Web Data Collection with R

Xpath Case Study

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Overview

Live coding

Extracting links of notable political scientists

Extension

Overview

. . . in which we . . .

- extract **links** using **XPath**
- folow them to **extract links** again
- and build a **network** of notable political scientists

. . . and learn about . . .

- **Xpath**
- **Selector Gadget**

. . . while using packages . . .

- **rvest** (information extraction from HTML)
- **stringr** (string manipulation)
- **d3Network** (network data visualizetion)

Live coding

a first glance at the page

```
require(rvest)
require(stringr)
```

```
url <-
"https://en.wikipedia.org/wiki/List_of_political_scientists

## browseURL(url)
```

a first try at extracting links

- lets get all the links

a first try at extracting links

- How shall we do it?

a first try at extracting links

- How shall we do it?
- think first
- looking for similarities
- looking for differences
- using every available tool in conjunction

a first try at extracting links

- How shall we do it?
- <a>-nodes
- href should entail `/wiki/`
- child of `<li>`, child of `<ul>`
- always 1st child
- XPath: `//ul/li/a[1]`
- than do further filter by RegEx

a first try at extracting links

```
html   <- read_html(url)
ankers <- html_nodes(html, xpath="//a")
length(ankers)
```

```
## [1] 669
```

- thereafter using RegEx to get rid of those links that did not lead to PDF files
- **we could also use XPath for filtering**

a first try at extracting links

- the links a nodes we are looking for

```
ankers[100:102]
```

```
## {xml_nodeset (3)}
## [1] <a href="/wiki/Alan_Abramowitz" title="Alan Abramowi
## [2] <a href="/wiki/David_Adamany" title="David Adamany">
## [3] <a href="/wiki/Temple_University" title="Temple Univ
```

```
xml_path(ankers[100:102])
```

```
## [1] "/html/body/div[3]/div[3]/div[4]/ul[1]/li[1]/a"
## [2] "/html/body/div[3]/div[3]/div[4]/ul[1]/li[2]/a[1]"
## [3] "/html/body/div[3]/div[3]/div[4]/ul[1]/li[2]/a[2]"
```

Extracting links of notable political scientists

get reasonable subset of links

```
ankers <- html_nodes(html, xpath="//ul/li/a[1]")
links  <- html_attr(ankers, "href")
# according to SelectorGagdget should be around
length(links)
```

```
## [1] 420
```

fine tuning selection of links

```
links_iffer <- # subsetting links by position
  seq_along(links) >=
    seq_along(links)[str_detect(links, "Abramowitz")]  &
  seq_along(links) <=
    seq_along(links)[str_detect(links, "John_Zaller")] &
  str_detect(links, "/wiki/")

links_index <- seq_along(links)[links_iffer]
links <- links[links_iffer]

length(links)
```

```
## [1] 294
```

Further information on notable political scientists

names

```
names <- html_attr(ankers, "title")[links_index]
names <- str_replace(names, " \\(.*\\)", "")
# maybe needed - Windows e.g. depends on your locale:
# Sys.getlocale()
# stringi::stri_enc_detect(paste(names, collapse = ""))
# names <- iconv(names, "utf8", "latin1")
```

other information might come from their personal wiki-pages

- **links to other notable political scientists**
- universities
- place of birth
- key puplications,
- ...

Downloading PS pages - preparation

```
# loop preparation
baseurl <- "https://en.wikipedia.org"
HTML    <- list()
Fname   <- str_c("downloads/", basename(links), ".html")
dir.create("downloads", FALSE)
URL     <- str_c(baseurl, links)
```

Downloading PS pages - loop

```
# loop
for ( i in seq_along(links) ){
  # url
  url <- URL[i]
  # fname
  fname <- Fname[i]
  # download
  if ( !file.exists(fname) ){
    download.file(url, fname)
    Sys.sleep(0.8)
  }
  # read in files
  HTML[[i]] <- read_html(fname)
}
```

Gathering data on links to other notable PS

```
# loop preparation
connections <- data.frame(from=NULL, to=NULL)

# loop
for ( i in seq_along(HTML))  {
  pslinks           <- html_attr(
                         html_nodes(HTML[[i]], xpath="//a"),
                       "href")
  links_in_pslinks <- seq_along(links)[links %in% pslinks]
  links_in_pslinks <- links_in_pslinks[links_in_pslinks!=i]
  connections       <- rbind(
                 connections,
                 data.frame(
                   from=rep(i, length(links_in_pslinks)),
                   to=links_in_pslinks
                   )
                       )
}
```

Gathering data on links to other notable PS

```
# results
names(connections) <-
  c("from", "to")
head(connections)
```

```
##   from  to
## 1    5  46
## 2    5 154
## 3    5 274
## 4    8  45
## 5    8 123
## 6   10 253
```

Gathering data on links to other notable PS

```
# make symmetrical
connections <-
  rbind(
    connections,
    data.frame(
      from=connections$to,
      to=connections$from
    )
 )
```

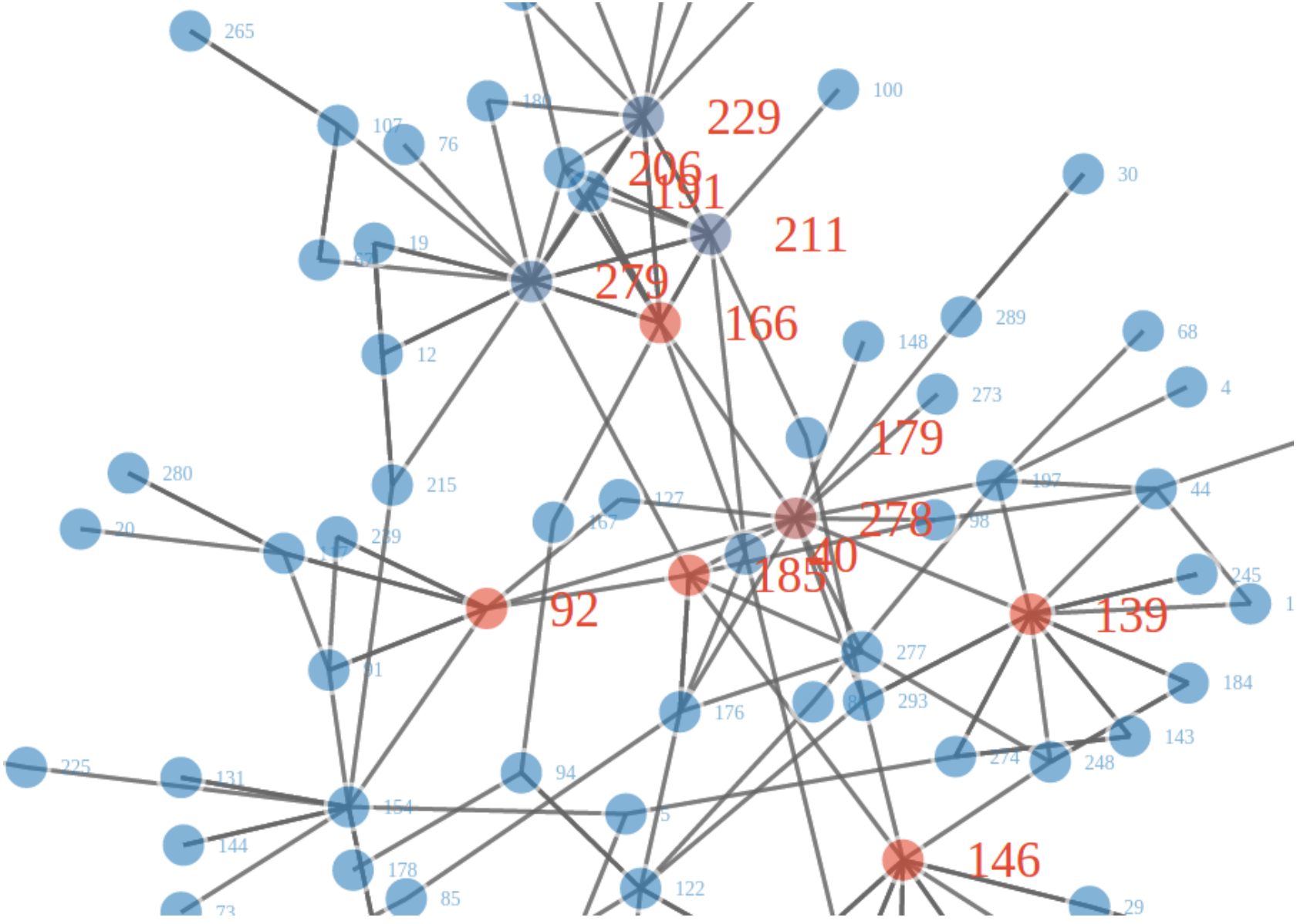
Plot connections

```
require(d3Network)
```

```
## Loading required package: d3Network
```

```
d3SimpleNetwork( connections,
                 width = 1000,
                 height = 900,
                 file="connections.html")
# browseURL("connections.html")
```

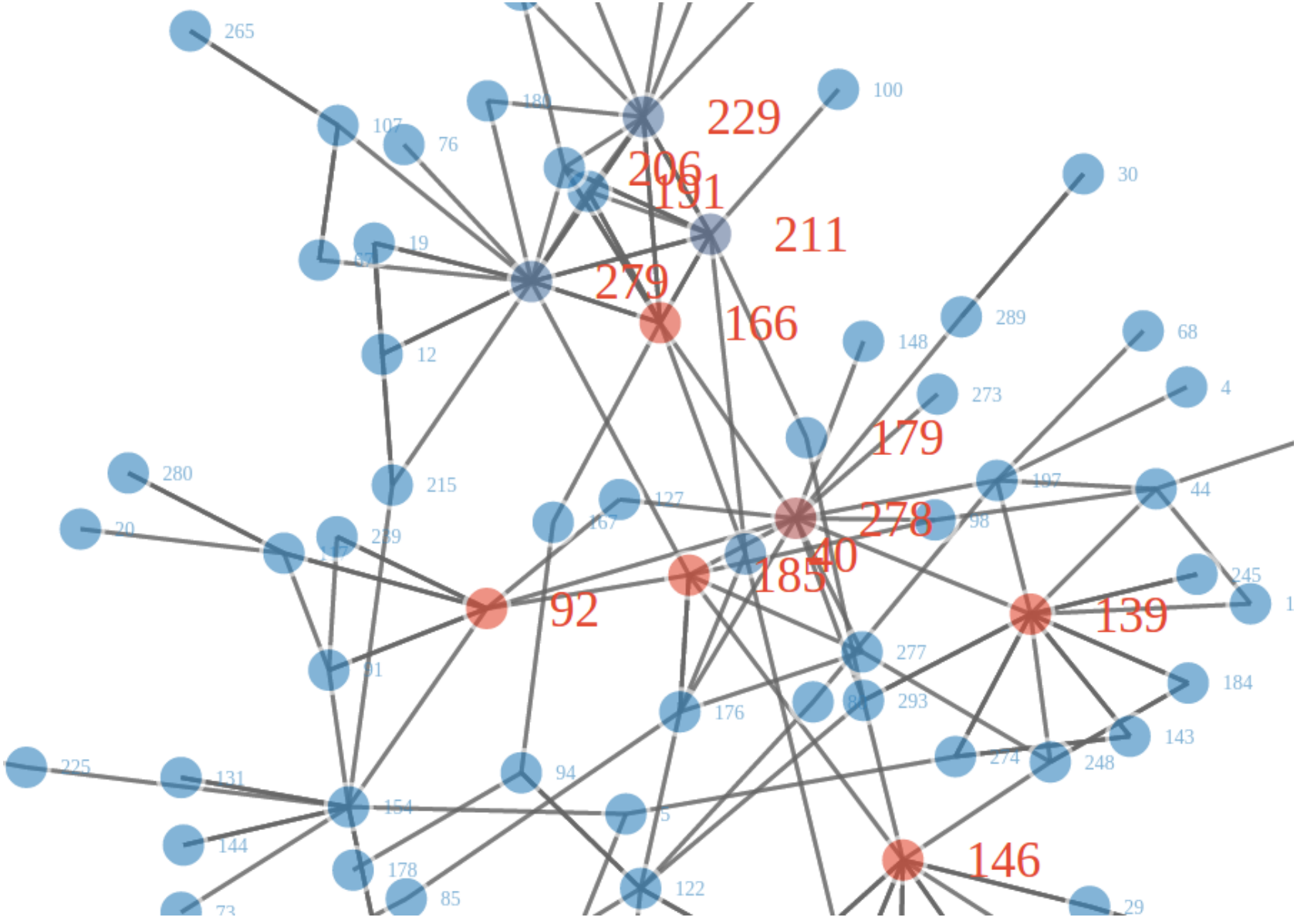
Plot connections



Plot connections

```
d3ForceNetwork(Links = connections, Nodes = data.frame(name
    Target = "to", opacity = 0.9, zoom = T, width = 1000, h
# browseURL('connections2.html')
```

Plot connections



Plot connections

Plot connections

Extension

localize notable political scientists

- go through all PS pages and extract university mentions
  - links
  - ... that have *University*, *School*, *???* in text
- think about how to best store/organize this information
- go get it
- geocode universities similar to scenario 1

localize notable political scientists

- Wikipedia pages sometimes entail geographic information
- go through all PS pages and extract all links
  - keep those links that lead to Wikipedia pages
- go through all page links left and look for geolocations connected to the notable political scientist

plot all locations gathered on a map

- have a look at scenario 1 for ideas on how to do it