Web Scraping with R

Eduard Szöcs

Institute for Environmental Sciences, UnVersity of Koblenz-Landau

Landau, 07.04.2016

https://github.com/edild/talk_webscrapingr

About me

- Phd-Student @Uni Koblenz-Landau
  - Environmental data
- Freelance (R) Consultant
  - Data sourcing, cleaning & analysis
  - Chemoinformatics
  - R Courses

About me

- Phd-Student @Uni Koblenz-Landau
  - Environmental data
- Freelance (R) Consultant
  - Data sourcing, cleaning & analysis
  - Chemoinformatics
  - R Courses

R packages:

taxize Taxonomic Information from Around the Web

webchem Chemical Information from the Web

Getting data from the internet

Getting data from the internet

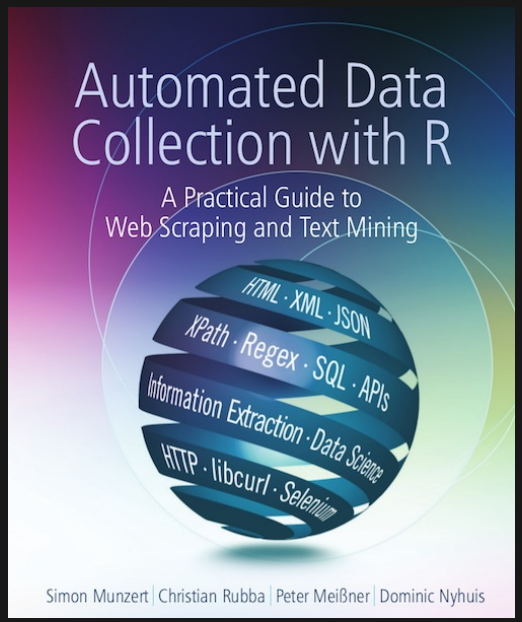
(in a structured automated way)

II - R Packages for web scraping (selected)

xml2	Parsing HTML & XML
rvest	parse common html structures (e.g. tables)
xmlview	View pretty HTML/XML, explore XPaths
httr*	Working with APIs / http protocol
jsonlite*	Parse JSON

II - R Packages for web scraping (selected)

xml2	Parsing HTML & XML
rvest	parse common html structures (e.g. tables)
xmlview	View pretty HTML/XML, explore XPaths
httr*	Working with APIs / http protocol
jsonlite*	Parse JSON



* I won't cover APIs here.

III - Scraping structured web-pages

What is structured data?

```
<table class="wikitable">
  <tbody>
    <tr>
      <th>First name</th>
      <th>Last name</th>
      <th>Age</th>
    </tr>
    <tr>
      <td>Tinu</td>
      <td>Elejogun</td>
      <td>14</td>
    </tr>
    <tr>
      <td>Blaszczyk</td>
      <td>Kostrzewski</td>
      <td>25</td>
    </tr>
    [...]
  </tbody>
</table>
```

2D representation of data -> data.frame

III - Demo

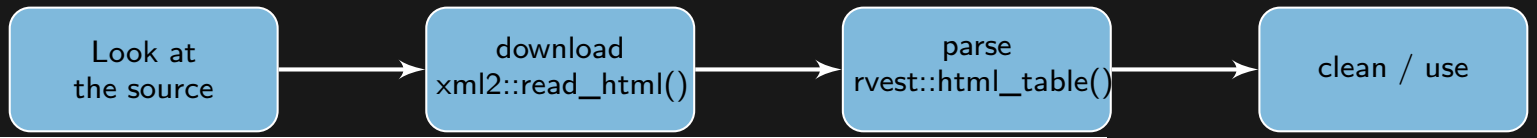
Extract election results from wikipedia

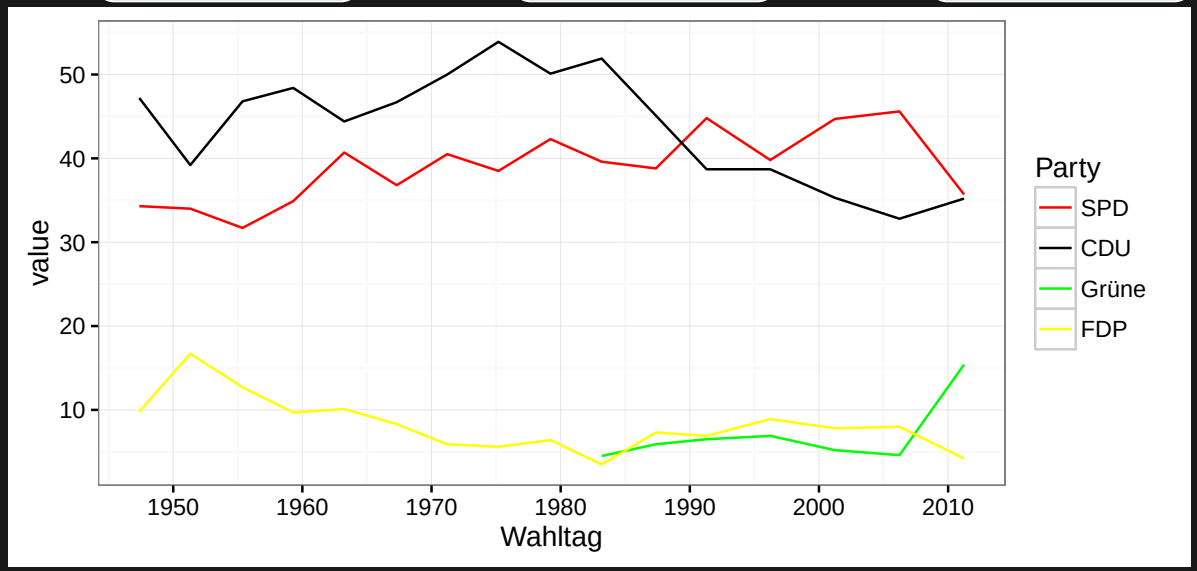
`https://de.wikipedia.org/wiki/Landtagswahlen_in_Rheinland-Pfalz`

III - Demo

Extract election results from wikipedia

`https://de.wikipedia.org/wiki/Landtagswahlen_in_Rheinland-Pfalz`





IV - Scraping unstructured web-pages

- Not all data is stored in <table>
- scattered on the web page
- Need to find and extract the parts we need.

http://webbook.nist.gov/cgi/cbook.cgi?ID=50-00-0&Units=SI

```
<h1 id="Top">Formaldehyde</h1>
<ul>
<li>
<strong>
<a title="IUPAC definition of relatVe molecular mass (molecular weight)">Molecular weight</a>
:
</strong>
30.0260
</li>
<li>
<strong>IUPAC Standard InChIKey:</strong>
<span style="font-family: monospace;">WSFSSNUMVMOOMR-UHFFFAOYSA-N</span>
</li>
<li>
<strong>CAS Registry Number:</strong>
50-00-0
</li>
```

IV - XPath

- XPath is a query language for selecting parts (nodes).

\\a	Select all a elements (links)
\\li\a	Select all links within li
\\li\a[3]	Select third link within li

- Inspectors can export paths (fragile)
- Build robust Xpaths
- `http://www.w3schools.com/xsl/xpath_intro.asp`

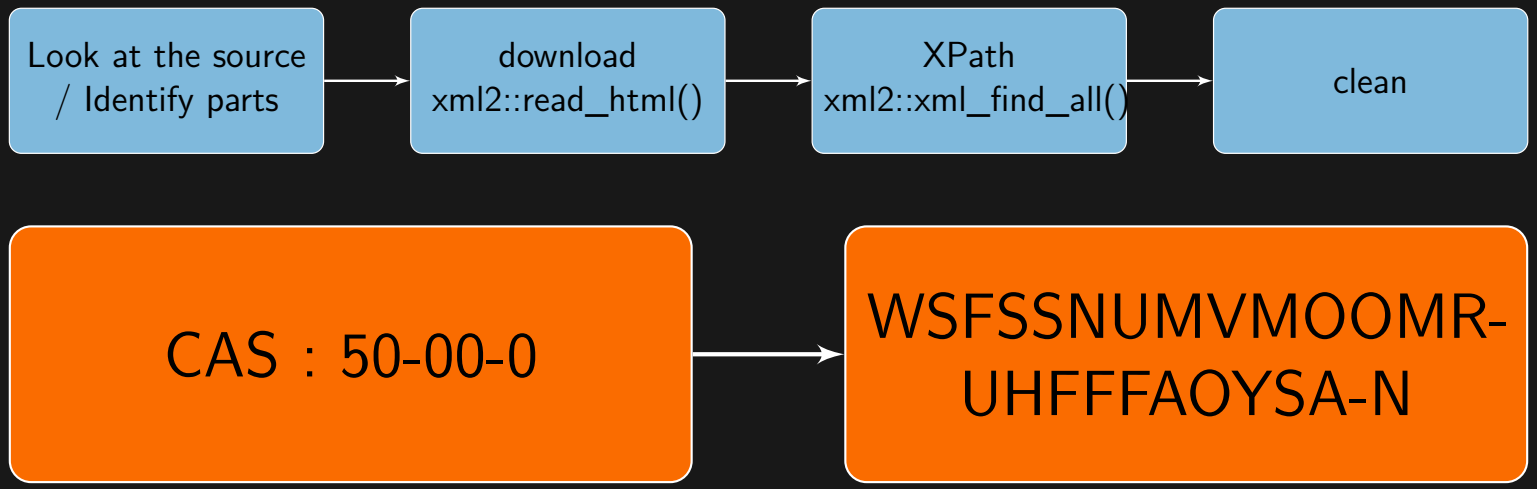
IV - RegEx

Regular Expressions

- For residual cleaning of characters
- E.g. Split Value and Unit
- gsub() & Co
- `http://www.regular-expressions.info`

IV - Demo

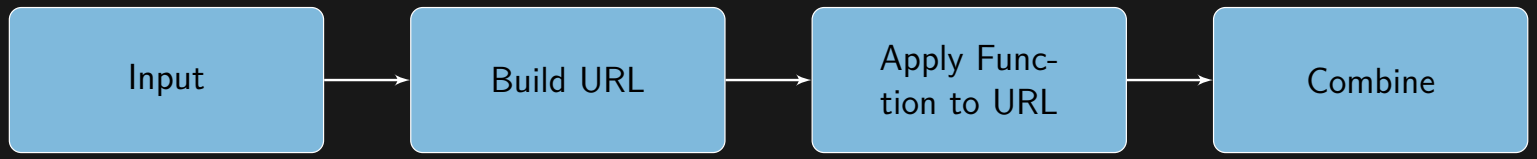
Extract Inchikeys from `webbook.nist.gov`



V - Automatisation

- Wrap into function (Input = URL)
- Function should return vector or list
- Build URLs
- Iterate with l/sapply

V - Demo Automatisation



CAS	inchikey	mw
50-00-0	WSFSSNUMVMOOMR-UHFFFAOYSA-N	30.026
126-86-3	LXOFYPKXCSULTL-UHFFFAOYSA-N	226.355
28159-98-0	HDHLIWCXDDZUFH-UHFFFAOYSA-N	253.367
1461-25-2	AFCAKJKUYFLYFK-UHFFFAOYSA-N	347.167
120-18-3		
25637-99-4		

VI - Remarks

- Error handling?
- Robustness? (e.g. Change in website)
- APIs! (functions provided by servers to query data)
- ROpenSci (e.g. webchem) provides good functionalities
- `forum.r-statistik.de`

VI - Lessons learned

- scraping is easy.
- being user-friendly is not.
- be nice to the servers!
  - scrape slowly, time-outs
  - Sys.sleep(rgamma(1, shape = 30, scale = 1/10))
- legal?
  - even slower
  - anonymous EC2
  - TOR

Web Scraping with R

Eduard Szöcs

Institute for Environmental Sciences, UnVersity of Koblenz-Landau


http://edild.github.io/


https://github.com/edild/talk_webscrapingr


@EduardSzoecs


szoecs@uni-landau.de