STAT 118: Notes B

Wrangling data with `dplyr::` `filter`, `select`, `arrange`

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Importing Data

In this class, we are going to be working with a dataset relating to the languages spoken at home by Canadian residents. Many Indigenous peoples exist in Canada with their own languages and cultures. Sadly, colonization has led to the loss of many of these languages. This data is a subset of data collected during the 2016 census.

What is a .csv file?

How do we import it into R?

Use `read.csv()`! Note that your data file (`.csv`) needs to be saved in the same folder as your notes template document (`.qmd`).

```
can_lang <- read.csv("can_lang.csv")
```

Alternatively, you can download it directly from the internet. Github user `ttimbers` hosts this file to share with the public at the link: https://raw.githubusercontent.com/ttimbers/canlang/master/inst/extdata/can_lang.csv

```
can_lang <- read.csv("https://raw.githubusercontent.com/ttimbers/canlang/master/inst/extda
```

Let's take a look at this data for a minute to see what information has been recorded.

```
head(can_lang)
```

```
                              category                         language
1                  Aboriginal languages   Aboriginal languages, n.o.s.
2 Non-Official & Non-Aboriginal languages                      Afrikaans
3 Non-Official & Non-Aboriginal languages Afro-Asiatic languages, n.i.e.
4 Non-Official & Non-Aboriginal languages                     Akan (Twi)
5 Non-Official & Non-Aboriginal languages                       Albanian
6                  Aboriginal languages   Algonquian languages, n.i.e.
  mother_tongue most_at_home most_at_work lang_known
1           590          235           30        665
2         10260         4785           85      23415
3          1150          445           10       2775
4         13460         5985           25      22150
5         26895        13135          345      31930
6            45           10            0        120
```

Installing and Using Packages

Sometimes everything we need (data, functions, etc) are not available in base R. In R, expert users will package up useful things like data and functions into packages that be download and used.

First, you need to download the package from the right hand menu –> You only need to do this once.

In each new .Rmd document, you need to call any packages you want to use but adding the code `library(packagename)` inside an R chunk.

For example, in this class we will use the `tidyverse` package a lot.

```r
library(tidyverse)
```

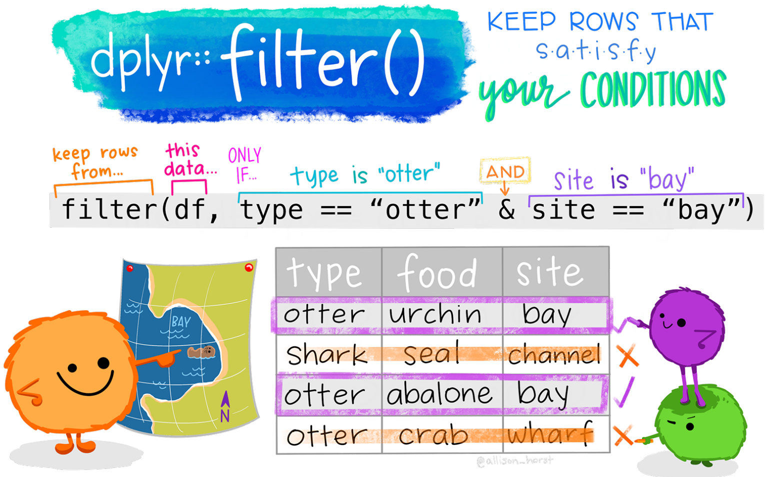
`dplyr`

There are actually many commonly used packages wrapped up inside one `tidyverse` package.

Today we are specifically going to be talking about the package `dplyr` which is useful to manipulating data sets.

filter

We can use the `filter` function to extract ***rows*** from the data that have a particular characteristic.



```
filter(df, type == “otter” & site == “bay”)
```

type	food	site
otter	urchin	bay
shark	seal	channel
otter	abalone	bay
otter	crab	wharf

Figure 1: Artwork by @allisonhorst

For example, we may be interested in only looking at only the languages in this dataset that are Aboriginal languages.

Start with the `can_lang dataset`, the pipe "%" means apply the action on the following line to the previous line. In this case, pick out only the rows were the category variable is "Aboriginal languages"

```
can_lang  %>%
  filter(category == "Aboriginal languages")
```

```
              category                        language mother_tongue most_at_home
1 Aboriginal languages Aboriginal languages, n.o.s.          590          235
2 Aboriginal languages Algonquian languages, n.i.e.           45           10
3 Aboriginal languages                      Algonquin         1260          370
4 Aboriginal languages Athabaskan languages, n.i.e.           50           10
5 Aboriginal languages                      Atikamekw         6150         5465
6 Aboriginal languages          Babine (Wetsuwet'en)          110           20
7 Aboriginal languages                         Beaver          190           50
8 Aboriginal languages                      Blackfoot         2815         1110
9 Aboriginal languages                        Carrier         1025          250
```

```
10 Aboriginal languages                      Cayuga            45          10
11 Aboriginal languages                   Chilcotin           655         255
12 Aboriginal languages                       Comox            85           0
13 Aboriginal languages                Cree, n.o.s.         64050       37950
14 Aboriginal languages                      Dakota          1210         255
15 Aboriginal languages                        Dene         10700        7710
16 Aboriginal languages             Dogrib (Tlicho)          1650        1020
17 Aboriginal languages           Gitxsan (Gitksan)           880         315
18 Aboriginal languages                    Gwich'in           255          50
19 Aboriginal languages                       Haida            80          10
20 Aboriginal languages                      Haisla            90          20
21 Aboriginal languages                  Halkomelem           480          50
22 Aboriginal languages                    Heiltsuk           100           5
23 Aboriginal languages  Inuinnaqtun (Inuvialuktun)          1020         165
24 Aboriginal languages     Inuit languages, n.i.e.           310          90
25 Aboriginal languages                   Inuktitut         35210       29230
26 Aboriginal languages Iroquoian languages, n.i.e.            35           5
27 Aboriginal languages              Kaska (Nahani)           180          20
28 Aboriginal languages                     Kutenai           110          10
29 Aboriginal languages        Kwakiutl (Kwak'wala)           325          25
30 Aboriginal languages                    Lillooet           315          25
31 Aboriginal languages                    Malecite           300          55
32 Aboriginal languages                     Mi'kmaq          6690        3565
33 Aboriginal languages                      Michif           465          80
34 Aboriginal languages                      Mohawk           985         255
35 Aboriginal languages           Montagnais (Innu)         10235        8585
36 Aboriginal languages                  Moose Cree           105          10
37 Aboriginal languages                     Naskapi          1205        1195
38 Aboriginal languages                     Nisga'a           400          75
39 Aboriginal languages         North Slavey (Hare)           765         340
40 Aboriginal languages          Northern East Cree           315         110
41 Aboriginal languages           Northern Tutchone           220          30
42 Aboriginal languages     Nuu-chah-nulth (Nootka)           280          30
43 Aboriginal languages                    Oji-Cree         12855        7905
44 Aboriginal languages                     Ojibway         17885        6175
45 Aboriginal languages                    Okanagan           275          80
46 Aboriginal languages                      Oneida            60          15
47 Aboriginal languages              Ottawa (Odawa)           150          75
48 Aboriginal languages                 Plains Cree          3065        1345
49 Aboriginal languages    Salish languages, n.i.e.           260          25
50 Aboriginal languages              Sarsi (Sarcee)            80          10
51 Aboriginal languages                      Sekani            85          15
52 Aboriginal languages     Shuswap (Secwepemctsin)           445          50
```

```
53 Aboriginal languages     Siouan languages, n.i.e.            55           20
54 Aboriginal languages               Slavey, n.o.s.           280          105
55 Aboriginal languages                 South Slavey           945          370
56 Aboriginal languages           Southern East Cree            45           15
57 Aboriginal languages            Southern Tutchone            70            5
58 Aboriginal languages                     Squamish            40            5
59 Aboriginal languages                       Stoney          3025         1950
60 Aboriginal languages                      Straits            80           25
61 Aboriginal languages                  Swampy Cree          1440          330
62 Aboriginal languages                      Tahltan            95            5
63 Aboriginal languages       Thompson (Ntlakapamux)           335           20
64 Aboriginal languages                      Tlingit            95            0
65 Aboriginal languages                    Tsimshian           200           30
66 Aboriginal languages   Wakashan languages, n.i.e.            10            0
67 Aboriginal languages                   Woods Cree          1840          800
   most_at_work lang_known
1            30        665
2             0        120
3            40       2480
4             0         85
5          1100       6645
6            10        210
7             0        340
8            85       5645
9            15       2100
10           10        125
11           15       1150
12            0        185
13         7800      86115
14           20       1760
15          770      13060
16          165       2375
17           10       1305
18           10        360
19            0        465
20            0        175
21           20       1060
22           10        125
23           30       1975
24           15        470
25         8795      40620
26            0        115
27           10        365
```

28	0	170
29	15	605
30	15	790
31	10	760
32	915	9025
33	10	1210
34	30	2415
35	2055	11445
36	0	195
37	370	1465
38	10	1055
39	95	1005
40	35	550
41	0	280
42	10	560
43	1080	15605
44	765	28580
45	20	820
46	0	185
47	0	205
48	95	5905
49	0	560
50	0	145
51	0	185
52	35	1305
53	0	140
54	10	675
55	35	1365
56	0	40
57	0	145
58	10	285
59	240	3675
60	15	365
61	10	2350
62	0	265
63	0	450
64	10	260
65	10	410
66	0	25
67	75	2665

Some notes:

- the aboriginal languages is text/categorical and so quotation marks are needed.
- R doesn't care about whether they are double quotation marks (") or single ('). They work the same.
- If we don't assign it to an object, then it just prints out for us to see!

Oftentimes, we want to take our subset and give it a new name. This takes our subset and assigns it to a new dataset called `aboriginal_lang`.

```r
aboriginal_lang <- can_lang  %>%
  filter(category == "Aboriginal languages")
```

Notes:

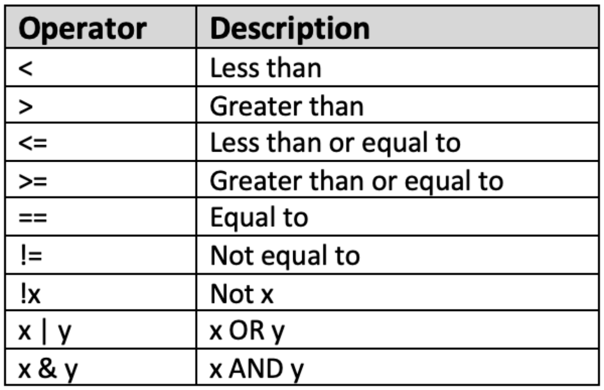
- Notice if you assign it to an object that it doesn't print out the contents.
- You'll see the new object in your environment on the top right —>
- If you click on the word `aboriginal languages` (not the blue play button) it will open the object so you can see what is saved inside.

It can also be used with numeric criteria.

Suppose we want a list of all the languages in Canada that are spoken by less than 100 people as their mother tongue.

```r
rare_lang <- can_lang  %>%
  filter(mother_tongue < 100)
```

The logical operators are given below:



Operator	Description
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
==	Equal to
!=	Not equal to
!x	Not x
x | y	x OR y
x & y	x AND y

select

select is used to extract only certain ***columns***. For example, perhaps we only want to print out a list names of the aboriginal languages (language column).

```
aboriginal_lang %>%
  select(language)
```

```
                       language
1  Aboriginal languages, n.o.s.
2  Algonquian languages, n.i.e.
3                     Algonquin
4  Athabaskan languages, n.i.e.
5                     Atikamekw
6          Babine (Wetsuwet'en)
7                        Beaver
8                     Blackfoot
9                       Carrier
10                       Cayuga
11                    Chilcotin
12                        Comox
13                 Cree, n.o.s.
14                       Dakota
15                         Dene
16              Dogrib (Tlicho)
17            Gitxsan (Gitksan)
18                     Gwich'in
19                        Haida
20                       Haisla
21                   Halkomelem
22                     Heiltsuk
23   Inuinnaqtun (Inuvialuktun)
24      Inuit languages, n.i.e.
25                    Inuktitut
26  Iroquoian languages, n.i.e.
27               Kaska (Nahani)
28                      Kutenai
29         Kwakiutl (Kwak'wala)
30                     Lillooet
31                     Malecite
32                      Mi'kmaq
33                       Michif
```

```
34                       Mohawk
35            Montagnais (Innu)
36                   Moose Cree
37                      Naskapi
38                      Nisga'a
39          North Slavey (Hare)
40           Northern East Cree
41            Northern Tutchone
42      Nuu-chah-nulth (Nootka)
43                     Oji-Cree
44                      Ojibway
45                     Okanagan
46                       Oneida
47               Ottawa (Odawa)
48                  Plains Cree
49     Salish languages, n.i.e.
50               Sarsi (Sarcee)
51                       Sekani
52      Shuswap (Secwepemctsin)
53     Siouan languages, n.i.e.
54               Slavey, n.o.s.
55                 South Slavey
56           Southern East Cree
57            Southern Tutchone
58                     Squamish
59                       Stoney
60                      Straits
61                  Swampy Cree
62                      Tahltan
63       Thompson (Ntlakapamux)
64                      Tlingit
65                    Tsimshian
66   Wakashan languages, n.i.e.
67                   Woods Cree
```

We can combine criteria together as well in one command with multiple pipes:

```
can_lang %>%
  filter(category == "Aboriginal languages") %>%
  select(language)
```

```
                       language
```

```
1  Aboriginal languages, n.o.s.
2  Algonquian languages, n.i.e.
3                     Algonquin
4  Athabaskan languages, n.i.e.
5                     Atikamekw
6          Babine (Wetsuwet'en)
7                        Beaver
8                     Blackfoot
9                       Carrier
10                       Cayuga
11                    Chilcotin
12                        Comox
13                 Cree, n.o.s.
14                       Dakota
15                         Dene
16              Dogrib (Tlicho)
17            Gitxsan (Gitksan)
18                     Gwich'in
19                        Haida
20                       Haisla
21                   Halkomelem
22                     Heiltsuk
23   Inuinnaqtun (Inuvialuktun)
24      Inuit languages, n.i.e.
25                    Inuktitut
26  Iroquoian languages, n.i.e.
27               Kaska (Nahani)
28                      Kutenai
29         Kwakiutl (Kwak'wala)
30                     Lillooet
31                     Malecite
32                      Mi'kmaq
33                       Michif
34                       Mohawk
35            Montagnais (Innu)
36                   Moose Cree
37                      Naskapi
38                      Nisga'a
39          North Slavey (Hare)
40           Northern East Cree
41            Northern Tutchone
42      Nuu-chah-nulth (Nootka)
43                     Oji-Cree
```

```
44                      Ojibway
45                     Okanagan
46                       Oneida
47               Ottawa (Odawa)
48                  Plains Cree
49     Salish languages, n.i.e.
50               Sarsi (Sarcee)
51                       Sekani
52      Shuswap (Secwepemctsin)
53     Siouan languages, n.i.e.
54               Slavey, n.o.s.
55                 South Slavey
56           Southern East Cree
57            Southern Tutchone
58                     Squamish
59                       Stoney
60                      Straits
61                  Swampy Cree
62                      Tahltan
63       Thompson (Ntlakapamux)
64                      Tlingit
65                    Tsimshian
66   Wakashan languages, n.i.e.
67                   Woods Cree
```

arrange

The `arrange` function allows us to order the rows of the data frame by the values of a particular column.

For example, arrange all the aboriginal languages in canada by from most to least spoken as mother tongue.

```
aboriginal_lang %>%
  arrange(desc(mother_tongue))
```

```
               category                     language mother_tongue most_at_home
1  Aboriginal languages                 Cree, n.o.s.         64050        37950
2  Aboriginal languages                    Inuktitut         35210        29230
3  Aboriginal languages                      Ojibway         17885         6175
4  Aboriginal languages                     Oji-Cree         12855         7905
```

```
5  Aboriginal languages                          Dene         10700         7710
6  Aboriginal languages             Montagnais (Innu)         10235         8585
7  Aboriginal languages                       Mi'kmaq          6690         3565
8  Aboriginal languages                     Atikamekw          6150         5465
9  Aboriginal languages                   Plains Cree          3065         1345
10 Aboriginal languages                        Stoney          3025         1950
11 Aboriginal languages                     Blackfoot          2815         1110
12 Aboriginal languages                    Woods Cree          1840          800
13 Aboriginal languages               Dogrib (Tlicho)          1650         1020
14 Aboriginal languages                   Swampy Cree          1440          330
15 Aboriginal languages                     Algonquin          1260          370
16 Aboriginal languages                        Dakota          1210          255
17 Aboriginal languages                       Naskapi          1205         1195
18 Aboriginal languages                       Carrier          1025          250
19 Aboriginal languages   Inuinnaqtun (Inuvialuktun)          1020          165
20 Aboriginal languages                        Mohawk           985          255
21 Aboriginal languages                  South Slavey           945          370
22 Aboriginal languages             Gitxsan (Gitksan)           880          315
23 Aboriginal languages           North Slavey (Hare)           765          340
24 Aboriginal languages                     Chilcotin           655          255
25 Aboriginal languages Aboriginal languages, n.o.s.           590          235
26 Aboriginal languages                    Halkomelem           480           50
27 Aboriginal languages                        Michif           465           80
28 Aboriginal languages       Shuswap (Secwepemctsin)           445           50
29 Aboriginal languages                       Nisga'a           400           75
30 Aboriginal languages        Thompson (Ntlakapamux)           335           20
31 Aboriginal languages          Kwakiutl (Kwak'wala)           325           25
32 Aboriginal languages                      Lillooet           315           25
33 Aboriginal languages            Northern East Cree           315          110
34 Aboriginal languages       Inuit languages, n.i.e.           310           90
35 Aboriginal languages                      Malecite           300           55
36 Aboriginal languages       Nuu-chah-nulth (Nootka)           280           30
37 Aboriginal languages                Slavey, n.o.s.           280          105
38 Aboriginal languages                      Okanagan           275           80
39 Aboriginal languages      Salish languages, n.i.e.           260           25
40 Aboriginal languages                      Gwich'in           255           50
41 Aboriginal languages             Northern Tutchone           220           30
42 Aboriginal languages                     Tsimshian           200           30
43 Aboriginal languages                        Beaver           190           50
44 Aboriginal languages                Kaska (Nahani)           180           20
45 Aboriginal languages                Ottawa (Odawa)           150           75
46 Aboriginal languages          Babine (Wetsuwet'en)           110           20
47 Aboriginal languages                       Kutenai           110           10
```

```
48 Aboriginal languages                   Moose Cree           105           10
49 Aboriginal languages                     Heiltsuk           100            5
50 Aboriginal languages                      Tahltan            95            5
51 Aboriginal languages                      Tlingit            95            0
52 Aboriginal languages                       Haisla            90           20
53 Aboriginal languages                        Comox            85            0
54 Aboriginal languages                       Sekani            85           15
55 Aboriginal languages                        Haida            80           10
56 Aboriginal languages               Sarsi (Sarcee)            80           10
57 Aboriginal languages                      Straits            80           25
58 Aboriginal languages            Southern Tutchone            70            5
59 Aboriginal languages                       Oneida            60           15
60 Aboriginal languages     Siouan languages, n.i.e.            55           20
61 Aboriginal languages Athabaskan languages, n.i.e.            50           10
62 Aboriginal languages Algonquian languages, n.i.e.            45           10
63 Aboriginal languages                       Cayuga            45           10
64 Aboriginal languages           Southern East Cree            45           15
65 Aboriginal languages                     Squamish            40            5
66 Aboriginal languages  Iroquoian languages, n.i.e.            35            5
67 Aboriginal languages   Wakashan languages, n.i.e.            10            0
   most_at_work lang_known
1          7800      86115
2          8795      40620
3           765      28580
4          1080      15605
5           770      13060
6          2055      11445
7           915       9025
8          1100       6645
9            95       5905
10          240       3675
11           85       5645
12           75       2665
13          165       2375
14           10       2350
15           40       2480
16           20       1760
17          370       1465
18           15       2100
19           30       1975
20           30       2415
21           35       1365
22           10       1305
```

23	95	1005
24	15	1150
25	30	665
26	20	1060
27	10	1210
28	35	1305
29	10	1055
30	0	450
31	15	605
32	15	790
33	35	550
34	15	470
35	10	760
36	10	560
37	10	675
38	20	820
39	0	560
40	10	360
41	0	280
42	10	410
43	0	340
44	10	365
45	0	205
46	10	210
47	0	170
48	0	195
49	10	125
50	0	265
51	10	260
52	0	175
53	0	185
54	0	185
55	0	465
56	0	145
57	15	365
58	0	145
59	0	185
60	0	140
61	0	85
62	0	120
63	10	125
64	0	40
65	10	285

```
66              0        115
67              0         25
```

Note:

- use arrange(variable) to go from least to most
- use arrange(desc(variable)) to go from most to least, arrange(-variable) also works

`slice`

The slice function will allow us to pick only a subset of the rows based on their numeric order (1st through last).

For example, if I want a list of the 10 most commonly spoken aboriginal languages.

```
aboriginal_lang %>%
  arrange(desc(mother_tongue)) %>%
  slice(1:10) %>%
  select(language, mother_tongue) #optional
```

```
            language mother_tongue
1        Cree, n.o.s.         64050
2           Inuktitut         35210
3             Ojibway         17885
4            Oji-Cree         12855
5                Dene         10700
6  Montagnais (Innu)         10235
7             Mi'kmaq          6690
8           Atikamekw          6150
9         Plains Cree          3065
10             Stoney          3025
```

Brain Break

Students at Allison Bernard Memorial High School in Eskasoni, Cape Breton recorded Paul McCartney's Blackbird in their native Mi'kmaq language. https://www.youtube.com/watch?v=99-LoEkAA3w