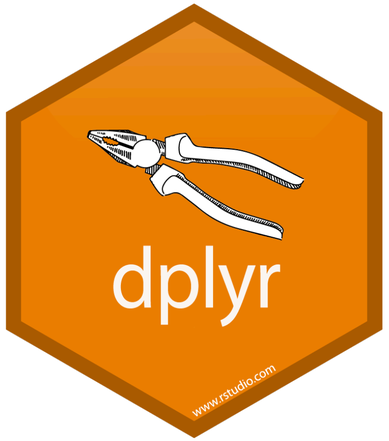
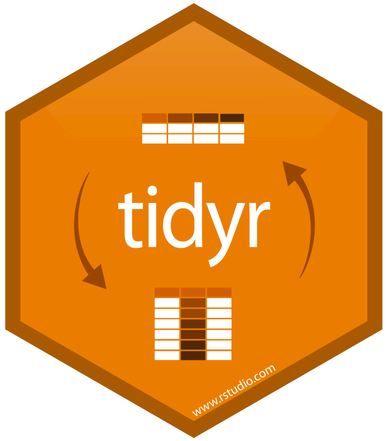
Programme for today

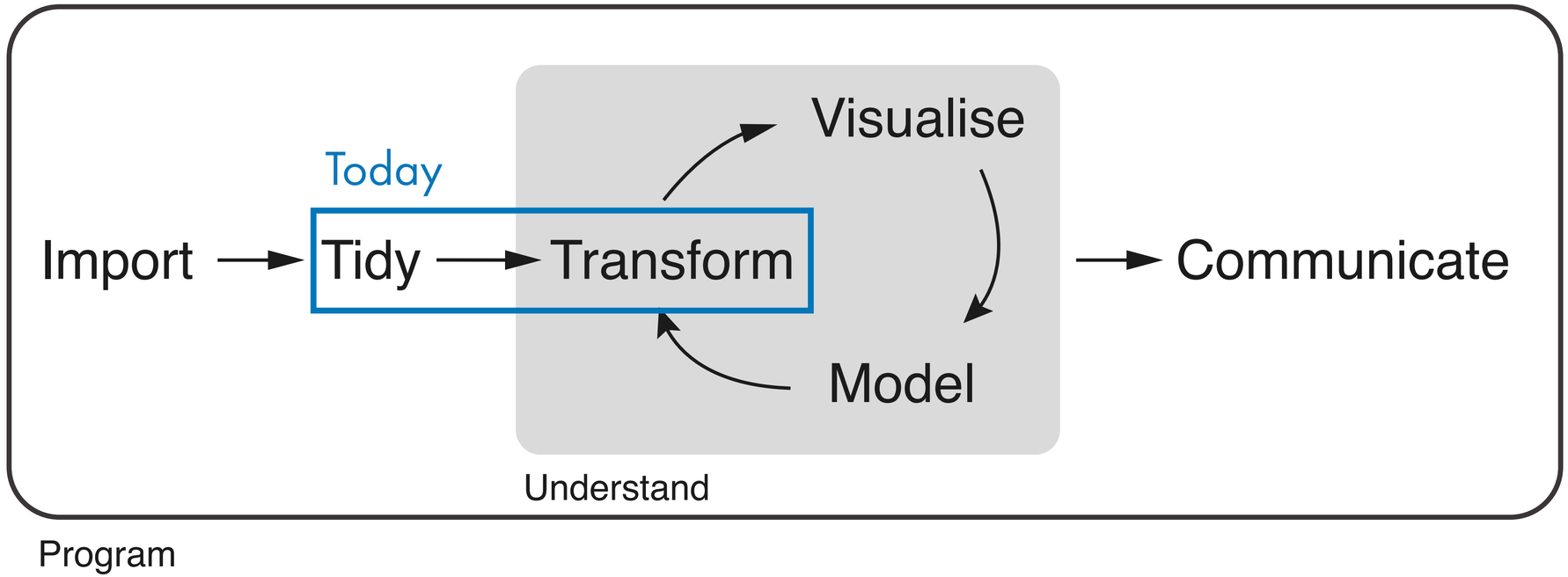
- Introductory lecture
- Hands-on tutorial on data wrangling
- Individual exercises





At the end of the day you should be familiar with transforming and tidying data in R using the dplyr and tidy packages

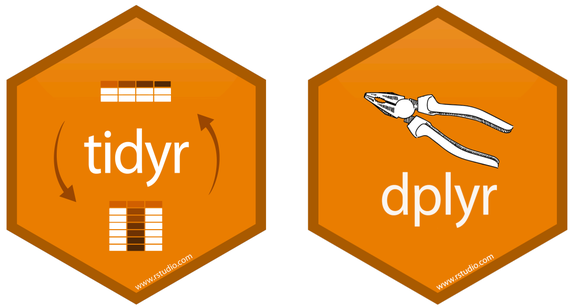
A data science project workflow



https://r4ds.had.co.nz/introduction.html

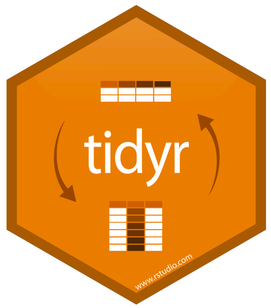
Data tidying

Data transformation



Data tidying

Data transformation

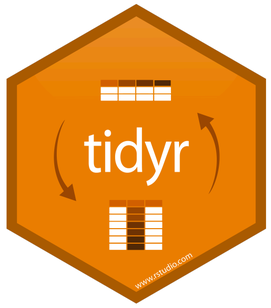


Data tidying

Data transformation

Untidy Data

species	habitat	weight	length	latitude/longitude	date
Alligator mississippiensis	swamp	431 lb	4 ft 2	29.531,-82.184	Sept 15, 2015
Puma concolor	forest	125 lb	2.2m	29.125,-81.682	08/10/2015
Ursus americanus	forest	88 kg	133 cm	N29°7'30"/W81°40'55.2"	07-13-2015



In which ways is this dataset “untidy”?

Hart et al (2016) PLoS Comp Biol

Data tidying

Data transformation

Untidy Data

species	habitat	weight	length	latitude/longitude	date
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Tidy Data

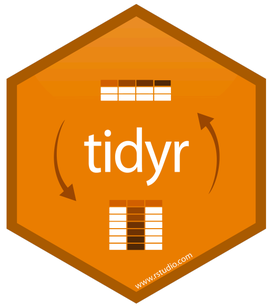
meta-data

data

species_code	date	station_code	weight_kg	length_cm
TSN 551771	2015-09-15	1	196	127
TSN 55247	2015-08-10	2	57	220
TSN 180544	2015-07-13	2	88	133

station_code	habitat	latitude	longitude
1	swamp	29.531	-82.184
2	forest	29.125	-81.682

species_code	class	genus	species
TSN 551771	Reptilia	Alligator	mississippiensis
TSN 55247	Mammalia	Puma	concolor
TSN 180544	Mammalia	Ursus	americanus

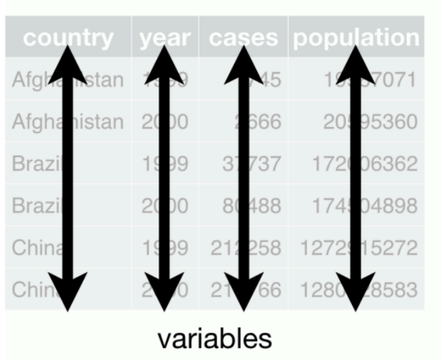


Example of a tidy version of dataset

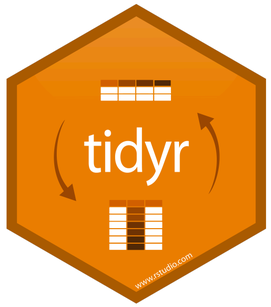
Hart et al (2016) PLoS Comp Biol

Data tidying

Data transformation



1. Each variable has its own column

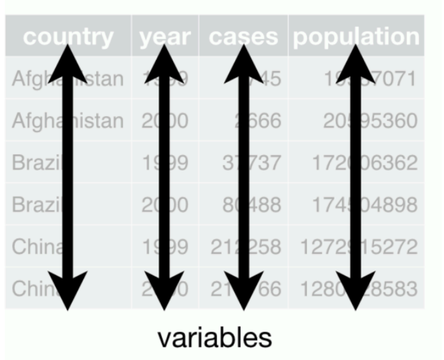


Rules for tidy data

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

Data tidying

Data transformation



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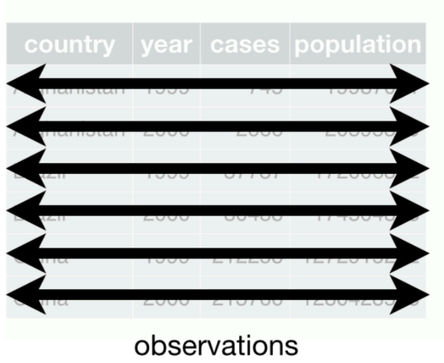
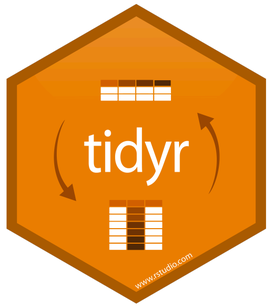


2. Each observation has its own row



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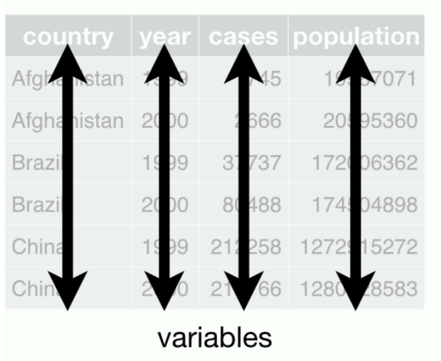

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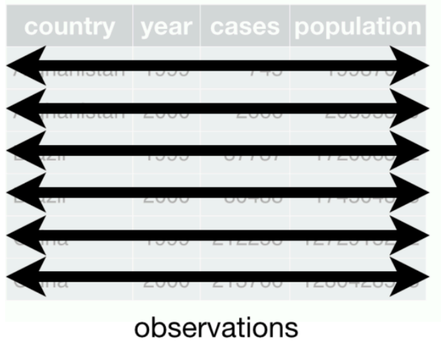
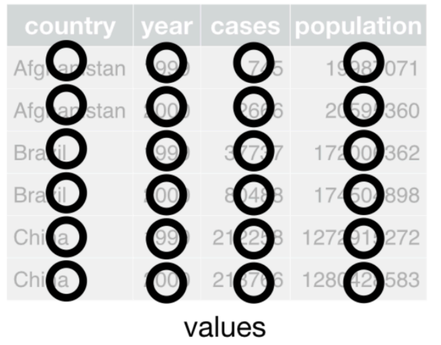
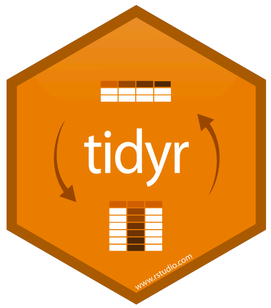


2. Each observation has its own row



3. Each values has its own cell



Rules for tidy data

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

Data tidying

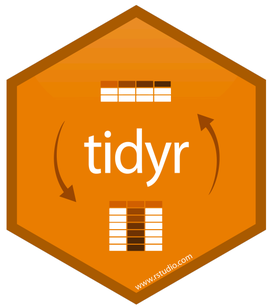
Data transformation

pivot_longer(data, cols, names_to = "name", values_to = "value", values_drop_na = FALSE**)**

table4a

country	1999	2000
A	0.7K	2K
B	37K	80K
C	212K	213K

country	year	cases
A	1999	0.7K
B	1999	37K
C	1999	212K
A	2000	2K
B	2000	80K
C	2000	213K



The pivot_* functions

https://posit.co/wp-content/uploads/2022/10/tidyr.pdf

Data tidying

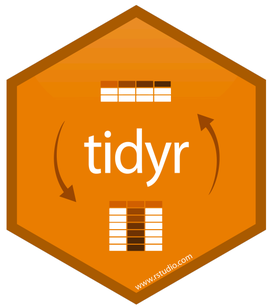
Data transformation

pivot_wider(data, names_from = "name", values_from = "value"**)**

table2

country	year	type	count
A	1999	cases	0.7K
A	1999	pop	19M
A	2000	cases	2K
A	2000	pop	20M
B	1999	cases	37K
B	1999	pop	172M
B	2000	cases	80K
B	2000	pop	174M
C	1999	cases	212K
C	1999	pop	1T
C	2000	cases	213K
C	2000	pop	1T

country	year	cases	pop
A	1999	0.7K	19M
A	2000	2K	20M
B	1999	37K	172M
B	2000	80K	174M
C	1999	212K	1T
C	2000	213K	1T



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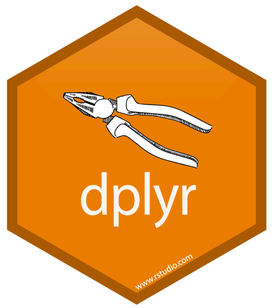
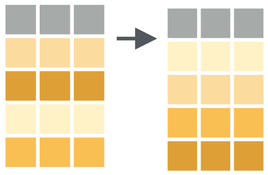
Data transformation

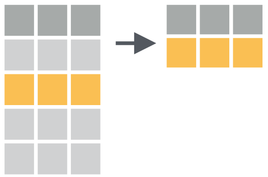


Data transformation

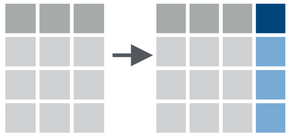
select(.data, …**)** Extract columns as a table.
select(mtcars, mpg, wt)



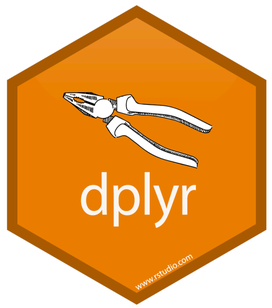
arrange(.data, …, .by_group = FALSE**)** Order rows by values of a column or columns (low to high), use with **desc()** to order from high to low.
arrange(mtcars, mpg)
arrange(mtcars, desc(mpg))



filter(.data, …, .preserve = FALSE**)** Extract rows that meet logical criteria.
filter(mtcars, mpg > 20)



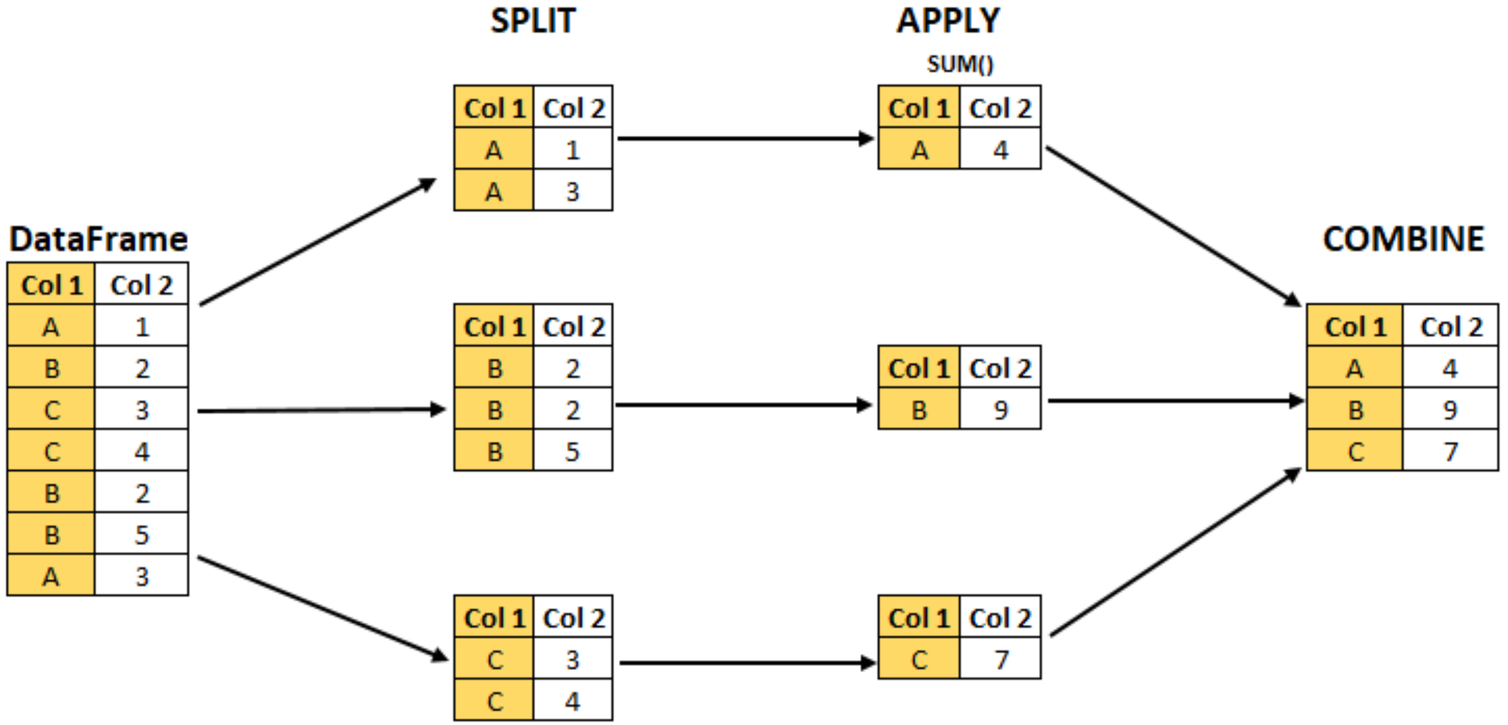
mutate(.data, …, .keep = "all", .before = NULL, .after = NULL**)** Compute new column(s). Also **add_column(), add_count(),** and **add_tally().**
mutate(mtcars, gpm = 1 / mpg)

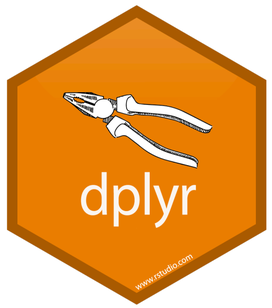


Simple transformations

https://medium.com/analytics-vidhya/split-apply-combine-strategy-for-data-mining-4fd6e2a0cc99

Data transformation



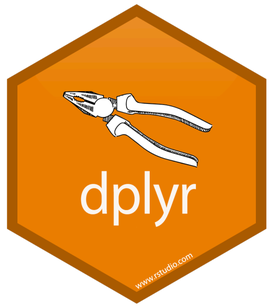


split-apply-combine

https://medium.com/analytics-vidhya/split-apply-combine-strategy-for-data-mining-4fd6e2a0cc99

Data transformation

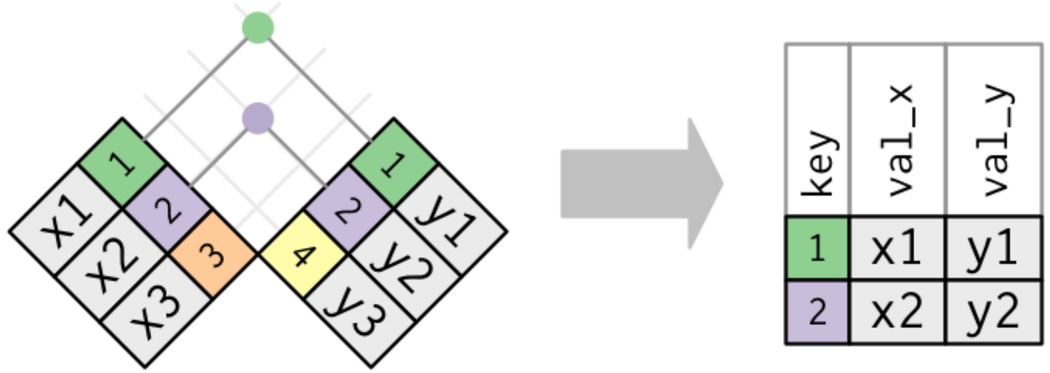
```
mtcars  %>%
  group_by(cyl) %>%
  summarise(avg = mean(mpg))
```

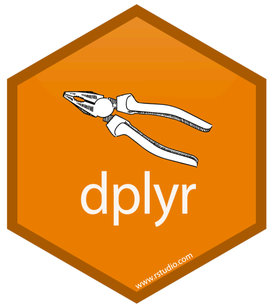



split-apply-combine

https://posit.co/wp-content/uploads/2022/10/data-transformation-1.pdf

Data transformation

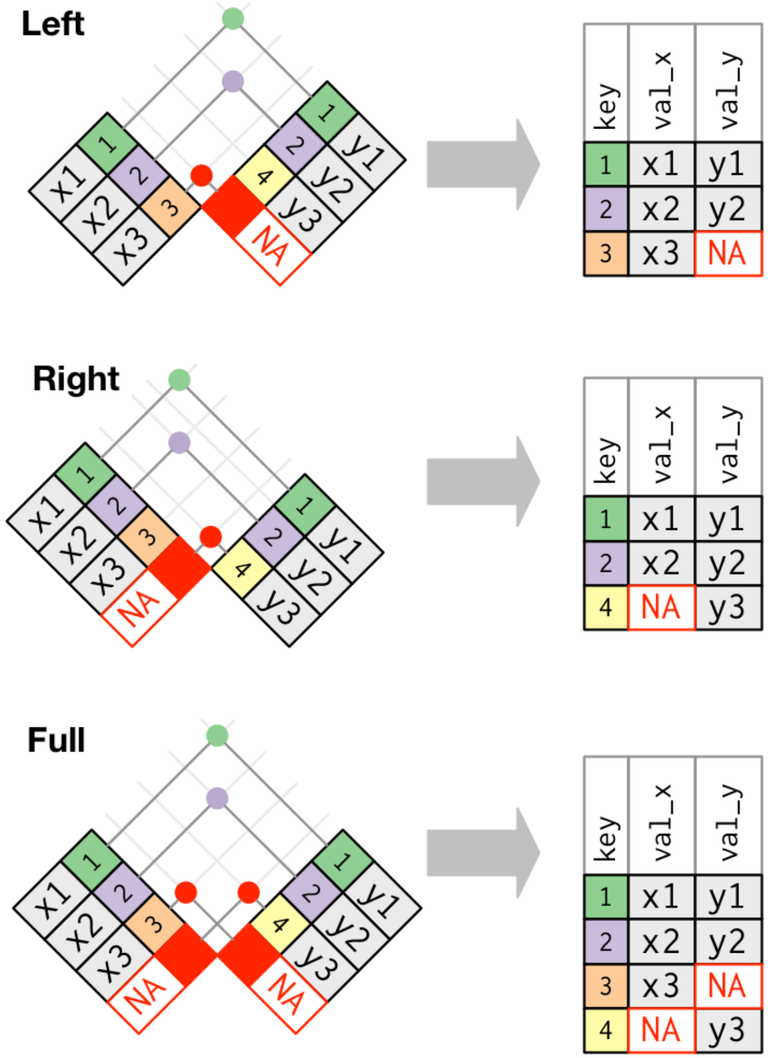




Mutating joins - Inner join

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

Data transformation

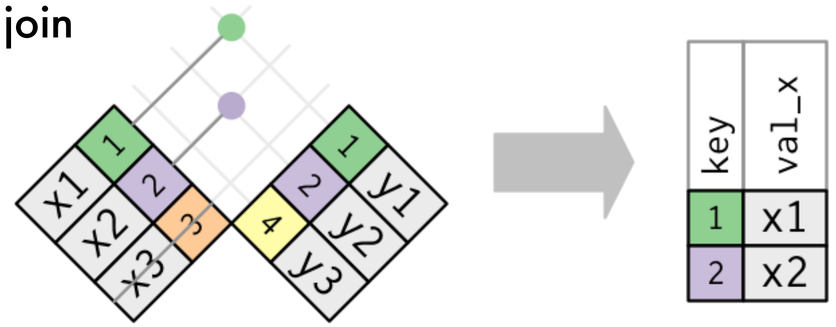


Mutating joins - Outer joins

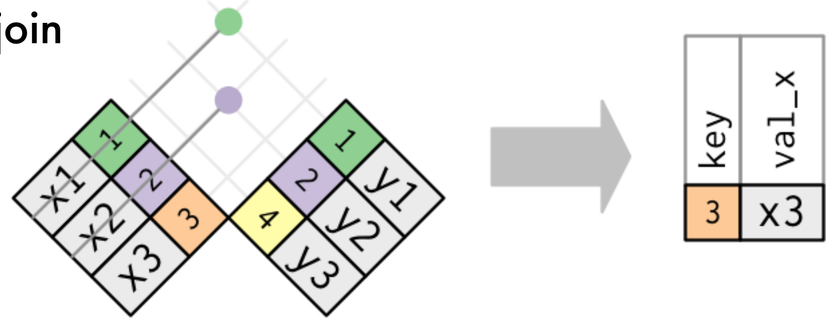
https://r4ds.had.co.nz/relational-data.html

Data transformation

Semi join



Anti join



Filtering joins

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- Hands-on tutorial on data wrangling
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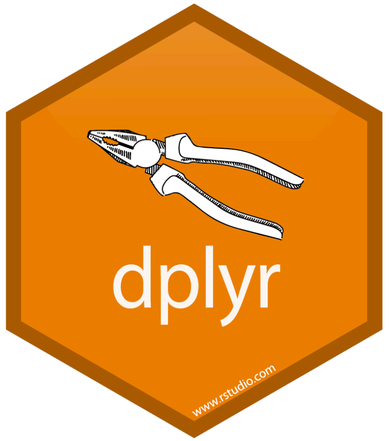

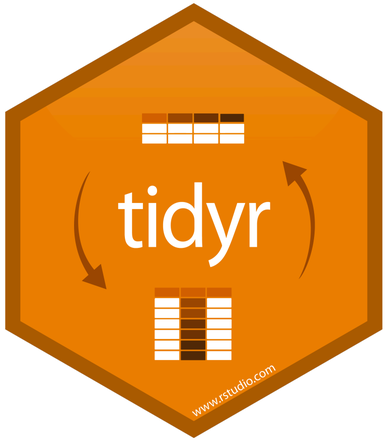

At the end of the day you should be familiar with transforming and tidying data in R using the dplyr and tidy packages