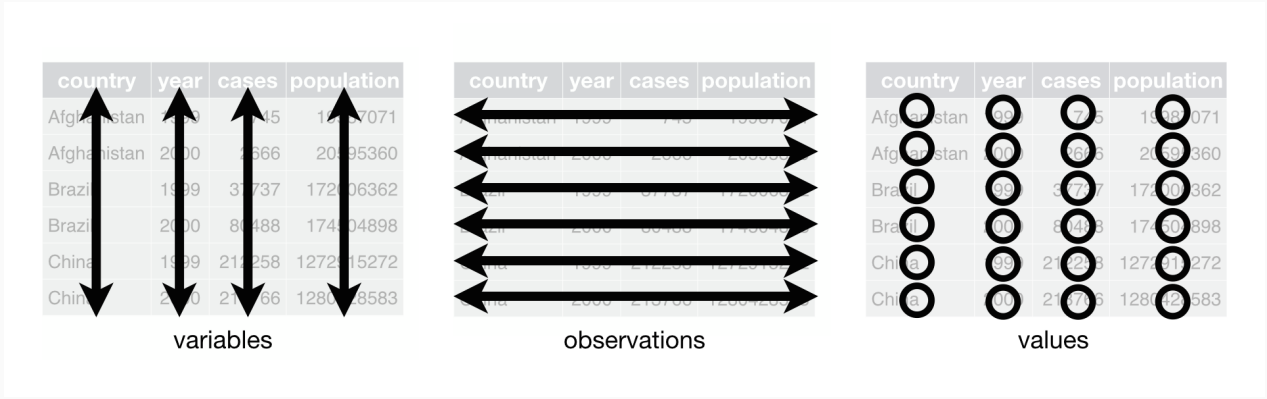
Online CDS 101 *Introduction to Computational and Data Sciences*

Data reshaping

Principles of tidy data

Principles



1. *Each variable must have its own column.*
2. *Each observation (case) must have its own row.*
3. *Each value must have its own cell.*

Source: Figure 12.1 in *R for Data Science* by Garrett Grolemund and Hadley Wickham.

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> 1. *There's a general advantage to picking one consistent way of storing data. If you have a consistent data structure, it's easier to learn the tools that work with it because they have an underlying uniformity.*
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> 2. *There's a specific advantage to placing variables in columns because it allows R's vectorised nature to shine. As you learned in mutate and summary functions, most built-in R functions work with vectors of values. That makes transforming tidy data feel particularly natural.*

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The "vectorized" tools of the tidyverse are both faster and easier to understand!

Why should we care?

- There's a theoretical foundation to this, actually
- Closely related to the formalism of *relational databases*
- If you follow these rules, your data will be in Codd's 3rd normal form (https://en.wikipedia.org/wiki/Third_normal_form)
- Helpful if you are working with a large or complex enough dataset that you need to store in a formal database, such as SQL databases (Postgresql, Mysql)

Why should we care?

- Practically speaking, the tidying process makes the categories in your data more clear
- It makes analysis much easier too, because you can easily subdivide your data by category, and apply transformations where needed
- Provides a standardized, "best practices" way to structure and store our datasets
    - Note that you may not collect or input your data straight into tidy format

Tidying ≠ Cleaning

- Data tidying does **not** encompass the entire data cleaning process
- Data tidying only refers to reshaping things, such as moving columns and rows around
- Data cleaning is a separate topic:
  - Extracting data from an unstructured source
  - Correcting spelling errors
  - Renaming variables
  - Imputing missing data
  - Validation
  - And the list goes on!

The `tidyr` package

- Functions (commands) that allow you to reshape data
- Oriented towards the kinds of datasets we've worked with previously, each column may be a different data type (numeric, string, logical, etc)
- Functions (commands) are typed in a way that's very similar to the `dplyr` *verbs*, such as `filter` and `mutate`
- `tidyr` verbs
  - `gather`: transforms wide data to narrow data
  - `spread`: transforms narrow data to wide data
  - `separate`: make multiple columns out of a single column
  - `unite`: make a single column out of multiple columns

Credits

License

Acknowledgments

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