Gov 50: 4. Data Wrangling

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Roadmap

1. Data Wrangling
2. Operating on rows
3. Operating on columns
4. Operating on groups

1/ Data Wrangling

Why?

data.frames vs tibbles

- The standard R object for datasets is the `data.frame`
    - Each column is a vector of the same length.
    - Columns can be different types
- Access columns with $: `mydata$myvariable`

```
mtcars$mpg
```

```
##  [1] 21.0 21.0 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 17.8
## [12] 16.4 17.3 15.2 10.4 10.4 14.7 32.4 30.4 33.9 21.5 15.5
## [23] 15.2 13.3 19.2 27.3 26.0 30.4 15.8 19.7 15.0 21.4
```

Problems with data frames

```
mtcars
```

```
##                     mpg cyl  disp  hp drat   wt qsec vs am
## Mazda RX4          21.0   6 160.0 110 3.90 2.62 16.5  0  1
## Mazda RX4 Wag      21.0   6 160.0 110 3.90 2.88 17.0  0  1
## Datsun 710         22.8   4 108.0  93 3.85 2.32 18.6  1  1
## Hornet 4 Drive     21.4   6 258.0 110 3.08 3.21 19.4  1  0
## Hornet Sportabout  18.7   8 360.0 175 3.15 3.44 17.0  0  0
## Valiant            18.1   6 225.0 105 2.76 3.46 20.2  1  0
## Duster 360         14.3   8 360.0 245 3.21 3.57 15.8  0  0
## Merc 240D          24.4   4 146.7  62 3.69 3.19 20.0  1  0
## Merc 230           22.8   4 140.8  95 3.92 3.15 22.9  1  0
## Merc 280           19.2   6 167.6 123 3.92 3.44 18.3  1  0
## Merc 280C          17.8   6 167.6 123 3.92 3.44 18.9  1  0
## Merc 450SE         16.4   8 275.8 180 3.07 4.07 17.4  0  0
## Merc 450SL         17.3   8 275.8 180 3.07 3.73 17.6  0  0
## Merc 450SLC        15.2   8 275.8 180 3.07 3.78 18.0  0  0
## Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.25 18.0  0  0
## Lincoln Continental 10.4  8 460.0 215 3.00 5.42 17.8  0  0
## Chrysler Imperial  14.7   8 440.0 230 3.23 5.34 17.4  0  0
## Fiat 128           32.4   4  78.7  66 4.08 2.20 19.5  1  1
## Honda Civic        30.4   4  75.7  52 4.93 1.61 18.5  1  1
## Toyota Corolla     33.9   4  71.1  65 4.22 1.83 19.9  1  1
```

tibbles: a tidyverse alternative

```
midwest
```

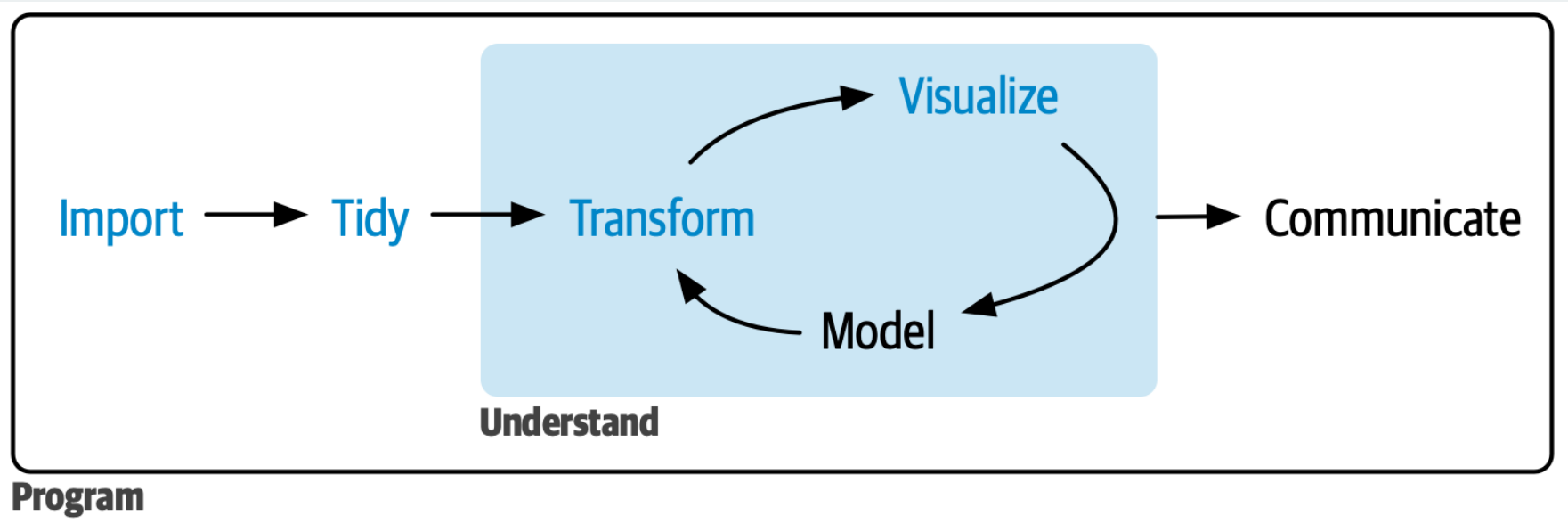
```
## # A tibble: 437 x 28
##      PID county    state  area poptotal popdensity
##    <int> <chr>     <chr> <dbl>    <int>       <dbl>
##  1   561 ADAMS     IL    0.052    66090       1271.
##  2   562 ALEXANDER IL    0.014    10626        759
##  3   563 BOND      IL    0.022    14991        681.
##  4   564 BOONE     IL    0.017    30806       1812.
##  5   565 BROWN     IL    0.018     5836        324.
##  6   566 BUREAU    IL    0.05     35688        714.
##  7   567 CALHOUN   IL    0.017     5322        313.
##  8   568 CARROLL   IL    0.027    16805        622.
##  9   569 CASS      IL    0.024    13437        560.
## 10   570 CHAMPAIGN IL    0.058   173025       2983.
## # ... with 427 more rows, and 22 more variables:
## #   popwhite <int>, popblack <int>,
## #   popamerindian <int>, popasian <int>,
## #   popother <int>, percwhite <dbl>, percblack <dbl>,
## #   percamerindan <dbl>, percasian <dbl>,
```

rows x columns

column types

abridged output

Transform-Visualize-Model cycle



Credit: Hadley Wickham

dplyr: a package for data transformation

- All `dplyr` functions:
  - Take a dataset as their first argument
  - Manipulate the dataset in some way
  - Returns the manipulated dataset

pipe

Nested calls can be hard to read (have to read inside out):

```
f(g(h(r(x))))
```

The pipe |> allows us to move output between functions (|> = “and then”):

```
x |>
  r() |>
  h() |>
  g() |>
  h()
```

The piped output goes to the first argument by default.

Local news data

- How does station ownership affect local news coverage?
- Martin and McCrain (2019) use data on local news at TV stations before and after a large acquisition by a conglomorate.

Variable	Description
`callsign`	Callsign of the station
`affiliation`	Network affiliation of the station
`date`	Airdate of news
`weekday`	Day of the week of airdate
`ideology`	Measure of news slant (bigger is more conservative)
`national_politics`	Avg proportion of segments on national politics
`local_politics`	Avg proportion of segments on national politics
`sinclair2017`	Station acquired by Sinclair group in Sept 2017
`post`	Date is before/after acquisition (0/1)

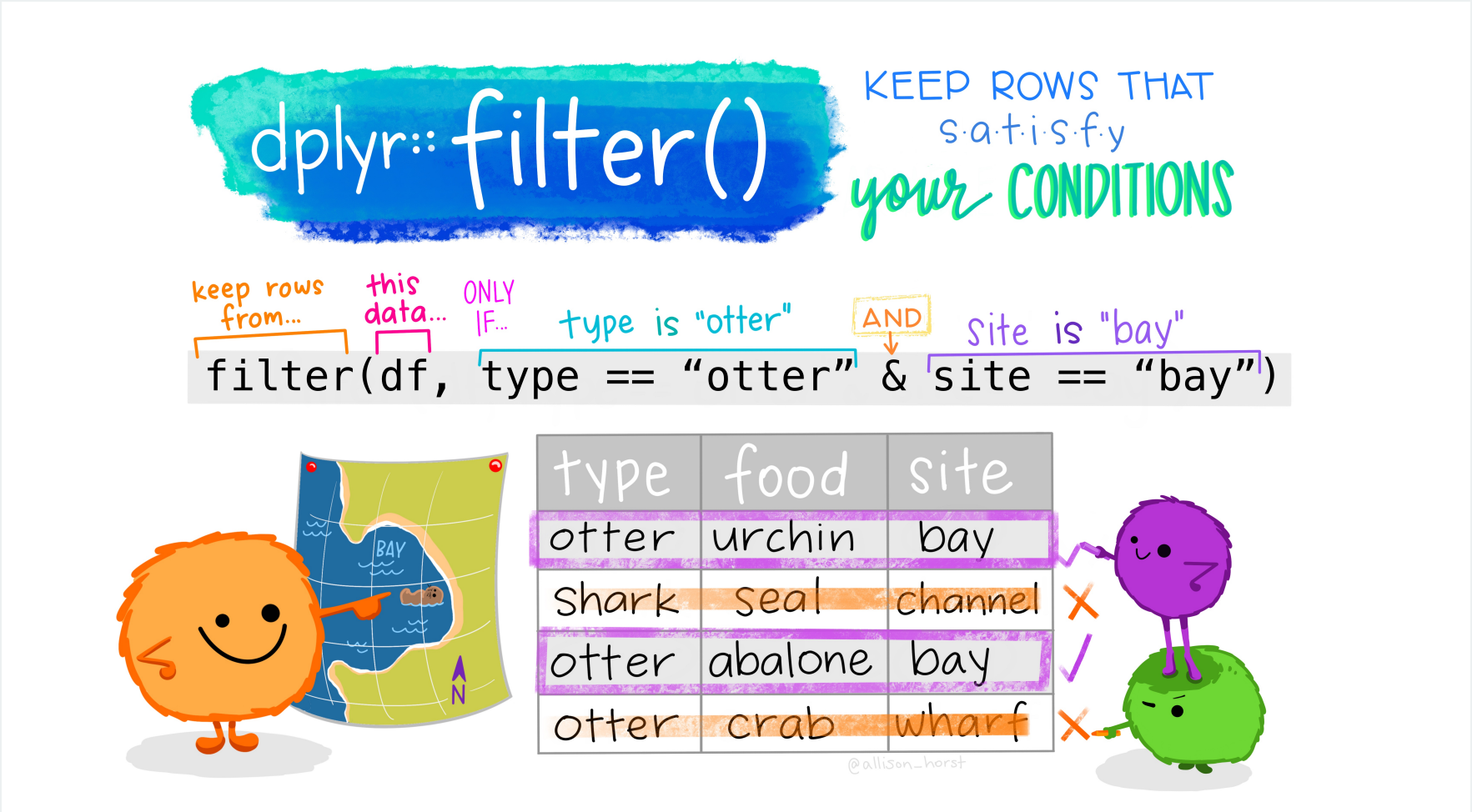
```
library(gov50data)
data(news)
news
```

```
## # A tibble: 3,137 x 10
##    callsign affiliation date       weekday ideology nation~1
##    <chr>    <chr>       <date>     <ord>      <dbl>    <dbl>
##  1 KRBC     NBC         2017-06-05 Mon       NA       0.0286
##  2 KTAB     CBS         2017-06-05 Mon       NA       0.0286
##  3 KXVA     FOX         2017-06-05 Mon       NA       0.0393
##  4 KPAX     CBS         2017-06-06 Tue       NA       0.00357
##  5 KTAB     CBS         2017-06-06 Tue       NA       0.0945
##  6 KECI     NBC         2017-06-07 Wed        0.0655  0.225
##  7 KPAX     CBS         2017-06-07 Wed        0.0853  0.283
##  8 KRBC     NBC         2017-06-07 Wed        0.0183  0.130
##  9 KTAB     CBS         2017-06-07 Wed        0.0850  0.0901
## 10 KTMF     ABC         2017-06-07 Wed        0.0842  0.152
## # ... with 3,127 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

2/ Operating on rows

filter()

`filter()` selects rows that satisfy the argument you pass it:



Credit: Allison Horst

```
news |>
  filter(weekday == "Tue")
```

```
## # A tibble: 626 x 10
##    callsign affiliation date       weekday ideology nation~1
##    <chr>    <chr>       <date>     <ord>      <dbl>    <dbl>
##  1 KPAX     CBS         2017-06-06 Tue       NA      0.00357
##  2 KTAB     CBS         2017-06-06 Tue       NA      0.0945
##  3 KAEF     ABC         2017-06-13 Tue        0.0242 0.180
##  4 KBVU     FOX         2017-06-13 Tue        0.00894 0.186
##  5 KBZK     CBS         2017-06-13 Tue        0.129  0.306
##  6 KCVU     FOX         2017-06-13 Tue        0.114  0.124
##  7 KECI     NBC         2017-06-13 Tue        0.115  0.283
##  8 KHSL     CBS         2017-06-13 Tue        0.0821 0.274
##  9 KNVN     NBC         2017-06-13 Tue        0.120  0.261
## 10 KPAX     CBS         2017-06-13 Tue        0.0984 0.208
## # ... with 616 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

Multiple conditions means “and”

```
news |>
  filter(weekday == "Tue",
         affiliation == "FOX")
```

```
## # A tibble: 130 x 10
##    callsign affiliation date       weekday ideology nation~1
##    <chr>    <chr>       <date>     <ord>      <dbl>    <dbl>
##  1 KBVU     FOX         2017-06-13 Tue      0.00894   0.186
##  2 KCVU     FOX         2017-06-13 Tue      0.114     0.124
##  3 WEMT     FOX         2017-06-13 Tue      0.235     0.149
##  4 WYDO     FOX         2017-06-13 Tue      0.0949    0.182
##  5 KBVU     FOX         2017-06-20 Tue     NA         0.0229
##  6 KCVU     FOX         2017-06-20 Tue     NA         0.0170
##  7 KXVA     FOX         2017-06-20 Tue     NA         0.0203
##  8 WEMT     FOX         2017-06-20 Tue      0.268     0.134
##  9 WYDO     FOX         2017-06-20 Tue      0.0590    0.155
## 10 KBVU     FOX         2017-06-27 Tue     NA         0.0601
## # ... with 120 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

logicals

- Comparing two values/vectors:
    - >/>=: greater than/greater than or equal to
    - </<=: less than/less than or equal to
    - ==/!=: equal to/not equal to
- Combining multiple logical statements:
    - &: and
    - |: or

Common gotcha!

```
news |>
  filter(weekday = "Tue")
```

```
## Error in `filter()`:
## ! We detected a named input.
## i This usually means that you've used `=` instead of `==`.
## i Did you mean `weekday == "Tue"`?
```

```
news |>
  filter(affiliation == "FOX" | affiliation == "ABC")
```

```
## # A tibble: 1,525 x 10
##    callsign affiliation date       weekday  ideology natio~1
##    <chr>    <chr>       <date>     <ord>       <dbl>   <dbl>
##  1 KXVA     FOX         2017-06-05 Mon     NA        0.0393
##  2 KTMF     ABC         2017-06-07 Wed      0.0842   0.152
##  3 KTXS     ABC         2017-06-07 Wed     -0.000488 0.0925
##  4 KXVA     FOX         2017-06-07 Wed     NA        0.00718
##  5 KAEF     ABC         2017-06-08 Thu      0.0426   0.213
##  6 KBVU     FOX         2017-06-08 Thu     -0.0860   0.169
##  7 KTMF     ABC         2017-06-08 Thu      0.0433   0.179
##  8 KTXS     ABC         2017-06-08 Thu      0.0627   0.158
##  9 KXVA     FOX         2017-06-08 Thu     NA        0.0124
## 10 WCTI     ABC         2017-06-08 Thu      0.139    0.225
## # ... with 1,515 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

```
news |>
  filter(ideology < 0 & weekday == "Tue")
```

```
## # A tibble: 66 x 10
##    callsign affiliation date       weekday ideology nation~1
##    <chr>    <chr>       <date>     <ord>      <dbl>    <dbl>
##  1 KAEF     ABC         2017-06-27 Tue     -0.0117     0.162
##  2 KECI     NBC         2017-06-27 Tue     -0.00362    0.177
##  3 KHSL     CBS         2017-06-27 Tue     -0.0735     0.170
##  4 KNVN     NBC         2017-06-27 Tue     -0.0175     0.180
##  5 KPAX     CBS         2017-06-27 Tue     -0.134      0.219
##  6 KTXS     ABC         2017-06-27 Tue     -0.0307     0.129
##  7 WCTI     ABC         2017-06-27 Tue     -0.0308     0.187
##  8 WITN     NBC         2017-06-27 Tue     -0.0233     0.155
##  9 WJHL     CBS         2017-06-27 Tue     -0.00388    0.166
## 10 WNCT     CBS         2017-06-27 Tue     -0.130      0.181
## # ... with 56 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

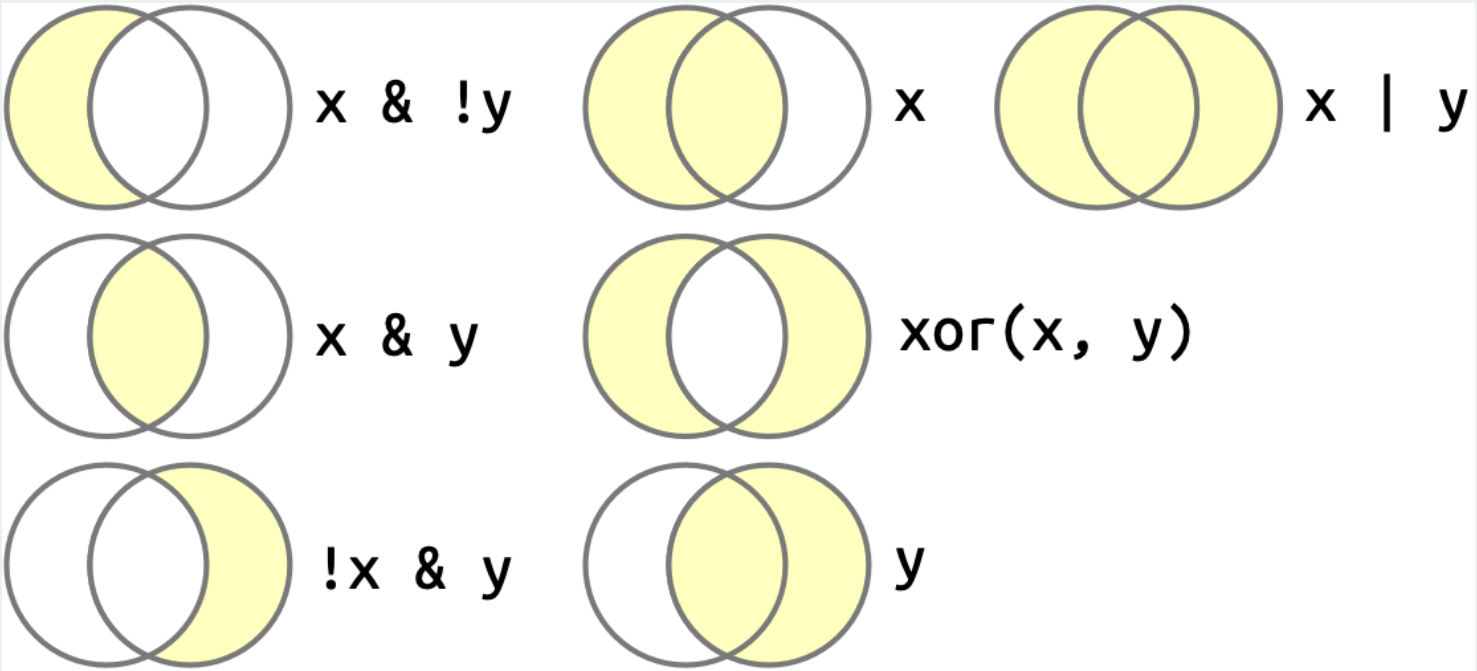
Combining %in%

When combining | and ==, useful to use %in%:

```
news |>
  filter(weekday %in% c("Mon", "Fri"))
```

```
## # A tibble: 1,253 x 10
##    callsign affiliation date       weekday ideology nation~1
##    <chr>    <chr>       <date>     <ord>      <dbl>    <dbl>
##  1 KRBC     NBC         2017-06-05 Mon       NA        0.0286
##  2 KTAB     CBS         2017-06-05 Mon       NA        0.0286
##  3 KXVA     FOX         2017-06-05 Mon       NA        0.0393
##  4 KAEF     ABC         2017-06-09 Fri        0.0870   0.153
##  5 KBVU     FOX         2017-06-09 Fri       NA        0.0553
##  6 KECI     NBC         2017-06-09 Fri        0.115    0.216
##  7 KPAX     CBS         2017-06-09 Fri        0.0882   0.315
##  8 KRBC     NBC         2017-06-09 Fri        0.0929   0.152
##  9 KTAB     CBS         2017-06-09 Fri        0.0588   0.0711
## 10 KTMF     ABC         2017-06-09 Fri       NA        0.0495
## # ... with 1,243 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

Complicated logicals



arrange()

`arrange()` will reorder the rows based on the values of the columns.

With multiple arguments, sort by first argument, then second, then third...

Arrange by callsign then date

```
news |>
  arrange(callsign, date)
```

```
## # A tibble: 3,137 x 10
##    callsign affiliation date       weekday ideology nation~1
##    <chr>    <chr>       <date>     <ord>      <dbl>    <dbl>
##  1 KAEF     ABC         2017-06-08 Thu       0.0426   0.213
##  2 KAEF     ABC         2017-06-09 Fri       0.0870   0.153
##  3 KAEF     ABC         2017-06-12 Mon       0.0135   0.149
##  4 KAEF     ABC         2017-06-13 Tue       0.0242   0.180
##  5 KAEF     ABC         2017-06-14 Wed       0.123    0.182
##  6 KAEF     ABC         2017-06-15 Thu       0.0778   0.114
##  7 KAEF     ABC         2017-06-16 Fri      NA        0.109
##  8 KAEF     ABC         2017-06-19 Mon       0.778    0.0823
##  9 KAEF     ABC         2017-06-20 Tue       0.115    0.131
## 10 KAEF     ABC         2017-06-21 Wed      -0.315    0.130
## # ... with 3,127 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

Which station-dates were the most liberal?

```
news |>
  arrange(ideology)
```

```
## # A tibble: 3,137 x 10
##    callsign affiliation date       weekday ideology nation~1
##    <chr>    <chr>       <date>     <ord>      <dbl>    <dbl>
##  1 KRBC     NBC         2017-10-19 Thu       -0.674   0.0731
##  2 WJHL     CBS         2017-12-08 Fri       -0.673   0.0364
##  3 KRBC     NBC         2017-10-18 Wed       -0.586   0.0470
##  4 KCVU     FOX         2017-06-22 Thu       -0.414   0.158
##  5 KRBC     NBC         2017-12-11 Mon       -0.365   0.0674
##  6 KAEF     ABC         2017-06-21 Wed       -0.315   0.130
##  7 KTMF     ABC         2017-12-01 Fri       -0.303   0.179
##  8 KWYB     ABC         2017-12-01 Fri       -0.303   0.160
##  9 KTVM     NBC         2017-09-01 Fri       -0.302   0.0507
## 10 KNVN     NBC         2017-12-08 Fri       -0.299   0.121
## # ... with 3,127 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

Which station-dates were the most conservative?

Use `desc()` to reverse the order:

```
news |>
  arrange(desc(ideology))
```

```
## # A tibble: 3,137 x 10
##    callsign affiliation date       weekday ideology nation~1
##    <chr>    <chr>       <date>     <ord>      <dbl>    <dbl>
##  1 KAEF     ABC         2017-06-19 Mon        0.778   0.0823
##  2 WYDO     FOX         2017-07-19 Wed        0.580   0.126
##  3 KRCR     ABC         2017-10-03 Tue        0.566   0.123
##  4 KAEF     ABC         2017-10-18 Wed        0.496   0.0892
##  5 KBVU     FOX         2017-11-16 Thu        0.491   0.159
##  6 KTMF     ABC         2017-11-06 Mon        0.455   0.138
##  7 KAEF     ABC         2017-06-29 Thu        0.447   0.126
##  8 KPAX     CBS         2017-11-23 Thu        0.437   0.125
##  9 KTAB     CBS         2017-11-16 Thu        0.427   0.0631
## 10 KCVU     FOX         2017-07-06 Thu        0.406   0.154
## # ... with 3,127 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

3/ Operating on columns

`select()`:

`select()` selects columns via their names.

Selecting based on names

```
news |>
  select(callsign, date, ideology)
```

```
## # A tibble: 3,137 x 3
##    callsign date       ideology
##    <chr>    <date>        <dbl>
##  1 KRBC     2017-06-05   NA
##  2 KTAB     2017-06-05   NA
##  3 KXVA     2017-06-05   NA
##  4 KPAX     2017-06-06   NA
##  5 KTAB     2017-06-06   NA
##  6 KECI     2017-06-07    0.0655
##  7 KPAX     2017-06-07    0.0853
##  8 KRBC     2017-06-07    0.0183
##  9 KTAB     2017-06-07    0.0850
## 10 KTMF     2017-06-07    0.0842
## # ... with 3,127 more rows
```

Selecting based on a range of variables

```
news |>
  select(callsign:ideology)
```

```
## # A tibble: 3,137 x 5
##    callsign affiliation date       weekday ideology
##    <chr>    <chr>       <date>     <ord>      <dbl>
##  1 KRBC     NBC         2017-06-05 Mon       NA
##  2 KTAB     CBS         2017-06-05 Mon       NA
##  3 KXVA     FOX         2017-06-05 Mon       NA
##  4 KPAX     CBS         2017-06-06 Tue       NA
##  5 KTAB     CBS         2017-06-06 Tue       NA
##  6 KECI     NBC         2017-06-07 Wed        0.0655
##  7 KPAX     CBS         2017-06-07 Wed        0.0853
##  8 KRBC     NBC         2017-06-07 Wed        0.0183
##  9 KTAB     CBS         2017-06-07 Wed        0.0850
## 10 KTMF     ABC         2017-06-07 Wed        0.0842
## # ... with 3,127 more rows
```

Selecting all not in a range

```
news |>
  select(!callsign:ideology)
```

```
## # A tibble: 3,137 x 5
##    national_politics local_politics sinclair2017  post month
##                <dbl>          <dbl>        <dbl> <dbl> <ord>
##  1            0.0286         0.0190            0     0 Jun
##  2            0.0286         0.0190            0     0 Jun
##  3            0.0393         0.0262            0     0 Jun
##  4            0.00357        0.194             0     0 Jun
##  5            0.0945         0.109             0     0 Jun
##  6            0.225          0.148             1     0 Jun
##  7            0.283          0.123             0     0 Jun
##  8            0.130          0.189             0     0 Jun
##  9            0.0901         0.138             0     0 Jun
## 10            0.152          0.129             0     0 Jun
## # ... with 3,127 more rows
```

Selecting all numeric columns

```
news |>
  select(where(is.numeric))
```

```
## # A tibble: 3,137 x 5
##    ideology national_politics local_politics sinclai~1  post
##       <dbl>             <dbl>          <dbl>     <dbl> <dbl>
##  1  NA                0.0286         0.0190         0     0
##  2  NA                0.0286         0.0190         0     0
##  3  NA                0.0393         0.0262         0     0
##  4  NA                0.00357        0.194          0     0
##  5  NA                0.0945         0.109          0     0
##  6   0.0655           0.225          0.148          1     0
##  7   0.0853           0.283          0.123          0     0
##  8   0.0183           0.130          0.189          0     0
##  9   0.0850           0.0901         0.138          0     0
## 10   0.0842           0.152          0.129          0     0
## # ... with 3,127 more rows, and abbreviated variable name
## #   1: sinclair2017
```

Combining multiple selections

```
news |>
  select(callsign:weekday, ends_with("politics"))
```

```
## # A tibble: 3,137 x 6
##    callsign affiliation date       weekday nationa~1 local~2
##    <chr>    <chr>       <date>     <ord>       <dbl>   <dbl>
##  1 KRBC     NBC         2017-06-05 Mon       0.0286  0.0190
##  2 KTAB     CBS         2017-06-05 Mon       0.0286  0.0190
##  3 KXVA     FOX         2017-06-05 Mon       0.0393  0.0262
##  4 KPAX     CBS         2017-06-06 Tue       0.00357 0.194
##  5 KTAB     CBS         2017-06-06 Tue       0.0945  0.109
##  6 KECI     NBC         2017-06-07 Wed       0.225   0.148
##  7 KPAX     CBS         2017-06-07 Wed       0.283   0.123
##  8 KRBC     NBC         2017-06-07 Wed       0.130   0.189
##  9 KTAB     CBS         2017-06-07 Wed       0.0901  0.138
## 10 KTMF     ABC         2017-06-07 Wed       0.152   0.129
## # ... with 3,127 more rows, and abbreviated variable names
## #   1: national_politics, 2: local_politics
```

rename()

`rename(new_name = old_name)` renames the `old_name` variable to `new_name`

```
news |>
  rename(call_sign = callsign)
```

```
## # A tibble: 3,137 x 10
##    call_sign affiliation date       weekday ideology natio~1
##    <chr>     <chr>       <date>     <ord>      <dbl>   <dbl>
##  1 KRBC      NBC         2017-06-05 Mon       NA      0.0286
##  2 KTAB      CBS         2017-06-05 Mon       NA      0.0286
##  3 KXVA      FOX         2017-06-05 Mon       NA      0.0393
##  4 KPAX      CBS         2017-06-06 Tue       NA      0.00357
##  5 KTAB      CBS         2017-06-06 Tue       NA      0.0945
##  6 KECI      NBC         2017-06-07 Wed        0.0655 0.225
##  7 KPAX      CBS         2017-06-07 Wed        0.0853 0.283
##  8 KRBC      NBC         2017-06-07 Wed        0.0183 0.130
##  9 KTAB      CBS         2017-06-07 Wed        0.0850 0.0901
## 10 KTMF      ABC         2017-06-07 Wed        0.0842 0.152
## # ... with 3,127 more rows, 4 more variables:
## #   local_politics <dbl>, sinclair2017 <dbl>, post <dbl>,
## #   month <ord>, and abbreviated variable name
## #   1: national_politics
```

mutate()

`mutate(new_var = fun(old_vars))` adds new columns that are functions of existing columns.

```r
news |>
  mutate(
    national_local_diff = national_politics - local_politics,
    national_politics_perc = national_politics * 100
  ) |>
  select(callsign, date, national_politics, local_politics,
         national_local_diff, national_politics_perc)
```

```
## # A tibble: 3,137 x 6
##    callsign date       national_politics local_politics national_local_diff national_politics_perc
##    <chr>    <date>                 <dbl>          <dbl>               <dbl>                  <dbl>
##  1 KRBC     2017-06-05           0.0286         0.0190             0.00952                   2.86
##  2 KTAB     2017-06-05           0.0286         0.0190             0.00952                   2.86
##  3 KXVA     2017-06-05           0.0393         0.0262             0.0131                    3.93
##  4 KPAX     2017-06-06           0.00357        0.194              -0.191                    0.357
##  5 KTAB     2017-06-06           0.0945         0.109              -0.0145                   9.45
##  6 KECI     2017-06-07           0.225          0.148              0.0761                   22.5
##  7 KPAX     2017-06-07           0.283          0.123              0.160                    28.3
##  8 KRBC     2017-06-07           0.130          0.189              -0.0589                  13.0
##  9 KTAB     2017-06-07           0.0901         0.138              -0.0476                   9.01
## 10 KTMF     2017-06-07           0.152          0.129              0.0229                   15.2
## # ... with 3,127 more rows
```

`if_else()`

`if_else(test_condition, yes, no)` allows us to create a vector that depends on a logical

New vector gets `yes` expression when `test_condition` is TRUE, `no` otherwise

```
news |>
  mutate(Ownership = if_else(sinclair2017 == 1,
                             "Acquired by Sinclair",
                             "Not Acquired")) |>
  select(callsign, affiliation, date, Ownership)
```

```
## # A tibble: 3,137 x 4
##    callsign affiliation date       Ownership
##    <chr>    <chr>       <date>     <chr>
##  1 KRBC     NBC         2017-06-05 Not Acquired
##  2 KTAB     CBS         2017-06-05 Not Acquired
##  3 KXVA     FOX         2017-06-05 Not Acquired
##  4 KPAX     CBS         2017-06-06 Not Acquired
##  5 KTAB     CBS         2017-06-06 Not Acquired
##  6 KECI     NBC         2017-06-07 Acquired by Sinclair
##  7 KPAX     CBS         2017-06-07 Not Acquired
##  8 KRBC     NBC         2017-06-07 Not Acquired
##  9 KTAB     CBS         2017-06-07 Not Acquired
## 10 KTMF     ABC         2017-06-07 Not Acquired
## # ... with 3,127 more rows
```

4/ Operating on groups

group_by()

`group_by(var)` divides the data into groups based on the `var` variable.

Doesn't change data yet, but subsequent operations will by `var`.

```
news |>
  group_by(month)
```

```
## # A tibble: 3,137 x 10
## # Groups:   month [7]
##    callsign affil~1 date       weekday ideol~2 natio~3 local~4 sincl~5
##    <chr>    <chr>   <date>     <ord>     <dbl>   <dbl>   <dbl>   <dbl>
##  1 KRBC     NBC     2017-06-05 Mon      NA      0.0286   0.0190       0
##  2 KTAB     CBS     2017-06-05 Mon      NA      0.0286   0.0190       0
##  3 KXVA     FOX     2017-06-05 Mon      NA      0.0393   0.0262       0
##  4 KPAX     CBS     2017-06-06 Tue      NA      0.00357  0.194        0
##  5 KTAB     CBS     2017-06-06 Tue      NA      0.0945   0.109        0
##  6 KECI     NBC     2017-06-07 Wed       0.0655 0.225    0.148        1
##  7 KPAX     CBS     2017-06-07 Wed       0.0853 0.283    0.123        0
##  8 KRBC     NBC     2017-06-07 Wed       0.0183 0.130    0.189        0
##  9 KTAB     CBS     2017-06-07 Wed       0.0850 0.0901   0.138        0
## 10 KTMF     ABC     2017-06-07 Wed       0.0842 0.152    0.129        0
## # ... with 3,127 more rows, 2 more variables: post <dbl>,
## #   month <ord>, and abbreviated variable names 1: affiliation,
## #   2: ideology, 3: national_politics, 4: local_politics,
## #   5: sinclair2017
```

summarize()

`summarize(sum_var = fun(curr_var))` calculates summaries of variables by groups.

Ideological slant by weekday

```
news |>
  group_by(month) |>
  summarize(
    slant_mean = mean(ideology, na.rm = TRUE)
  )
```

```
## # A tibble: 7 x 2
##   month slant_mean
##   <ord>      <dbl>
## 1 Jun       0.0786
## 2 Jul       0.103
## 3 Aug       0.105
## 4 Sep       0.0751
## 5 Oct       0.0862
## 6 Nov       0.0972
## 7 Dec       0.0774
```

Summaries by ownership and pre/post

```
news |>
  group_by(sinclair2017, post) |>
  summarize(
    slant_mean = mean(ideology, na.rm = TRUE),
    national_mean = mean(national_politics, na.rm = TRUE)
  )
```

```
## # A tibble: 4 x 4
## # Groups:   sinclair2017 [2]
##   sinclair2017  post slant_mean national_mean
##          <dbl> <dbl>      <dbl>         <dbl>
## 1            0     0     0.100          0.118
## 2            0     1     0.0768         0.107
## 3            1     0     0.0936         0.124
## 4            1     1     0.0938         0.144
```

Summarize across types of variables

`across()` will apply a summary function across many variables

```
news |>
  group_by(sinclair2017, post) |>
  summarize(
    across(where(is.numeric), mean, na.rm = TRUE),
  )
```

```
## # A tibble: 4 x 5
## # Groups:   sinclair2017 [2]
##   sinclair2017  post ideology national_politics local_politics
##          <dbl> <dbl>    <dbl>             <dbl>          <dbl>
## 1            0     0   0.100              0.118          0.158
## 2            0     1   0.0768             0.107          0.150
## 3            1     0   0.0936             0.124          0.170
## 4            1     1   0.0938             0.144          0.147
```