Programming, Problem Solving, and Algorithms

CPSC203, 2019 W1

Announcements

Lab this week: web-data-viz pipeline

“Problem of the Day” continues!

Today:

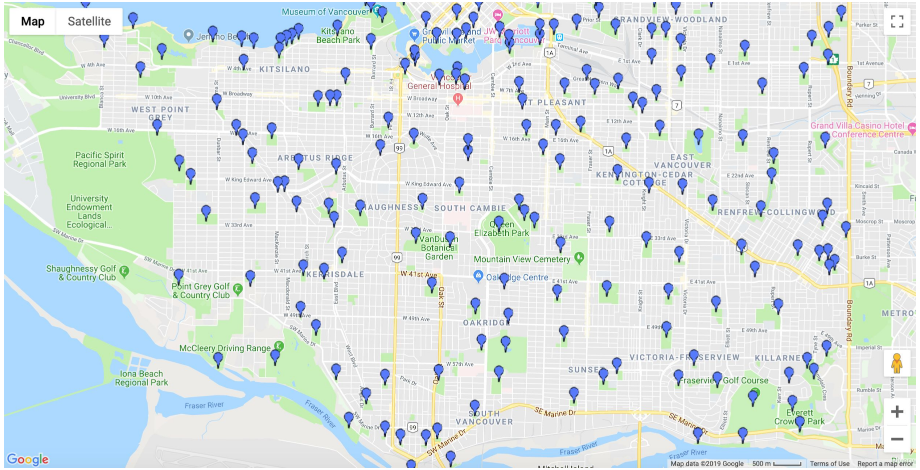
What’s your favorite source of data?

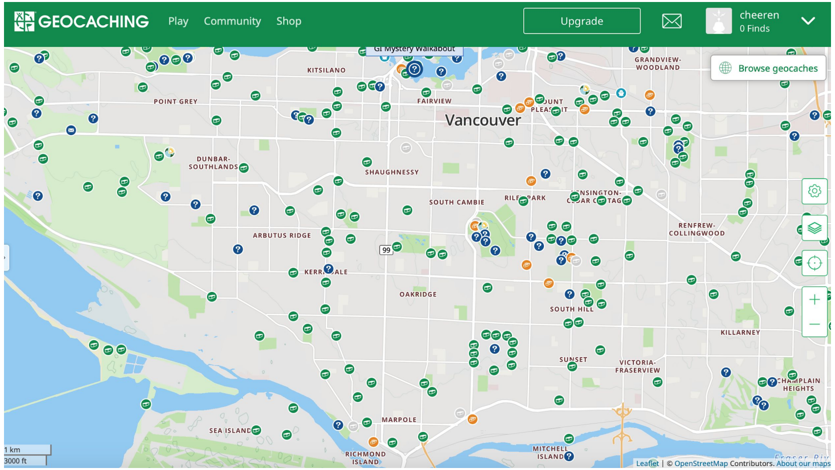
Intro to scraping

Pandas

Information from data...

https://vanmapp1.vancouver.ca/gmaps/covmap.htm?map=parks_areas

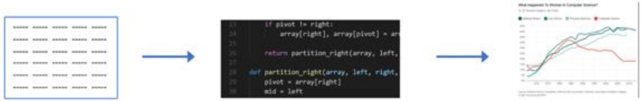




https://www.geocaching.com/play/map?lat=49.23710338135142&lng=-123.1318473815918&zoom=13&asc=true&sort=distance&st=vancouver%2C+British+Columbia

103 to 203

Typical Introductory Data Flow:



```
    if pivot != right:
        array[right], array[pivot] = ar

    return partition_right(array, left,

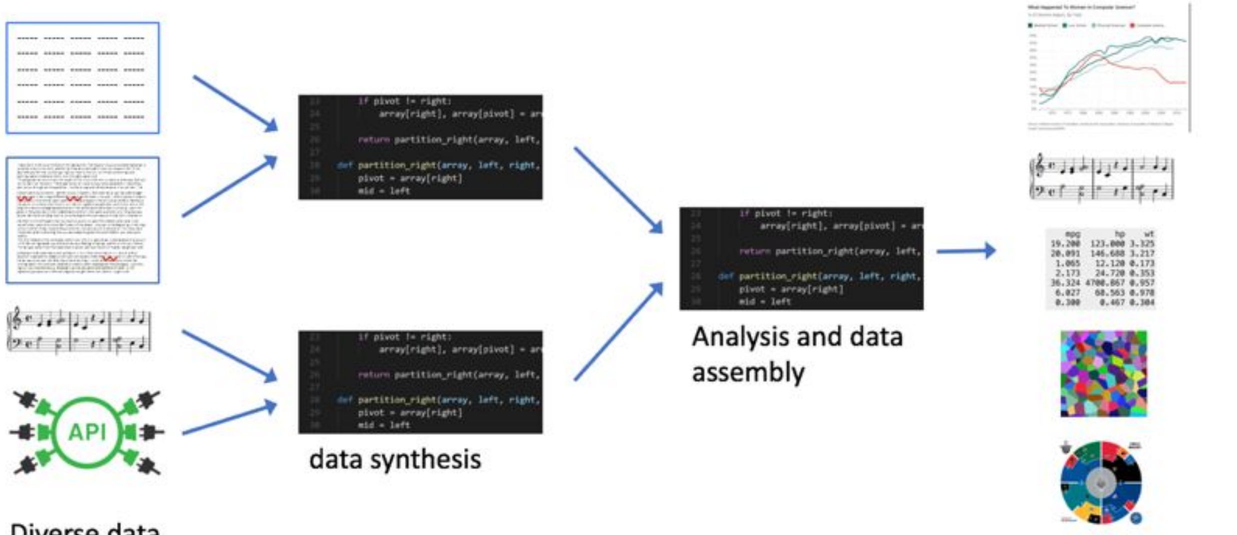
def partition_right(array, left, right,
    pivot = array[right]
    mid = left
```

.csv file

Python problem solution using simple data types and elementary list iteration.

Matplotlib bar or line graph or other summative output illustrating results of computation.

CPSC103++ Data Flow:



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data synthesis

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def partition_right(array, left, right,
    pivot = array[right]
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```

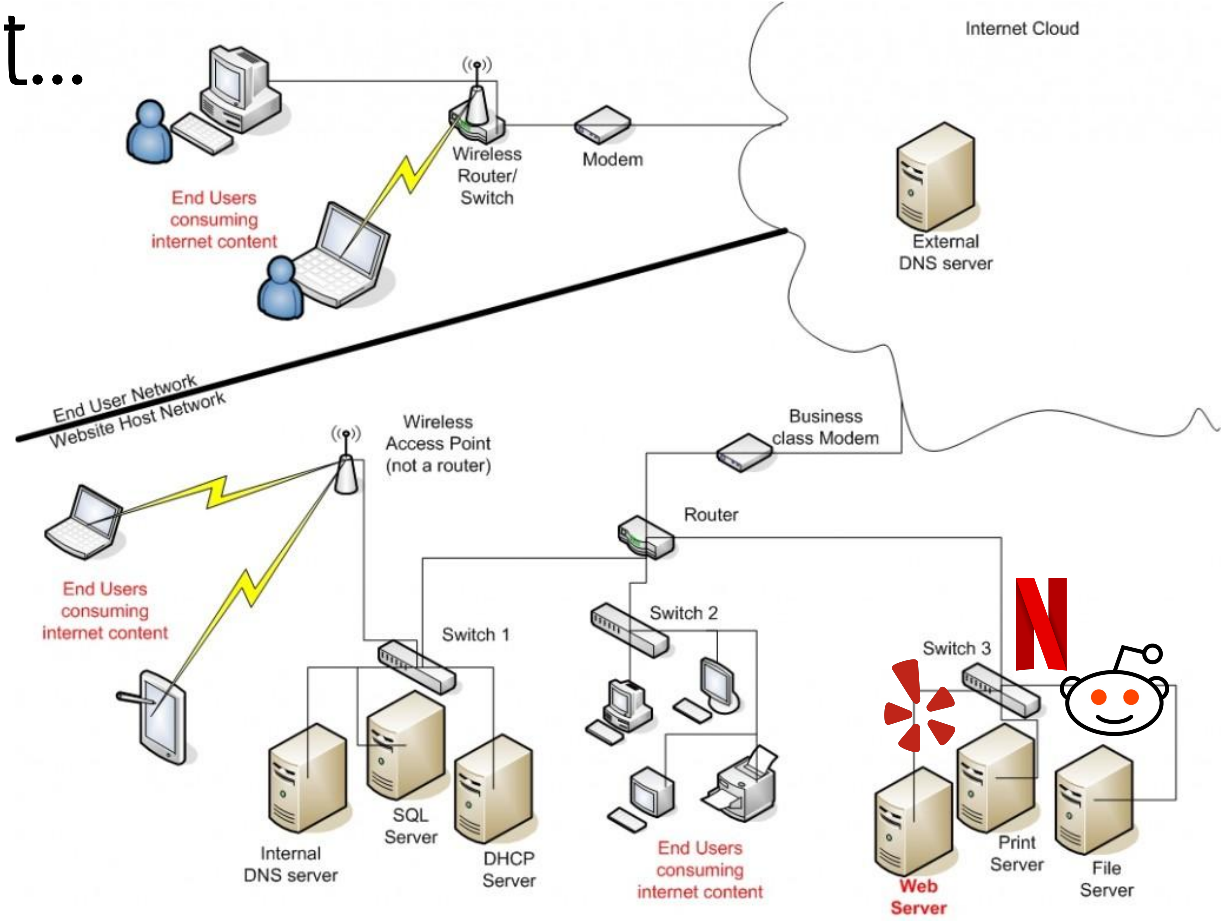
Analysis and data assembly

```
   mpg        hp     wt
19.200   123.000  3.325
20.091   146.688  3.217
 1.065    12.120  0.173
 2.173    24.720  0.353
36.324  4700.867  0.957
 6.027    68.563  0.978
 0.300     0.467  0.304
```

Diverse data sources

Diverse outputs

The internet...



Billboard Hot 100...

Navigate to https://www.billboard.com/charts/hot-100

What happens to the URL if you load a past week?______________________________

What happens to the page if you substitute a different date into the URL?

____

Write one question you would like to ask of this data: __________________________

____

Anatomy of html...

```
<!DOCTYPE html>

<html><head><title>The Dormouse's story</title></head>

    <body><p class="title"><b>The Dormouse's story</b></p>

        <p class="story">Once upon a time there were two little sisters.
    Their names were <a href="http://example.com/elsie" class="sister"
    id="link1">Elsie</a>, and <a href="http://example.com/lacie"
    class="sister" id="link2">Lacie</a>, and they lived at the bottom of a
    well.</p>

    </body>

</html>
```

Billboard Hot 100… page source

```
<div class="chart-list-item   piano-content-overlay__gated-item" data-rank="49" data-artist="Taylor Swift" data-title="Lover" data-has-content="true"> <div
class="chart-list-item__first-row chart-list-item__cursor-pointer"> <div class="chart-list-item__position chart-list-item__position--centered">          <div
class="chart-list-item__rank "> 49 </div>                                                                                                           <div
class="chart-list-item__award"> </div> </div>                                                                                                       <div
class="chart-list-item__image-wrapper"> <div class="chart-list-item__trend-icon">                                                                   <img
src="https://assets.billboard.com/assets/1568911107/images/charts/arrow-down.svg?df89925e3b37f64521bd"
srcset="https://assets.billboard.com/assets/1568911107/images/charts/arrow-down-mobile.svg?df89925e3b37f64521bd 30w,
https://assets.billboard.com/assets/1568911107/images/charts/arrow-down.svg?df89925e3b37f64521bd 38w" sizes="(min-width: 768px) 38px,
30px"></div>

<img src="data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAAEAAAABCAYAAAAfFcSJAAAADUlEQVR42mNkYPhfDwAChwGA60e6k
gAAAABJRU5ErkJggg==" data-src="https://charts-static.billboard.com/img/2019/08/taylor-swift-p7u-lover-tuk-53x53.jpg"
data-srcset="https://charts-static.billboard.com/img/2019/08/taylor-swift-p7u-lover-tuk-53x53.jpg 53w,
https://charts-static.billboard.com/img/2019/08/taylor-swift-p7u-lover-tuk-106x106.jpg 106w,
https://charts-static.billboard.com/img/2019/08/taylor-swift-p7u-lover-tuk-87x87.jpg 87w,
https://charts-static.billboard.com/img/2019/08/taylor-swift-p7u-lover-tuk-174x174.jpg 174w" sizes="(max-width: 767px) 72px, (min-width: 768px) 86px"
class="chart-list-item__image" alt="Taylor Swift Lover Billboard Hot 100"></div>

<div class="chart-list-item__text-wrapper"> <div class="chart-list-item__text "> <div class="chart-list-item__title">
<span class="chart-list-item__title-text">
Lover
```

```
Lover
</span> </div>
<div class="chart-list-item__artist">
<a href="/music/taylor-swift">
Taylor Swift
</a>
</div>
<div class="chart-list-item__lyrics ">
<a href="https://www.billboard.com/articles/news/lyrics/7950218/ready-for-it-taylor-swift-lyrics">
<span class="hidden-mobile show-expanded-mobile-inline">Song </span>Lyrics
</a></div></div></div>
<div class="chart-list-item__chevron-wrapper"><i class="fa fa-chevron-down"></i></div></div>
<div class="chart-list-item__extra-info"><div class="chart-list-item__extra-info-shadow"></div>
<div class="chart-list-item__stats">
<div class="chart-list-item__stats-cell  basic-user chart-list-item__stats-cell--first-cell"> <div class="chart-list-item__stats-icon fa fa-arrow-up
fa-rotate-45"></div>
<div class="chart-list-item__last-week">23</div>
LAST WEEK </div>
<div class="chart-list-item__stats-cell  basic-user "> <div class="chart-list-item__stats-icon fa fa-arrow-up fa-rotate-45"></div>
<div class="chart-list-item__last-week">10</div>
TWO WEEKS AGO</div>
<div class="chart-list-item__stats-cell  basic-user "> <div class="chart-list-item__stats-icon fa fa-line-chart"></div>
<div class="chart-list-item__weeks-at-one">10</div>
PEAK POSITION </div>
<div class="chart-list-item__stats-cell  basic-user  chart-list-item__stats-cell--no-border-right"><div class="chart-list-item__stats-icon fa fa-clock-o"></div>
<div class="chart-list-item__weeks-on-chart">4</div>
WEEKS ON CHART</div></div></div></div>
```

Beautiful Soup

Reads the html source into a data structure that’s easy to query!

https://www.crummy.com/software/BeautifulSoup/bs4/doc/

```
html = simple_get("https://www.billboard.com/charts/hot-100" + '/' + date)
mydivs = html.findAll("div", {"class": "chart-list-item"}) // all the data is here!!


for div in mydivs:
    s = Song(div.attrs['data-title'], div.attrs['data-artist'], int(div.attrs['data-rank']))
```

Pandas and data frames

`import pandas`

Imports the pandas library. We will almost always use an abbreviation…

Instead of saying `pandas.read_csv(‘file.csv’)`

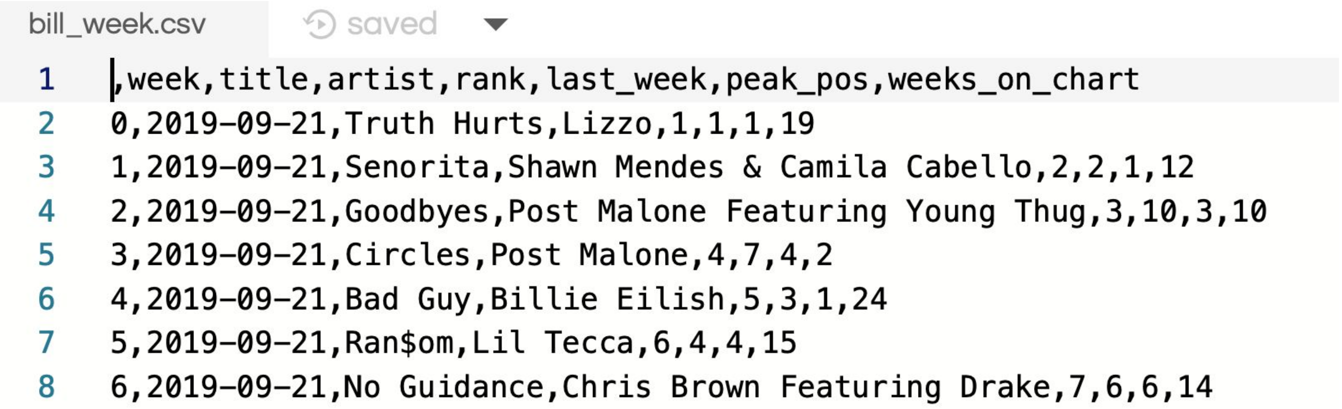
we can say

This function returns a DataFrame containing the data from `file.csv`

CSV files

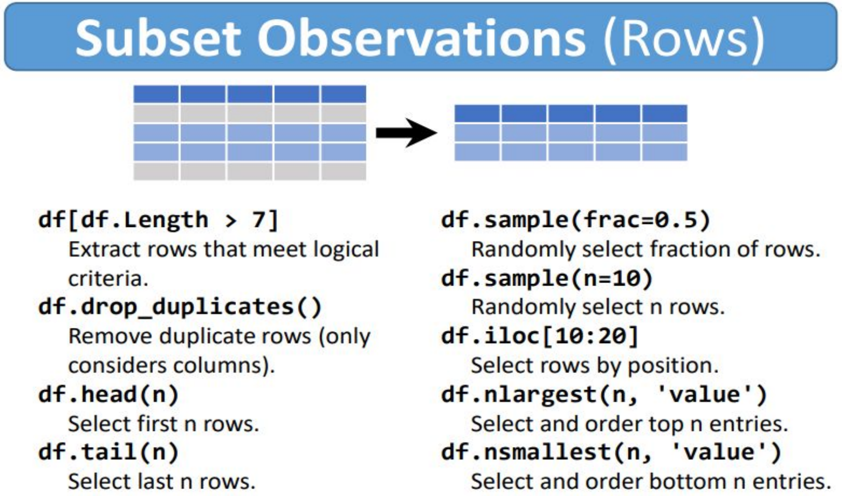
To implement `df = pd.read_csv(‘file.csv’)`

`file.csv` must have field names in row 1, and data beginning in row 2.



```
1   ,week,title,artist,rank,last_week,peak_pos,weeks_on_chart
2   0,2019-09-21,Truth Hurts,Lizzo,1,1,1,19
3   1,2019-09-21,Senorita,Shawn Mendes & Camila Cabello,2,2,1,12
4   2,2019-09-21,Goodbyes,Post Malone Featuring Young Thug,3,10,3,10
5   3,2019-09-21,Circles,Post Malone,4,7,4,2
6   4,2019-09-21,Bad Guy,Billie Eilish,5,3,1,24
7   5,2019-09-21,Ran$om,Lil Tecca,6,4,4,15
8   6,2019-09-21,No Guidance,Chris Brown Featuring Drake,7,6,6,14
```

Selecting Rows



Subset Observations (Rows)

`df[df.Length > 7]`
Extract rows that meet logical criteria.

`df.drop_duplicates()`
Remove duplicate rows (only considers columns).

`df.head(n)`
Select first n rows.

`df.tail(n)`
Select last n rows.

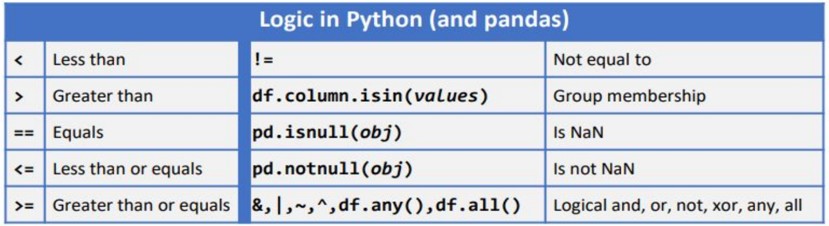
`df.sample(frac=0.5)`
Randomly select fraction of rows.

`df.sample(n=10)`
Randomly select n rows.

`df.iloc[10:20]`
Select rows by position.

`df.nlargest(n, 'value')`
Select and order top n entries.

`df.nsmallest(n, 'value')`
Select and order bottom n entries.



Logic in Python (and pandas)

<	Less than	!=	Not equal to
>	Greater than	df.column.isin(*values*)	Group membership
==	Equals	pd.isnull(*obj*)	Is NaN
<=	Less than or equals	pd.notnull(*obj*)	Is not NaN
>=	Greater than or equals	&,|,~,^,df.any(),df.all()	Logical and, or, not, xor, any, all

```
df.nlargest(10,‘last_week’)
```

Returns top 10 hits from last week.

```
df[ df[‘weeks_on_chart’] > 10 ]
```

Returns all songs that have been on the charts for more than 10 weeks.

Adding a column

```
df[‘gradient’] = df[‘last_week’] - df[‘rank’]
```

Adds a column to the DataFrame containing the difference for every row.

```
df[ df[‘weeks_on_chart’] > 10 ]
```

Returns all songs that have been on the charts for more than 10 weeks.

POTD #6 Tue

https://github.students.cs.ubc.ca/cpsc203-2019w-t1/potd06

Describe any snags you run into:

1. Line ___: ____
2. Line ___: ____
3. Line ___: ____
4. Line ___: ____
5. Line ___: ____

ToDo for next class...

POTD: Continue every weekday! Submit to repo.

Reading: TLACS Ch 10 & 12 (lists and dictionaries)

References:

TLACS Ch 17

https://pandas.pydata.org/Pandas_Cheat_Sheet.pdf

https://www.crummy.com/software/BeautifulSoup/bs4/doc/