Intro to the Tidyverse: A Collection of R Packages

Amit Talapatra

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

Setup

1. Download and Install R: https://www.r-project.org/
2. Download and Install RStudio: https://rstudio.com/
3. Run these lines in RStudio to install the packages we'll be using:

```
install.packages("unvotes")
install.packages("WDI")
install.packages("tidyverse")
install.packages("ggraph")
install.packages("igraph")
install.packages("tidygraph")
install.packages("widyr")
```

4. Download this Rmarkdown file: https://github.com/atalapatra/Intro-to-the-Tidyverse/blob/master/Intro%20to%20the%20Tidyverse.Rmd

Tidyverse Resources

- Tidyverse Website
- David Robinson's 'Teach the Tidyverse to Beginners'
  - I attended David's workshop at the DC R 2019 Conference. I'll be using some of his materials and examples for this talk.
- Hadley Wickam's Paper "Tidy Data"
  - This paper explains the founding principles on Tidy Data. Hadley Wickam is the primary developer of packages in the Tidyverse.

https://twitter.com/W_R_Chase/status/1155215530997035014

What is 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."*
>
> - From https://www.tidyverse.org/

The tidyverse is based on the concept of "Tidy Data", which follows these principles:

1. Each variable forms a column.
2. Each observation forms a row.
3. Each type of observational unit forms a table.

This is a version of Codd's Third Normal Form

https://en.wikipedia.org/wiki/Third_normal_form#Definition_of_third_normal_form
https://codeblab.com/wp-content/uploads/2009/12/rmdb-codd.pdf

What does tidy data look like?

Here are some examples of transformations that make data tidy.

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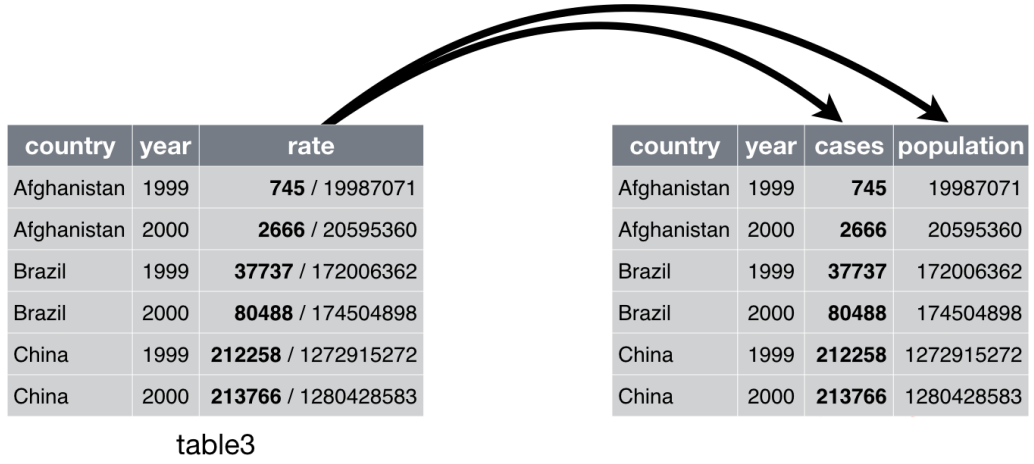

country	year	rate
Afghanistan	1999	**745** / 19987071
Afghanistan	2000	**2666** / 20595360
Brazil	1999	**37737** / 172006362
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country	year	cases	population
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table3

country	year	cases
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country	1999	2000
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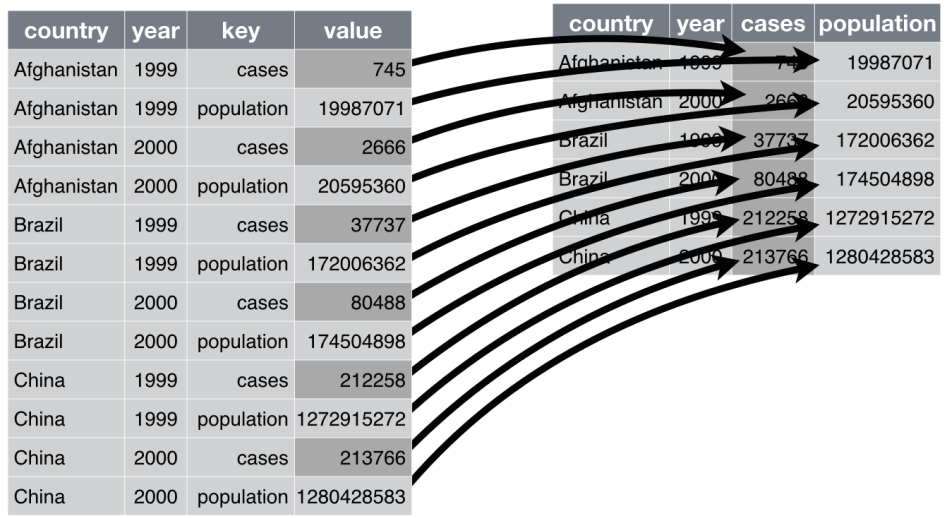
table4



country	year	key	value
Afghanistan	1999	cases	745
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table2

https://r4ds.had.co.nz/tidy-data.html

Why learn about the Tidyverse?

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https://twitter.com/rstatsmemes

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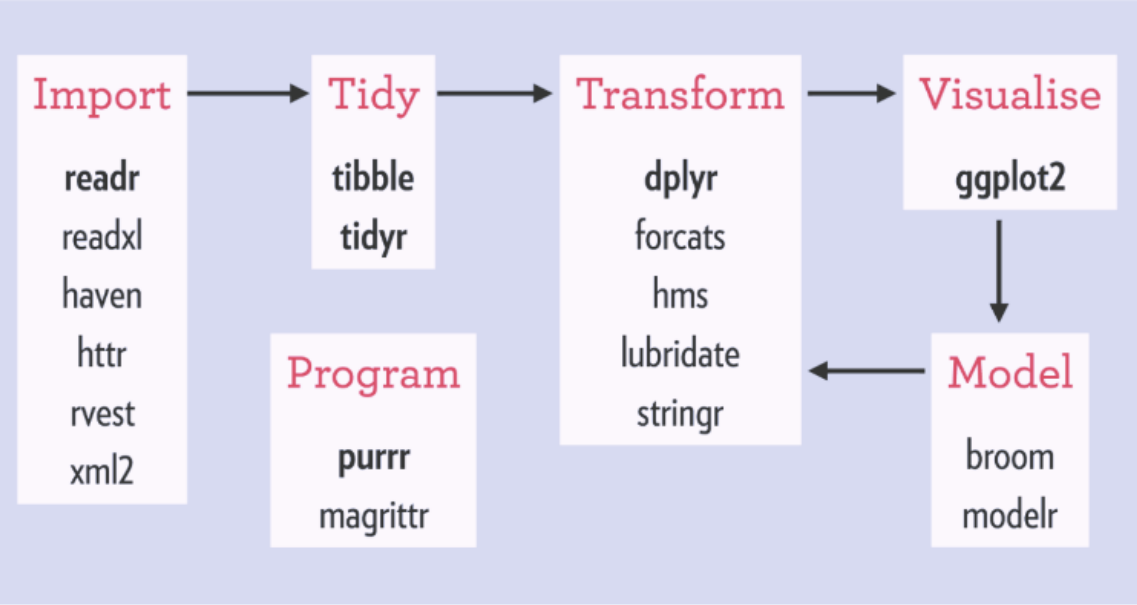
- Tidy data introduces concepts that are useful to anyone working with data.
- Some people love it.
- You might love it.

https://twitter.com/rstatsmemes

What we'll cover

Where tidyverse packages fit into the data analysis process (from David Robinson):



https://github.com/rstudio/rstudio-conf/blob/master/2018/TeachTidyverse-DavidRobinson/TeachTidyverse-DavidRobinson.pdf

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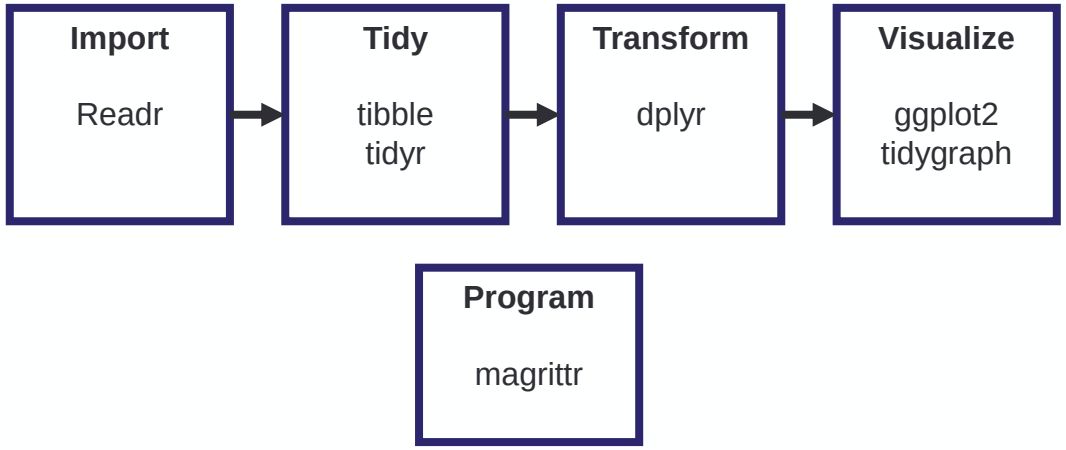
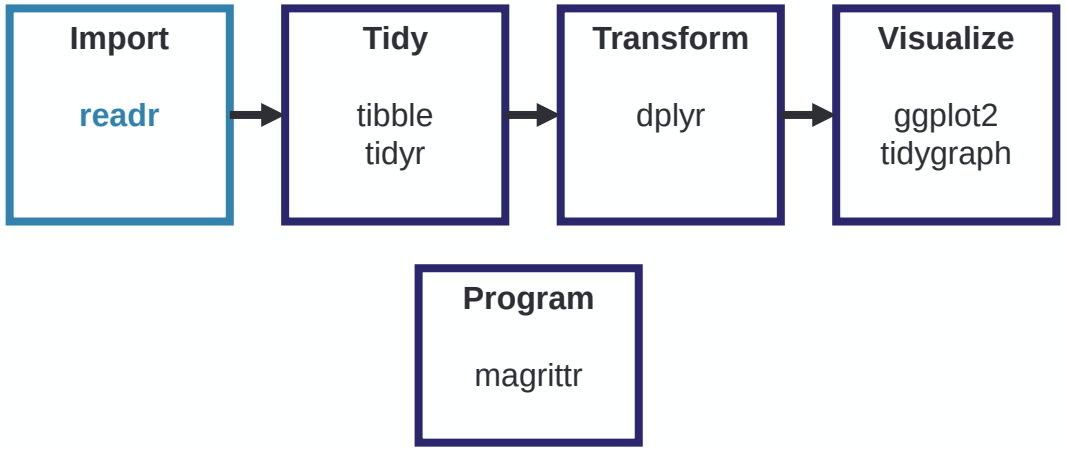
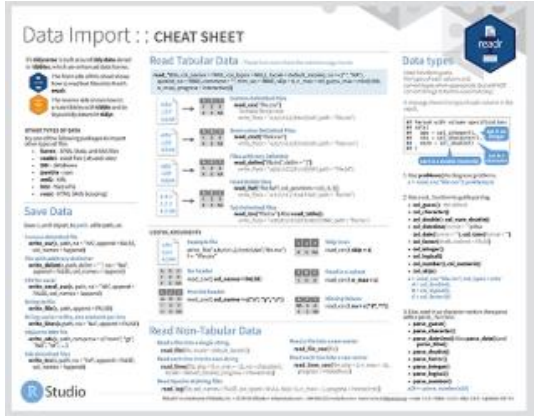


https://twitter.com/tslumley/status/1008799349998903299

readr

- A fast way to read rectangular data into tibbles – a type of enhanced data frame designed for tidy data.
- readr can also guess column data types and parse columns appropriately (date, int, double, etc.).





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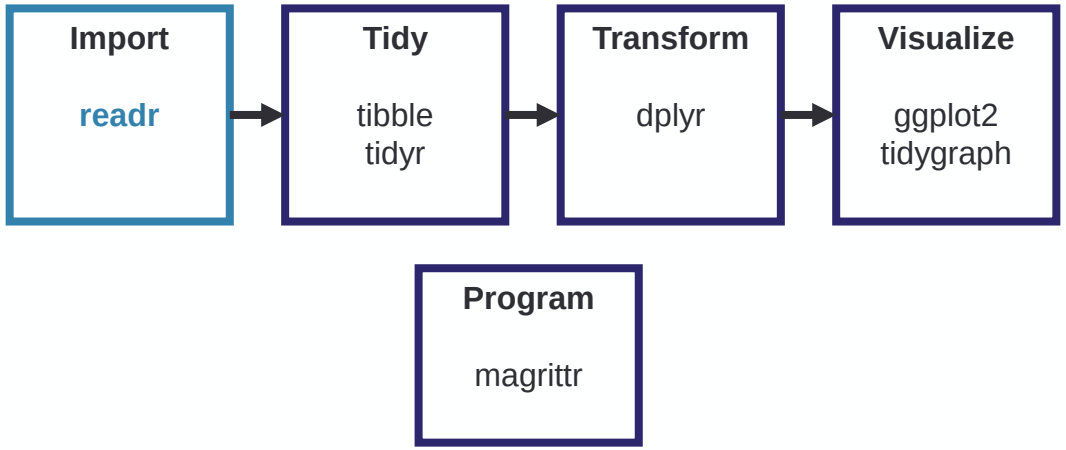

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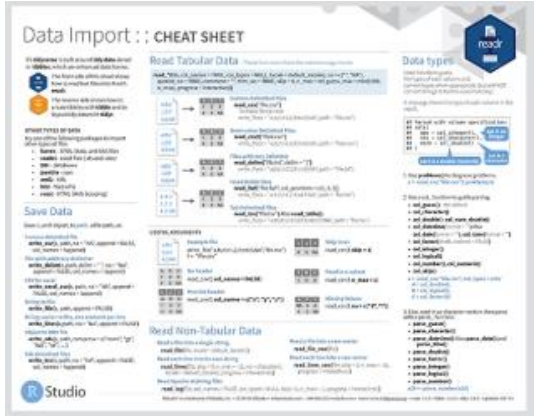

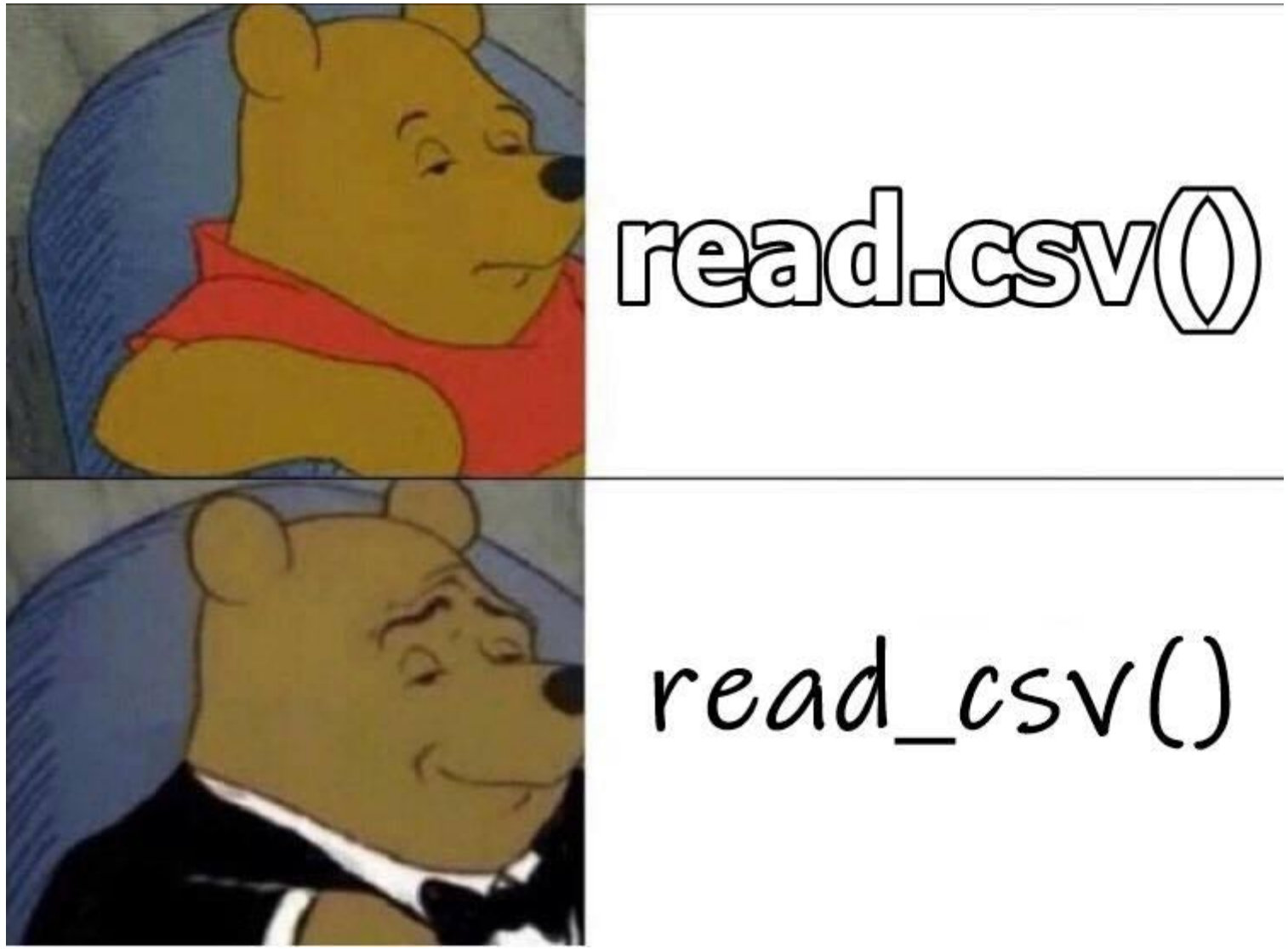

https://twitter.com/favstats/status/1112060496977510400

tibble and tidyr

- The tibble package gives us the tibble object. Tibbles are data frames with improvements to subsetting, viewing data, and defining data types.
- tidyr provides functions for data transformations that convert messy data into tidy data.

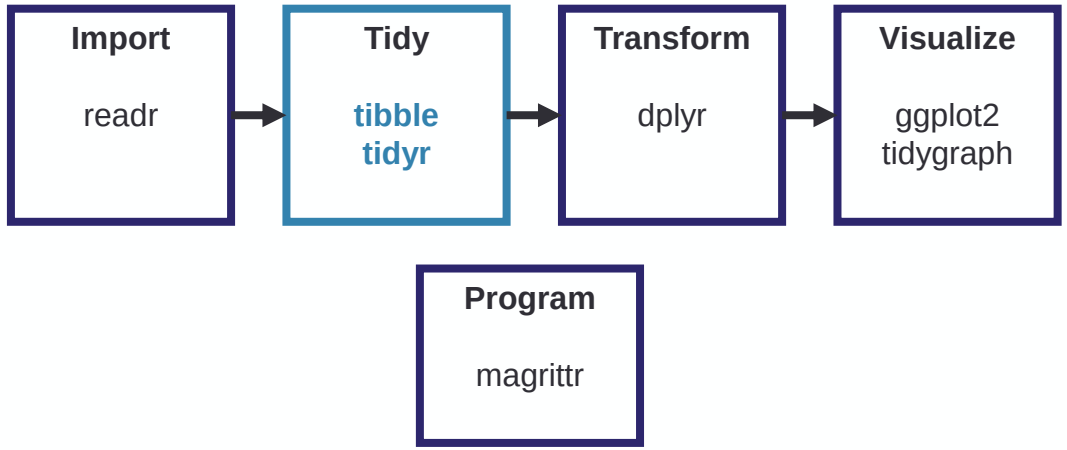

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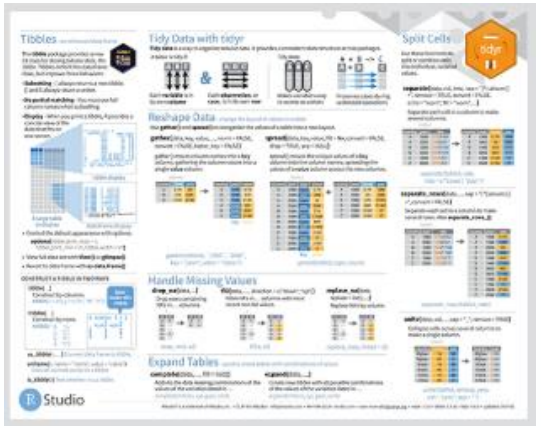
table2



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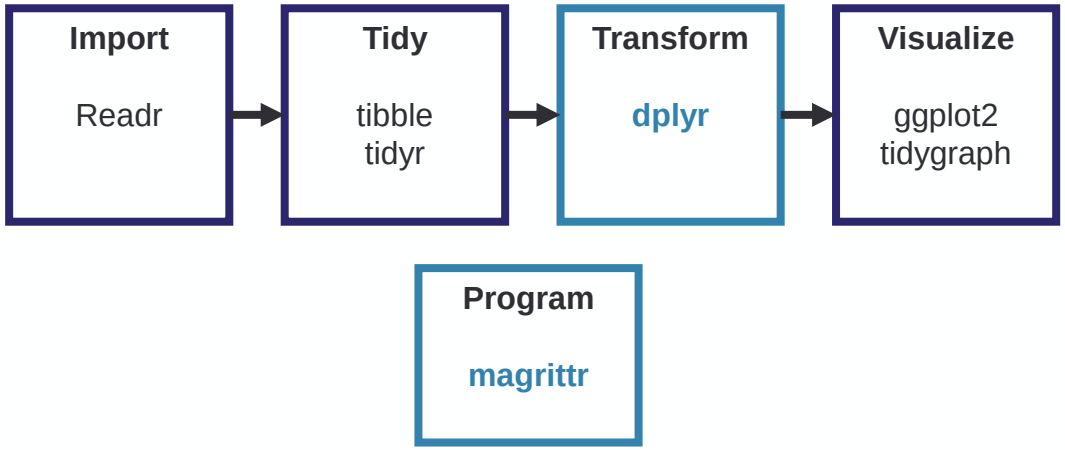
magrittr and dplyr

magrittr

- Pipes (%>%): https://uc-r.github.io/pipe

dplyr:

- Functions (https://dplyr.tidyverse.org/):
  - 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.



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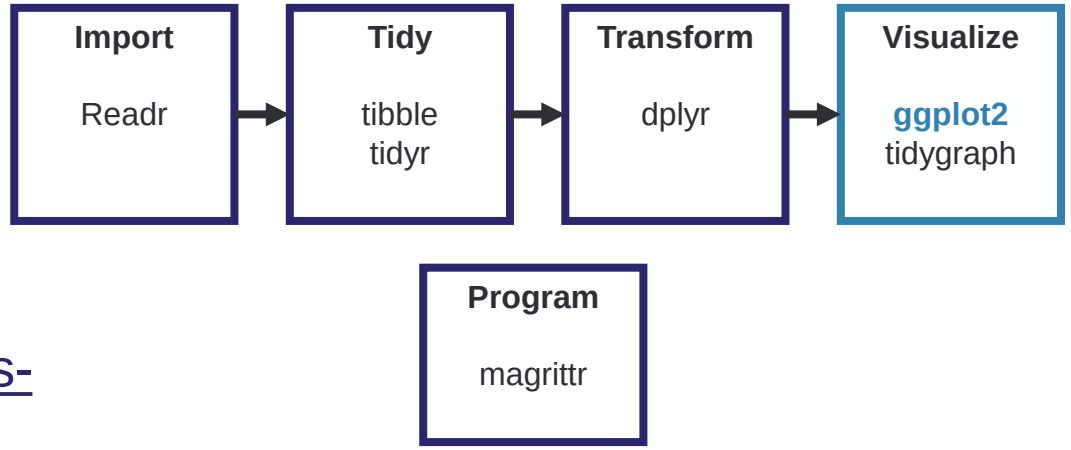
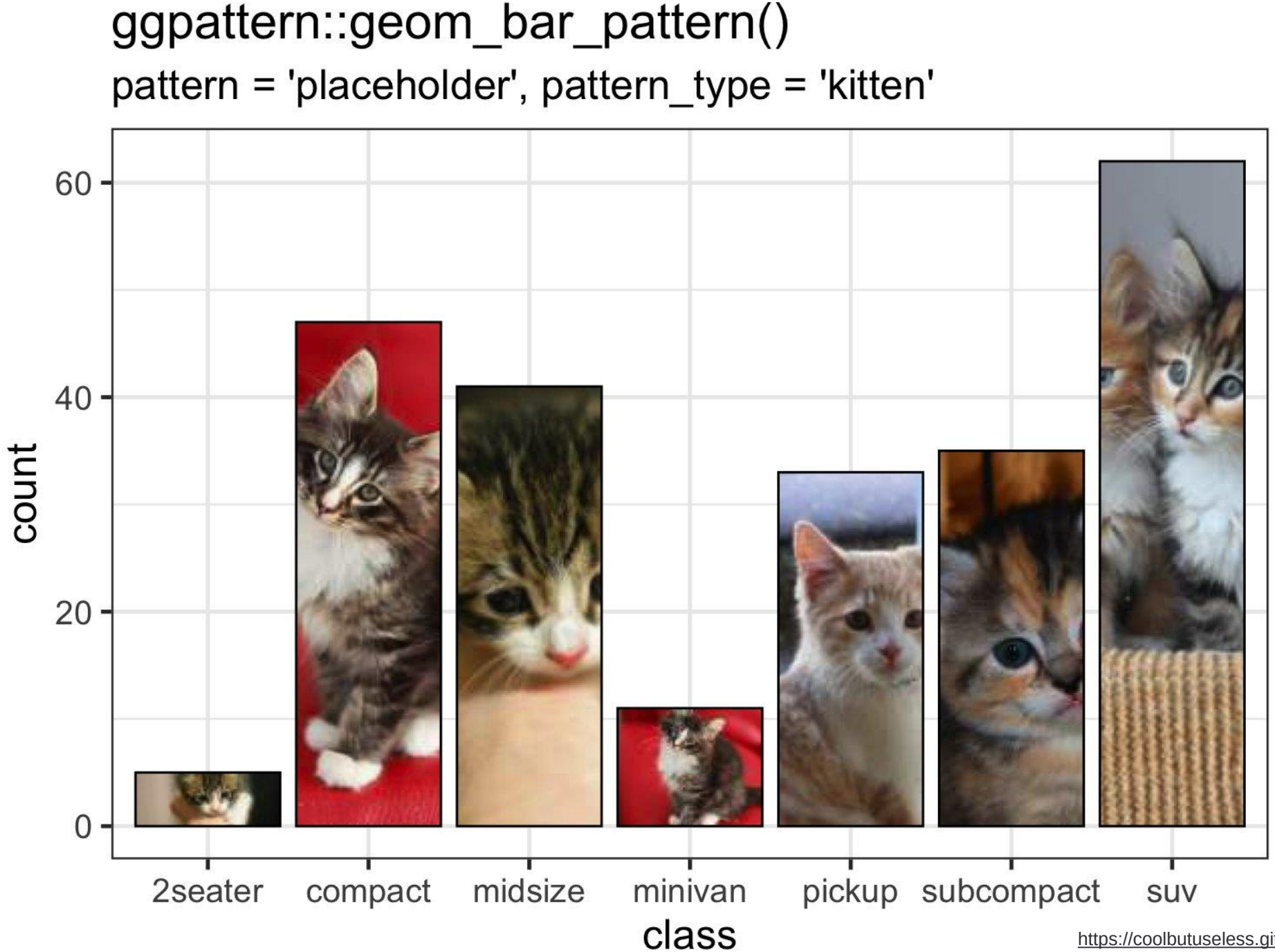
ggplot2

- General information on ggplot2: https://ggplot2.tidyverse.org/reference/ggplot.html
- ggplot2 cheat sheet: https://rstudio.com/wp-content/uploads/2015/03/ggplot2-cheatsheet.pdf
- Leland Wilkinson's The Grammar of Graphics https://www.amazon.com/Grammar-Graphics-Statistics-Computing/dp/0387245448
- Hadley Wickam's A Layered Grammar of Graphics https://vita.had.co.nz/papers/layered-grammar.html
- ggplot2 incorporates a wide range of data visualization options: http://r-statistics.co/Top50-Ggplot2-Visualizations-MasterList-R-Code.html

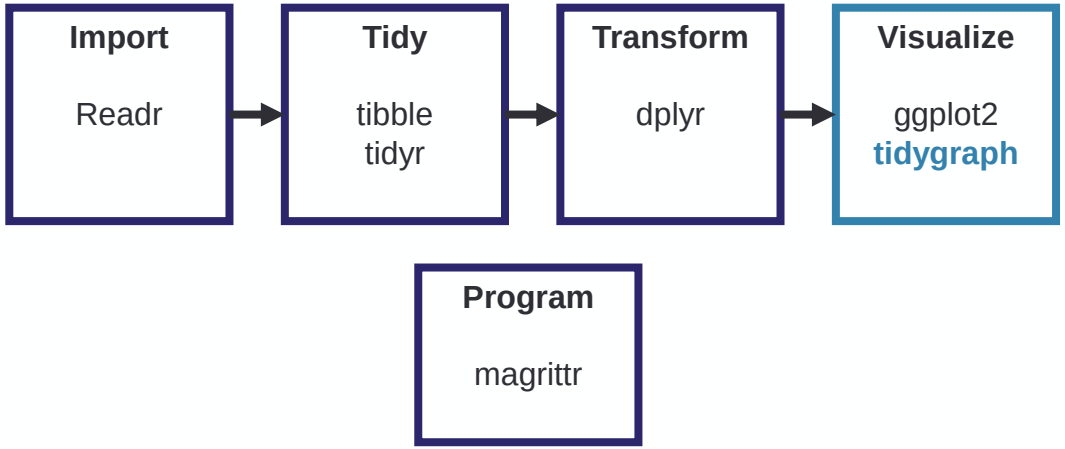


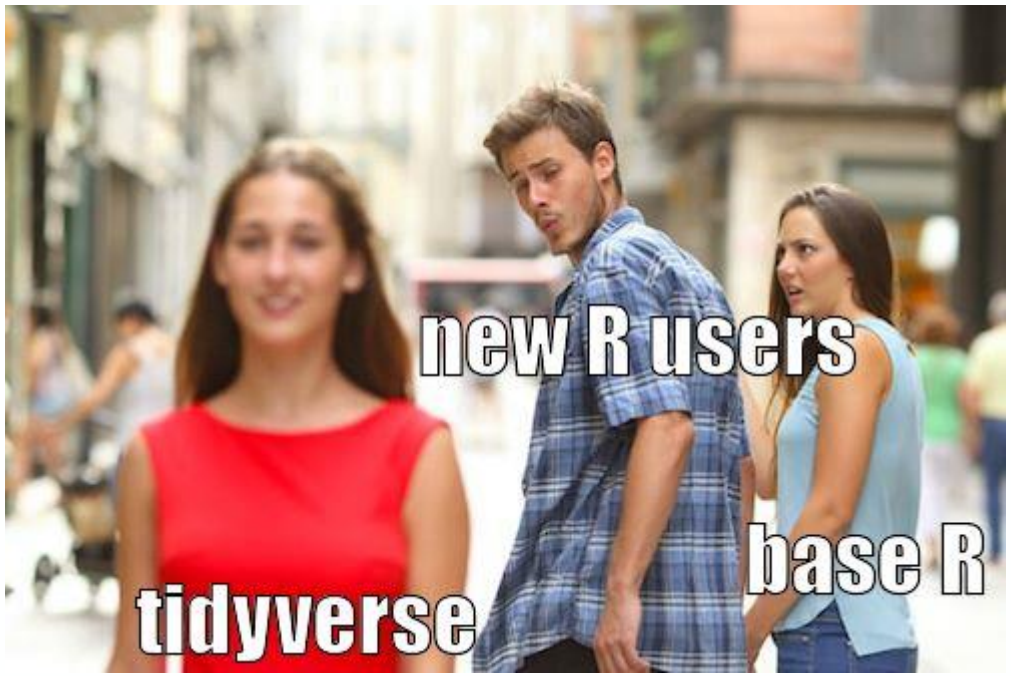


https://coolbutuseless.github.io/package/ggpattern/articles/geom-gallery-array.html#geom-bar-pattern-

tidygraph

- Network graph data is stored as edges and nodes, which is not a traditional format for “tidy” data.
- Tidygraph enables users to manipulate graph data using dplyr. Graph data can then be plotted using traditional network graph packages (e.g. ggraph, igraph).
- More info on tidygraph: https://www.data-imaginist.com/2017/introducing-tidygraph/





https://twitter.com/girsanov/status/1202389699958050818

Additional Sources

- R code examples used for this talk make use of David Robinson's 'unvotes' package, which uses data from the following source:
  - Erik Voeten "Data and Analyses of Voting in the UN General Assembly" Routledge Handbook of International Organization, edited by Bob Reinalda (published May 27, 2013)
- R memes courtesy of: https://twitter.com/rstatsmemes