Regular Expressions

Data Wrangling, Session 5

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Code Horizons

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A brief introduction to regular expressions

Load the packages, as always

```r
library(here)       # manage file paths
library(socviz)     # data and some useful functions
```

```r
library(tidyverse) # your friend and mine
library(gapminder) # gapminder data
library(stringr)
```

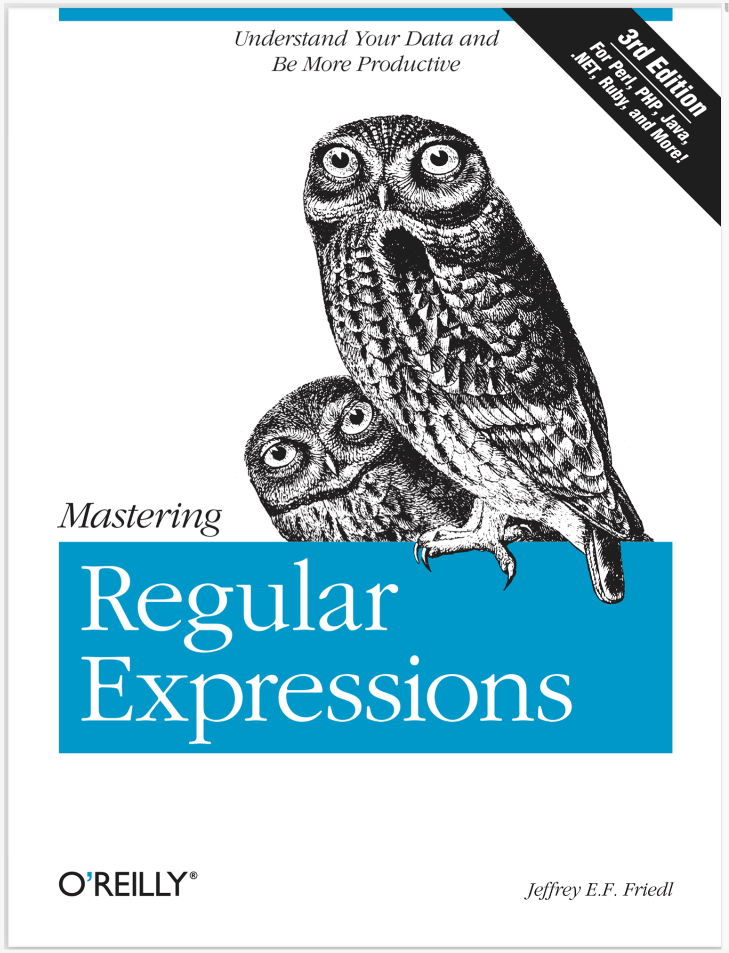
Regular Expressions

Or, waiter, there appears to be a language inside my language

stringr is your gateway to regexps

```r
library(stringr) # It's loaded by default with library(tidyverse)
```

regexps are their own whole world


Understand Your Data and Be More Productive
3rd Edition
For Perl, PHP, Java, .NET, Ruby, and More!
Mastering
Regular Expressions
O'REILLY
Jeffrey E.F. Friedl

This book is a thing of beauty.

Searching for patterns

A regular expression is a way of searching for a piece of text, or *pattern*, inside some larger body of text, called a *string*.

Searching for patterns

Here I’ll follow the exposition in Wickham & Grolemund (2017).

```r
x ← c("apple", "banana", "pear")

str_view(x, "an", html=FALSE)
```

```
[2] │ b<an><an>a
```

Searching for patterns

Escaping

Hang on, I see a further problem

We use strings to represent regular expressions. \ is also used as an escape symbol in strings. So to create the regular expression \. we need the string \\.

```r
# To create the regular expression, we need \\
dot <- "\\."

# But the expression itself only contains one:
writeLines(dot)
```

```
\.
```

```r
# And this tells R to look for an explicit .
str_view(c("abc", "a.c", "bef"), "a\\.c")
```

```
[2] │ <a.c>
```

But … how do you match a literal \?

```r
x <- "a\\b"
writeLines(x)
```

```
a\b
```

```r
#> a\b

str_view(x, "\\\\") # you need four!
```

```
[1] │ a<\>b
```

But … how do you match a literal \?

This is the price we pay for having to express searches for patterns using a language containing these same characters, which we may also want to search for.

I *promise* this will pay off

Matching start and end

Use ^ to match the start of a string.

```r
x <- c("apple", "banana", "pear")
str_view(x, "^a")
```

```
[1] │ <a>pple
```

Matching start and end

Use ^ to match the start of a string.

```r
x <- c("apple", "banana", "pear")
str_view(x, "^a")
```

```
[1] │ <a>pple
```

Use $ to match the end of a string.

```r
str_view(x, "a$")
```

```
[2] │ banan<a>
```

Matching start and end

To force a regular expression to only match a complete string, anchor it with both `^` and `$`

```r
x <- c("apple pie", "apple", "apple cake")
str_view(x, "apple")
```

```
[1] │ <apple> pie
[2] │ <apple>
[3] │ <apple> cake
```

```r
str_view(x, "^apple$")
```

```
[2] │ <apple>
```

Matching character classes

`\d` matches any digit.

`\s` matches any whitespace (e.g. space, tab, newline).

`abc` matches a, b, or c.

`^abc` matches anything except a, b, or c.

Matching the *special* characters

Look for a literal character that normally has special meaning in a regex:

```
str_view(c("abc", "a.c", "a*c", "a c"), "a[.]c")
```

```
[2] │ <a.c>
```

```
str_view(c("abc", "a.c", "a*c", "a c"), ".[*]c")
```

```
[3] │ <a*c>
```

This works for most (but not all) regex metacharacters: `$ . | ? * + ( ) [ {`. Unfortunately, a few characters have special meaning even inside a character class and must be handled with backslash escapes. These are `] \ ^` and `-`

Alternation

Use parentheses to make the precedence of the ‘or’ operator | clear:

```r
str_view(c("groy", "grey", "griy", "gray"), "gr(e|a)y")
```

```
[2] │ <grey>
[4] │ <gray>
```

Repeated patterns

? is 0 or 1

+ is 1 or more

* is 0 or more

```r
x <- "1888 is the longest year in Roman numerals: MDCCCLXXXVIII"
str_view(x, "CC?")
```

```
[1] │ 1888 is the longest year in Roman numerals: MD<CC><C>LXXXVIII
```

Repeated patterns

- ? is 0 or 1
- + is 1 or more
- * is 0 or more

```r
str_view(x, "CC+")
```

```
[1] │ 1888 is the longest year in Roman numerals: MD<CCC>LXXXVIII
```

Repeated patterns

- `?` is 0 or 1
- `+` is 1 or more
- `*` is 0 or more

```r
x <- "1888 is the longest year in Roman numerals: MDCCCLXXXVIII"
str_view(x, 'C[LX]+')
```

```
[1] │ 1888 is the longest year in Roman numerals: MDCC<CLXXX>VIII
```

Exact numbers of repetitions

{n} is exactly n

{n,} is n or more

{,m} is at most m

{n,m} is between n and m

```r
str_view(x, "C{2}")
```

```
[1] │ 1888 is the longest year in Roman numerals: MD<CC>CLXXXVIII
```

Exact numbers of repetitions

{n} is exactly n

{n,} is n or more

{,m} is at most m

{n,m} is between n and m

```r
str_view(x, "C{2,}")
```

```
[1] │ 1888 is the longest year in Roman numerals: MD<CCC>LXXXVIII
```

Exact numbers of repetitions

{n} is exactly n

{n,} is n or more

{,m} is at most m

{n,m} is between n and m

```
str_view(x, "C{2,3}")
```

```
[1] │ 1888 is the longest year in Roman numerals: MD<CCC>LXXXVIII
```

Exact numbers of repetitions

- {n} is exactly n
- {n,} is n or more
- {,m} is at most m
- {n,m} is between n and m

By default regexps use *greedy* matches. You can make them match the *shortest* string possible by putting a ? after them. **This is often very useful!**

```
str_view(x, 'C{2,3}?')
```

```
[1] │ 1888 is the longest year in Roman numerals: MD<CC>CLXXXVIII
```

Exact numbers of repetitions

- {n} is exactly n
- {n,} is n or more
- {,m} is at most m
- {n,m} is between n and m

By default these are *greedy* matches. You can make them “lazy”, matching the shortest string possible by putting a ? after them. **This is often very useful!**

```r
str_view(x, 'C[LX]+?')
```

```
[1] │ 1888 is the longest year in Roman numerals: MDCC<CL>XXXVIII
```

And finally … backreferences

```r
fruit # built into stringr
```

```
 [1] "apple"             "apricot"           "avocado"          
 [4] "banana"            "bell pepper"       "bilberry"         
 [7] "blackberry"        "blackcurrant"      "blood orange"     
[10] "blueberry"         "boysenberry"       "breadfruit"       
[13] "canary melon"      "cantaloupe"        "cherimoya"        
[16] "cherry"            "chili pepper"      "clementine"       
[19] "cloudberry"        "coconut"           "cranberry"        
[22] "cucumber"          "currant"           "damson"           
[25] "date"              "dragonfruit"       "durian"           
[28] "eggplant"          "elderberry"        "feijoa"           
[31] "fig"               "goji berry"        "gooseberry"       
[34] "grape"             "grapefruit"        "guava"            
[37] "honeydew"          "huckleberry"       "jackfruit"        
[40] "jambul"            "jujube"            "kiwi fruit"       
[43] "kumquat"           "lemon"             "lime"             
[46] "loquat"            "lychee"            "mandarine"        
[49] "mango"             "mulberry"          "nectarine"        
[52] "nut"               "olive"             "orange"           
[55] "pamelo"            "papaya"            "passionfruit"     
```

Grouping and backreferences

Find all fruits that have a repeated pair of letters:

```r
str_view(fruit, "(..)\\1", match = TRUE)
```

```
 [4] │ b<anan>a
[20] │ <coco>nut
[22] │ <cucu>mber
[41] │ <juju>be
[56] │ <papa>ya
[73] │ s<alal> berry
```

Grouping and backreferences

Backreferences and grouping will be very useful for string *replacements*.

OK that was a lot

Learning and testing regexps

Practice with a tester like https://regexr.com or https://regex101.com

Or an app like Patterns

The regex engine or “flavor” used by `stringr` is Perl- or PCRE2-like.

Regexps in practice

Example: Politics and Placenames

```r
library(ukelection2019)
```

Example: Politics and Placenames

```r
library(ukelection2019)

ukvote2019
```

```
# A tibble: 3,320 × 13
   cid     constituency electorate party_name candidate
votes vote_share_percent
   <chr>   <chr>             <int> <chr>      <chr>
<int>              <dbl>
 1 W07000… Aberavon          50747 Labour     Stephen …
17008               53.8
 2 W07000… Aberavon          50747 Conservat… Charlott…
6518               20.6
 3 W07000… Aberavon          50747 The Brexi… Glenda D…
3108                9.8
 4 W07000… Aberavon          50747 Plaid Cym… Nigel Hu…
2711                8.6
 5 W07000… Aberavon          50747 Liberal D… Sheila K…
1072                3.4
 6 W07000… Aberavon          50747 Independe… Captain …
731                2.3
 7 W07000… Aberavon          50747 Green      Giorgia …
450                1.4
 8 W07000… Aberconwy         44699 Conservat… Robin Mi…
14687               46.1
 9 W07000… Aberconwy         44699 Labour     Emily Ow…
12653               39.7
10 W07000… Aberconwy         44699 Plaid Cym… Lisa Goo…
2704                8.5
```

Example: Politics and Placenames

```r
library(ukelection2019)

ukvote2019 |>
  group_by(constituency)
```

```
# A tibble: 3,320 × 13
# Groups:   constituency [650]
   cid     constituency electorate party_name candidate
votes vote_share_percent
   <chr>   <chr>             <int> <chr>      <chr>
<int>              <dbl>
 1 W07000… Aberavon          50747 Labour     Stephen …
17008               53.8
 2 W07000… Aberavon          50747 Conservat… Charlott…
6518               20.6
 3 W07000… Aberavon          50747 The Brexi… Glenda D…
3108                9.8
 4 W07000… Aberavon          50747 Plaid Cym… Nigel Hu…
2711                8.6
 5 W07000… Aberavon          50747 Liberal D… Sheila K…
1072                3.4
 6 W07000… Aberavon          50747 Independe… Captain …
731                2.3
 7 W07000… Aberavon          50747 Green      Giorgia …
450                1.4
 8 W07000… Aberconwy         44699 Conservat… Robin Mi…
14687               46.1
 9 W07000… Aberconwy         44699 Labour     Emily Ow…
12653               39.7
10 W07000… Aberconwy         44699 Plaid Cym… Lisa Goo…
```

Example: Politics and Placenames

```r
library(ukelection2019)

ukvote2019 |>
  group_by(constituency) |>
  slice_max(votes)
```

```
# A tibble: 650 × 13
# Groups:   constituency [650]
   cid     constituency electorate party_name candidate
votes vote_share_percent
   <chr>   <chr>             <int> <chr>      <chr>
<int>              <dbl>
 1 W07000… Aberavon          50747 Labour     Stephen …
17008              53.8
 2 W07000… Aberconwy         44699 Conservat… Robin Mi…
14687              46.1
 3 S14000… Aberdeen No…      62489 Scottish … Kirsty B…
20205              54
 4 S14000… Aberdeen So…      65719 Scottish … Stephen …
20388              44.7
 5 S14000… Aberdeenshi…      72640 Conservat… Andrew B…
22752              42.7
 6 S14000… Airdrie & S…      64008 Scottish … Neil Gray
17929              45.1
 7 E14000… Aldershot         72617 Conservat… Leo Doch…
27980              58.4
 8 E14000… Aldridge-Br…      60138 Conservat… Wendy Mo…
27850              70.8
 9 E14000… Altrincham …      73096 Conservat… Graham B…
26311              48
10 W07000… Alyn & Dees…      62783 Labour     Mark Tami
```

Example: Politics and Placenames

```r
library(ukelection2019)

ukvote2019 ▷
  group_by(constituency) ▷
  slice_max(votes) ▷
  ungroup()
```

```
# A tibble: 650 × 13
   cid     constituency electorate party_name candidate
votes vote_share_percent
   <chr>   <chr>             <int> <chr>      <chr>
<int>              <dbl>
 1 W07000… Aberavon          50747 Labour     Stephen …
17008               53.8
 2 W07000… Aberconwy         44699 Conservat… Robin Mi…
14687               46.1
 3 S14000… Aberdeen No…      62489 Scottish … Kirsty B…
20205               54
 4 S14000… Aberdeen So…      65719 Scottish … Stephen …
20388               44.7
 5 S14000… Aberdeenshi…      72640 Conservat… Andrew B…
22752               42.7
 6 S14000… Airdrie & S…      64008 Scottish … Neil Gray
17929               45.1
 7 E14000… Aldershot         72617 Conservat… Leo Doch…
27980               58.4
 8 E14000… Aldridge-Br…      60138 Conservat… Wendy Mo…
27850               70.8
 9 E14000… Altrincham …      73096 Conservat… Graham B…
26311               48
10 W07000… Alyn & Dees…      62783 Labour     Mark Tami
18271               42.5
```

Example: Politics and Placenames

```r
library(ukelection2019)

ukvote2019 ▷
  group_by(constituency) ▷
  slice_max(votes) ▷
  ungroup() ▷
  select(constituency, party_name)
```

```
# A tibble: 650 × 2
   constituency                     party_name
   <chr>                            <chr>
 1 Aberavon                         Labour
 2 Aberconwy                        Conservative
 3 Aberdeen North                   Scottish National
Party
 4 Aberdeen South                   Scottish National
Party
 5 Aberdeenshire West & Kincardine Conservative
 6 Airdrie & Shotts                 Scottish National
Party
 7 Aldershot                        Conservative
 8 Aldridge-Brownhills              Conservative
 9 Altrincham & Sale West           Conservative
10 Alyn & Deeside                   Labour
# ℹ 640 more rows
```

Example: Politics and Placenames

```r
library(ukelection2019)

ukvote2019 ▷
  group_by(constituency) ▷
  slice_max(votes) ▷
  ungroup() ▷
  select(constituency, party_name) ▷
  mutate(shire = str_detect(constituency, "shire"),
         field = str_detect(constituency, "field"),
         dale = str_detect(constituency, "dale"),
         pool = str_detect(constituency, "pool"),
         ton = str_detect(constituency, "(ton$)|(ton )"),
         wood = str_detect(constituency, "(wood$)|(wood )"),
         saint = str_detect(constituency, "(St )|(Saint)"),
         port = str_detect(constituency, "(Port)|(port)"),
         ford = str_detect(constituency, "(ford$)|(ford )"),
         by = str_detect(constituency, "(by$)|(by )"),
         boro = str_detect(constituency, "(boro$)|(boro )|(borough$)|(borough )"),
         ley = str_detect(constituency, "(ley$)|(ley )|(leigh$)|(leigh )"))
```

```
# A tibble: 650 × 14
   constituency party_name shire field dale  pool  ton  
wood  saint port  ford 
   <chr>        <chr>      <lgl> <lgl> <lgl> <lgl> <lgl>
<lgl> <lgl> <lgl> <lgl>
 1 Aberavon     Labour     FALSE FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
 2 Aberconwy    Conservat… FALSE FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
 3 Aberdeen No… Scottish … FALSE FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
 4 Aberdeen So… Scottish … FALSE FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
 5 Aberdeenshi… Conservat… TRUE  FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
 6 Airdrie & S… Scottish … FALSE FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
 7 Aldershot    Conservat… FALSE FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
 8 Aldridge-Br… Conservat… FALSE FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
 9 Altrincham … Conservat… FALSE FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
10 Alyn & Dees… Labour     FALSE FALSE FALSE FALSE FALSE
FALSE FALSE FALSE FALSE
```

Example: Politics and Placenames

```r
library(ukelection2019)

ukvote2019 ▷
  group_by(constituency) ▷
  slice_max(votes) ▷
  ungroup() ▷
  select(constituency, party_name) ▷
  mutate(shire = str_detect(constituency, "shire"),
         field = str_detect(constituency, "field"),
         dale = str_detect(constituency, "dale"),
         pool = str_detect(constituency, "pool"),
         ton = str_detect(constituency, "(ton$)|(ton )"),
         wood = str_detect(constituency, "(wood$)|(wood )"),
         saint = str_detect(constituency, "(St )|(Saint)"),
         port = str_detect(constituency, "(Port)|(port)"),
         ford = str_detect(constituency, "(ford$)|(ford )"),
         by = str_detect(constituency, "(by$)|(by )"),
         boro = str_detect(constituency, "(boro$)|(boro )|(borough$)|(borough )"),
         ley = str_detect(constituency, "(ley$)|(ley )|(leigh$)|(leigh )")) ▷
  pivot_longer(shire:ley, names_to = "toponym")
```

```
# A tibble: 7,800 × 4
   constituency party_name toponym value
   <chr>        <chr>      <chr>   <lgl>
 1 Aberavon     Labour     shire   FALSE
 2 Aberavon     Labour     field   FALSE
 3 Aberavon     Labour     dale    FALSE
 4 Aberavon     Labour     pool    FALSE
 5 Aberavon     Labour     ton     FALSE
 6 Aberavon     Labour     wood    FALSE
 7 Aberavon     Labour     saint   FALSE
 8 Aberavon     Labour     port    FALSE
 9 Aberavon     Labour     ford    FALSE
10 Aberavon     Labour     by      FALSE
# ℹ 7,790 more rows
```

Example: Politics and Placenames

```r
place_tab <- ukvote2019 |>
  group_by(constituency) |>
  slice_max(votes) |>
  ungroup() |>
  select(constituency, party_name) |>
  mutate(shire = str_detect(constituency, "shire"),
         field = str_detect(constituency, "field"),
         dale = str_detect(constituency, "dale"),
         pool = str_detect(constituency, "pool"),
         ton = str_detect(constituency, "(ton$)|(ton )"),
         wood = str_detect(constituency, "(wood$)|(wood )"),
         saint = str_detect(constituency, "(St )|(Saint)"),
         port = str_detect(constituency, "(Port)|(port)"),
         ford = str_detect(constituency, "(ford$)|(ford )"),
         by = str_detect(constituency, "(by$)|(by )"),
         boro = str_detect(constituency, "(boro$)|(boro )|(borough$)|(borough )"),
         ley = str_detect(constituency, "(ley$)|(ley )|(leigh$)|(leigh )")) |>
  pivot_longer(shire:ley, names_to = "toponym")
```

Example: Politics and Placenames

```r
place_tab
```

```
# A tibble: 7,800 × 4
   constituency party_name toponym value
   <chr>        <chr>      <chr>   <lgl>
 1 Aberavon     Labour     shire   FALSE
 2 Aberavon     Labour     field   FALSE
 3 Aberavon     Labour     dale    FALSE
 4 Aberavon     Labour     pool    FALSE
 5 Aberavon     Labour     ton     FALSE
 6 Aberavon     Labour     wood    FALSE
 7 Aberavon     Labour     saint   FALSE
 8 Aberavon     Labour     port    FALSE
 9 Aberavon     Labour     ford    FALSE
10 Aberavon     Labour     by      FALSE
# ℹ 7,790 more rows
```

Example: Politics and Placenames

```r
place_tab |>
  group_by(party_name, toponym)
```

```
# A tibble: 7,800 × 4
# Groups:   party_name, toponym [120]
   constituency party_name toponym value
   <chr>        <chr>      <chr>   <lgl>
 1 Aberavon     Labour     shire   FALSE
 2 Aberavon     Labour     field   FALSE
 3 Aberavon     Labour     dale    FALSE
 4 Aberavon     Labour     pool    FALSE
 5 Aberavon     Labour     ton     FALSE
 6 Aberavon     Labour     wood    FALSE
 7 Aberavon     Labour     saint   FALSE
 8 Aberavon     Labour     port    FALSE
 9 Aberavon     Labour     ford    FALSE
10 Aberavon     Labour     by      FALSE
# ℹ 7,790 more rows
```

Example: Politics and Placenames

```r
place_tab ▷
  group_by(party_name, toponym) ▷
  filter(party_name %in% c("Conservative", "Labour"))
```

```
# A tibble: 6,816 × 4
# Groups:   party_name, toponym [24]
   constituency party_name toponym value
   <chr>        <chr>      <chr>   <lgl>
 1 Aberavon     Labour     shire   FALSE
 2 Aberavon     Labour     field   FALSE
 3 Aberavon     Labour     dale    FALSE
 4 Aberavon     Labour     pool    FALSE
 5 Aberavon     Labour     ton     FALSE
 6 Aberavon     Labour     wood    FALSE
 7 Aberavon     Labour     saint   FALSE
 8 Aberavon     Labour     port    FALSE
 9 Aberavon     Labour     ford    FALSE
10 Aberavon     Labour     by      FALSE
# ℹ 6,806 more rows
```

Example: Politics and Placenames

```r
place_tab |>
  group_by(party_name, toponym) |>
  filter(party_name %in% c("Conservative", "Labour")) |>
  group_by(toponym, party_name)
```

```
# A tibble: 6,816 × 4
# Groups:   toponym, party_name [24]
   constituency party_name toponym value
   <chr>        <chr>      <chr>   <lgl>
 1 Aberavon     Labour     shire   FALSE
 2 Aberavon     Labour     field   FALSE
 3 Aberavon     Labour     dale    FALSE
 4 Aberavon     Labour     pool    FALSE
 5 Aberavon     Labour     ton     FALSE
 6 Aberavon     Labour     wood    FALSE
 7 Aberavon     Labour     saint   FALSE
 8 Aberavon     Labour     port    FALSE
 9 Aberavon     Labour     ford    FALSE
10 Aberavon     Labour     by      FALSE
# ℹ 6,806 more rows
```

Example: Politics and Placenames

```r
place_tab |>
  group_by(party_name, toponym) |>
  filter(party_name %in% c("Conservative", "Labour")) |>
  group_by(toponym, party_name) |>
  summarize(freq = sum(value))
```

```
# A tibble: 24 × 3
# Groups:   toponym [12]
   toponym party_name    freq
   <chr>   <chr>        <int>
 1 boro    Conservative     7
 2 boro    Labour           1
 3 by      Conservative     6
 4 by      Labour           2
 5 dale    Conservative     3
 6 dale    Labour           1
 7 field   Conservative    10
 8 field   Labour          10
 9 ford    Conservative    17
10 ford    Labour          12
# ℹ 14 more rows
```

Example: Politics and Placenames

```r
place_tab ▷
  group_by(party_name, toponym) ▷
  filter(party_name %in% c("Conservative", "Labour")) ▷
  group_by(toponym, party_name) ▷
  summarize(freq = sum(value)) ▷
  mutate(pct = freq/sum(freq))
```

```
# A tibble: 24 × 4
# Groups:   toponym [12]
   toponym party_name    freq   pct
   <chr>   <chr>        <int> <dbl>
 1 boro    Conservative     7 0.875
 2 boro    Labour           1 0.125
 3 by      Conservative     6 0.75
 4 by      Labour           2 0.25
 5 dale    Conservative     3 0.75
 6 dale    Labour           1 0.25
 7 field   Conservative    10 0.5
 8 field   Labour          10 0.5
 9 ford    Conservative    17 0.586
10 ford    Labour          12 0.414
# ℹ 14 more rows
```

Example: Politics and Placenames

```r
place_tab |>
  group_by(party_name, toponym) |>
  filter(party_name %in% c("Conservative", "Labour")) |>
  group_by(toponym, party_name) |>
  summarize(freq = sum(value)) |>
  mutate(pct = freq/sum(freq)) |>
  filter(party_name == "Conservative")
```

```
# A tibble: 12 × 4
# Groups:   toponym [12]
   toponym party_name    freq   pct
   <chr>   <chr>        <int> <dbl>
 1 boro    Conservative     7 0.875
 2 by      Conservative     6 0.75
 3 dale    Conservative     3 0.75
 4 field   Conservative    10 0.5
 5 ford    Conservative    17 0.586
 6 ley     Conservative    26 0.722
 7 pool    Conservative     2 0.286
 8 port    Conservative     3 0.333
 9 saint   Conservative     3 0.5
10 shire   Conservative    37 0.974
11 ton     Conservative    37 0.507
12 wood    Conservative     7 0.636
```

Example: Politics and Placenames

```r
place_tab |>
  group_by(party_name, toponym) |>
  filter(party_name %in% c("Conservative", "Labour")) |>
  group_by(toponym, party_name) |>
  summarize(freq = sum(value)) |>
  mutate(pct = freq/sum(freq)) |>
  filter(party_name == "Conservative") |>
  arrange(desc(pct))
```

```
# A tibble: 12 × 4
# Groups:   toponym [12]
   toponym party_name    freq   pct
   <chr>   <chr>        <int> <dbl>
 1 shire   Conservative    37 0.974
 2 boro    Conservative     7 0.875
 3 by      Conservative     6 0.75
 4 dale    Conservative     3 0.75
 5 ley     Conservative    26 0.722
 6 wood    Conservative     7 0.636
 7 ford    Conservative    17 0.586
 8 ton     Conservative    37 0.507
 9 field   Conservative    10 0.5
10 saint   Conservative     3 0.5
11 port    Conservative     3 0.333
12 pool    Conservative     2 0.286
```

Example: Politics and Placenames

```r
place_tab |>
  group_by(party_name, toponym) |>
  filter(party_name %in% c("Conservative", "Labour")) |>
  group_by(toponym, party_name) |>
  summarize(freq = sum(value)) |>
  mutate(pct = freq/sum(freq)) |>
  filter(party_name == "Conservative") |>
  arrange(desc(pct))
```

```
# A tibble: 12 × 4
# Groups:   toponym [12]
   toponym party_name    freq   pct
   <chr>   <chr>        <int> <dbl>
 1 shire   Conservative    37 0.974
 2 boro    Conservative     7 0.875
 3 by      Conservative     6 0.75
 4 dale    Conservative     3 0.75
 5 ley     Conservative    26 0.722
 6 wood    Conservative     7 0.636
 7 ford    Conservative    17 0.586
 8 ton     Conservative    37 0.507
 9 field   Conservative    10 0.5
10 saint   Conservative     3 0.5
11 port    Conservative     3 0.333
12 pool    Conservative     2 0.286
```