QSS20: Modern Statistical Computing

Unit 12: Web-scraping, Part I

Goals for today

- Recap of supervised machine learning
- Lecture on web-scraping
  - Living in a digital era
  - Researching the digital era
  - How to scrape/crawl without reinventing the flat tire
  - Intro to packages for wrangling web data
  - Ethics (briefly)
- Notebook for basic web-scraping
  - Making `requests`
  - Parsing HTML
  - Scraping URLs

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Recap of supervised machine learning

What do you remember?

Recap of supervised ML: Steps with code, optimized

1. Preprocess the data: make DTM, do train/test split

```
vec = CountVectorizer(); dtm_sparse = vec.fit_transform(texts)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size)
```

2. Initialize model and parameters to search

```
dt = DecisionTreeClassifier(min_samples_split=5, min_samples_leaf=10)
param_grid = {'min_samples_split': [2,10], 'min_samples_leaf': [2,10]}
```

3. Using training data, select optimal model via gridsearch

```
grid_dt = GridSearchCV(dt, param_grid, cv=3)
grid_dt.fit(X_train, y_train)
best_idx = np.argmax(grid_dt.cv_results_["mean_train_score"]) # get best
grid_dt.cv_results_["params"][best_idx] # best params
```

4. Re-train optimal model with full training data, get predictions

```
best_dt.fit(X_train, y_train)
y_pred = best_dt.predict(X_test)
y_predprob = best_dt.predict_proba(X_test)
```

5. Interpret model to identify important features

```
feat_imp = pd.DataFrame({'feature_imp': best_dt.feature_importances_,
                'feature_name': [col for col in X_train.columns]})
```

When to use which model?

- Depends on type of outcome:
  - If numeric, use OLS and consider fixed-effects if clustered at some second level (e.g., students in schools)
  - If categorical, use logistic regression: standard logit if distinct (multiclass OK), ordinal logit if in sequential 'steps' (use `statsmodels`
- Depends on (theorized) data generation process:
  - If expecting a smooth change in y with X, use some kind of linear regression
  - If wanting to model complex, non-linear relationships, use a tree-based method (e.g., Decision Trees) or deep learning (e.g., BERT)
- Depends on amount of data: more data allows for more complex models

Optimizing ML: terminology

- **overfitting:** When a model is trained on too little data to generalize to new data, usually when trained and tested on the same sample. In this case, the model just repeats the labels of the samples that it has just seen, and is evaluated to have a perfect score–but it fails to predict anything useful on yet-unseen data.
- **underfitting:** When a model fails to adequately capture the underlying structure of the data, usually when trained on too little data
- **cross-validation:** A way to assess the performance of an algorithm on an unseen data set. Essentially this repeats a train-test split several times and averages the result of these independent slices, giving a superior estimation of model accuracy compared to a single train-test split.
- **parameter:** An algorithm setting that may be selected for performance or substantive reasons. If a parameter is not learned directly within an estimator but instead must be set explicitly (passed as an argument), then it's called a *hyper-parameter*.
- **optimization:** Selecting the best element from some set of alternatives such that the result maximizes some criterion (e.g., model accuracy)
- **grid-search:** An exhaustive search over model parameters to discover the optimal configuration, maximizing model performance

Where we are

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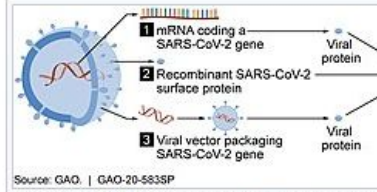
Living in a digital era

Vaccine types

As of January 2021, nine different technology platforms – with the technology of numerous candidates remaining undefined – are under research and development to create an effective vaccine against COVID-19.[3][27] Most of the platforms of vaccine candidates in clinical trials are focused on the coronavirus spike protein and its variants as the primary antigen of COVID-19 infection.[27] Platforms being developed in 2020 involved nucleic acid technologies (nucleoside-modified messenger RNA and DNA), non-replicating viral vectors, peptides, recombinant proteins, live attenuated viruses, and inactivated viruses.[14][27][28][34]

Many vaccine technologies being developed for COVID-19 are not like vaccines already in use to prevent influenza, but rather are using "next-generation" strategies for precision on COVID-19 infection mechanisms.[27][28][34] Several of the synthetic vaccines use a 2P mutation to lock the spike protein into its prefusion configuration, stimulating an immune response to the virus before it attaches to a human cell.[90] Vaccine platforms in development may improve flexibility for antigen manipulation and effectiveness for targeting mechanisms of COVID-19 infection in susceptible population subgroups, such as healthcare workers, the elderly, children, pregnant women, and people with existing weakened immune systems.[27][28]



Conceptual diagram showing three vaccine for forming SARS-CoV-2 proteins to promp immune response: (1) RNA vaccine, (2) su vaccine, (3) viral vector vaccine

RNA vaccines

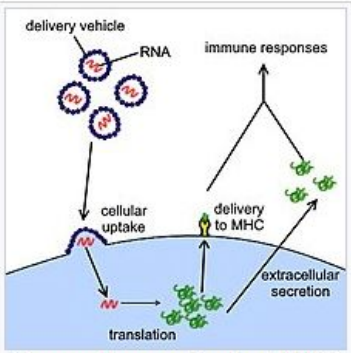
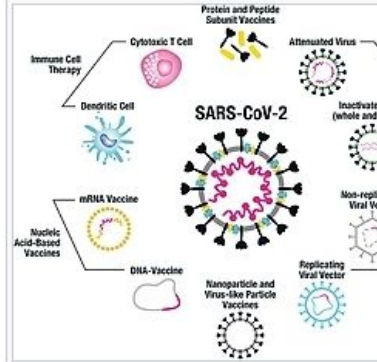


Diagram of the operation of an RNA vaccine. Messenger RNA contained in the vaccine enters cells and is translated into foreign proteins, which trigger an immune response.

An RNA vaccine contains RNA which, when introduced into a tissue, acts as messenger RNA (mRNA) to cause the cells to build the foreign protein and stimulate an adaptive immune response which teaches the body how to identify and destroy the corresponding pathogen or cancer cells. RNA vaccines often, but not always, use nucleoside-modified messenger RNA. The delivery of mRNA is achieved by a coformulation of the molecule into lipid nanoparticles which protect the RNA strands and help their absorption into the cells.[91][92][93][94]

RNA vaccines were the first COVID-19 vaccines to be authorized in the United States and the European Union.[95][96] As of January 2021, authorized vaccines of this type are the Pfizer–BioNTech COVID-19 vaccine[97][98][99] and the Moderna COVID-19 vaccine.[100][101] As of February 2021, the CVnCoV RNA vaccine from CureVac is awaiting authorization in the EU.[102]

Severe allergic reactions are rare. In December 2020, 1,893,360 first doses of Pfizer-BioNTech COVID-19 vaccine administration resulted in 175 cases of severe allergic reaction, of which 21 were anaphylaxis.[103] For 4,041,396 Moderna COVID-19 vaccine dose administrations in December 2020 and January 2021, only 10 cases of anaphylaxis were reported.[103] The lipid nanoparticles were most likely responsible for the allergic reactions.[103]



Vaccine platforms being employed for SAR 2. Whole virus vaccines include both attenu inactivated forms of the virus. Protein and p subunit vaccines are usually combined with adjuvant in order to enhance immunogenic main emphasis in SARS-CoV-2 vaccine de has been on using the whole spike protein trimeric form or components of it, such as t region. Multiple non-replicating viral vector have been developed, particularly focused adenovirus; while there has been less emp the replicating viral vector constructs.[89]

Adenovirus vector vaccines

These vaccines are examples of non-replicating viral vector vaccines, using an adenovirus shell containing DNA that encodes a SARS-CoV-2 protein.[104][105] The viral vector-based vaccines against COVID-19 are non-replicating, meaning that they do not make new virus particles, but rather produce only the antigen which elicits a systemic immune response.[104]

As of January 2021, authorized vaccines of this type are the Oxford–AstraZeneca COVID-19 vaccine,[106][107][108] the Sputnik V COVID-19 vaccine,[109] Convidecia, and the Johnson & Johnson COVID-19 vaccine.[110][111]

Convidecia and the Johnson & Johnson COVID-19 vaccine are both one-shot vaccines which offer less complicated logistics and can be stored under ordinary refrigeration for several months.[112][113]

The Sputnik V COVID-19 vaccine uses Ad26 for the first dose, which is the same as the Johnson & Johnson vaccine's only dose, and Ad5 for the second dose. Convidecia uses Ad5 for its only dose.[114]

Inactivated virus vaccines

Inactivated vaccines consist of virus particles that have been grown in culture and then are killed using a method such as heat or formaldehyde to lose disease producing capacity, while still stimulating an immune response.[115]

As of January 2021, authorized vaccines of this type are the Chinese CoronaVac,[116][117][118] BBIBP-CorV,[119] and WIBP-CorV; the Indian Covaxin; and the Russian CoviVac.[120] Vaccines in clinical trials include the Valneva COVID-19 vaccine.[121][122]

Subunit vaccines

Subunit vaccines present one or more antigens without introducing whole pathogen particles. The antigens involved are often protein subunits, but can be any molecule that is a fragment of the pathogen.[123]

As of April 2021, the two authorized vaccines of this type are the peptide vaccine EpiVacCorona[124] and RBD-Dimer.[3] Vaccines with pending authorizations include the Novavax COVID-19 vaccine,[125] SOBERANA 02 (a conjugate vaccine), and the Sanofi–GS

Search Low Income Apartments And Waiting Lists

Search and Select City, State, or Zip

Affordable Housing Online is monitoring the federal government's response to the coronavirus disease (COVID-19) outbreak.

An extensive list of coronavirus resources for low-income households can be found here.

Housing Waiting List News for April, 26th 2021

Falmouth, MA Section 8 HCV and Mainstream Section 8 HCV Waiting Lists

Open until May 31st, 2021

The Falmouth Housing Authority (FHA) Section 8 Housing Choice Voucher waiting list and Mainstream Section 8 Housing Choice Voucher waiting list applications are being accepted until May 31, 2021 at 4:30 pm ET.

Learn How To Apply

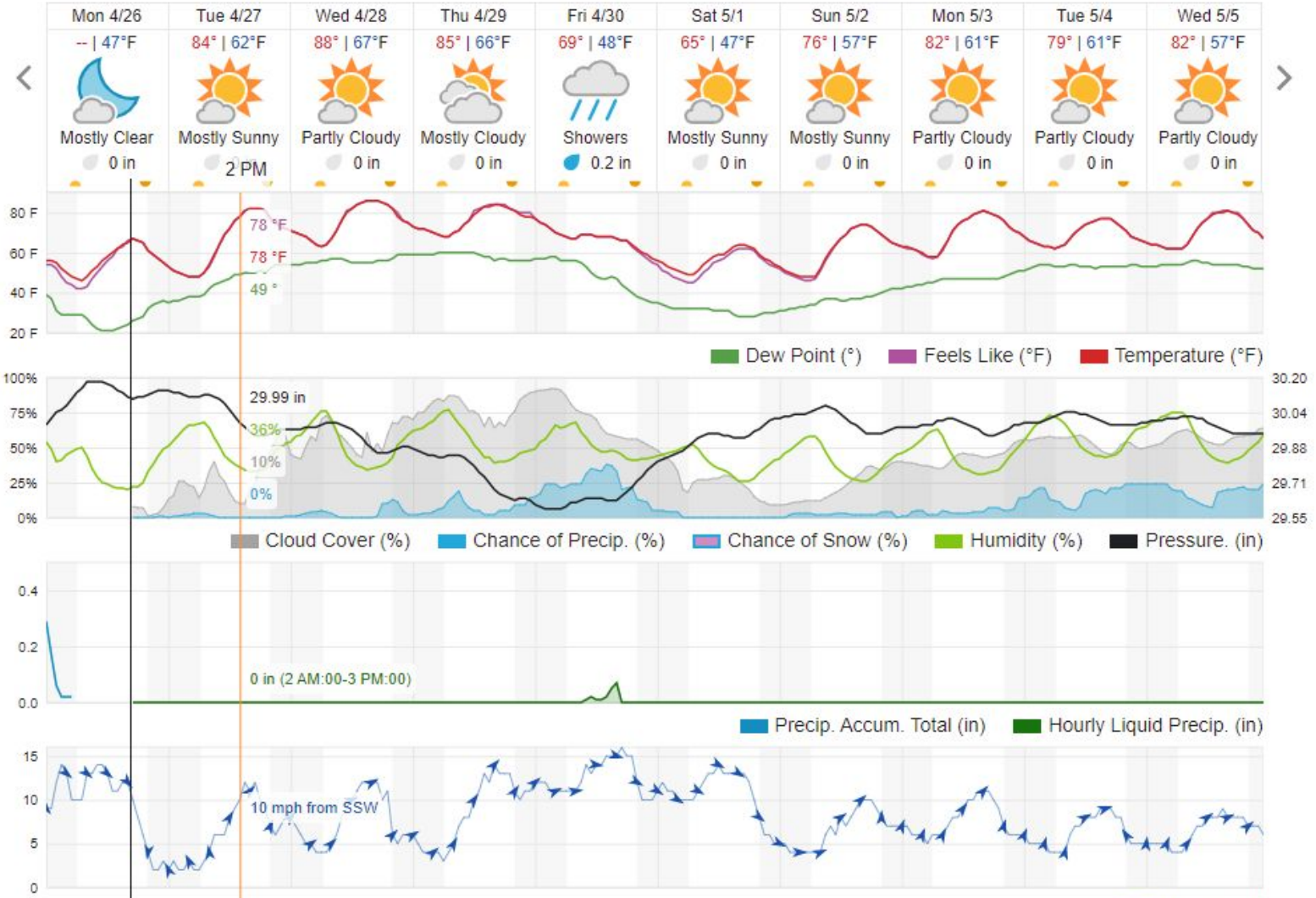
wunderground.com/forecast/us/dc/washington

Washington, DC 10-Day Weather Forecast

68° RONALD REAGAN WASHINGTON NATIONAL AIRPORT STATION | CHANGE

TODAY | HOURLY | **10-DAY** | CALENDAR | HISTORY | WUNDERMAP

Customize



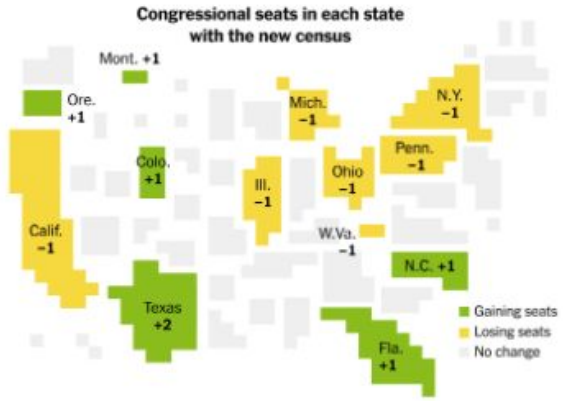
The New York Times

U.S. Population Over Last Decade Grew at Slowest Rate Since 1930s

- With immigration leveling off and a declining birthrate, the U.S. may be entering an era of substantially lower population growth, demographers said.
- The Census Bureau also reported changes to the political map: The South and the West gained population — and Congressional representation.

Which States Will Gain or Lose Seats in the Next Congress

Texas and Florida will get more House representatives. California and New York will lose slots. Here's how the 2020 census redistributes political power.



Washington Updates

- D.H.S. to review how it identifies and addresses extremism and white supremacy in its ranks.
- The Justice Department will investigate the Louisville police, Garland says.

New York will lose one House seat starting with the 2022 election, after coming up 89 people short on the Census.

LIVE

U.S. Expected to Share AstraZeneca Vaccine Doses With Other Nations

The Biden administration plans to share up to 60 million doses, as long as they clear a safety review, officials said. Here's the latest on Covid-19.

India's Fashion Artisans Face 'Extreme Distress' in Pandemic

The working conditions of the so-called karigars, who make handicrafts for luxury brands, have long been an issue. Now many have no job at all.

Karigars is an Urdu term for artisans who specialize in handicrafts like embroidery, beading and appliqué. Atul Loke for The New York Times

The European Union may soon reopen to American tourists. Here's what to know.

United States ›	On Apr. 25	14-day change
New cases	33,662	−16% ↘
New deaths	282	−3% →

Exposure risk in your area ›

Search for a county

Find specific information about the county where you live.

U.S. vaccinations ›

Fully vaccinated 29%

At least one dose 42%

Opinion

Gail Collins and Bret Stephens

Joe Biden Has Something Else He'd Like to Transform

"I can't remember the last time the conversation was so polarized."

Jessica Bruder

I Lived in a Van to Write the Book Behind 'Nomadland.' The Fear Is Real.

For people whose only home is a vehicle, "the knock" is a visceral threat.

Kathleen Kingsbury

Why The New York Times Is Retiring the Term 'Op-Ed'

'Sway'

The C.I.A.'s Top Technologist Is Uncomfortable With Facebook

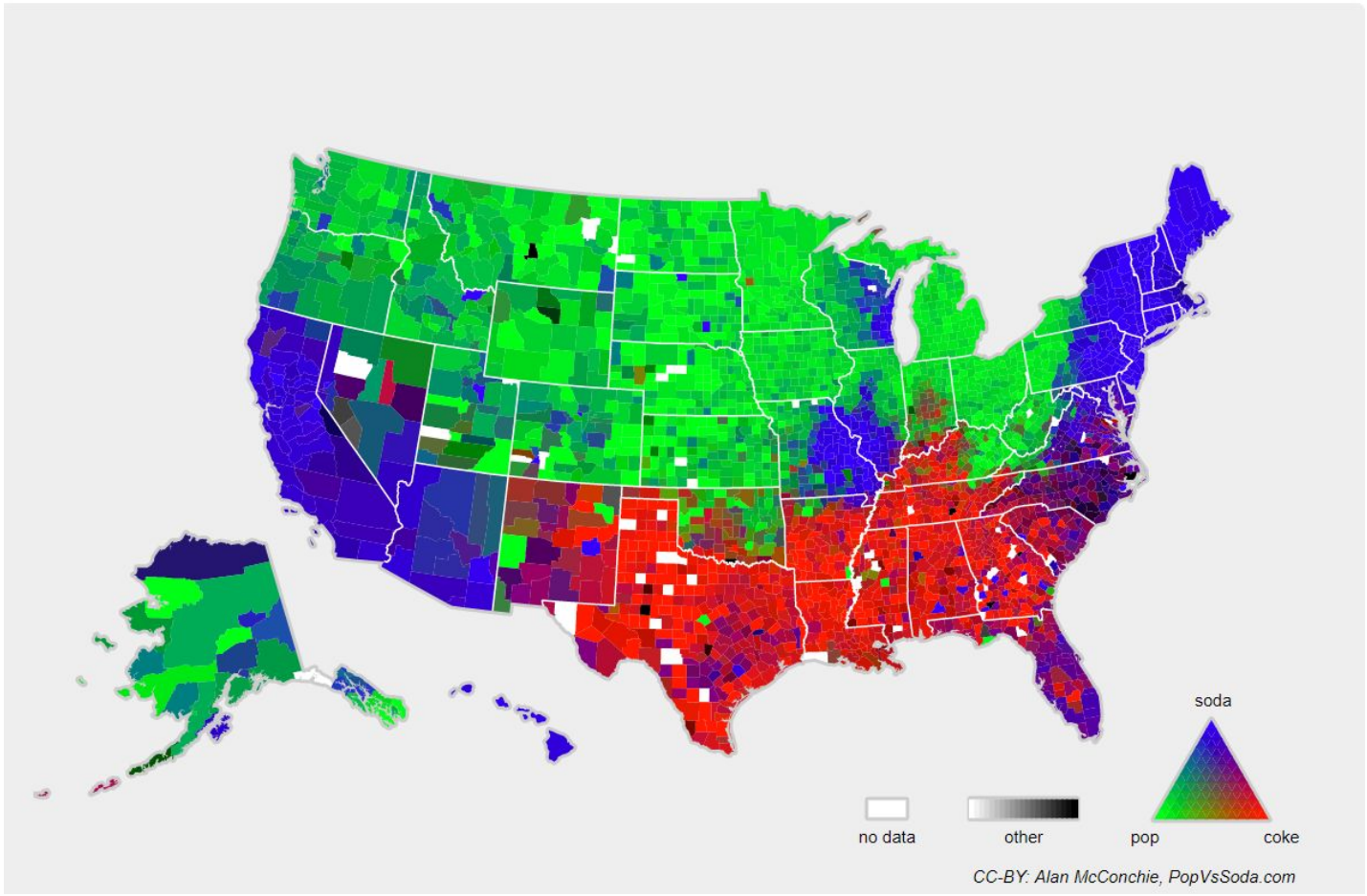
Daniela Gerson

Researching the digital era

Social media → geography

Input: Tweet

Output: Latitude, Longitude

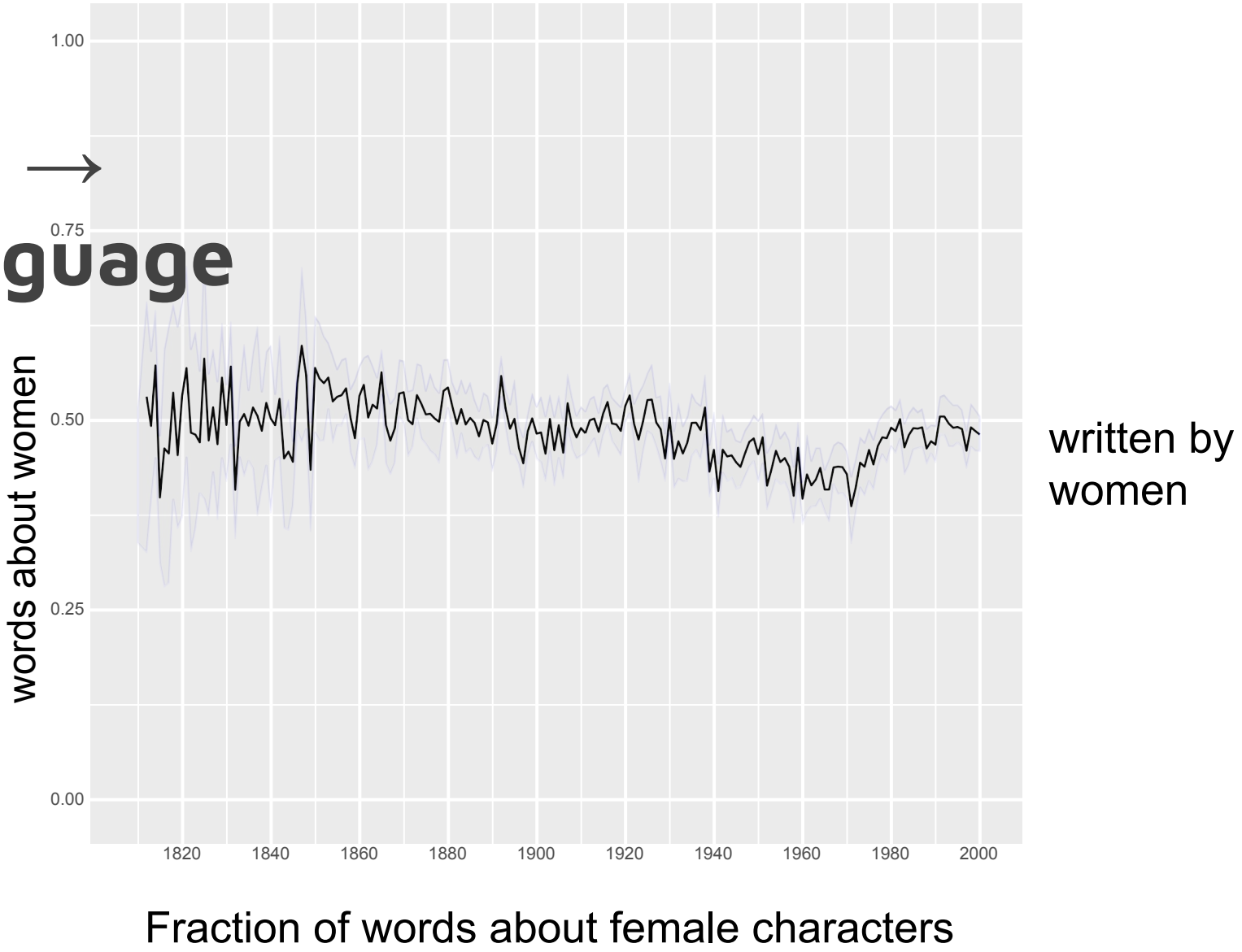


Benjamin Wing and Jason Baldridge (2011), "Simple supervised document geolocation with geodesic grids" (ACL)

Digital books → gendered language

Input: Fictional texts

Output: Proportion words about females



Ted Underwood, David Bamman, and Sabrina Lee (2018), "The Transformation of Gender in English-Language Fiction," (*Cultural Analytics*)

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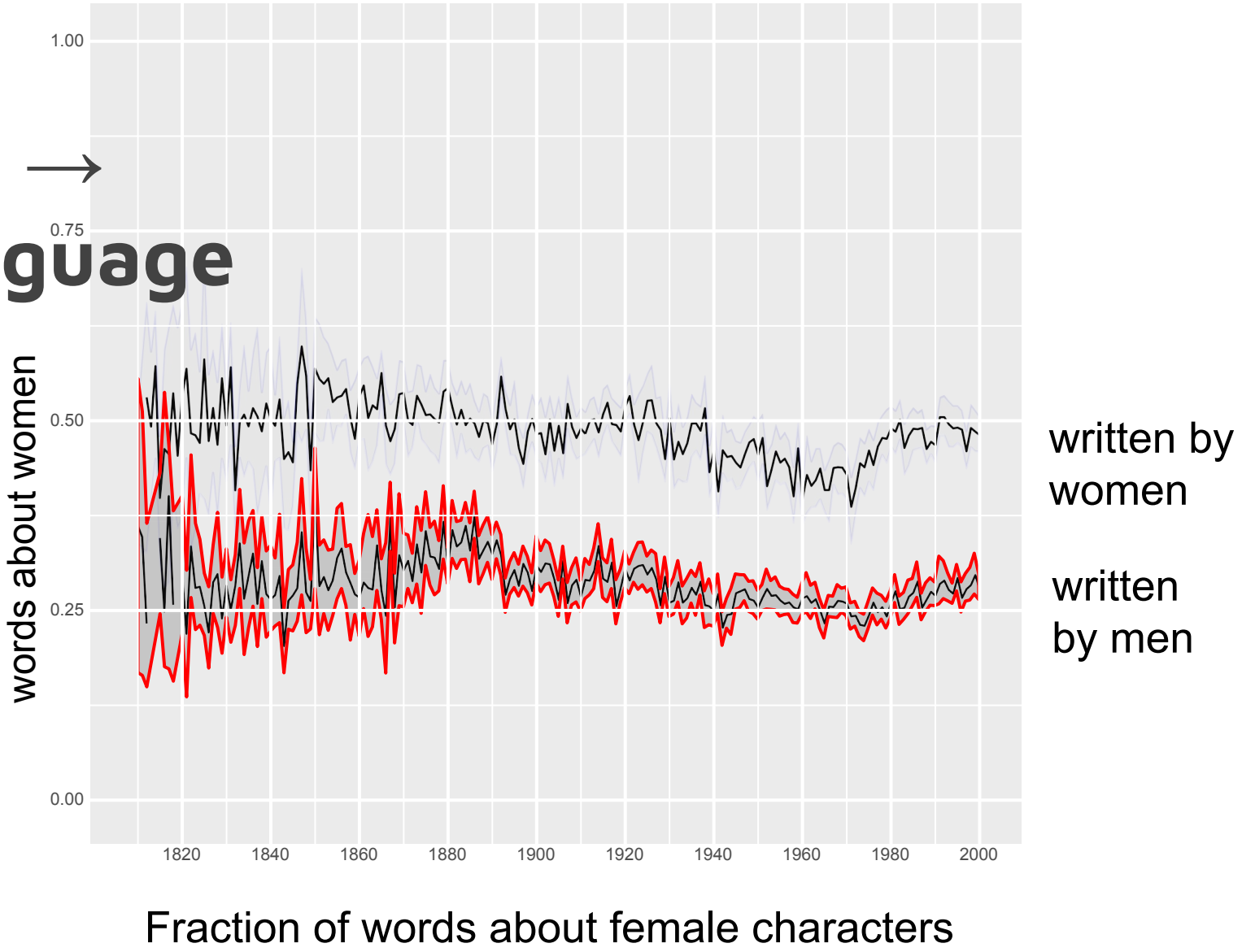
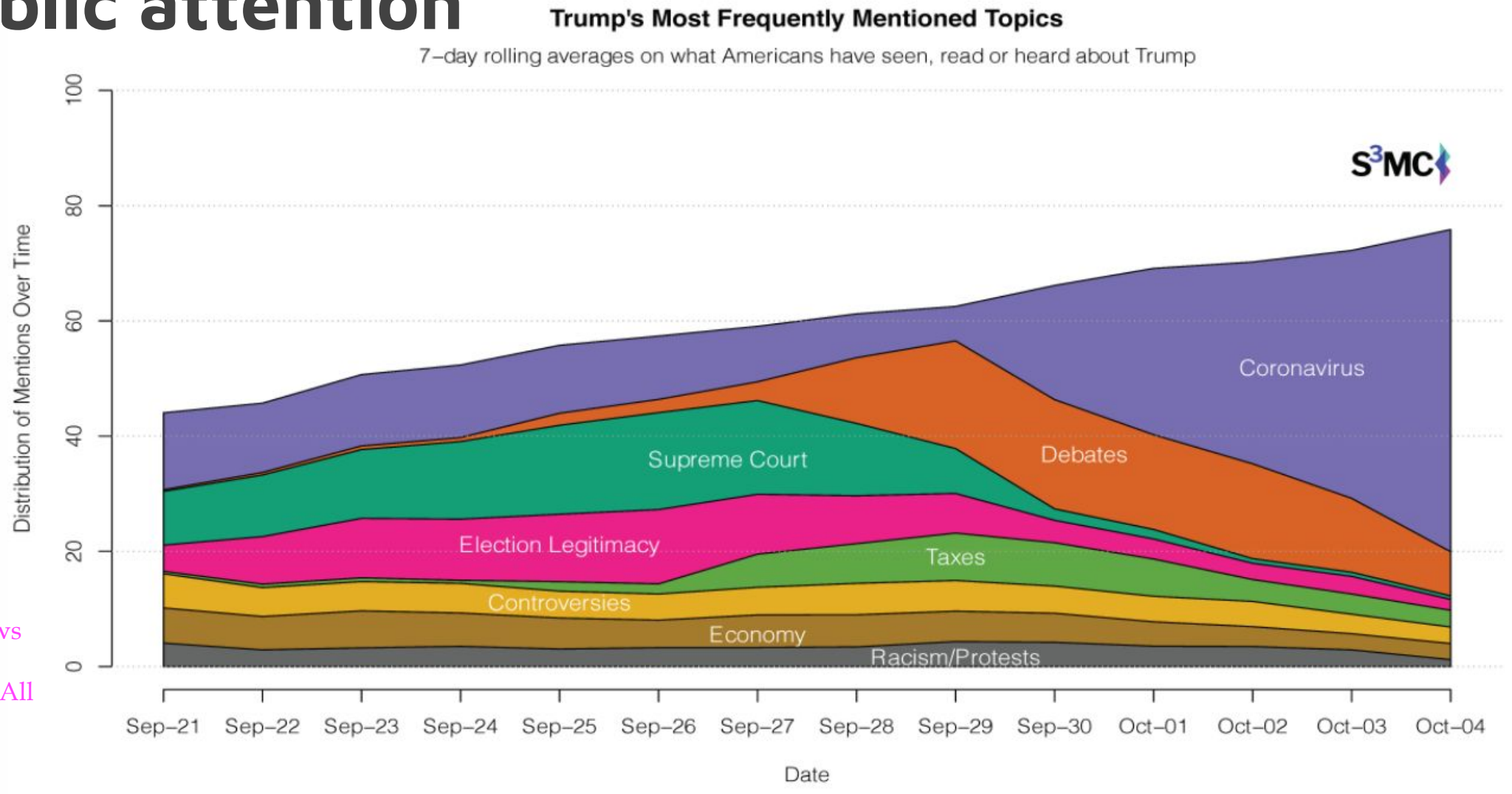


Ted Underwood, David Bamman, and Sabrina Lee (2018), "The Transformation of Gender in English-Language Fiction," (*Cultural Analytics*)

Presidential language → public attention

Input: News articles

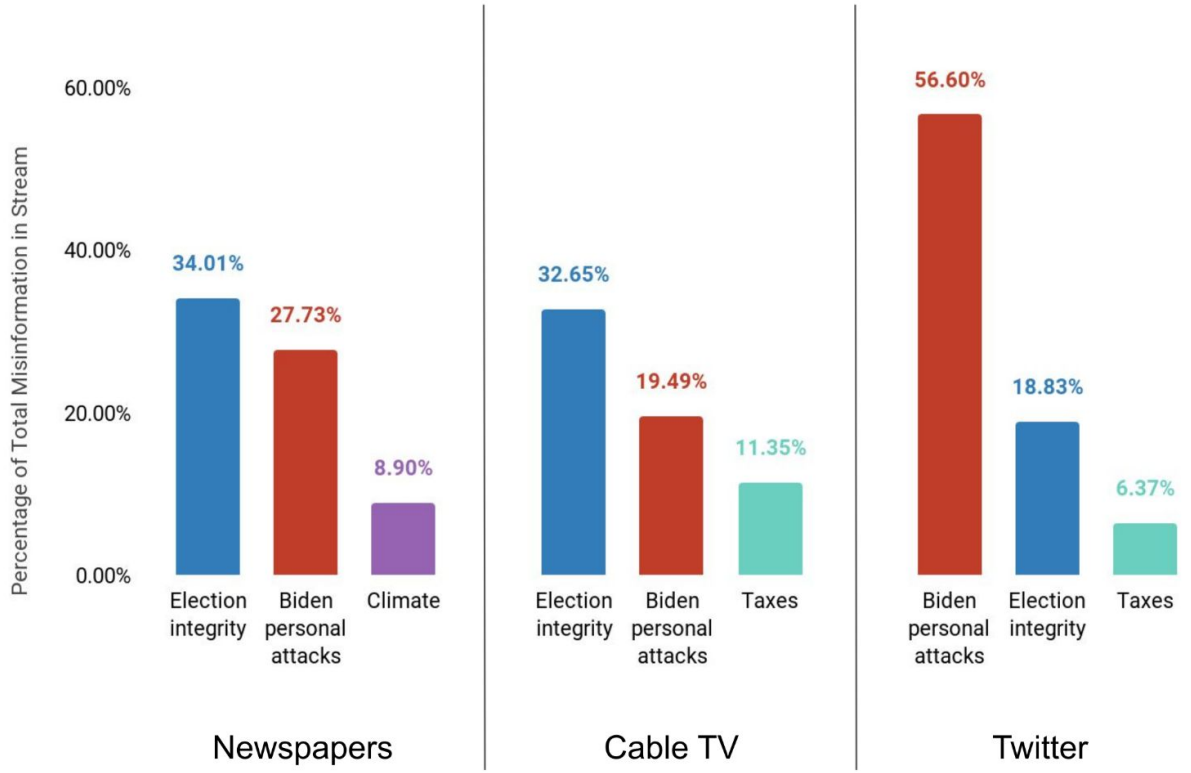
Output: Topics recalled by public



Jennifer Agiesta (2020), "In News about the Presidential Race, Coronavirus Overtakes Nearly All Else" (CNN Politics)

Digital media → misinformation over time

Input: Articles, Tweets, segments
Output: Misinformation themes pushed by presidential candidates



Jaren Haber, Lisa Singh, Ceren Budak, Josh Pasek, et al. (2021), Lies and presidential debates: How political misinformation spread across media streams during the 2020 election (HKS Misinfo. Review)

How to scrape/crawl without reinventing the flat tire

Web-scraping decision hierarchy

Existing data

No scraping

A-Z Databases

Find the best library databases for your research.

All Subjects | All Database Types | All Vendors / Provid | Search for Databas | Go

All A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

927 Databases found

A

Abbreviationes Online
An electronic dictionary of medieval Latin abbreviations, a database designed for use in both learning and teaching medieval Latin paleography, can be used as a reference and research tool.

ABELL (Annual Bibliography of English Language and Literature)
Alternative Name(s) & Keywords: Literature Online
ABELL is part of the Literature Online (LION) database and covers all aspects and periods of English-language literature, linguistics, folklore, drama, and cultural studies. Indexes literary criticism, book reviews, periodical articles, critical editions of literary works, collections of essays, and doctoral dissertations published worldwide. Includes material in languages other than English. ABELL is linked to 325+ full text journals in the LION database.

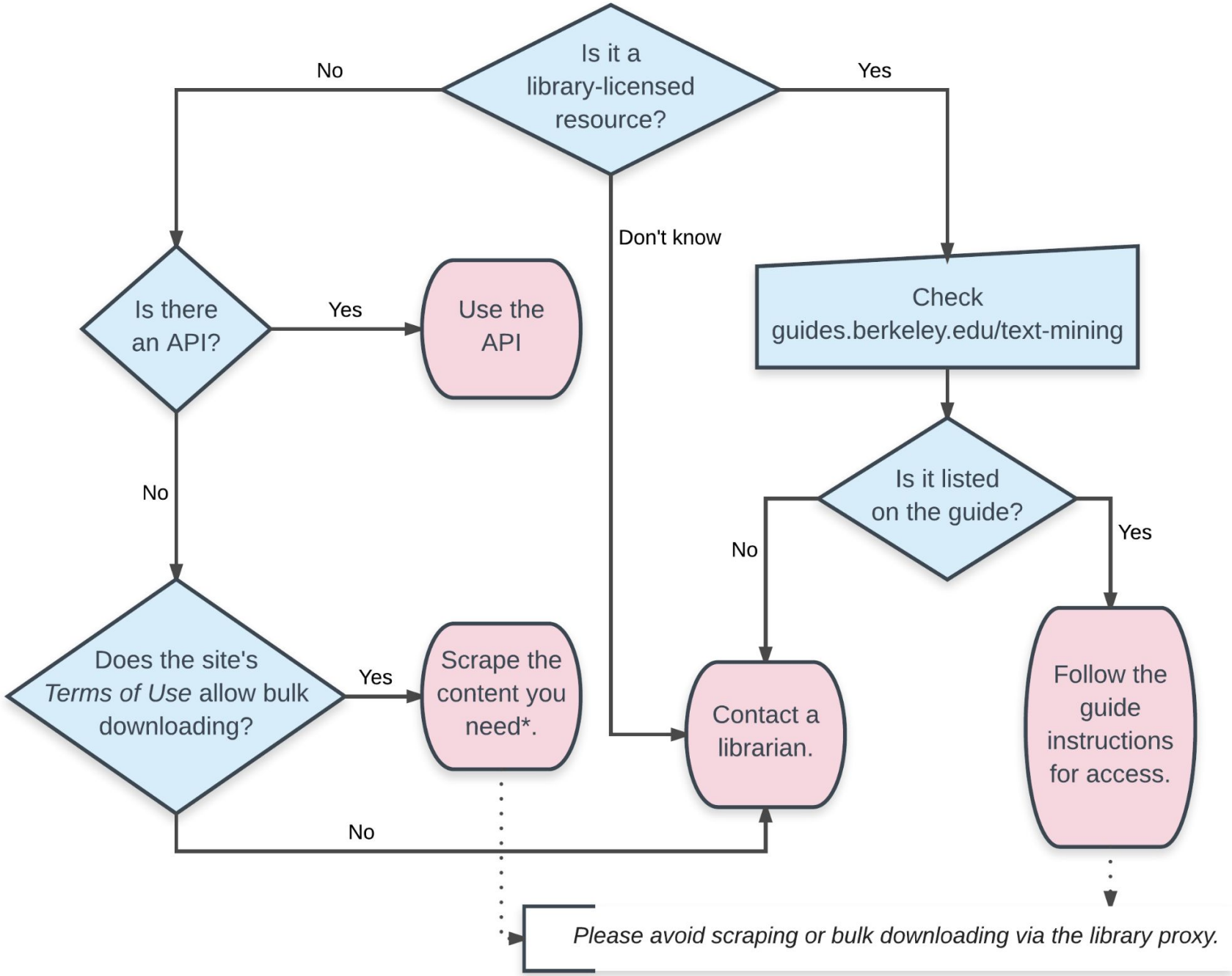
New / Trial Databases

The following databases are newly acquired or being evaluated for a future subscription.

Black Life in America Trial
Trial expires April 30, 2021.
more...

Independent and Revolutionary Mexican Newspapers New
The open access collection, Independent and Revolutionary Mexican Newspapers, traces the evolution of Mexico during a pivotal period in Mexico's history. Comprising over 1,000 titles from Mexico's pre-independence, independence and revolutionary periods (1807-1929), the newspapers in this collection provide rare documentation of the dramatic events of this era.

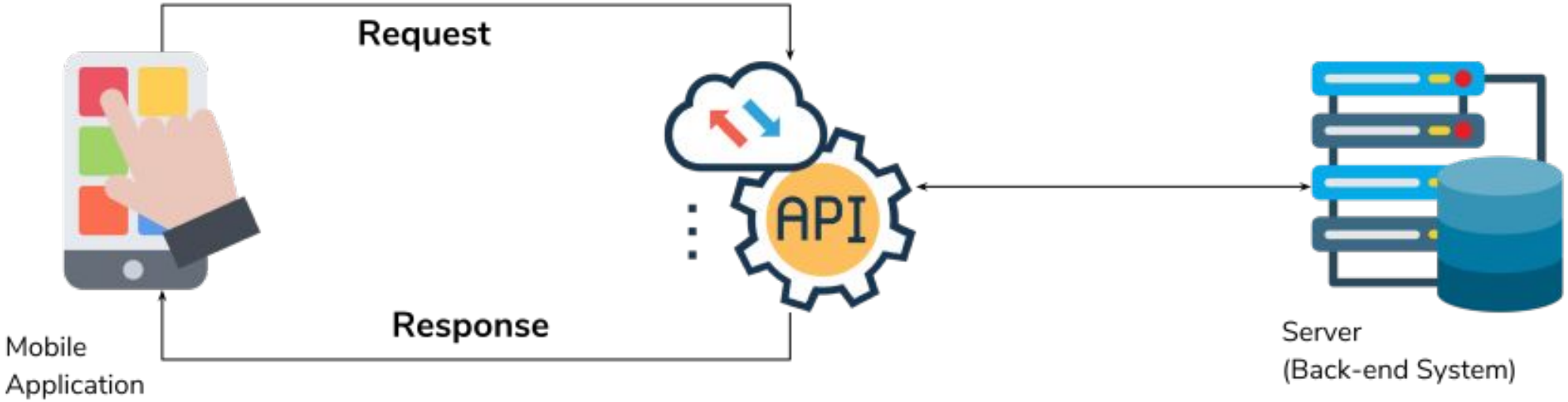

English Reference Corpora
British National Corpus (bnc)
eng-uk / 111,246,947 / 4,054
The Brown Corpus (brown)
eng-us / 1,172,053 / 500
COCA - Corpus of Contemporary Am
eng-us / 122,445,373 / 26,203
COCA - Corpus of Contemporary Am
eng-us / 108,622,152 / 82,021
COCA - Corpus of Contemporary Am
eng-us / 126,484,317 / 25,993
COCA - Corpus of Contemporary Am
eng-us / 129,459,423 / 86,225
COCA - Corpus of Contemporary Am
eng-us / 126,231,664 / 90,243
COCA - Corpus of Contemporary Am
eng-us / 130,081,788 / 44,803
COCA - Corpus of Contemporary Am
eng-us / 153 / 23,975
COCA - Corpus of Contemporary Am
eng-us / 139 / 88,989
Frown Corpus J (frown_j)
eng-uk / 185,276 / 80
Georgetown University Multilayer Co
eng / 109,140 / 126
The Georgetown Multilayer Corpus 6
eng / 129,660 / 148
Penn Treebank CQPfied (auto tagged
eng-us / 1,678,233 / 2
Penn Treebank CQPfied (gold tagged
eng-us / 2,467,944 / 3,153
Spoken Language Corpora
HCRC Map Task Corpus (hcrcmap_2)
eng-sct / 188,898 / 128
Switchboard Corpus (switchboard)
eng-us / 1,159,308 / 649
TED talks English (ted)
eng / 5,159,586 / 2,085
Non-English Reference Corpora
Lancaster Corpus of Mandarin Chinese (lcm
zho / 1,002,340 / 500
Literary Corpora
Jane Austen Corpus (austen)
eng-uk / 423,669 / 3
Charles Dickens Corpus (dickens)
eng-uk / 3,407,085 / 14
Don Quijote (don_quijote_spa)
spa / 429,855 / 1
Tom Sawyer (tom_sawyer_eng)
eng-us / 86,747 / 1
Political Corpora
Bush and Kerry Presidential Debate (bush_
eng-us / 48,230 / 2
Inaugural Address Corpus (inaugural)
eng-us / 144,980 / 56
The Mueller Report Corpus (mueller)
eng-us / 228,799 / 2
German Bundestag Protocols (parlament)
deu / 36,723,139 / 837
State of the Union Corpus (1790-2017) (so
eng-us / 1,937,728 / 231
State of the Union Corpus (1790-2020) (so
eng-us / 2,081,385 / 234
Web Corpora
DECOW - COrpora from the Web - Ger
deu / 300,002,861 / 198,608
DECOW - COrpora from the Web - Ger
deu / 300,003,990 / 231,532
DECOW - COrpora from the Web - Ger
deu / 300,008,102 / 325,463
DE Web as Corpus - Part 1 (dewac01)
deu / 268,848,124 / 289,824
DE Web as Corpus - Part 2 (dewac02)
deu / 268,848,124 / 288,223
DE Web as Corpus - Part 3 (dewac03)
deu / 268,884,554 / 290,941
DE Web as Corpus - Part 4 (dewac04)
deu / 268,931,207 / 289,139
DE Web as Corpus - Part 5 (dewac05)
deu / 268,908,956 / 288,386
DE Web as Corpus - Part 6 (dewac06)
deu / 282,733,943 / 305,382
ENCOW2016 - COrpora from the Web
eng / 300,004,068 / 225,073
ENCOW2016 - COrpora from the Web
eng / 214,108,271 / 163,651
ENCOW2016 - COrpora from the Web
eng / 288,386 / 288,386
ENCOW2016 - COrpora from the Web
eng / 161,936 / 161,936
Corpus of Web-Based Global English -
eng-us / 142,425,833 / 106,385
Corpus of Web-Based Global English -
eng-us / 272,905,012 / 168,771
Russian Internet Corpus Sampler
rus / 5,231,112 / 843
Stanford Sentiment Analyzed Twitter
eng / 24,473,485 / 2
Newspaper Corpora
Arabic Treebank CQPfied (arabictb)
ara / 168,722 / 734
Chinese Treebank 9.0 (chinese_treebank9)
zho / 2,080,333 / 3,726
New York Times - Arts Subcorpus (nyt_arts)
eng-us / 101,087,365 / 118,433
Slate Magazine Corpus (slate_alt)
eng-us / 4,929,752 / 4,531
Learner Corpora and Native Contr
Arabic Learner Corpus (arablearn)
ara / 444,321 / 1,585
Hong Kong City University Corpus of English
eng-L2 / 7,720,912 / 11,170
International Corpus of Learner English (icle
eng-L2 / 2,808,577 / 3,701
Louvain Corpus of Nativ English Student Es
eng-uk/us / 346,906 / 388
Spanish Learner Language Oral Corpora (SP
spa-L2 / 372,567 / 561
Bible Corpora
The King James Bible Corpus (biblekjv)
eng-uk / 915,179 / 66
The Luther Bible Corpus (bibleluther)
World English Corpora
Corpus of Web-Based Global English - Hon
eng-hk / 42,979,217 / 43,936
ICE Jamaica (ice_ja)
eng-ja / 1,156,149 / 500
ICE Singapore (ice_sg)
eng-sg / 1,163,008 / 500
National University of Singapore SMS Corp
eng-sg / 150,397 / 10,117
Historical Corpora
Ancient Chinese Corpus - Zuozhuan (acc)
zho-lzh / 194,258 / 2
Corpus of Historical American English (coh
eng-us / 448,200,483 / 116,773
Georgetown University Historical Reddit Co
eng / 43,858,955 / 557,579
Penn Parsed Corpus of Middle English v2
eng-enm / 1,351,054 / 56
Sheffield Corpus of Chinese - Historical Ch
zho / 14,282 / 3
Coptic Scriptorium Corpora
Besa Letters Corpus (besa)
cop / 1,907 / 2
Uncategorised
Chatino Zapotec Corpus (chazap)
zap / 721,976 / 290,292
Gradable Modal Expressions (for CQP, buil
So many in CQPWeb...

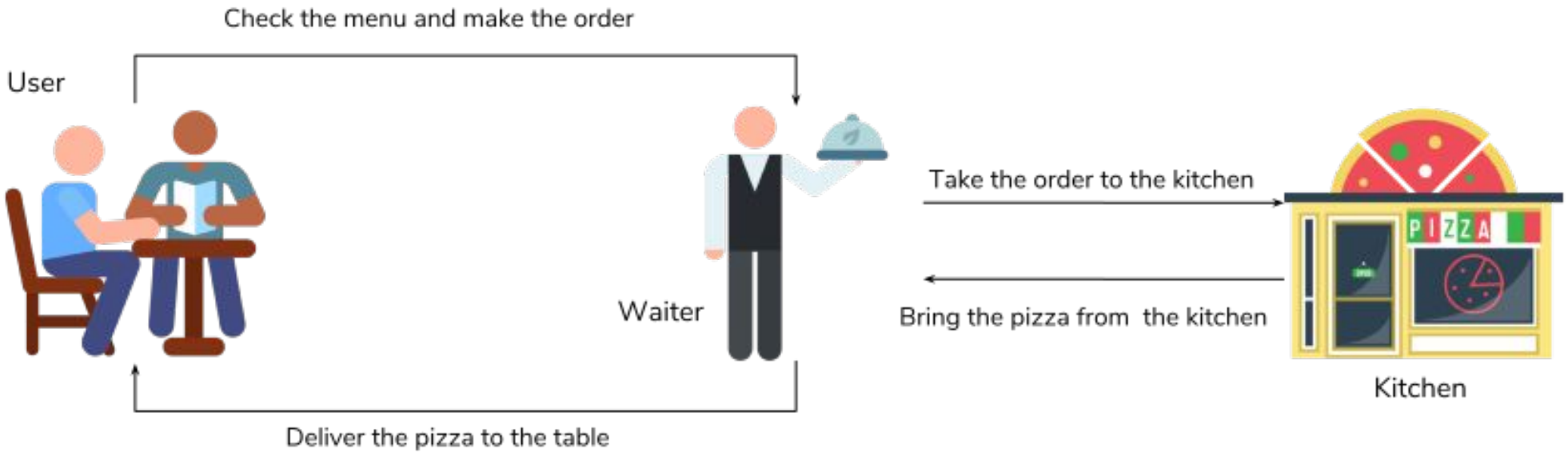

Is it a library-licensed resource?
No
Yes
Don't know
Is there an API?
Yes
Use the API
No
Does the site's *Terms of Use* allow bulk downloading?
Yes
Scrape the content you need*.
No
Contact a librarian.
Check guides.berkeley.edu/text-mining
Is it listed on the guide?
No
Yes
Follow the guide instructions for access.
Please avoid scraping or bulk downloading via the library proxy.

Web-scraping decision hierarchy

No scraping

Easy scraping





Amanda Kothawala (2018), *What is an API? How does it work?* (Medium) https://medium.com/@ama.thanu/what-is-an-api-how-does-it-work-f4ea552d741f

Web-scraping decision hierarchy

No scraping

Easy scraping

Consistent scraping

How the web works

Please send me the files to display this website (REQUEST)

Here you go, parse away (RESPONSE)

Web-scraping decision hierarchy

Existing data	Web APIs	Structured HTML	*Wild West*
No scraping	Easy scraping	Consistent scraping	• Directory • Scrape URLs • Scrape HTML • Parse HTML • Store output • Filter content

Parents & Families | Future Staff | Partners & Donors

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KIPP HOUSTON PUBLIC SCHOOLS

Prime T.I.M.E.

ASPIRE PUBLIC SCHOOLS

DISCOVER ASPIRE | LOCATIONS | EN

← Central Valley Region

ASPIRE PORT CITY ACADEMY

- Intro
- School Address & Contact Information
- School Officials
- School Officials
- Social Networks
- Key Documents + Links
- Board Meetings
- Location

Enroll Now

Aspire Port

Welcome to the Aspire Pc

Grades: K – 5
Sponsoring District: Stock
CDS/Charter Numbers: CI
#1553

Enrollment: 410
Ethnicity:
Hispanic: 52.4%

Will Carleton Academy

About | Admissions | Academics | Athletics | Student Life | Parents | Calendar | Faculty | Contact

Will Carleton Academy is a K-12 tuition-free public charter school in Hillsdale, Michigan founded in 1998. Will Carleton Academy devotes itself to serving the community as a charter school where parents can choose a traditional curriculum and educational atmosphere that is committed to both the intellectual development and the character formation of the students.

Our Mission Is

To Educate
- Back-to-basics curriculum
  - K-8th-Core Knowledge Sequence
  - 9th-12th: Michigan Merit/College Preparatory Curriculum
- Small classroom sizes at

To Enrich
- Advanced Placement class offerings on demand
- Dual Enrollment, Early/Middle College, and Vocational-Technical Programs
- Extensive extracurricular offerings at all grade

To Enlighten
- Orderly, disciplined environment
- Focus on the whole child, with the goal of helping to mold outstanding citizens
- K-12th Art and Music curriculum
- 4th-12th French

Aspire Port City Academy

— ACCESS SCHOOLMINT

chedule a Tour

AIM College and Career Preparatory Academy
5200 Ave N 1/2, Galveston, TX, 77550

Select a School | Translate

Sign In Register

For Parents | Counseling | Clubs | For Staff | Calendar

New School Hours for the 2018 - 2019 School Year

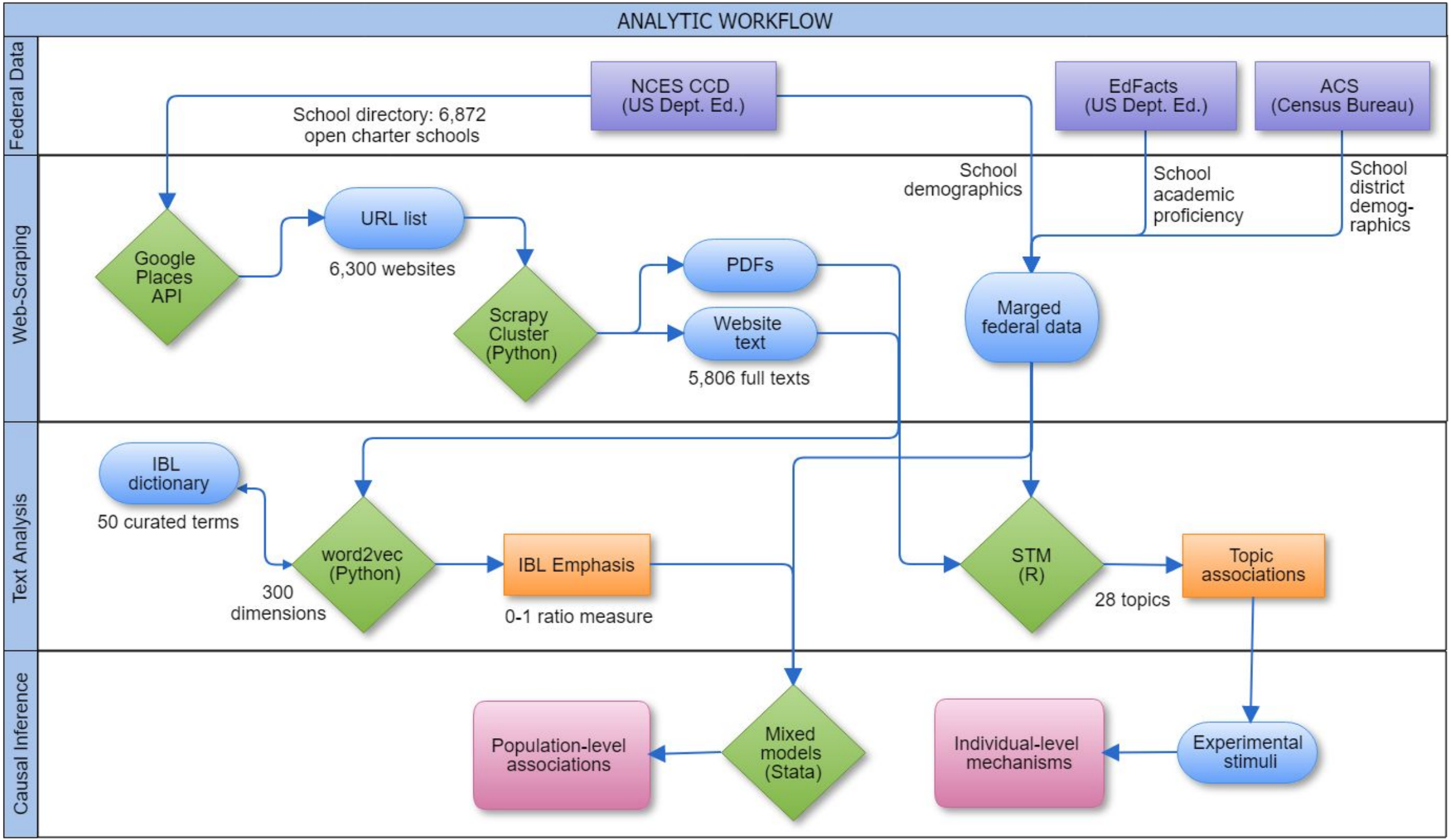
8:15 AM - 3:45 PM

Welcome to AIM College and Career Preparatory Academy

AIM is a GISD charter school that provides students the opportunity to accelerate their own learning. We are a 6th – 12th grade campus with a variety of programs. Middle school students have opportunities to test and promote to the next grade level. High school students attend face-to-face, hybridized and online courses. We also offer the HSEP (High School Equivalency Program) for qualifying students.

The mission of Ann Arbor Learning Community is to nurture independent learners as they acquire the tools they need to shape an environmentally and socially responsible future.

Enroll Your Student K-8


ANALYTIC WORKFLOW
Federal Data
Web-Scraping
Text Analysis
Causal Inference
NCES CCD
(US Dept. Ed.)
EdFacts
(US Dept. Ed.)
ACS
(Census Bureau)
School directory: 6,872
open charter schools
School
demographics
School
academic
proficiency
School
district
demog-
raphics
Google
Places
API
URL list
6,300 websites
Scrapy
Cluster
(Python)
PDFs
Website
text
5,806 full texts
Marged
federal data
IBL
dictionary
50 curated terms
word2vec
(Python)
300
dimensions
IBL Emphasis
0-1 ratio measure
STM
(R)
28 topics
Topic
associations
Mixed
models
(Stata)
Population-level
associations
Individual-level
mechanisms
Experimental
stimuli

Essential tools we'll use to wrangle web data

charter school

Betty Shabazz International Charter School
4.0 ★★★★☆ (1)
School · 6547 S Stewart Ave
(773) 651-1661
Website Directions

The University of Chicago Charter School
No reviews
Charter school · 6420 S University Ave
(773) 752-8101
Website Directions

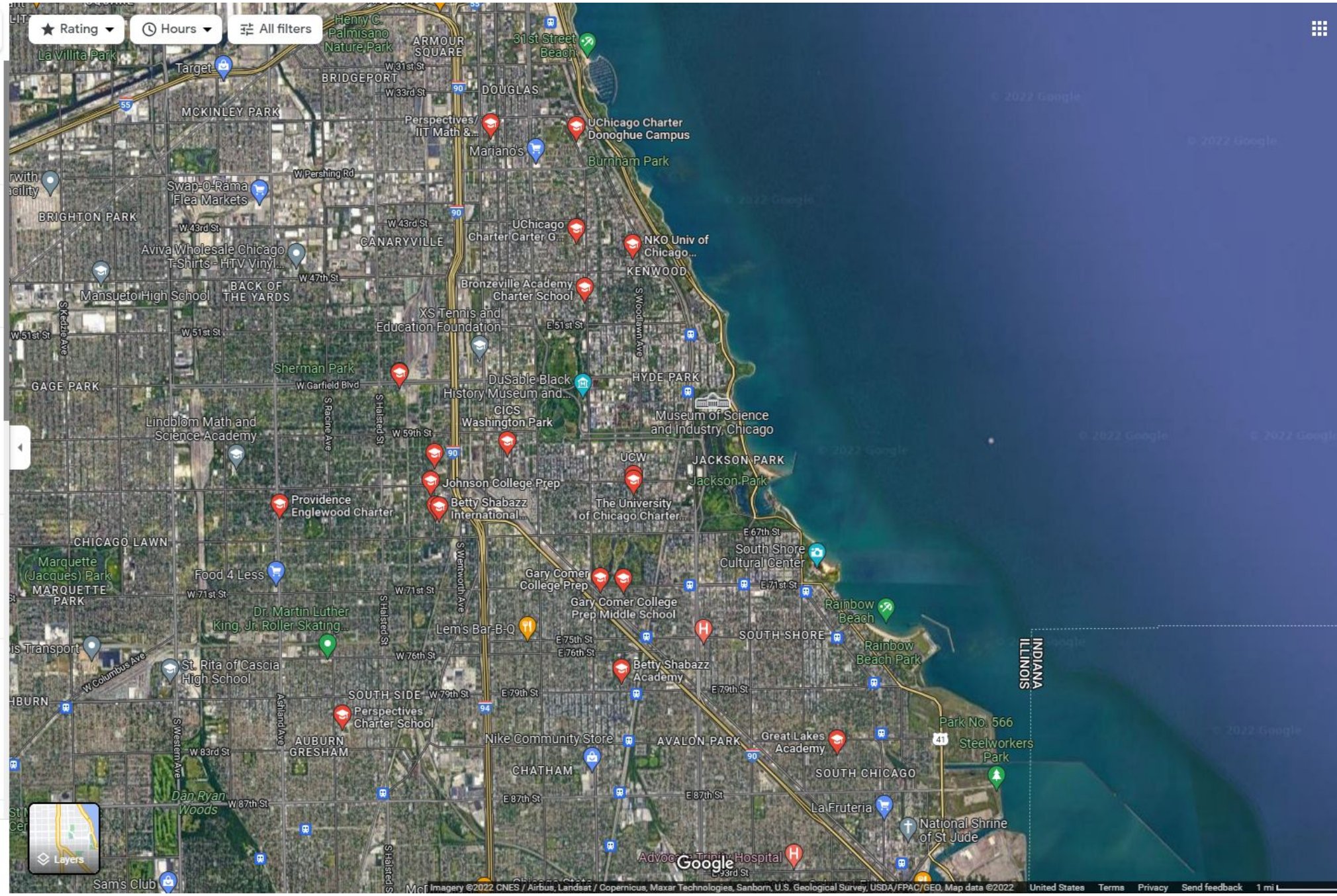
Barbara A. Sizemore Academy
3.7 ★★★½☆ (7)
Charter school · 6547 S Stewart Ave
(773) 651-1661
"Great school for African American children to learn about their culture."
Website Directions

CICS Washington Park
3.8 ★★★★☆ (17)
Elementary school · 110 E 61st St
Open · Closes 4PM · (773) 347-0200
Website Directions

Bronzeville Academy Charter School
2.4 ★★½☆☆ (10)
Elementary school · 4930 S Cottage Grove Ave
Open · Closes 3:15PM · (773) 285-8040
Website Directions

Showing results 1 - 20

Update results when map moves



Requests

```
# Simple page HTML grabbing
import requests

url =
'https://www.politifact.com/factchecks/2021/apr/02/citizens-united/citizens-united-calls-bidens-infrastructure-plan-g/'
response = requests.get(url)
html = response.text
```

Beautiful Soup

```
# Anchor extraction from HTML document
from bs4 import BeautifulSoup
from urllib.request import urlopen
with
urlopen('https://en.wikipedia.org/wiki/Main_Page')
as response:
    soup = BeautifulSoup(response, 'html.parser')
    for anchor in soup.find_all('a'):
        print(anchor.get('href', '/'))
```

Parsing with an exclusion list

```
soup = BeautifulSoup(open(HTML_file), "lxml")
inline_tags = ["b", "big", "i", "small", "tt", "abbr", "acronym", "cite", "dfn",
"em", "kbd", "strong", "samp", "var", "bdo", "map", "object", "q", "span", "sub",
"sup"] # junk tags to eliminate

[s.extract() for s in soup(['style', 'script', 'head', 'title', 'meta',
'[document]'])] # Remove non-visible tags

for it in inline_tags:
    [s.extract() for s in soup("</" + it + ">")] # Remove inline tags
```

Scrapy

```python
# Simple quote scraper
import scrapy
class SimpleSpider(scrapy.Spider):
    name = "simple"
    start_urls = ['http://quotes.toscrape.com/page/1/']

    def parse(self, response):
        page = response.url.split("/")[-2]
        filename = 'quotes-%s.html' % page
        with open(filename, 'wb') as f:
            f.write(response.body)
```

Mission and Vision

Stony Point Academy is committed to provide a rigorous preparatory program that ensures all students are ready for successful post-secondary pathway. This includes an academically rich curriculum with rigorous content. It includes an expectation that students will apply their knowledge through higher-order skills, and will develop the habits of mind and character traits known to support personal standards within a student-centered environment that emphasizes the Common Core Anchor Standards for College and Career Readiness (CCR) across all content areas at every grade level. It is with this preparation that students will become contributing members of the local and global communities.

Stony Point Academy

Scrapy **output**

Home
Our School
...
Mission and Vision

Stony Point Academy is committed to provide a rigorous preparatory program that ensures all students are ready for successful post-secondary pathway. This includes an academically rich curriculum with rigorous content. It includes an expectation that students will apply their knowledge through higher-order skills, and will develop the habits of mind and character traits known to support personal standards within a student-centered environment that emphasizes the Common Core Anchor Standards for College and Career Readiness (CCR) across all content areas at every grade level. It is with this preparation that students will become contributing members of the local and global communities.
Stony Point Academy
Building Future Leaders
Job Opportunities
Contact us
Website Issues
...

Also useful: wget

```
wget {URL}
```

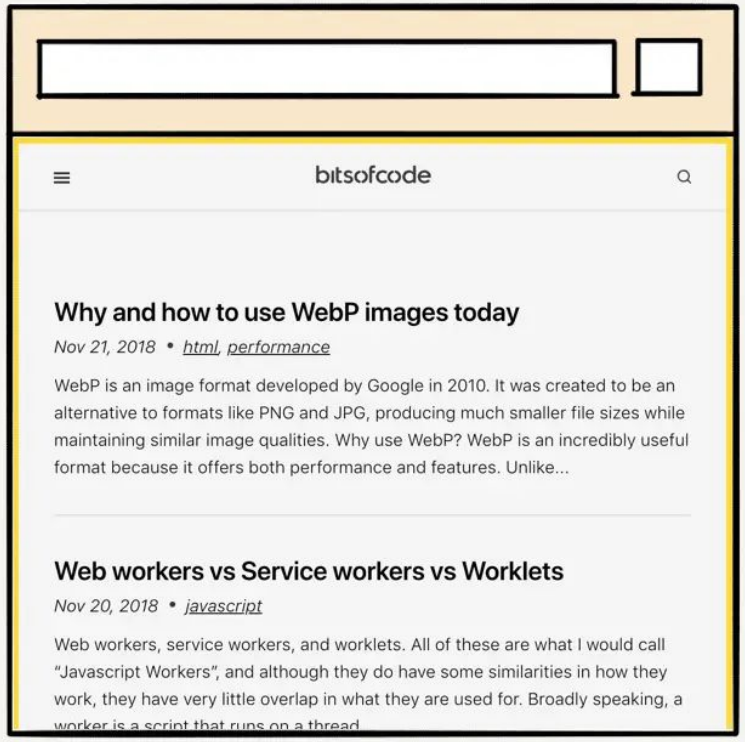
```
wget --no-parent --level 0 --no-check-certificate --recursive --adjust-extension
--convert-links --page-requisites --wait=10 --random-wait --execute robots=off
--follow-ftp --secure-protocol=auto --retry-connrefused --tries=12 --no-remove-listing
--local-encoding=UTF-8 --no-cookies --default-page=default --server-response
--trust-server-names --header="Accept:text/html" --user-agent=Mozilla
--warc-file=bridge_warc --warc-cdx --warc-max-size=0.5G {URL}
```

`--recursive`	Recursively download files and follow links
`--no-parent`	Follow links, but not beyond the last parent directory
`--page-requisites`	Grab all of the linked resources necessary to render the page (images, CSS, JS, etc.)
`--adjust-extension`	Append .html to the files when appropriate
`--convert-links`	Turn links into local links as appropriate
`--execute robots=off`	Turn off wget's automatic robots.txt checking
`--user-agent`	Mask the user agent and show wget like a browser

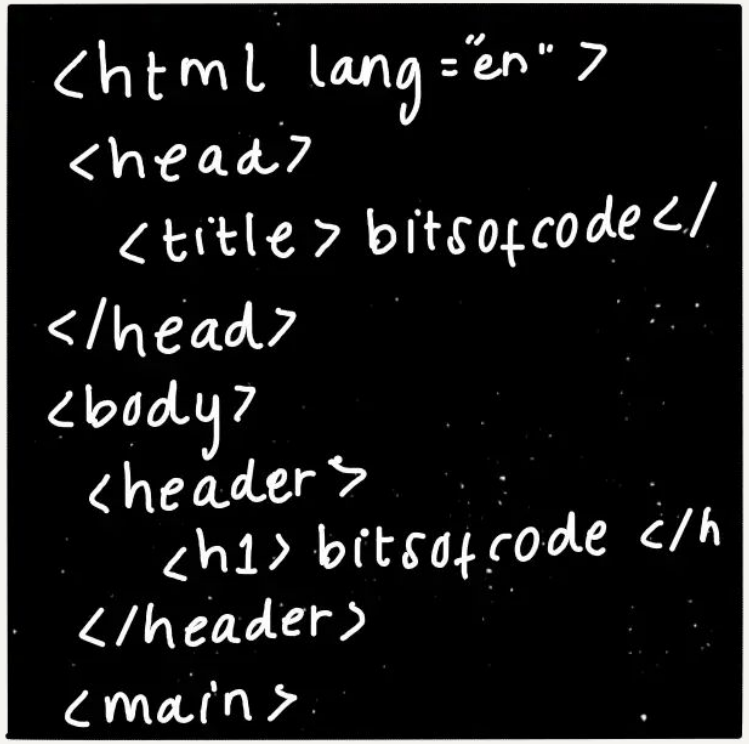
wget **output**

… xp=s\x92éëÊ00ÿ\r[ÖMission and VisionÈèüû]Dg¨\x98\x95\xad-\x01ê\x1bÿìö?YüoeF2æAv\x150TS
\x8bS\x82 ÄÝ¤\x98rY-#cÌ\x16µääâ\x8d8@¯L\x01û\x80sÍ\x89xp=s\x92éëÊ00ÿ\r[ÖÈèüû]Dg ¨
\x98\x95\xad-\x01ê\x1bÿìö?Yüo … x80sÍ\x89xp=s\x92éëÊ00ÿ\r[ÖBell ScheduleÈèüû]Dg ¨
\x98\x95\xad-\x01ê\x1bÿìö?YüoeF2æAv\x150TS\x8bS\ x82Ä Ý¤\x98rY-#cÌ\x16µääâ\x8d8@ ¯
L\x01û\x80sÍ\x89xp=s\x92éëÊ00ÿ\r[ÖÈèüû]Dg¨\x98\x95\xad-\x01ê\x1bÿìö … â\x8d8@ ¯
L\x01û\x80sÍ\x89xp=s\x92éëÊ00ÿ\r[ÖCollege & Career ReadinessÈèüû]Dg¨\x98\x95\xad-\x01ê\x1 …
x16µääâ\x8d8@¯L\x01û\x80sÍ\x89xp=s\x92éëÊ00ÿ\r[ÖStony Point Academy is committed to provide a rigorous preparatory program that ensures all students are ready for successful post-secondary pathway. This includes an academically rich curriculum with rigorous content. It includes an expectation that students will apply their knowledge through higher-order skills, and will develop the habits of mind and character traits known to support personal standards within a student-centered environment that emphasizes the Common Core Anchor Standards for College and Career Readiness (CCR) across all content areas at every grade level. It is with this preparation that students will become contributing members of the local and global communities.Èèüû]Dg¨\x98\x95\xad-\x01ê\x1bÿìö?YüoeF2æAv\x150TS\x8bS\x82ÄÝ¤\
x98rY-#cÌ\x16µääâ\x8d8 @ ¯L\x01û\x80sÍ\x89xp=s\x9 2éëÊ00ÿ\r[ÖÈèüû]Dg ¨
\x98\x95\xad-\x01ê\x1bÿìö?YüoeF2æAv\x150TS\x8bS\x82

Also useful: `Selenium`

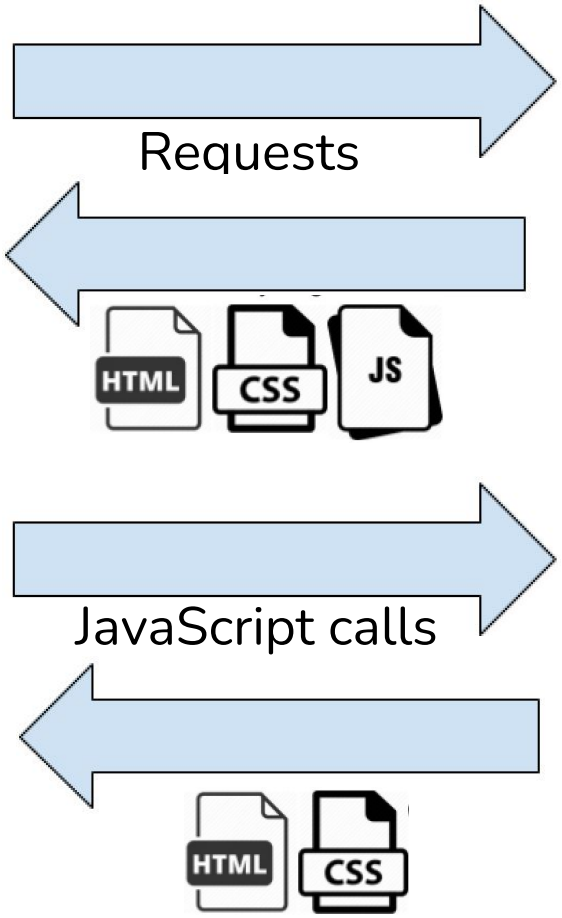


headful



headless

How interactive websites work



Limits of Selenium

```
[31mcrawler_10       |[0m 2018-04-05 21:42:10 [selenium.webdriver.remote.remote_connection]
DEBUG: GET http://172.18.0.2:4444/wd/hub/session/a9700948ceef7d04568452492f07e968/element/
0.786584017266313-80/attribute/href {"sessionId": "a9700948ceef7d04568452492f07e968", "name":
"href", "id": "0.786584017266313-80"}
[36;1mcrawler_2      |[0m TypeError: can't pickle thread.lock objects
[32mcrawler_5        |[0m 2018-04-05 21:41:37 [selenium.webdriver.remote.remote_connection]
DEBUG: GET http://172.18.0.2:4444/wd/hub/session/dcc13b350db90f2c33fccf3a6a15f850/element/
0.30704028792259 35-111/attribute/href {"sessionId": "dcc13b350db90f2c33fccf3a6a15f850",
"name": "href", "id": "0.30704028792259 35-111"}
[32;1mcrawler_9      |[0m 2018-04-05 21:42:29 [selenium.webdriver.remote.remote_connection]
DEBUG: Finished Request
[36mcrawler_6        |[0m {'appid': u'testapp',
[35;1mcrawler_1      |[0m 2018-04-05 21:42:44 [selenium.webdriver.remote.remote_connection]
DEBUG: GET http://172.18.0.2:4444/wd/hub/session/a0eaf0be3a4c7e187452951948b8a333/element/
0.1420010272851573-52/attribute/href {"sessionId": "a0eaf0be3a4c7e187452951948b8a333",
"name": "href", "id": "0.1420010272851573-52"}
```

Ethics of web-scraping:

Politeness good

Hacking bad

More on ethics

- How do I know what's OK to scrape?
  - Ask your IRB (they don't always know)
  - Follow the website's Terms of Service (usually)
- Am I legally liable if I break the Terms of Service?
  - *Computer Fraud and Abuse Act* (1986): Kindof
  - *LinkedIn v. HiQ Labs* (2019, 2022): Nope, web-scraping is a public right
- So is the whole web in the public domain?
  - It depends (*contextual privacy*; see *Bit by Bit*, 2017)

Take-aways

- Web-crawling new corpora (still) the Wild West
- But don’t hurt anyone or reinvent the flat tire
  - First check for existing data and APIs!
  - Scraping is OK, but be polite and share wisely
- Cornerstone web-crawling tool (for Python): `scrapy`
  - Flexible! And depends on a parser like BeautifulSoup
  - Extensible! And still time-consuming to customize
- URL scraper, Scrapy spiders, etc.:
  - https://github.com/jhaber-zz/web_scraping

Where we are

- Recap of supervised machine learning
- Lecture on web-scraping
  - Living in a digital era
  - Researching the digital era
  - How to scrape/crawl without reinventing the flat tire
  - Intro to packages for wrangling web data
  - Ethics (briefly)
- **Notebook for basic web-scraping**
  - Making `requests`
  - Parsing HTML
  - Scraping URLs

Notebook for basic web-scraping

https://github.com/jhaber-zz/QSS20_public/blob/main/activities/10_partI_intro_scraping.ipynb

- Making `requests`
- Parsing HTML
- Scraping URLs