Code

Regular Expressions

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Chapter 17: Key Ideas

- Regular expressions allow us to match meaningful **patterns** in character strings
- Some popular uses:
    - detect whether a **pattern** is contained in a string (use `filter()` & `grepl()`)
    - substitute the elements of that **pattern** with something else (use `mutate()` & `gsub()`)
    - extract a component that matches the **pattern** (use `tidyr::extract()`)

Some Exploits in the Land of RegEx

- Medtronic, Inc - quality monitoring for medical technology
    - Match key word or phrase in offline complaint data (uncommon)
    - Subset of complaint data and evaluate rate of some outcome over time
- PSU Men's Volleyball
    - Teams now have access to complete data for play in every match
    - Using RegEx to help parse the data to gain competitive advantage for PSU
    - (Sort of like Moneyball for Volleyball…)
- Scraping HTML data
    - We scraped the Men's Pole Vault World Records from Wikipedia (https://en.wikipedia.org/wiki/Men%27s_pole_vault_world_record_progression)
    - The footnotes in the `Date` column do not allow working with the dates directly, so we need to clean them up.
    - We can use RegEx to clean up

How to Survive in the Land of Regex

- Step 1: Memorize the following special characters and their use: \d, \w, \S, [0-9], [^0-9], [[:lower:]], [[:alnum:]], \W, , ?, ., $, %, |, \<, ^, \, {3}, *, +, \s, \B, \>, \x

How to Survive in the Land of Regex

- **NO!!!** absolutely no need to memorize all of it
- Use the RStudio Cheat Sheet: https://www.rstudio.com/resources/cheatsheets/ (https://www.rstudio.com/resources/cheatsheets/)
- Use Google
- Just like everything else in (R) Programming:
    - Don’t start from scratch
    - Find working code that does something similar
    - Make many iterations of small changes checking at each change that it didn’t break
    - Keep going until the original code evolves into the thing you want!

Pole Vault Demo

- live demo to clean up Pole Vault Records progression seen in web scraping

Pole Vault Records Clean Up

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```
webpage <- "https://en.wikipedia.org/wiki/Men%27s_pole_vault_world_record_progression"

table_list <-
  webpage %>%
  read_html(header=TRUE) %>%
  html_nodes(css = "table") %>%
  html_table(fill = TRUE)

PVRecords <- table_list[[2]]  # convert list to data frame
head(PVRecords, 3) # inspect the data
```

Mark <chr>
4.02 m (.mw-parser-output .frac{white-space:nowrap}.mw-parser-output .frac .num,.mw-parser-output .frac .den{font-size:80%;line-height:0;vertical-align:super}.mw-parser-output .frac .den{vertical-align:sub}.mw-parser-output .sr-only{border:0;clip:rect(0,0,0,0);clip-path:polygon(0px 0px,0px 0px,0px 0px);height:1px;margin:-1px;overflow:hidden;padding:0;position:absolute;width:1px}13 ft 2+¼ in)
4.09 m (13 ft 5 in)
4.12 m (13 ft 6 in)

3 rows | 1-1 of 6 columns

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```
NA
```

Tasks to clean up:

1. we should fix the variable name representing the number of world records achieved by each athlete
2. locate and replace all footnotes in the `Date` variable using `gsub()`
3. convert `Date` to a date class variable in R using a `lubridate` function
4. use `tidyr::extract()` to store the metric heights from the `Record` variable (make sure there are no spaces)

Solutions

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```
# locate and replace all footnotes in the `Date` column
PVMen <-
  PVRecords %>%
  rename(recordsBroken = `#[4]`) %>%
  mutate(Date = gsub(pattern = "\\[.\\]", replacement = "", x = Date)) %>%
  mutate(Date = lubridate::mdy(Date)) %>% #convert to date
  tidyr::extract(col = Mark, into = "Meters", regex = "(^\\d\\.\\d)") %>%
  mutate(Meters = parse_number(Meters)) #convert to numeric(drops non-numeric characters)

PVMen %>%
  head()
```

Meters	Athlete	Nation	Venue	Date	recordsBroken
<dbl>	<chr>	<chr>	<chr>	<date>	<int>
4.0	Marc Wright	United States	Cambridge, U.S.	1912-06-08	1
4.0	Frank Foss	United States	Antwerp, Belgium	1920-08-20	1
4.1	Charles Hoff	Norway	Copenhagen, Denmark	1922-09-22	1
4.2	Charles Hoff	Norway	Copenhagen, Denmark	1923-07-22	2
4.2	Charles Hoff	Norway	Oslo, Norway	1925-08-13	3
4.2	Charles Hoff	Norway	Turku, Finland	1925-09-27	4

6 rows

Cool Graphs

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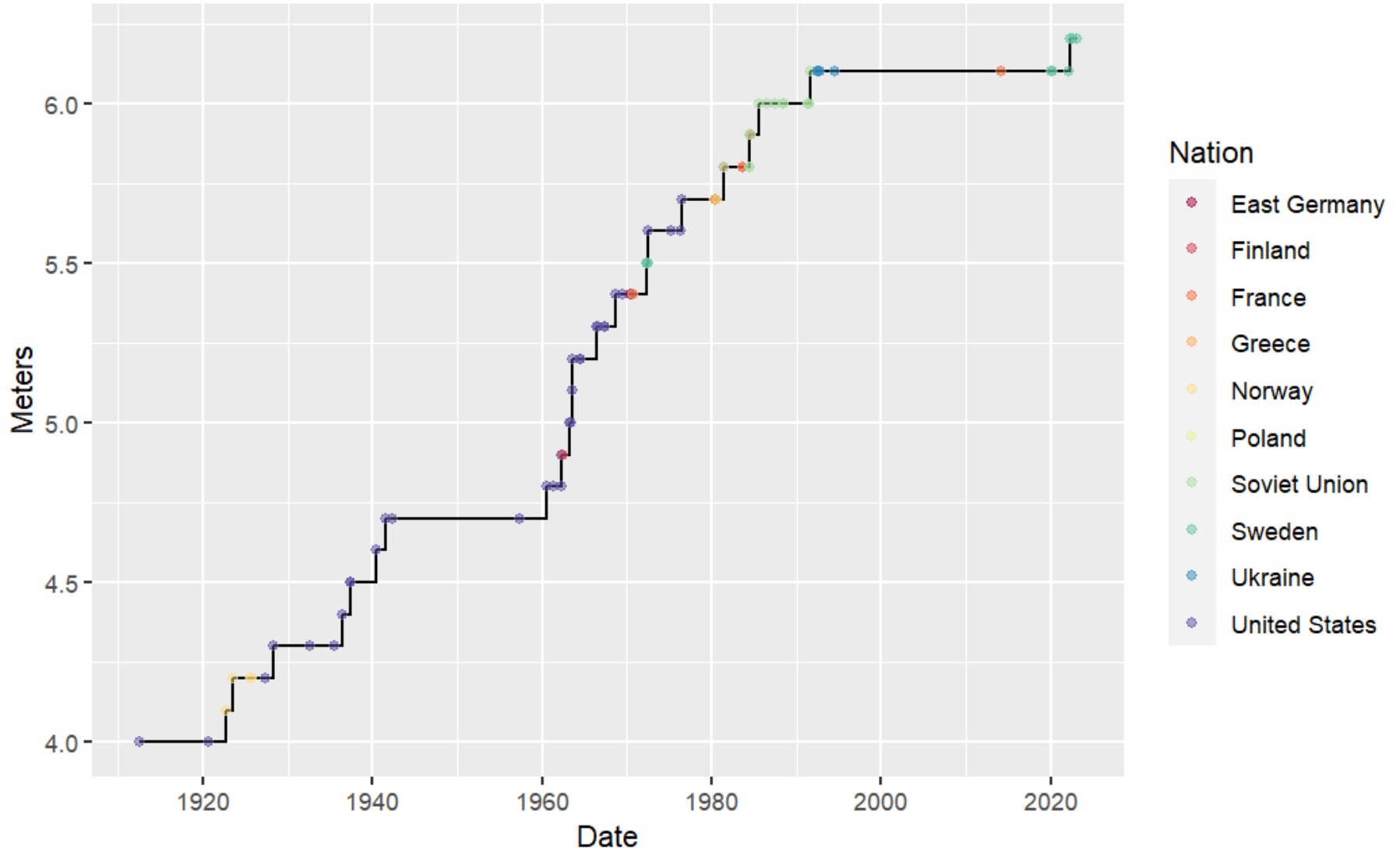
```
PVMen %>%
  ggplot(aes(x = Date, y = Meters)) +
  geom_step() +
  geom_point(alpha = 0.5, aes(color = Nation))+
  scale_color_brewer(palette = "Spectral")
```



Additional Resources

- https://www.datacamp.com/tutorial/regex-r-regular-expressions-guide (https://www.datacamp.com/tutorial/regex-r-regular-expressions-guide)
- https://github.com/rstudio/cheatsheets/blob/main/strings.pdf (https://github.com/rstudio/cheatsheets/blob/main/strings.pdf)

Assignments

- Activity: Statistics of Gene Expression (due 9:59am Sunday , July 30)