STAT 118: Notes Q

Working with text with `stringr`

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Figure 1: artwork by @allisonhorst

A few basics

What is a string?

- datatype we use to represent text
- use " "

Examples of strings:

- "Hello world"

- "5678"
- "blah blah blah"

** NOT a string:**

- 5678

Using `stringr`

stringr is a package containing a bunch of functions that help us work with strings. We'll discuss how to detect, remove, extract, and count words/characters/phrases from a string. We'll also talk about how to slice a string to get only the parts (aka the substrings) of it that you want.

stringr cheat sheet

`stringr` is contained within the `tidyverse` package.

```
library(tidyverse)
```

I'm registering for classes this Spring and am trying to decide what to take. Let's look at the course catalog!

Read in the courses data.

```
courses <- read_csv("Fall23courses.csv")
```

`str_detect`

inputs: - string - pattern

output: - TRUE/FALSE

little example:

```
str_detect("Welcome to data science, look at this cool data", "data")
```

```
[1] TRUE
```

```
str_detect("Welcome to data science, look at this cool data", "pineapple")
```

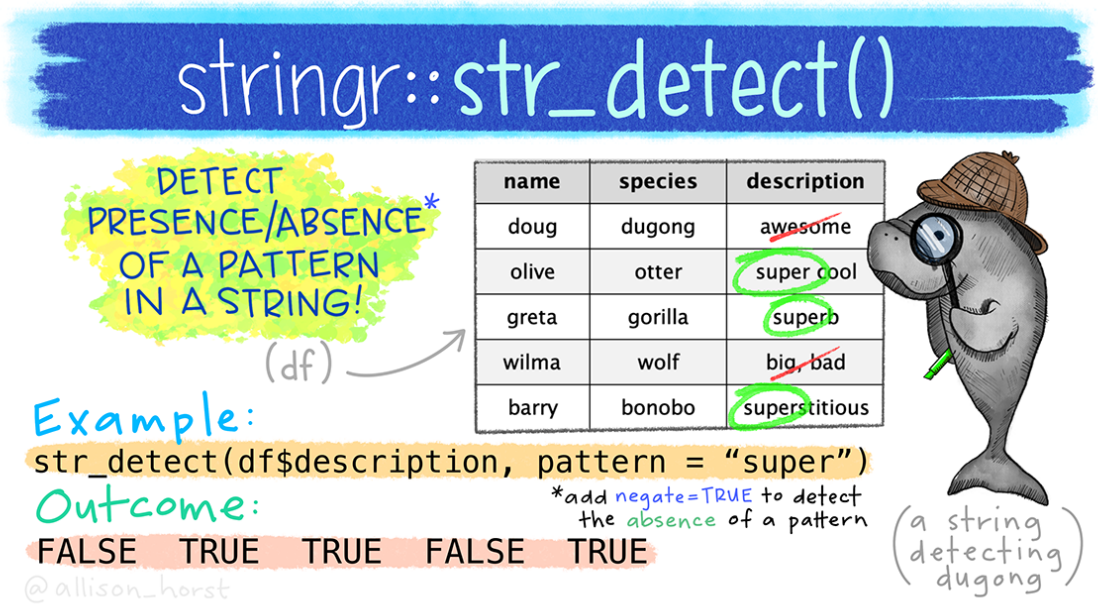


Figure 2: artwork by @allisonhorst

```
[1] FALSE
```

I only want to take classes in Warner!

```
courses %>%
  filter(str_detect(location, "WNS"))
```

```
# A tibble: 45 x 9
   titles      distros department time  location professor description courseNum
   <chr>       <chr>   <chr>      <chr> <chr>    <chr>     <chr>       <chr>
 1 Gothic and~ AMR HI~ Program i~ 2:15~ "Warner~ Michael ~ "\nThis co~ AMST0225~
 2 Education ~ AMR SOC Program i~ 2:15~ "Warner~ Melissa ~ "\nWhat ar~ BLST0115~
 3 Economic S~ DED     Economics  2:15~ "Warner~ Amanda G~ "\nAn intr~ ECON0111~
 4 Introducto~ SOC     Economics  9:45~ "Warner~ Raphaell~ "\nAn intr~ ECON0150~
 5 Introducto~ SOC     Economics  11:1~ "Warner~ Raphaell~ "\nAn intr~ ECON0150~
 6 Introducto~ SOC     Economics  8:15~ "Warner~ Will Pyle "\nAn intr~ ECON0155~
 7 Introducto~ SOC     Economics  9:45~ "Warner~ Will Pyle "\nAn intr~ ECON0155~
 8 Microecono~ <NA>    Economics  12:4~ "Warner~ <NA>      "\nMicroec~ ECON0255~
 9 Microecono~ <NA>    Economics  2:15~ "Warner~ <NA>      "\nMicroec~ ECON0255~
10 Federal Re~ AMR DED Economics  1:30~ "Warner~ Erin Wol~ "\nIn this~ ECON0360~
```

```
# i 35 more rows
# i 1 more variable: meet <chr>
```

Suppose I don't want any classes on Friday. Let's use `str_detect` to find our options.

```
notFriday <- courses %>%
  filter(!str_detect(meet, "Friday"))
```

Perhaps I'm interested in immigration.

The `regex` function is used to write regular expressions in R. Regular expressions are helpful if you want to search for a pattern rather than a specific word or phrase.

For now, we will only use regex to ignore capitalization.

If you're interested in using regular expressions at some point, this regex cheat sheet will be super helpful.

```
immigrationclasses <- courses %>%
  filter(str_detect(description, regex("immigration", ignore_case=TRUE)))

immigrationclasses
```

```
# A tibble: 10 x 9
   titles      distros department time  location professor description courseNum
   <chr>       <chr>   <chr>      <chr> <chr>    <chr>     <chr>       <chr>
 1 Immigrant ~ AMR HIS Program i~ 11:1~ "Axinn ~ Rachael ~ "\nIn this~ AMST0175~
 2 Introducti~ EUR LN~ French     2:15~ "Le Cha~ William ~ "\nIn this~ FREN0230~
 3 Introducti~ CW EUR~ French     2:15~ "Le Cha~ William ~ "\nIn this~ FREN0230~
 4 The United~ AMR HIS History    9:45~ "Axinn ~ Joyce Mao "\nThis co~ HIST0206~
 5 Introducti~ CMP     Internati~ 12:4~ "Twilig~ Amit Pra~ "\nThis is~ IGST0101~
 6 An Introdu~ EUR LN~ Italian    9:45~ "Wright~ Thomas V~ "\nIntende~ ITAL0251~
 7 An Introdu~ EUR LN~ Italian    11:1~ "75 Sha~ Sandra C~ "\nIntende~ ITAL0251~
 8 Globalizat~ SOC     Political~ 2:15~ "Librar~ Orion Le~ "\nHow doe~ PSCI0314~
 9 City Polit~ <NA>    Political~ 11:1~ "LaForc~ Bert Joh~ "\nCities ~ PSCI0465~
10 Christiani~ AMR HI~ Religion   7:30~ "Librar~ James Ca~ "\nReligio~ RELI0398~
# i 1 more variable: meet <chr>
```

`str_extract` and `str_remove`

str_extract inputs: - string - pattern **str_extract output**: - the extracted pattern, if it appears in the the string

str_remove inputs: - string - pattern **str_extract output**: - the string without the pattern, if it appears in the string

little example:

```
  str_extract("Welcome to data science, look at this cool data", "data")
```

```
[1] "data"
```

```
  str_extract_all("Welcome to data science, look at this cool data", "data")
```

```
[[1]]
[1] "data" "data"
```

```
  str_remove("Welcome to data science, look at this cool data", "data")
```

```
[1] "Welcome to  science, look at this cool data"
```

```
  str_remove_all("Welcome to data science, look at this cool data", "data")
```

```
[1] "Welcome to  science, look at this cool "
```

CW is part of the distribution requirement column. I want CW to be its own column.

```
  courses %>%
    mutate(CW = str_extract(distros, "CW")) %>%
    mutate(distros = str_remove(distros, "CW"))
```

```
# A tibble: 586 x 10
   titles      distros department time  location professor description courseNum
   <chr>       <chr>   <chr>      <chr> <chr>    <chr>     <chr>       <chr>
 1 Introducti~ AMR CMP Program i~ 12:4~ "Axinn ~ Roberto ~ "\nIn this~ AMST0101~
 2 Immigrant ~ AMR HIS Program i~ 11:1~ "Axinn ~ Rachael ~ "\nIn this~ AMST0175~
 3 American L~ AMR LIT Program i~ 11:1~ "Axinn ~ Ellery F~ "\nA study~ AMST0209~
 4 Introducti~ AMR HI~ Program i~ 1:30~ "Twilig~ Roberto ~ "\nIn this~ AMST0213~
 5 Gothic and~ AMR HI~ Program i~ 2:15~ "Warner~ Michael ~ "\nThis co~ AMST0225~
 6 American C~ AMR HIS Program i~ 9:45~ "Axinn ~ Holly Al~ "\nFor man~ AMST0234~
```

```
 7 Constructi~ AMR ART Program i~ 1:30~ "Ross C~ Deb Evans "\n"Democr~ AMST0251~
 8 African Am~ AMR LIT Program i~ 9:45~ "Axinn ~ William ~ "\nThis co~ AMST0252~
 9 American D~ AMR HI~ Program i~ 11:1~ "Axinn ~ Susan Bu~ "\nIn this~ AMST0260~
10 Chicagoland AMR HIS Program i~ 11:1~ "Giffor~ Jim Ralp~ "\nIn this~ AMST0264~
# i 576 more rows
# i 2 more variables: meet <chr>, CW <chr>
```

str_sub

str_sub inputs: - string
- starting character - ending character **str_sub output**: - string with only the characters between the start and the end

little example:

```
str_sub("Welcome to data science, look at this cool data", start=12, end=23)
```

```
[1] "data science"
```

Bounds are inclusive!

Maybe I only want 200 level math classes.

- First we filter for just math classes.
- Then we can create a new column called `level` that contains only the sixth character from the `courses` column.

We call this a **substring**, hence the function `str_sub`.

```
MathClasses <- courses %>%
  filter(department == "Mathematics") %>%
  mutate(level=str_sub(courseNum, start=6, end=6))

Math2Classes <- MathClasses %>%
  filter(level== "2")
```

str_count

str_count inputs: - string
- pattern **str_count output**: - a count of the number of times the pattern appears in the string

little example:

```
str_count("Welcome to data science, look at this cool data", "data")
```

```
[1] 2
```

Maybe I only want my classes to meet twice a week.

```
courses <- courses %>%
  mutate(dayCount = str_count(meet, "day"))

#what's the maximum number of days a week a class meets?
max(courses$dayCount)
```

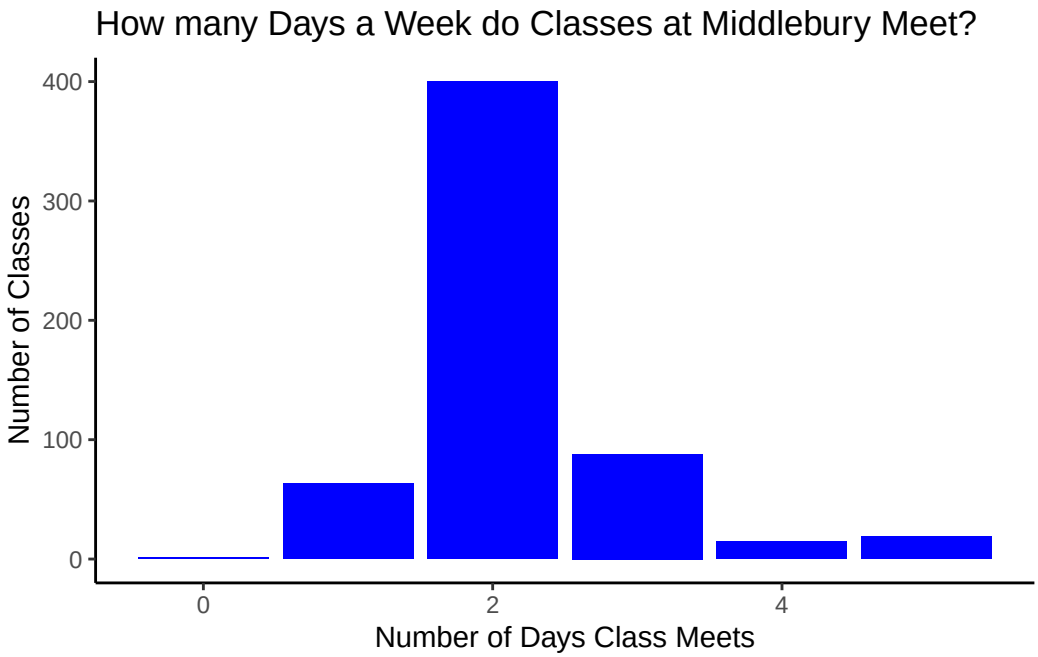
```
[1] 5
```

```
#what's the mean number of days?
mean(courses$dayCount)
```

```
[1] 2.187713
```

Let's visualize this data.

```
courses %>%
  ggplot() +
  geom_bar(aes(x=dayCount), fill="blue") +
  xlab("Number of Days Class Meets") +
  ylab("Number of Classes") +
  labs(title="How many Days a Week do Classes at Middlebury Meet?")+
  theme_classic()
```



Another useful function `str_squish`

`str_squish` is used to remove leading, trailing, and repeated interior whitespaces from strings

Figure 3: artwork by @allisonhorst