

# Automated data collection

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# Data collection



Sources for readymade data: World Bank, OECD, GLOCON, TÜİK, etc.



Application programming interfaces: Social media, messengers, etc.



Web scrapping



Advanced data extraction techniques: AI, ML, etc.

# Web scrapping

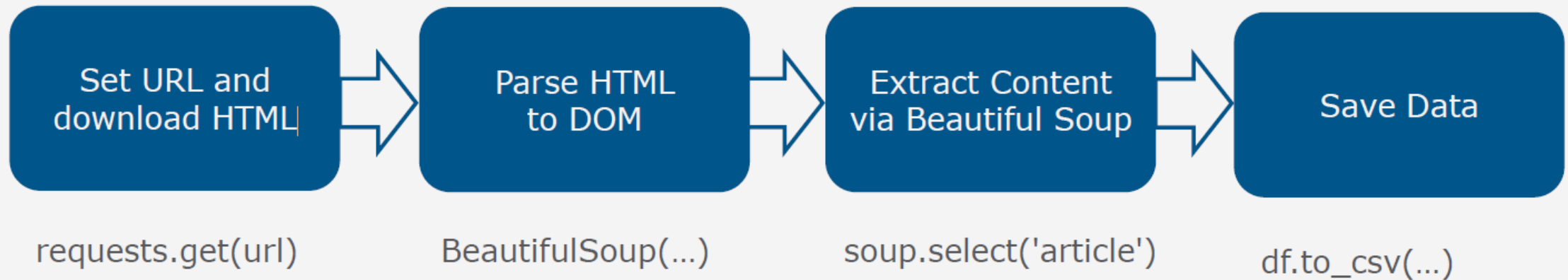
- Inspect the webpage and the HTML code
- Set URL and download HTML
- Cut out HTML
- Extract content
- Save your data

Relevant libraries in python

**Scrapy, BeautifulSoup, etc.**

# Webscraping with BeautifulSoup

- Python library for extracting data from HTML and XML files
- Official documentation: <https://www.crummy.com/software/BeautifulSoup/bs4/doc/#>



# URL and HTML structures

- url = path + “/” + searchterm + “?” + parameters

<https://www.aljazeera.com/search/Turkey?sort=date>

```
<html>
  <body>
    <div id="div1" class="class-1">
      <p class="class-1 class-2">Hello World!</p>
      <p>Data Science!</p>
    </div>
  </body>
</html>
```

- html = elements + attributes + text
  - Hypertext markup language
  - Children, parents and siblings, descendants

# Some HTML-Elements

## Metadata:

`<head>` collection of metadata  
`<title>` title of the document

## Sections:

`<body>` main contents of the document  
`<section>` section of the document  
`<h1>`, `<h2>`, ... headlines

## Grouped Contents

`<div>` container  
`<p>` paragraph

## Links

`<a>` Hyperlink, refers via href-attribute to resource

## Lists

`<ul>` unordered list  
`<ol>` ordered list  
`<li>` entry of a list

## Tables

`<table>` table  
`<tr>` row of a table  
`<td>` cell of a table

# XPATHS

to parse an html file with Scrapy

For the rest of the presentation, I would like to give credits for:  
<https://app.datacamp.com/learn/courses/web-scraping-with-python>

- / → The single forward-slash moves us forward one generation
- [] → The brackets specify the order of the noted element
- // → The double-forward slash tells us to look forward to all future generations
- *Xpath = '/html/body/div[2]//table'*

meaning that all tables under the second div element, which is child of first body element of the head element.

Examples:

*'//p'*

*'/head/body//div'*

*'div[3]//p'*

- To select attributes use:
- *Xpath = '//span[@class="span-class"]'*

meaning that all span elements, whose class attribute is 'span\_class'.

# XPATHS

## Example: Choose Data Science!

```
html =  
"""<html>  
  <body>  
    <div>  
      <p>Hello World!</p>  
      <div>  
        <p>Data Science!</p>  
      </div>  
    </div>  
    <div>  
      <p>Thanks for Watching!</p>  
    </div>  
  </body>  
</html>"""
```

- Collect all children of a specific element:  
*Xpath = '/html/body/\*'*
- Collect all descendants of the body element:  
*Xpath = "/html/body//\*"*
- Collect all elements in the entire HTML document:  
*Xpath = "//\*"*
- Now we can specify relevant path by using \*, /, //, [], @, searching for elements or attributes.
- Further we can use contain function for attributes containing multiple objects (e.g. <p class = 'class1 class2'>), to instead of direct match



# XPATHS

## Example:

```
html = '''
<html>
  <body>
    <div id="div1" class="class-1">
      <p class="class-1 class-2">Hello World!</p>
      <div id="div2">
        <p id="p2" class="class-2">Choose
          <a href="http://datascience.com">Data Science!</a>
        </p>
      </div>
    </div>
    <div id="div3" class="class-2">
      <p class="class-2">Thanks for Watching!</p>
    </div>
  </body>
</html>'''
```

- to select the paragraph element containing the phrase: "Thanks for Watching!", by using id attribute
- to select the paragraph element containing the phrase: "Hello World!", by using class attribute
- to select the href attribute value from the Data Science hyperlink (note that we want to get attribute content, not the element content)
- create an XPath which directs to all href attribute values of the hyperlink a elements whose class attributes contain the string "package-snippet"

# CSS locator

- To find an element by class, use a period “.”
  - “p.class-1” selects all paragraph elements belonging to class-1
- To find an element by id, use a pound sign “#”
  - “div#uid” selects the div elements with id equals to uid

## XPATH

```
xpath = '/html/body//div/p[2]'
```

## CSS

```
css = 'html > body div > p:nth-of-type(2)'
```

Select paragraph elements within class `class1`:

```
css_locator = 'div#uid > p.class1'
```

Select all elements whose class attribute belongs to `class1`:

```
css_locator = '.class1'
```

- Using XPath: `<xpath-to-element>/@attr-name`

```
xpath = '//div[@id="uid"]/a/@href'
```

- Using CSS Locator: `<css-to-element>::attr(attr-name)`

```
css_locator = 'div#uid > a::attr(href)'
```

# Extracting texts

## Xpath vs CSS locator

```
<p id="p-example">
  Hello world!
  Try <a href="http://www.datacamp.com">DataCamp</a> today!
</p>
```

- In XPath use `text()`

```
sel.xpath('//p[@id="p-example"]/text()').extract()
# result: ['\n Hello world!\n Try ', ' today!\n']
```

```
sel.xpath('//p[@id="p-example"]//text()').extract()
# result: ['\n Hello world!\n Try ', 'DataCamp', ' today!\n']
```

- For CSS Locator, use `::text`

```
sel.css('p#p-example::text').extract()
# result: ['\n Hello world!\n Try ', ' today!\n']
```

```
sel.css('p#p-example ::text').extract()
# result: ['\n Hello world!\n Try ', 'DataCamp', ' today!\n']
```

# Scraping with Spider

```
class DCspider( scrapy.Spider ):
    name = "dcspider"

    def start_requests( self ):
        urls = [ 'https://www.datacamp.com/courses/all' ]
        for url in urls:
            yield scrapy.Request( url = url, callback = self.parse )
    def parse( self, response ):
        links = response.css('div.course-block > a::attr(href)').extract()
        filepath = 'DC_links.csv'
        with open( filepath, 'w' ) as f:
            f.writelines( [link + '/n' for link in links] )
```

# Scraping with Spider

```
class DCspider( scrapy.Spider ):
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    def start_requests( self ):
        urls = [ 'https://www.datacamp.com/courses/all' ]
        for url in urls:
            yield scrapy.Request( url = url, callback = self.parse )
    def parse( self, response ):
        links = response.css('div.course-block > a::attr(href)').extract()
        for link in links:
            yield response.follow( url = link, callback = self.parse2 )
    def parse2( self, response ):
        # parse the course sites here!
```

# Scraping with Spider

```
import scrapy
from scrapy.crawler import CrawlerProcess

class DC_Chapter_Spider(scrapy.Spider):

    name = "dc_chapter_spider"

    def start_requests( self ):
        url = 'https://www.datacamp.com/courses/all'
        yield scrapy.Request( url = url,
                               callback = self.parse_front )

    def parse_front( self, response ):
        ## Code to parse the front courses page

    def parse_pages( self, response ):
        ## Code to parse course pages
        ## Fill in dc_dict here


dc_dict = dict()

process = CrawlerProcess()
process.crawl(DC_Chapter_Spider)
process.start()
```

# Scraping with Spider

```
def parse_front( self, response ):  
    # Narrow in on the course blocks  
    course_blocks = response.css( 'div.course-block' )  
    # Direct to the course links  
    course_links = course_blocks.xpath( './a/@href' )  
    # Extract the links (as a list of strings)  
    links_to_follow = course_links.extract()  
    # Follow the links to the next parser  
    for url in links_to_follow:  
        yield response.follow( url = url,  
                               callback = self.parse_pages )
```

```
def parse_pages( self, response ):  
    # Direct to the course title text  
    crs_title = response.xpath('//h1[contains(@class,"title")]/text()')  
    # Extract and clean the course title text  
    crs_title_ext = crs_title.extract_first().strip()  
    # Direct to the chapter titles text  
    ch_titles = response.css( 'h4.chapter__title::text' )  
    # Extract and clean the chapter titles text  
    ch_titles_ext = [t.strip() for t in ch_titles.extract()]  
    # Store this in our dictionary  
    dc_dict[ crs_title_ext ] = ch_titles_ext
```



# Practical session for Web scrapping: IMDB data