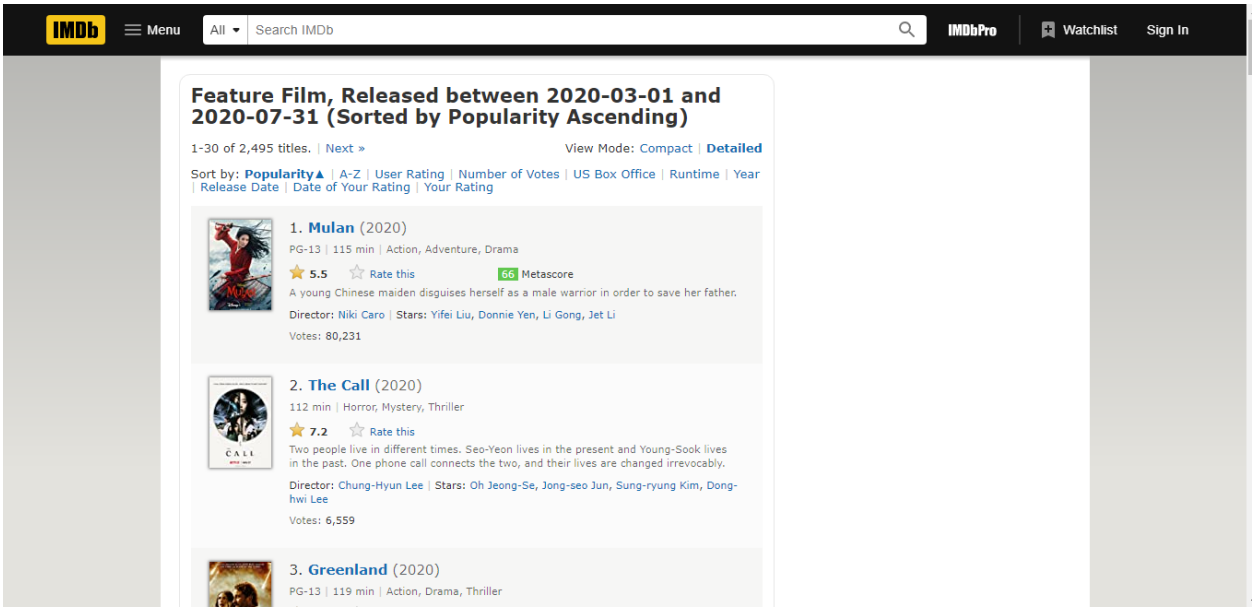
Web Scraping With R

Introduction

Not all websites provide you with an API that you can work with and so the alterntive to fetching data from such websites is to get the data through web scraping. The goal of this project is to demonstrate an end to end web scraping workflow with R. The web page we are going to be scraping looks like this



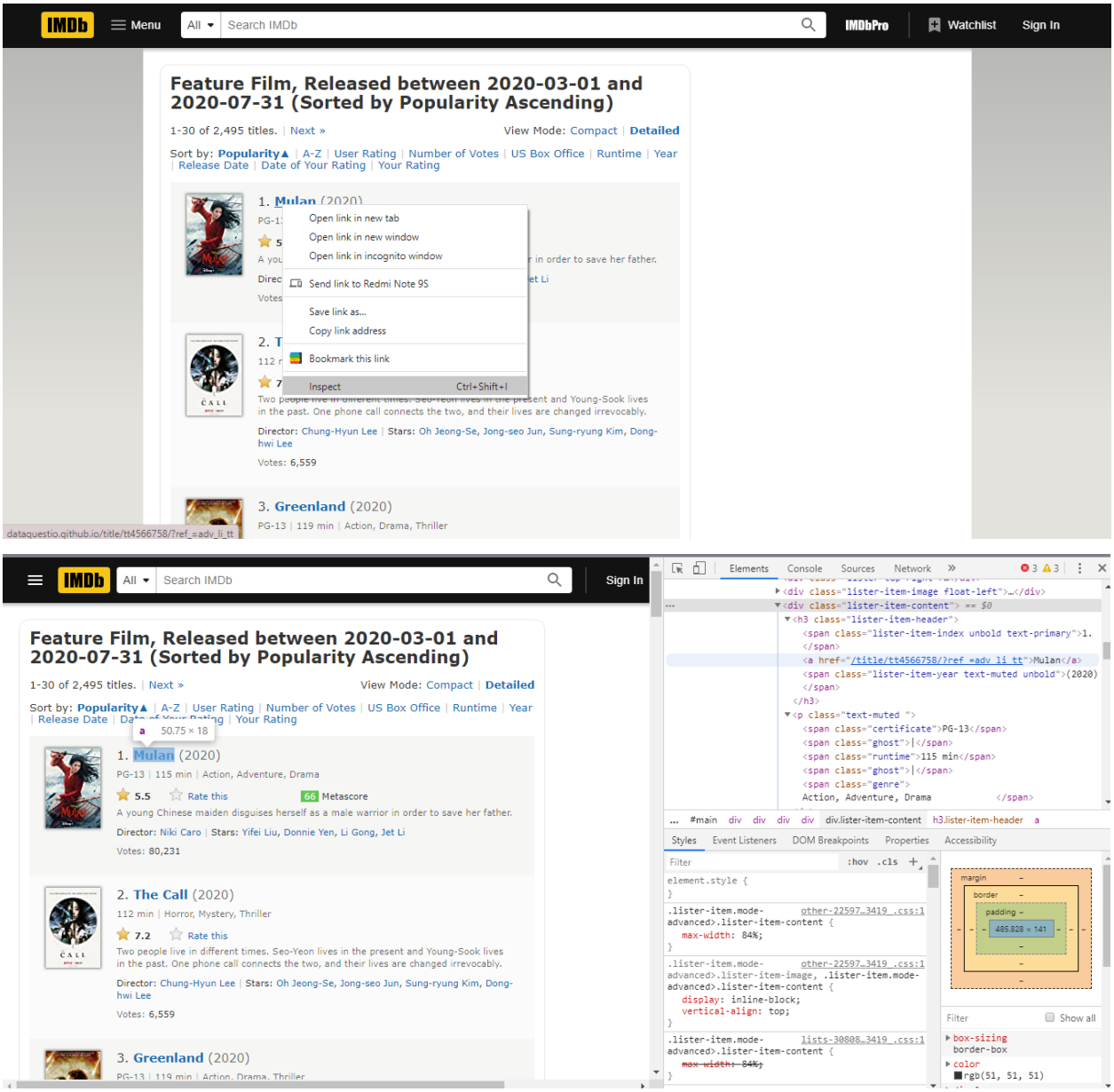
We want to extract data on the movie titles, the year it was released, the runtime, the genre, the user rating, metascore and the vote. At the end of this project we will have dataframe containing values for the afformentioned data points.

```
# loading the libraries
library(rvest)
library(tidyverse)
library(kableExtra)
```

```
# function to render tibbles as  pdf tables
render_table <- function(table, scale_down=F){
  if(scale_down == T){
    rendered_table <- kbl(table) %>% kable_styling(
      latex_options = c("stripe", "HOLD_position", "scale_down")
    )
  } else{
    rendered_table <- kbl(table) %>% kable_styling(
      latex_options = c("stripe", "HOLD_position")
    )
  }
  return(rendered_table)
}
```

Inspecting The Web Page HTML

The most important thing to do when web scraping is to inspect the html of the web page in your browser. This enables us to determine where we can extract the data we are looking for. To do this all we need to do is right click on the value we want to extract and then click the inspect option. This should open a tab showing the html source code of the web page.

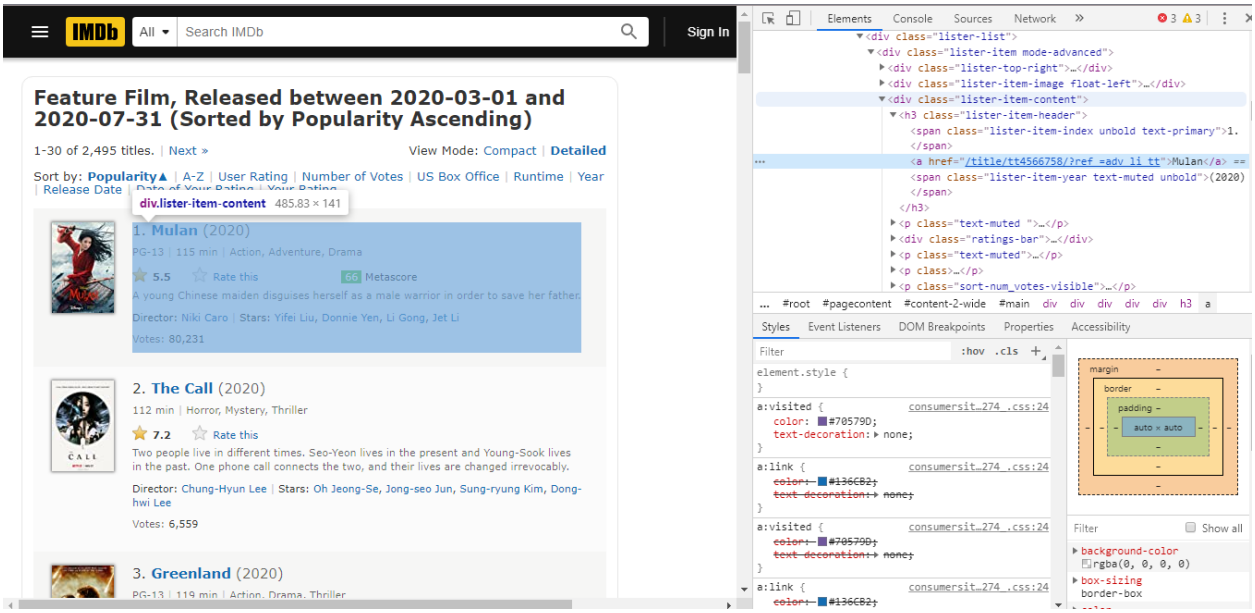


The data we need are nested in different html tags with different CSS classes or ids (CSS selectors). Identifying these tags, their CSS classes or ids will help us extract the right data. It is important to note that css classes are preceded by a `dot(.)` while ids are preceded by the `#` symbol.

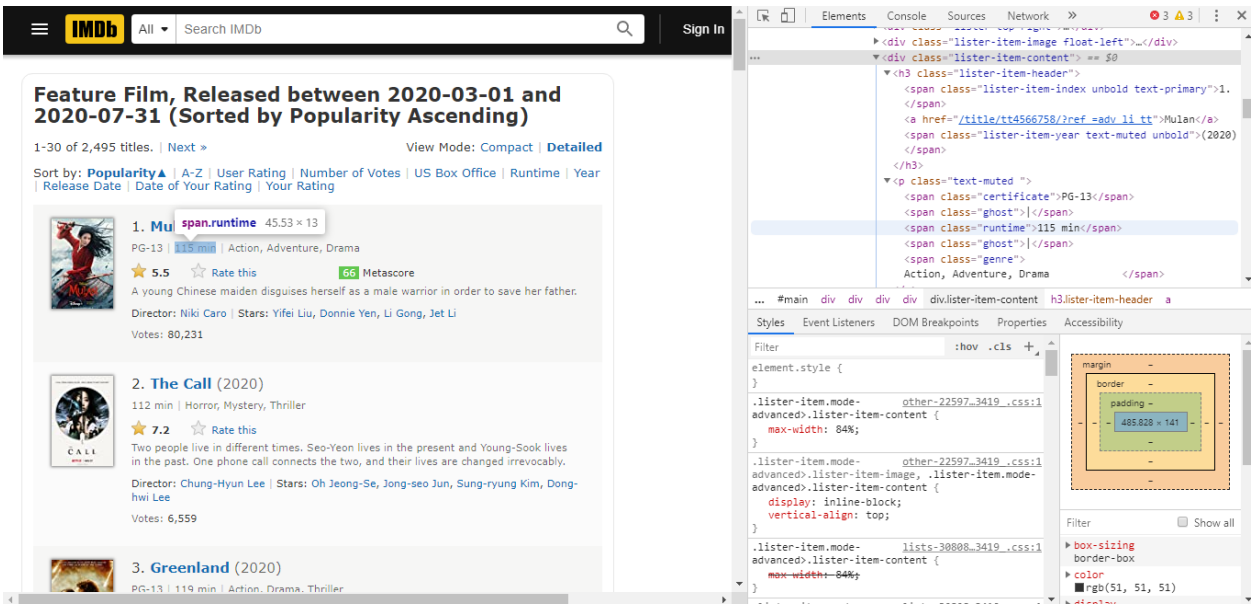
Parsing The HTML

Now that we know how to inspect a web page html, we need to use the `rvest` library to parse the the html tags, CSS selectors containing the required data. The approach we are going to take to extract the data is as follows:

1. We read the web page into an r object using the `read_html()` function.
2. We identify the tag containing data for the movies. This is a `div` tag with a class of `lister-item-content`. We use the `html_nodes()` function to extract every element with this `div` and class `lister-item-content` and store it in a variable called movies.



3. We create empty vectors for each data point, loop through every of the element in movies, pass in the appropriate html tag or CSS selector into the `html_node()` function to extract data contained within that tag or CSS selector. The text data is extracted using `html_text()` function. We clean the extracted data using `stringr` functions or `readr parse_number()` function for numeric data. This data is then added to the appropriate vector we created. The reason behind using a for loop is so that elements without any data is represented as `NA` when parsed. For example the runtime data is contained in a `span` tag with class `runtime`, so to extrat the runtime data we pass the argument `span.runtime` into the `html_node()` function. Extractng the runtime will look like this : `movies %>% html_node("span.runtime") %>% html_text()`.



4. The vectors are combined into a tibble, so we can visualise the result.

Exracting the data

```
# reading the web page
web_content <- read_html(
  "http://dataquestio.github.io/web-scraping-pages/IMDb-DQgp.html"
  )

# storing the movies data
movies <- web_content %>% html_nodes("div.lister-item-content")
```

```
# creating vectors to store the different data points
titles <- c()
years <- c()
runtimes <- c()
genres <- c()
metascores <- c()
user_ratings <- c()
votes <- c()

# looping through movies and adding each data to the appropriate vector
for (i in 1:length(movies)){
  title <- movies[i] %>% html_node("a") %>% html_text()
  year <- movies[i] %>% html_node(".lister-item-year") %>% html_text() %>% parse_number()
  runtime <- movies[i] %>% html_node("span.runtime") %>% html_text()
  genre <- movies[i] %>% html_node("span.genre") %>% html_text() %>% str_replace("\n", "") %>% str_trim
  user_rating <- movies[i] %>% html_node(".ratings-imdb-rating") %>% html_text() %>% parse_number()
  metascore <- movies[i] %>% html_node(".ratings-metascore") %>% html_text() %>% parse_number()
  vote <- movies[i] %>% html_node(".sort-num_votes-visible") %>% html_text() %>% parse_number()

  titles <- c(titles, title)
  year <- c(years, year)
  runtimes <- c(runtimes, runtime)
  genres <- c(genres, genre)
  user_ratings <- c(user_ratings, user_rating)
  metascores <- c(metascores, metascore)
  votes <- c(votes, vote)
}
```

```
# combining the vectors into a tibble
movies_df <- tibble(
  title = titles,
  year = years,
  runtime = runtimes,
  genre = genres,
  user_rating = user_ratings,
  metascore  = metascores,
  votes = votes
)

movies_df %>% head() %>% render_table()
```

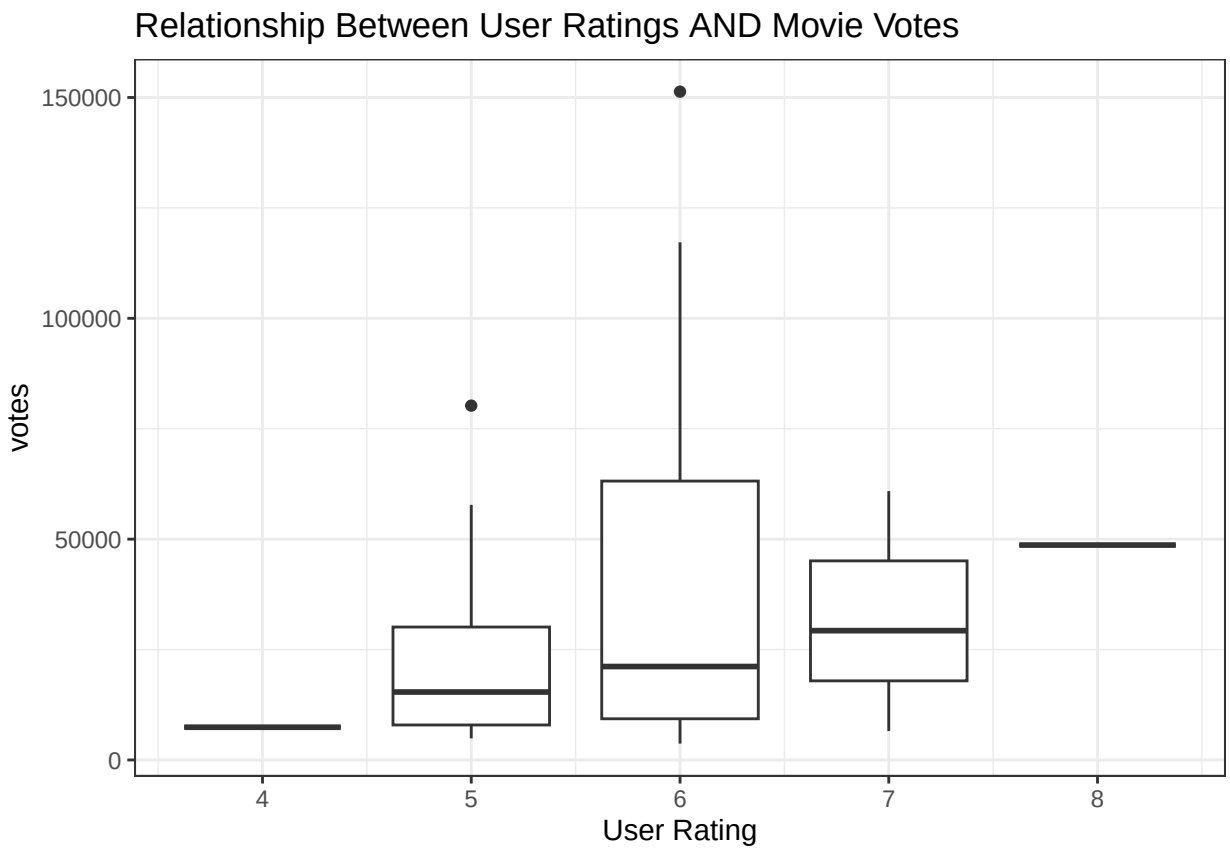
title	runtime	genre	user_rating	metascore	votes
Mulan	115 min	Action, Adventure, Drama	5.5	66	80231
The Call	112 min	Horror, Mystery, Thriller	7.2	NA	6559
Greenland	119 min	Action, Drama, Thriller	6.3	NA	27482
Don't Listen	97 min	Drama, Horror, Thriller	6.1	NA	4879
Unhinged	90 min	Action, Thriller	6.0	40	25316
Ava	96 min	Action, Crime, Drama	5.3	39	20882

Visualising the data

We want to find out if movies with higher user rating get higher votes.

```
movies_df <- movies_df %>% mutate(
  user_rating = floor(user_rating)
)

movies_df %>% ggplot(
  aes(x = user_rating, y = votes, group = user_rating)
) +
  labs(
    title = "Relationship Between User Ratings AND Movie Votes",
    x = "User Rating"
  ) +
  geom_boxplot() +
  theme_bw()
```



If we consider the median number of votes for each of the user rating, we can see that the number of votes

tend to increase as user rating increases.

Conclusion

We wanted to demonstrate an end to end web scraping work flow in this project and we were able to achieve this by doing the following:

- inspecting the web page and getting farmiliar with the html structure of the page
- Parsing html using the rvest library and using functions from such as `stringr str_replace()` and `readr parse_number()` to get our required result.

While I used a for loop in this project to be able to deal with `NA` values, one draw back to this method is that when scraping large number of pages, it isn't the fastest solution. It is also worth keeping in mind web scraping ethics when scraping web pages.