Data 2.0 Hackathon
Web Scraping Workshop

Sophie Janaskie
Yale School of Forestry and Environmental Studies
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What is web scraping?

- A method of extracting information from websites programmatically
- A way to convert semi-structured web data into usable, structured data that we can analyze

```
# convert contents to nested data structure
soup = BeautifulSoup(content, "lxml")

# parse HTML
date = soup.find('div', attrs={'class':'daily-history-select'}).h2.text
meantemp = soup.find_all('tr')[2].find_all('td')[1].find(attrs={"class":"wx-value"}).text
maxtemp = soup.find_all('tr')[3].find_all('td')[1].find(attrs={"class":"wx-value"}).text
mintemp = soup.find_all('tr')[4].find_all('td')[1].find(attrs={"class":"wx-value"}).text
precip = soup.find_all('tr')[13].find_all('td')[1].find(attrs={"class":"wx-value"}).text
wind = soup.find_all('tr')[17].find_all('td')[1].find(attrs={"class":"wx-value"}).text

# write resutls
with open("WeatherScrapeOnePage.csv", "w") as file:
    csv_writer = csv.writer(file)
    csv_writer.writerow(['Date', 'Mean Temp (C)', 'Max Temp (C)', 'Min Temp (C)', 'Precipitation (in)', 'Wind Speed (m/s)'])
    csv_writer.writerow([dateString, meantemp, maxtemp, mintemp, precip, wind])
```

```
import requests
from bs4 import BeautifulSoup

url = "https://www.wunderground.com/wx

def load(url):
    attempts = 5
    for i in range(attempts):
        try:
            response = requests.get(url)
            return response.content
        except requests.HTTPError:
            if i+1 == attempts:
                raise
            else:
                time.sleep(60)

content = load(url)
soup = BeautifulSoup(content, "html.parse

# move on to parsing!
```

Why is it useful, and when to use it?

- No API or readily available data
- Programmatically pull data from the web to save time from manual collection
- Useful for projects and capstones!

“The Internet is one giant API – with a really terrible interface.”

- Ryan Mitchell, author of Web Scraping with Python

Agenda

1. Scraping workflow
2. HTML Basics
3. Pulling the web page with Requests
4. Parsing the HTML with BeautifulSoup
5. Storing your data
6. Other considerations

Web Scraping Workflow

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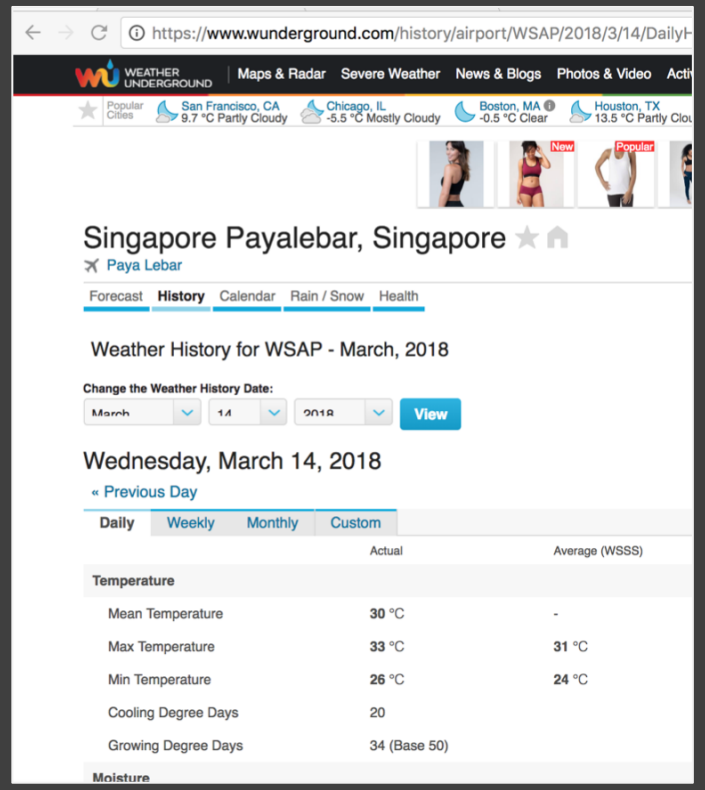
Requests ***BeautifulSoup*** ***csv***

```
import requests
from bs4 import BeautifulSoup
import csv
```

HTML Basics

Web Page Structure

Rendered HTML



Source Code

```
import requests
from bs4 import BeautifulSoup
import csv, time

# initial GET request
url = "https://www.wunderground.com/history/airport/WSAP/2017/1/1/DailyHistory.html"
response = requests.get(url)
content = response.content

# convert contents to nested data structure
soup = BeautifulSoup(content, "lxml")

# parse HTML
date = soup.find('div', attrs={'class':'daily-history-select'}).h2.text
meantemp = soup.find_all('tr')[2].find_all('td')[1].find(attrs={"class":"wx-value"}).text
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# write resutls
with open("WeatherScrapeOnePage.csv", "w") as file:
    csv_writer = csv.writer(file)
    csv_writer.writerow(['Date', 'Mean Temp (C)', 'Max Temp (C)', 'Min Temp (C)', 'Precipitation (in
    csv_writer.writerow([dateString, meantemp, maxtemp, mintemp, precip, wind])

print("Scrape complete!")
```
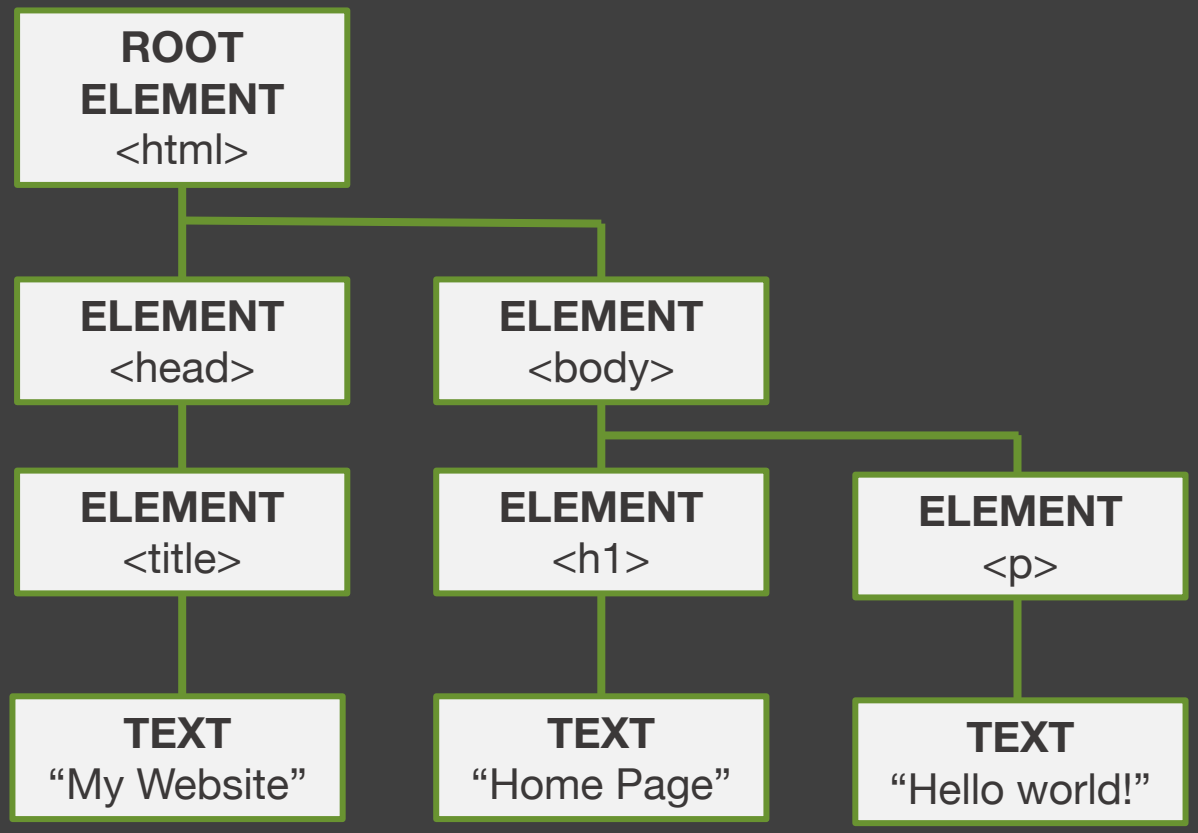

HTML/CSS

- *Hyper Text Markup Language provides structure for web pages.*
- *CSS provides styling and design.*

```
<!DOCTYPE html>
<html>
<body>

<h1>This is a heading</h1>
<h2>This is a smaller heading</h2>
<a href="https://www.google.com">This is a link</a>
<img src="picture.jpg" alt="this is a picture" width="100" height="150">

<ul>
  <li>This</li>
  <li>is an</li>
  <li>unordered list</li>
</ul>

</body>
</html>
```

Document Object Model

- *The DOM creates an object-oriented model of the information to enable easier manipulation.*



Get the website

Using the Requests library

Requests library

- Sending an HTTP request

```
url = "https://www.wunderground.com/history/airport/WSAP/"+startDate+"/DailyHistory.html"
response = requests.get(url)
```

- Access the response's body of content

```
content = response.content
```

- Check to make sure the request was successful (200 code)

```
status = response.status_code
```

Parse the HTML

Using the BeautifulSoup library

BeautifulSoup

Make the Soup

```
soup = BeautifulSoup(content, "lxml")
```

Navigate the Tree

- Using .title, .contents, .children, .parent, .next_sibling, .text etc.

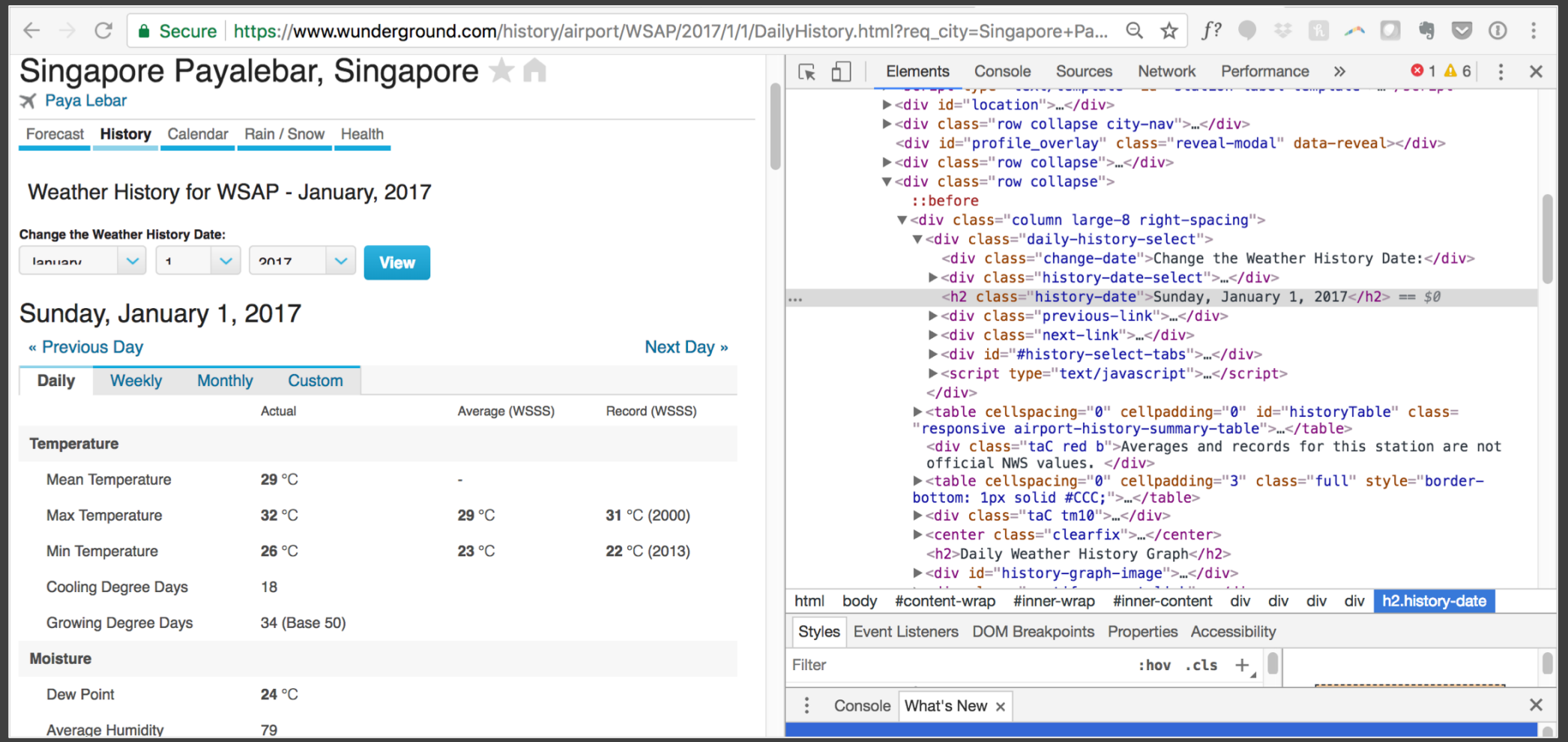
Search the Tree

- Using find( ), find_all( ), select( ), etc.

Modify the Tree

- Using decompose( ), insert( ), NavigableString( ), etc.

Using Inspect Element



Example 1: Wunderground

```
date = soup.find('div', attrs={'class':'daily-history-select'}).h2.text
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```

Further Examples: Wunderground

```
date = soup.find('div', attrs={'class':'daily-history-select'}).h2.text
```

```
nextlink = soup.find('div', attrs={'class':'daily-history-select'}).find_all('a')[1].get('href')
```

Store the results

Using the csv library

Example: Wunderground

- *Create a csv file to write your results to.*
- *Create headers.*
- *Write your results in a new row.*

```
with open("WeatherScrapeOnePage.csv", "w") as file:
    csv_writer = csv.writer(file)
    csv_writer.writerow(['Date', 'Mean Temp (C)', 'Max Temp (C)', 'Min Temp (C)', 'Precipitation (in)', 'Wind Speed (m/s)'])
    csv_writer.writerow([date, meantemp, maxtemp, mintemp, precip, wind])
```

```
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from bs4 import BeautifulSoup
import csv, time

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    csv_writer.writerow([dateString, meantemp, maxtemp, mintemp, precip, wind])

print("Scrape complete!")
```

Scaling up

And other important considerations

Traversing links

- Handling URL generation / pagination

```
# find next link
nextlink = soup.find('div', attrs={'class':'daily-history-select'}).find_all('a')[1].get('href')
url = 'https://www.wunderground.com'+nextlink
```

- Alternative methods for traversing pages in this scraper

Handling exceptions

- Try/except logic
- Filling in N/A's
- Consider special cases

```
import requests
from bs4 import BeautifulSoup

url = "https://www.wunderground.com/weather/sg/singapore"

def load(url):
    attempts = 5
    for i in range(attempts):
        try:
            response = requests.get(url)
            return response.content
        except requests.HTTPError:
            if i+1 == attempts:
                raise
            else:
                time.sleep(60)

content = load(url)
soup = BeautifulSoup(content, "html.parser")

# move on to parsing!
```

Data Cleaning

- Unnecessary characters may be present in your scraped data
- Can use the .replace( ) function, among other techniques, to remove and edit outputs

Review & Results

Thank you!

Resources

- Requests documentation
- BeautifulSoup documentation
- csv documentation