Basics of HTML and CSS
MY472 Week 4

October 22, 2019

Scraping the web

Scraping the web: what?

An increasing amount of data is available on the web:

- Speeches, sentences, biographical information…
- Social media data, newspaper articles, press releases…
- Geographic information, conflict data…

These datasets are often provided in an **unstructured format**.

Web scraping is the process of extracting this information automatically and transforming it into a **structured dataset.**

Scraping the web: Why?

Copy & pasting is time-consuming, boring, prone to errors, and impractical for large datasets

In contrast, automated web scraping:

1. Scales well for large datasets
2. Is reproducible
3. Involved adaptable techniques
4. Facilitates detecting and fixing errors

When to scrape?

1. Trade-off between your time today and your time in the future. **Invest in your future self!**
2. Computer time is cheap; human time is expensive

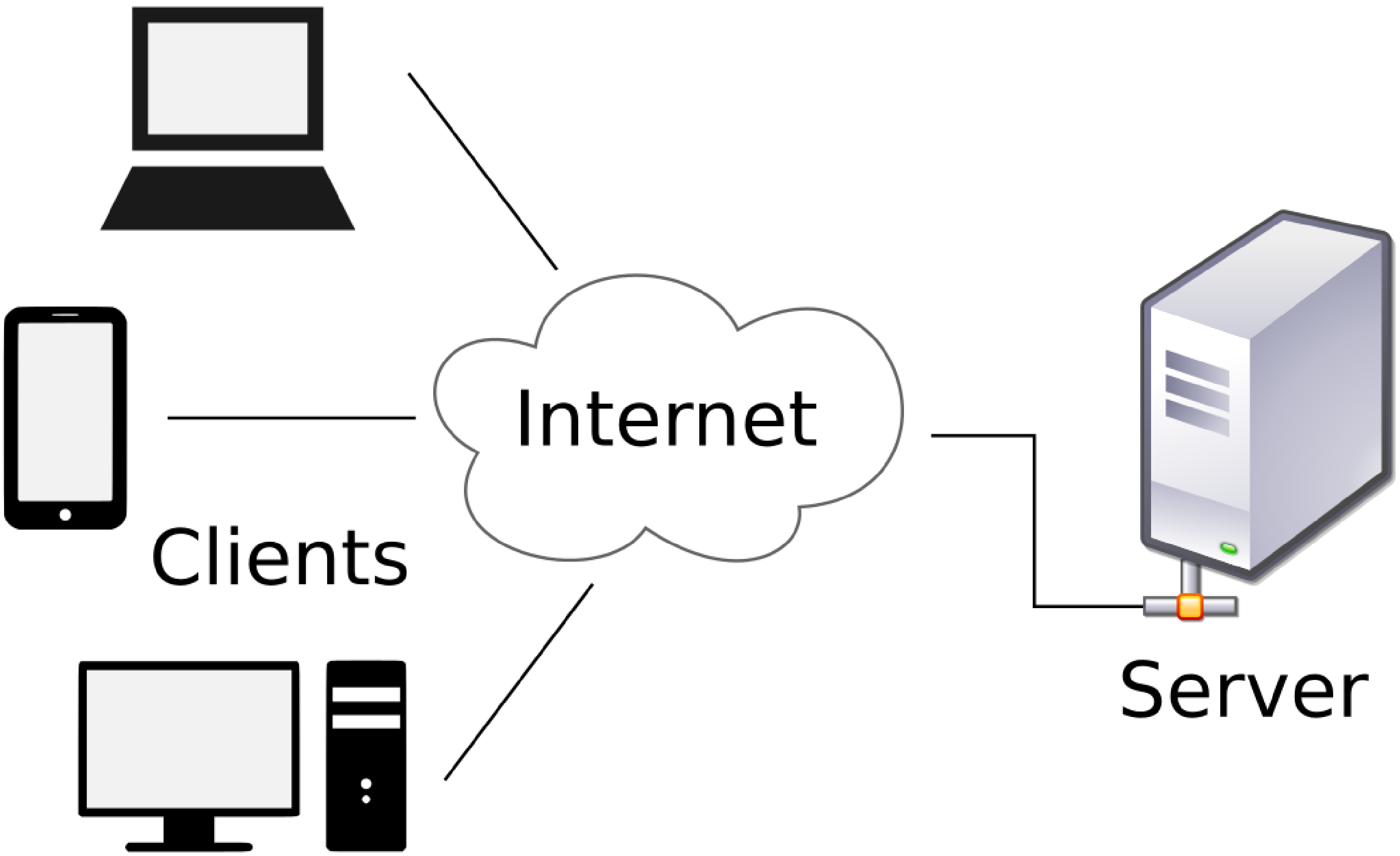
Scraping the web: two approaches

Two different approaches:

1. **Screen scraping**: extract data from source code of website, with html parser and/or regular expressions
   - `rvest` package in R
2. **Web APIs** (application programming interfaces): a set of structured http requests that return JSON or XML data
   - `httr` package to construct API requests
   - Packages specific to each API: weatherData, WDI, Rfacebook,
     - Check CRAN Task View on Web Technologies and Services for examples
   - More on APIs on Week 7

The Internet, how it works

Client-server model



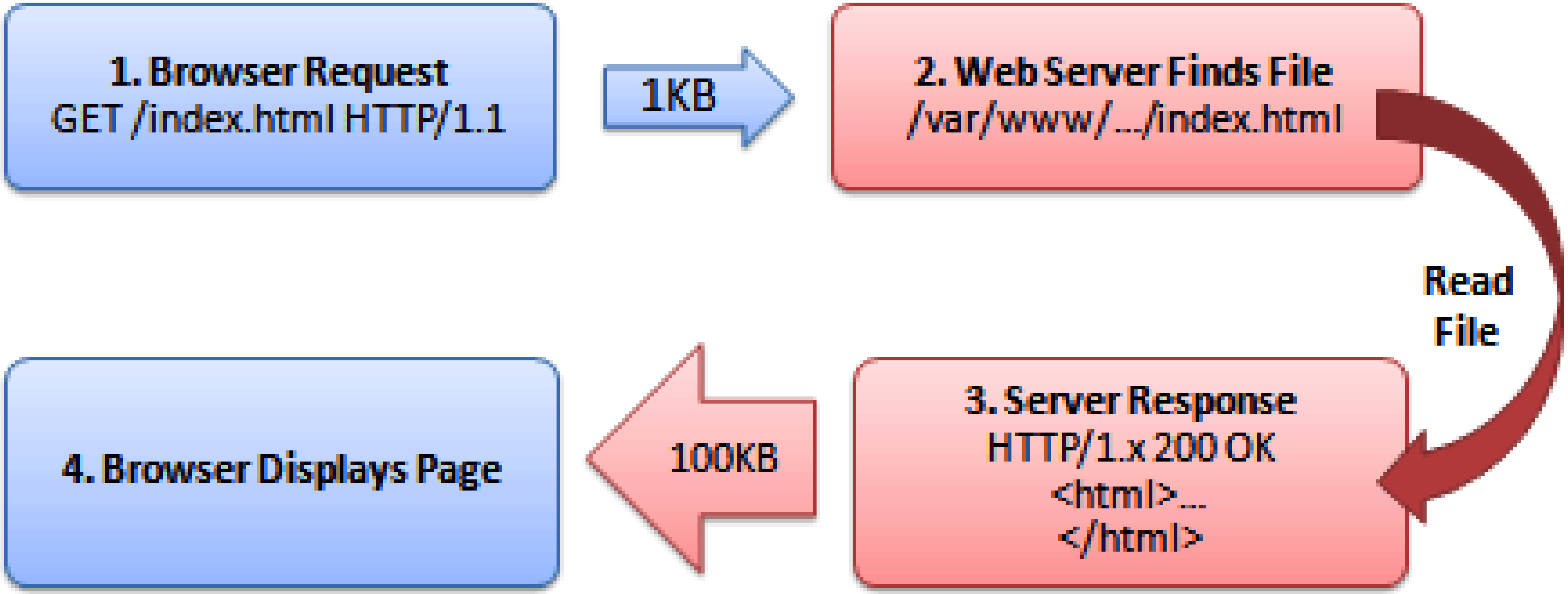
Client-server model

- Client: user computer; tablet; phone; software application; etc.
- Server: Jupyter server on Fabian; mail server; file server; web server; etc.

1. Client make requrests to the server
    - Depending on what you want to get, the request might be
        - HTTP
        - HTTPS
        - SMTP
        - FTP
2. Server returns something

In the case of HTTP request and response

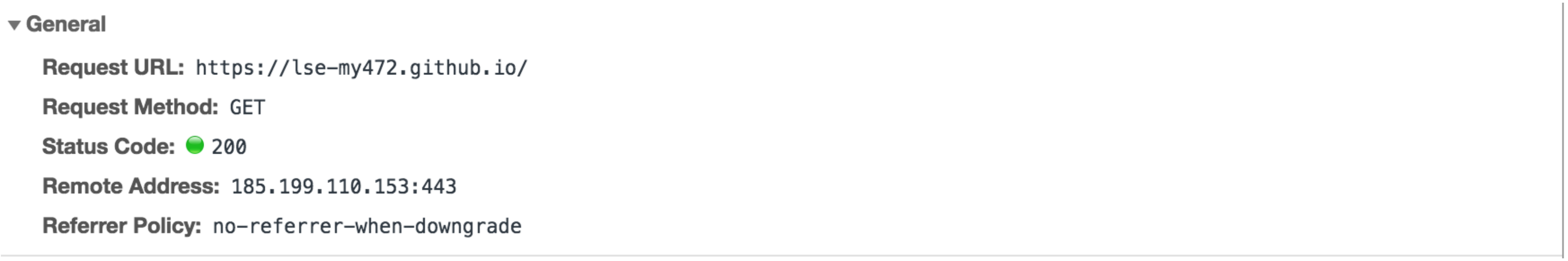
From StackOverflow



Simple example: MY472 website

Let’s see a very simple example of https://lse-my472.github.io

Simple example: MY472 website



▾ General

Request URL: `https://lse-my472.github.io/`

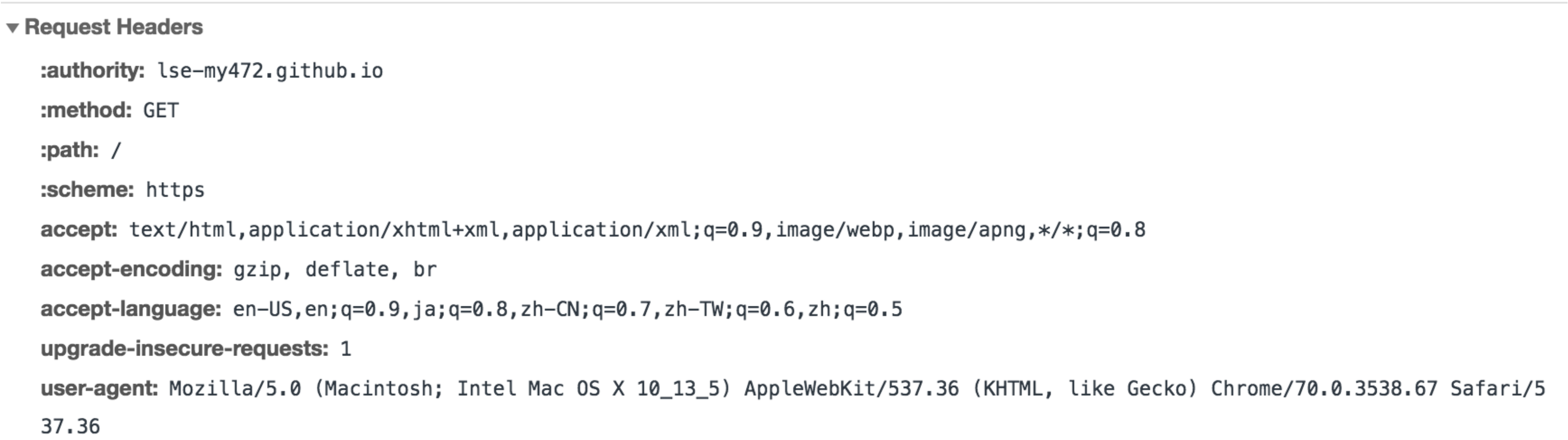
Request Method: `GET`

Status Code: ● `200`

Remote Address: `185.199.110.153:443`

Referrer Policy: `no-referrer-when-downgrade`

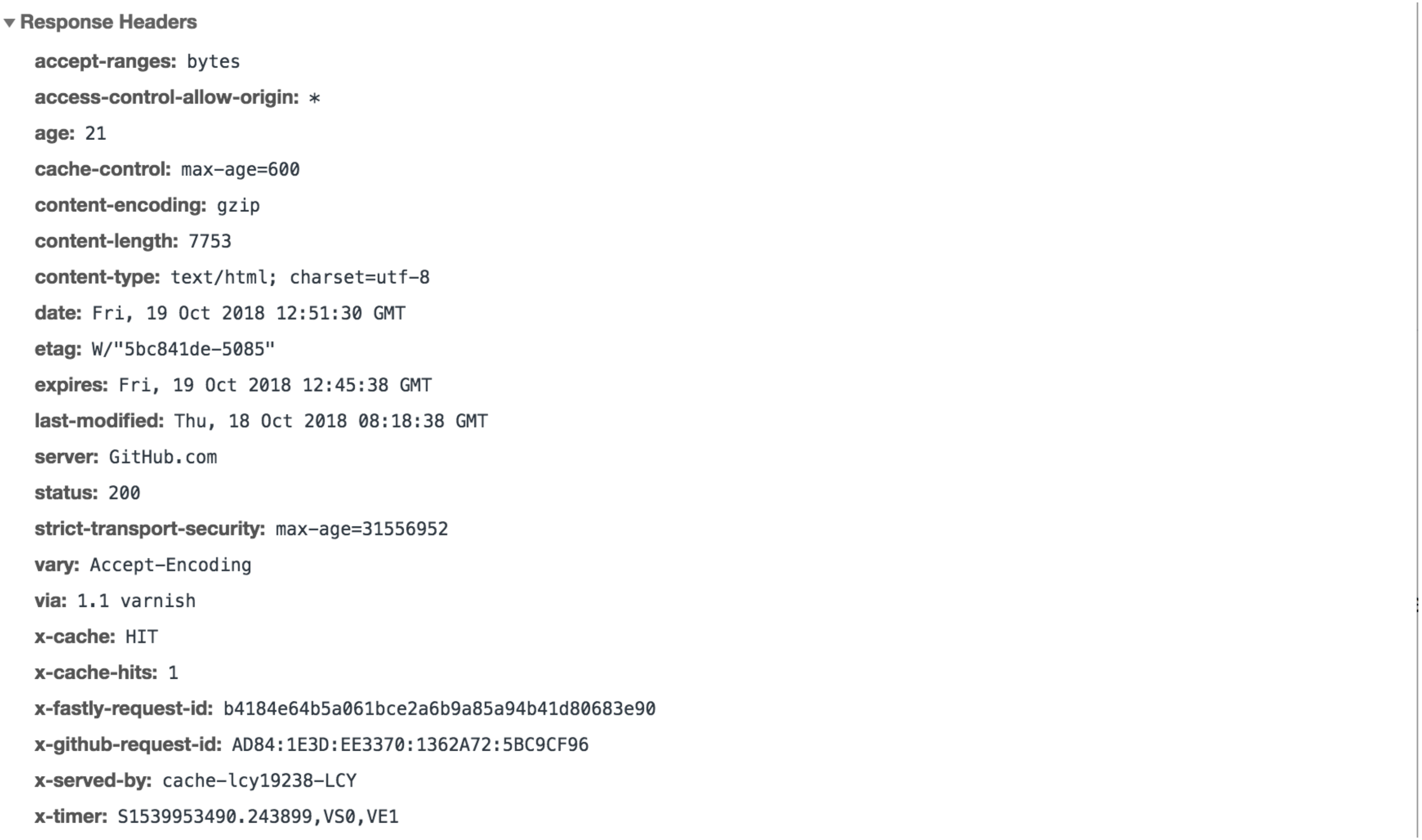
Simple example: Request headers



▼ Request Headers

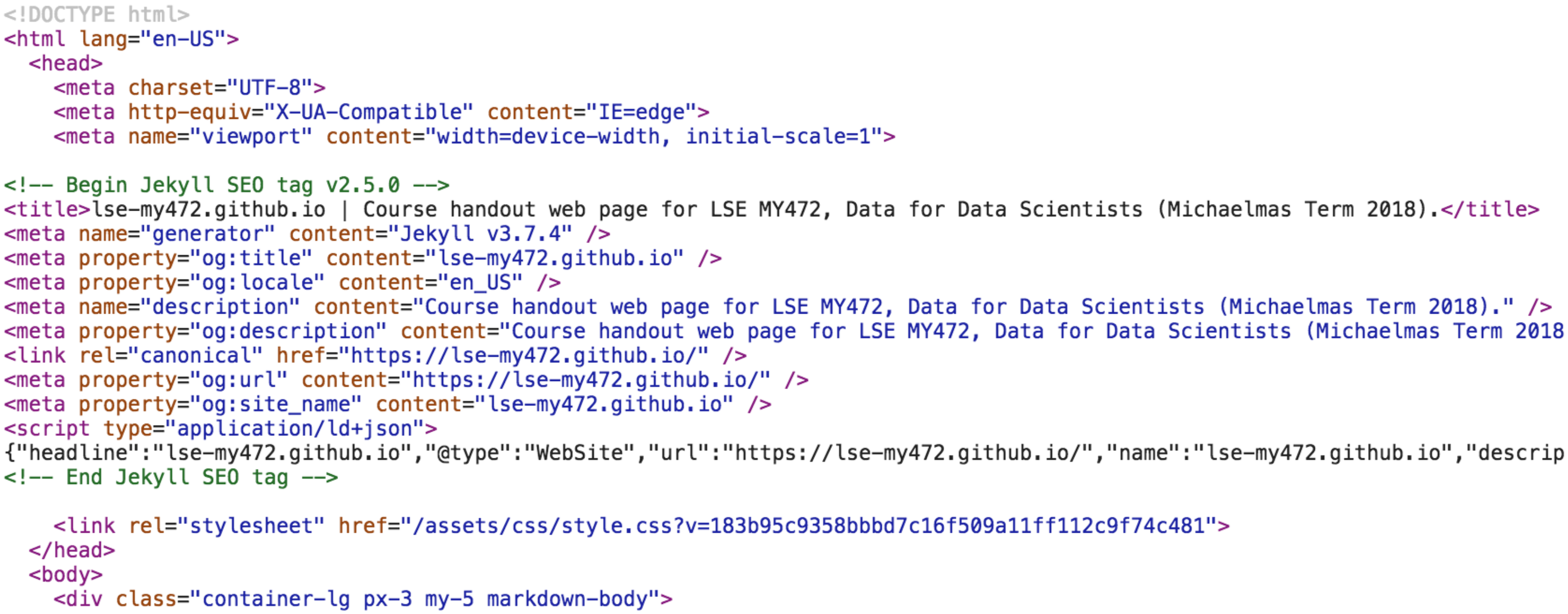
```
:authority: lse-my472.github.io
:method: GET
:path: /
:scheme: https
accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8
accept-encoding: gzip, deflate, br
accept-language: en-US,en;q=0.9,ja;q=0.8,zh-CN;q=0.7,zh-TW;q=0.6,zh;q=0.5
upgrade-insecure-requests: 1
user-agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_13_5) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/70.0.3538.67 Safari/537.36
```

Simple example: Response headers



```
▼ Response Headers
    accept-ranges: bytes
    access-control-allow-origin: *
    age: 21
    cache-control: max-age=600
    content-encoding: gzip
    content-length: 7753
    content-type: text/html; charset=utf-8
    date: Fri, 19 Oct 2018 12:51:30 GMT
    etag: W/"5bc841de-5085"
    expires: Fri, 19 Oct 2018 12:45:38 GMT
    last-modified: Thu, 18 Oct 2018 08:18:38 GMT
    server: GitHub.com
    status: 200
    strict-transport-security: max-age=31556952
    vary: Accept-Encoding
    via: 1.1 varnish
    x-cache: HIT
    x-cache-hits: 1
    x-fastly-request-id: b4184e64b5a061bce2a6b9a85a94b41d80683e90
    x-github-request-id: AD84:1E3D:EE3370:1362A72:5BC9CF96
    x-served-by: cache-lcy19238-LCY
    x-timer: S1539953490.243899,VS0,VE1
```

Simple example: Reponse content



```
<!DOCTYPE html>
<html lang="en-US">
  <head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1">

<!-- Begin Jekyll SEO tag v2.5.0 -->
<title>lse-my472.github.io | Course handout web page for LSE MY472, Data for Data Scientists (Michaelmas Term 2018).</title>
<meta name="generator" content="Jekyll v3.7.4" />
<meta property="og:title" content="lse-my472.github.io" />
<meta property="og:locale" content="en_US" />
<meta name="description" content="Course handout web page for LSE MY472, Data for Data Scientists (Michaelmas Term 2018)." />
<meta property="og:description" content="Course handout web page for LSE MY472, Data for Data Scientists (Michaelmas Term 2018
<link rel="canonical" href="https://lse-my472.github.io/" />
<meta property="og:url" content="https://lse-my472.github.io/" />
<meta property="og:site_name" content="lse-my472.github.io" />
<script type="application/ld+json">
{"headline":"lse-my472.github.io","@type":"WebSite","url":"https://lse-my472.github.io/","name":"lse-my472.github.io","descrip
<!-- End Jekyll SEO tag -->

    <link rel="stylesheet" href="/assets/css/style.css?v=183b95c9358bbbd7c16f509a11ff112c9f74c481">
  </head>
  <body>
    <div class="container-lg px-3 my-5 markdown-body">
```

HTML and CSS

HTML

HTML: Hyper-Text Markup Language

- HTML displays mostly **static** content
- Many contents of dynamic webpages cannot be found anywhere in html
  - Example: Google Maps
- Understanding what's static and what's dynamic in a webpage is a crucial first step for web scraping

A simplest html file

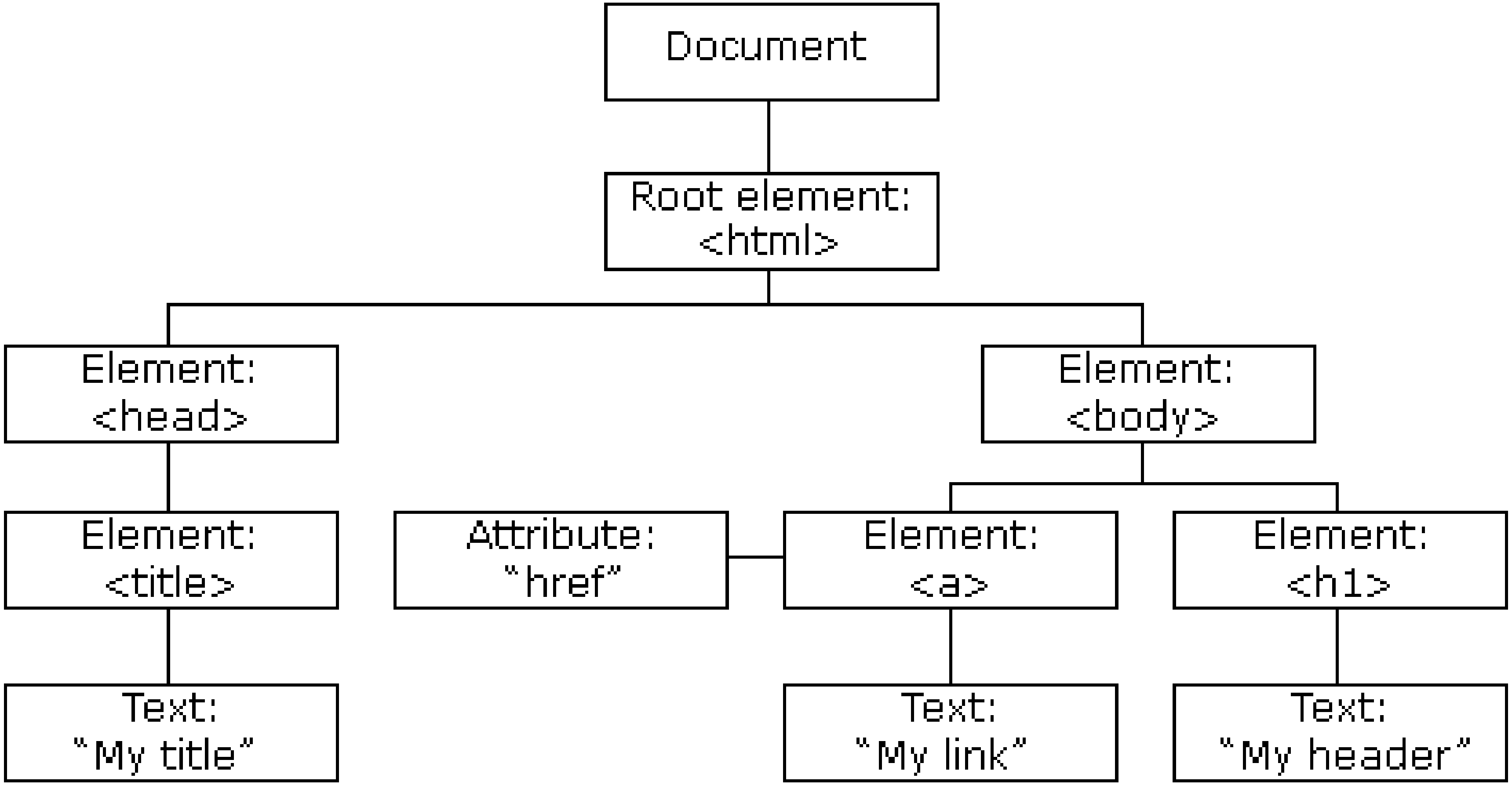
https://www.w3schools.com/html/tryit.asp?filename=tryhtml_intro

```
<!DOCTYPE html>
<html>
<head>
    <title>Page Title</title>
</head>
<body>
    <h1>My First Heading</h1>
    <p>My first paragraph.</p>
</body>
</html>
```

Another simple html file

```html
<!DOCTYPE html>
<html>
<head>
    <title>My Title</title>
</head>
<body>
    <h1>My Header</h1>
    <a href="http://kenbenoit.net">My link</a>
</body>
</html>
```

HTML Structure



Beyond HTML

1. **Cascading Style Sheets (CSS)** Describes formatting of HTML components, useful for us!

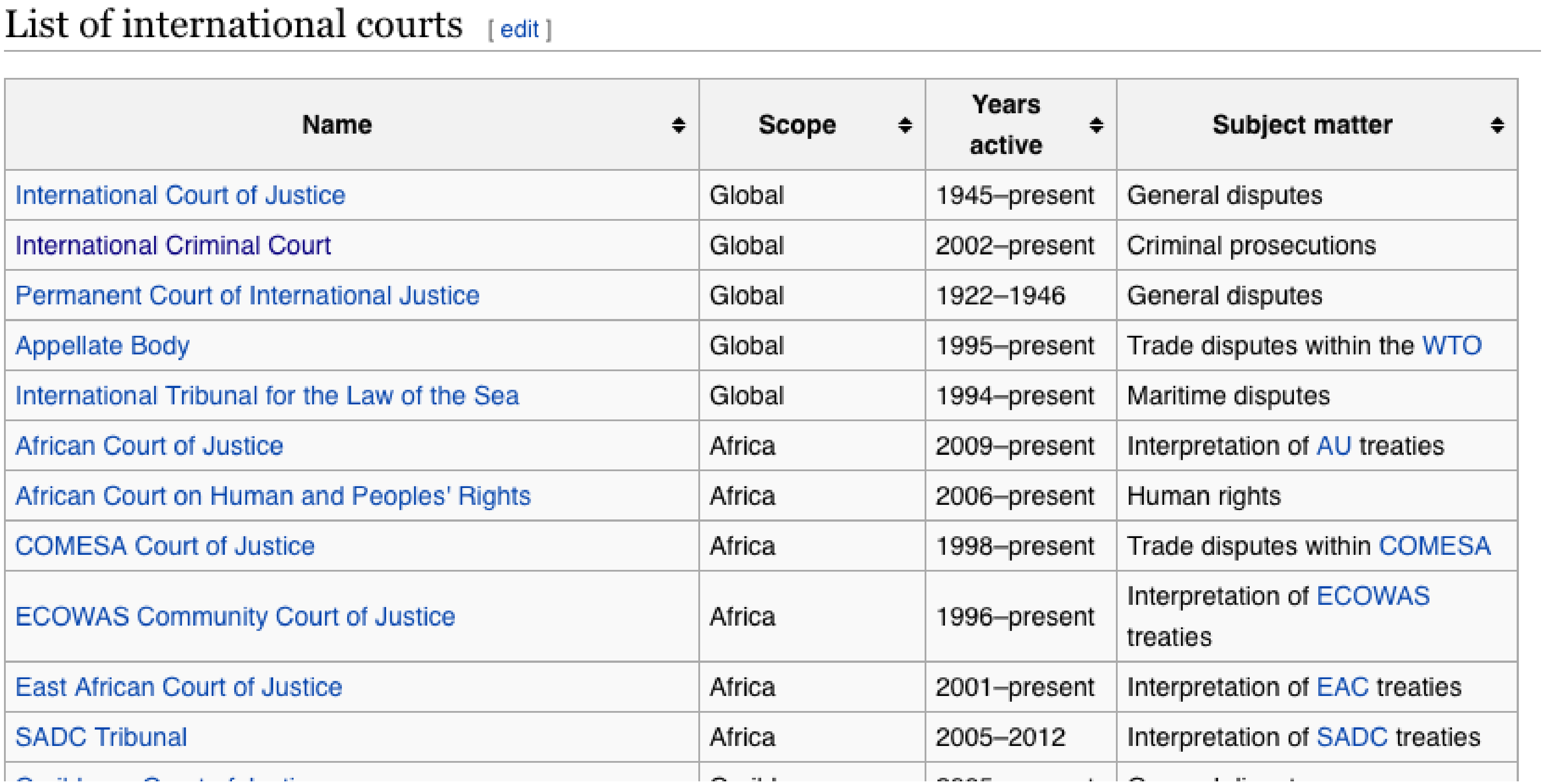
2. **Javascript:** adds functionalities to the website (e.g. change content/structure after website has been loaded)

Webscraping, three main scenarios

Scinario 1: Data in table format

International court

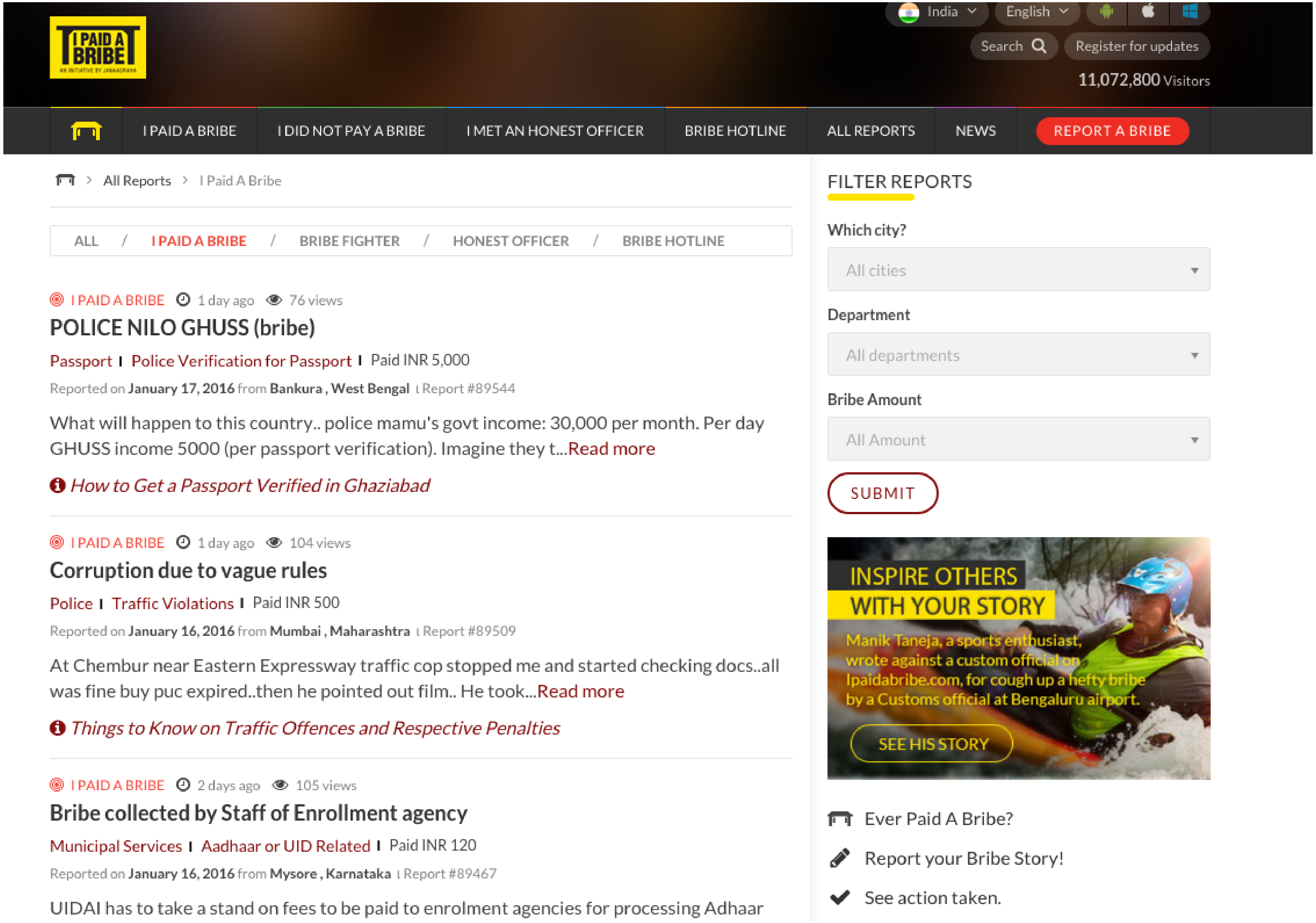
From Wikipedia, the free encyclopedia



List of international courts [edit]

Name	Scope	Years active	Subject matter
International Court of Justice	Global	1945–present	General disputes
International Criminal Court	Global	2002–present	Criminal prosecutions
Permanent Court of International Justice	Global	1922–1946	General disputes
Appellate Body	Global	1995–present	Trade disputes within the WTO
International Tribunal for the Law of the Sea	Global	1994–present	Maritime disputes
African Court of Justice	Africa	2009–present	Interpretation of AU treaties
African Court on Human and Peoples' Rights	Africa	2006–present	Human rights
COMESA Court of Justice	Africa	1998–present	Trade disputes within COMESA
ECOWAS Community Court of Justice	Africa	1996–present	Interpretation of ECOWAS treaties
East African Court of Justice	Africa	2001–present	Interpretation of EAC treaties
SADC Tribunal	Africa	2005–2012	Interpretation of SADC treaties

Scinario 2: Data in unstructured format



I PAID A BRIBE

India English

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I PAID A BRIBE 1 day ago 76 views

POLICE NILO GHUSS (bribe)

Passport | Police Verification for Passport | Paid INR 5,000

Reported on **January 17, 2016** from **Bankura , West Bengal** | Report #89544

What will happen to this country.. police mamu's govt income: 30,000 per month. Per day GHUSS income 5000 (per passport verification). Imagine they t...Read more

How to Get a Passport Verified in Ghaziabad

I PAID A BRIBE 1 day ago 104 views

Corruption due to vague rules

Police | Traffic Violations | Paid INR 500

Reported on **January 16, 2016** from **Mumbai , Maharashtra** | Report #89509

At Chembur near Eastern Expressway traffic cop stopped me and started checking docs..all was fine buy puc expired..then he pointed out film.. He took...Read more

Things to Know on Traffic Offences and Respective Penalties

I PAID A BRIBE 2 days ago 105 views

Bribe collected by Staff of Enrollment agency

Municipal Services | Aadhaar or UID Related | Paid INR 120

Reported on **January 16, 2016** from **Mysore , Karnataka** | Report #89467

UIDAI has to take a stand on fees to be paid to enrolment agencies for processing Adhaar

FILTER REPORTS

Which city?

All cities ▾

Department

All departments ▾

Bribe Amount

All Amount ▾

SUBMIT

INSPIRE OTHERS WITH YOUR STORY

Manik Taneja, a sports enthusiast, wrote against a custom official on Ipaidabribe.com, for cough up a hefty bribe by a Customs official at Bengaluru airport.

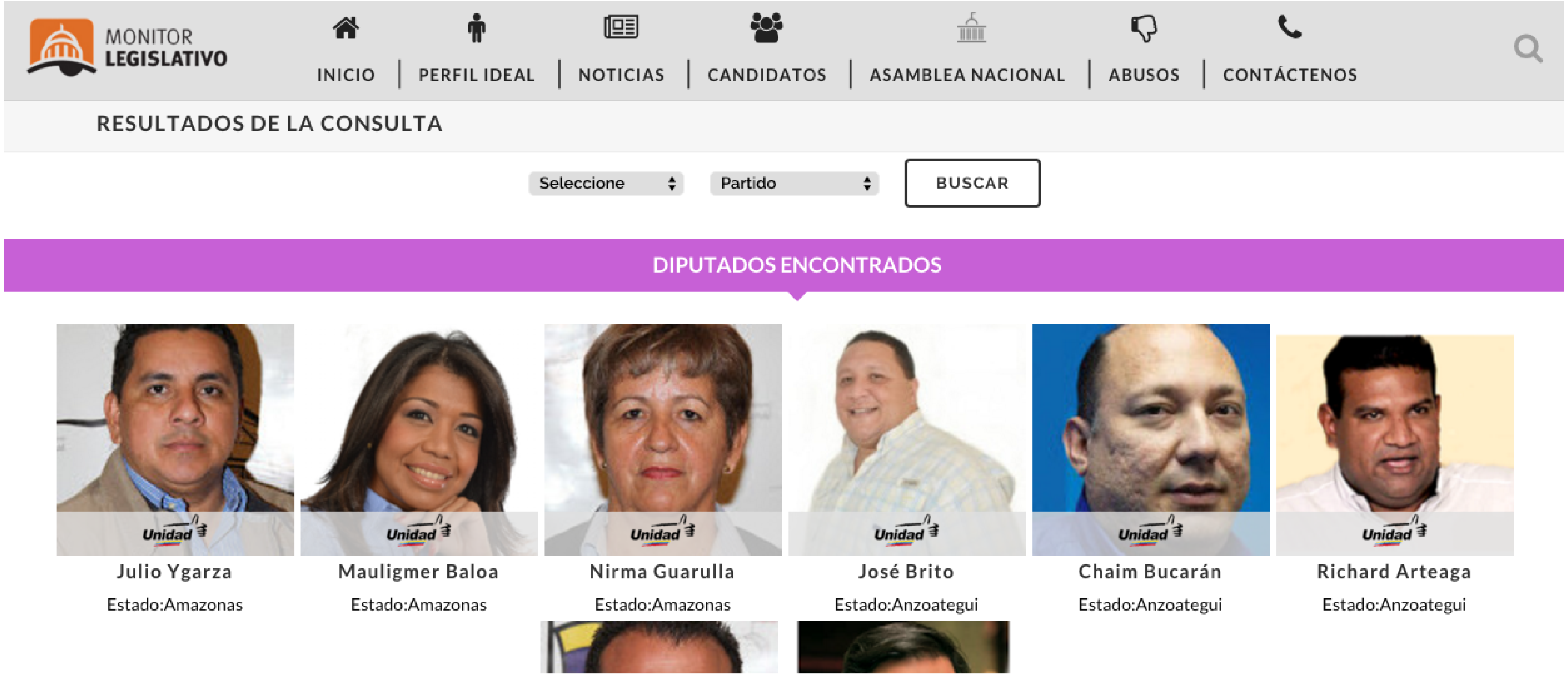
SEE HIS STORY

Ever Paid A Bribe?

Report your Bribe Story!

✓ See action taken.

Scinario 3: hidden behind web forms



MONITOR LEGISLATIVO

INICIO | PERFIL IDEAL | NOTICIAS | CANDIDATOS | ASAMBLEA NACIONAL | ABUSOS | CONTÁCTENOS

RESULTADOS DE LA CONSULTA

Seleccione ▾ Partido ▾ BUSCAR

DIPUTADOS ENCONTRADOS

Julio Ygarza	Mauligmer Baloa	Nirma Guarulla	José Brito	Chaim Bucarán	Richard Arteaga
Estado:Amazonas	Estado:Amazonas	Estado:Amazonas	Estado:Anzoategui	Estado:Anzoategui	Estado:Anzoategui

Three main scenarios

1. Data in *table* format
   - Automatic extraction with **rvest**
2. Data in *unstructured* format
   - Element identification
     - `selectorGadget`
     - *Inspect* in browser
   - Identify the target with *CSS* or *xpath* selector
   - Automatic extraction with **rvest**
3. Data hidden *behind web forms*
   - Automation of web browser behavior with **RSelenium**

CSS Selector

We use it to select particular element from a webpage:

- selecting by tag-name
  - example html code: `<h3>This is the main item</h3>`
  - selector: `h3`
- selecting by class
  - example html code: `<div class = 'itemdisplay'>This is the main item</div>`
  - selector: `.itemdisplay`
- selecting by id
  - example html code: `<div id = 'maintitle'>my main title</div>`
  - selector: `#maintitle`

CSS Selector

- selecting by tag structure
  - example html code: (link inside `div` tag)
    `<div><a href = 'https://www.google.com'>Google Link</a></div>`
    - selector: `div a`

Reference: https://www.w3schools.com/cssref/css_selectors.asp

A similar but more powerful selector is **xpath**

The rules of the game

1. Respect the hosting site's wishes:
   - Check if an API exists or if data are available for download
   - Keep in mind where data comes from and give credit (and respect copyright if you want to republish the data!)
   - Some websites *disallow* scrapers on `robots.txt` file
2. Limit your bandwidth use:
   - Wait one or two seconds after each hit
   - Scrape only what you need, and just once
3. When using APIs, read documentation
   - Is there a batch download option?
   - Are there any rate limits?
   - Can you share the data?

A note on code formatting

- The tidyverse style guide is a good set of principles to follow
    - Note: the style guide itself is published in a format called **bookdown** that automatically compiles a book/website/pdf/epub from Rmd sources
- Consider **lintr** (example)
- Works on .R, .Rmd, etc.

Lab preview

- Part 1: Scraping a table from the website of the UK parliament
- Part 2: Scraping unstructured data from a government petitions website
- More advanced topics follow next week, with APIs in Week 7
- Remedial topics from the Digital Skills Lab