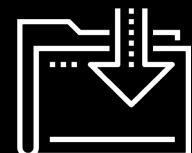




Zen of Data

Data Boot Camp
Lesson 1.1



WELCOME



The Rise of Data



Why is data analytics such
a **hot** skill these days?

1 Explosive Growth in Digitized Data (Creation)



2

Explosive Growth in Analytic Tools (Synthesis)



Best Restaurants in San Francisco, CA

Showing 1-20 of 7848

3

Accelerating Search for Actionable Insight (Value)

2. Derm Restaurant

34 reviews

\$\$ - Thai

This restaurant takes reservations

This restaurant accepts pickup orders

1. Aracy Cafe
 113 reviews
\$\$ - American (New), Venues & Event

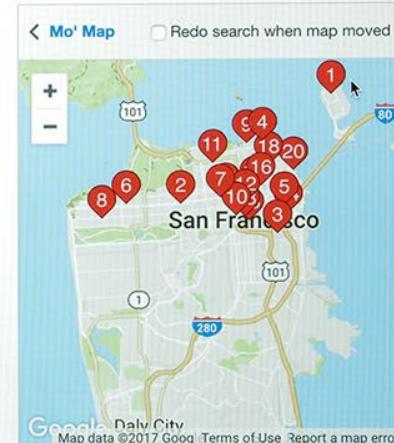
This restaurant takes reservations

Get 7% Cash Back when you dine here

I seriously hope all the hipster jerks from the city don't find this place and ruin it. I hesitate to post this because I don't want them to be aware of the presence of this place. But since it's... [read more](#)

401 13th St
San Francisco, CA 94130
(415) 985-7117[Find a Table](#)[Enroll in Cash Back](#)

Laurel Heights

3226 Geary Blvd
San Francisco, CA 94118
(415) 379-4549[Find a Table](#)[Start Order](#)

salutemarinabay.com ▾

Salute E Vita - Italian Food - Waterfront Dinning

Enjoy authentic Italian dishes with breathtaking views of San Francisco Bay.
1900 Esplanade Dr, Richmond, CA.



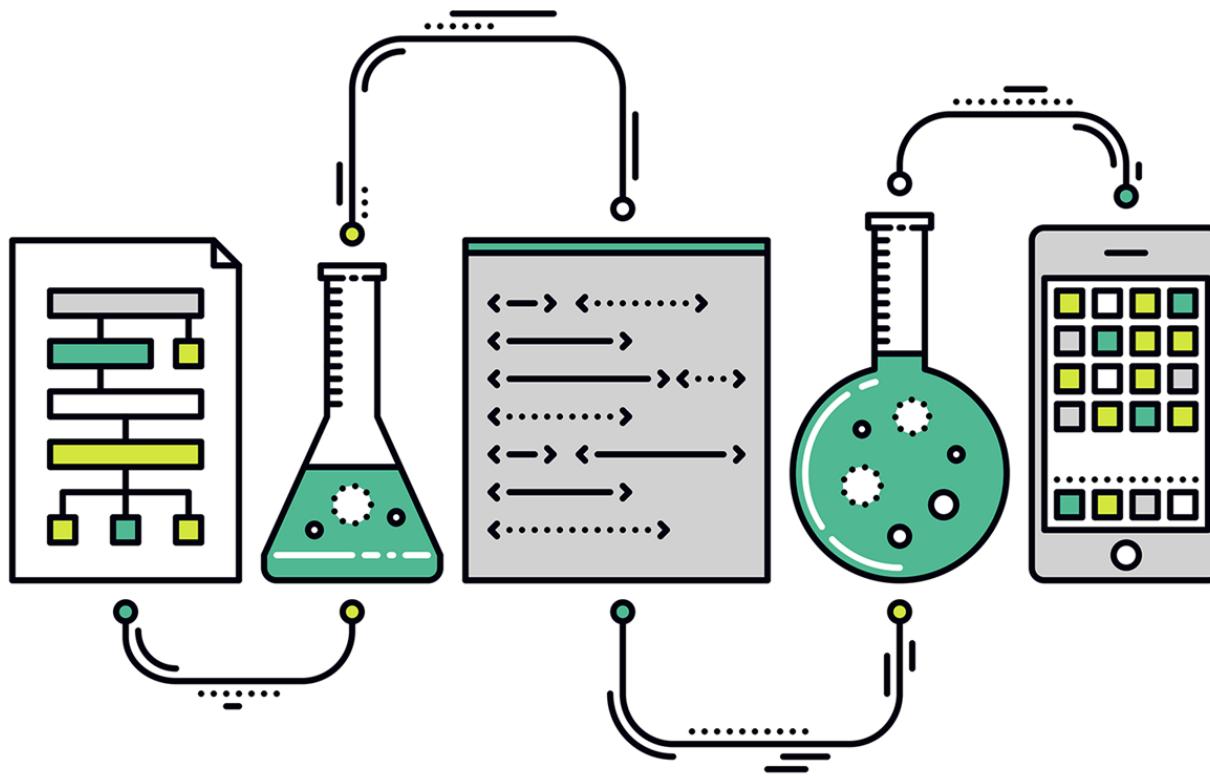
What does the term
data mean?



Perhaps you
are picturing
an Excel
spreadsheet.



Data Science Involves Spreadsheets and Formulas



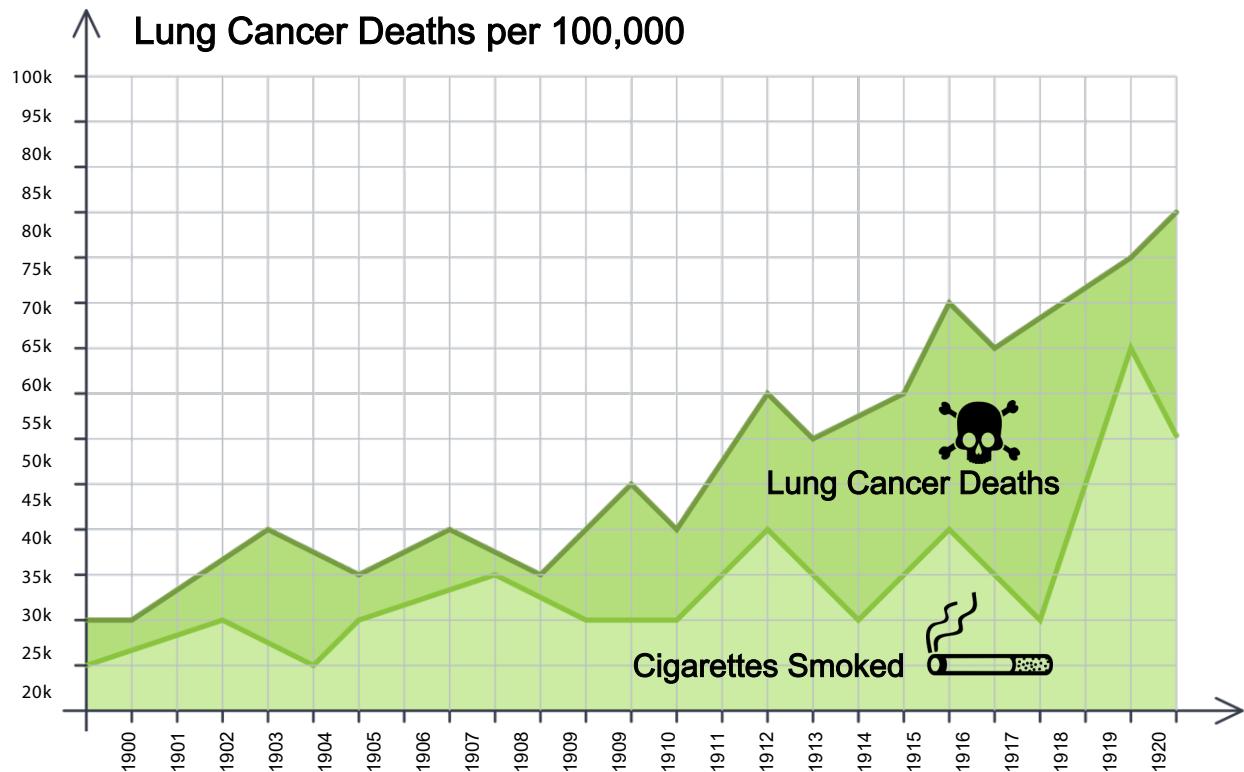


Fundamentally, data science
is about **storytelling** and
truth -telling.

Data as Truth-Telling

Data as Truth-Telling

Unearthing Relationships

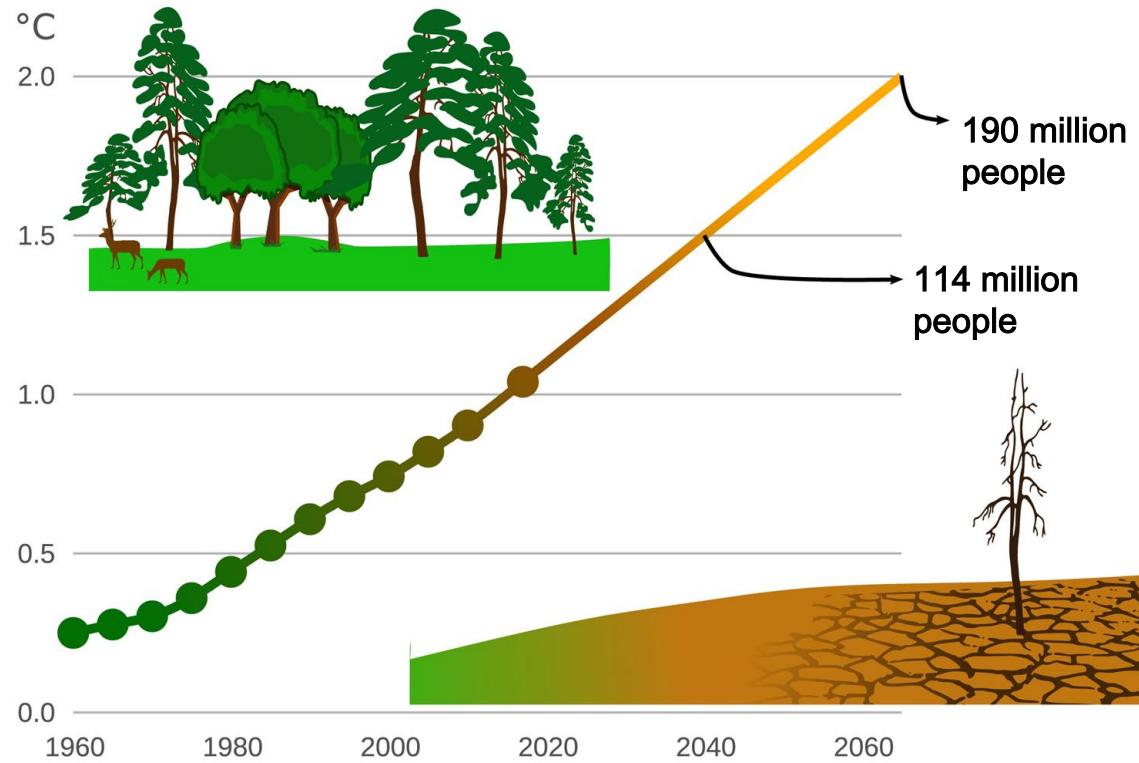




Data as Truth-Telling

Making Predictions

Exposure to Extreme Drought Is Increasing



Data as Truth-Telling

Stating Significance

Data as Storytelling

Data as Storytelling

U.S. Debt as Percentage of Gross Domestic Product, 1790–2011

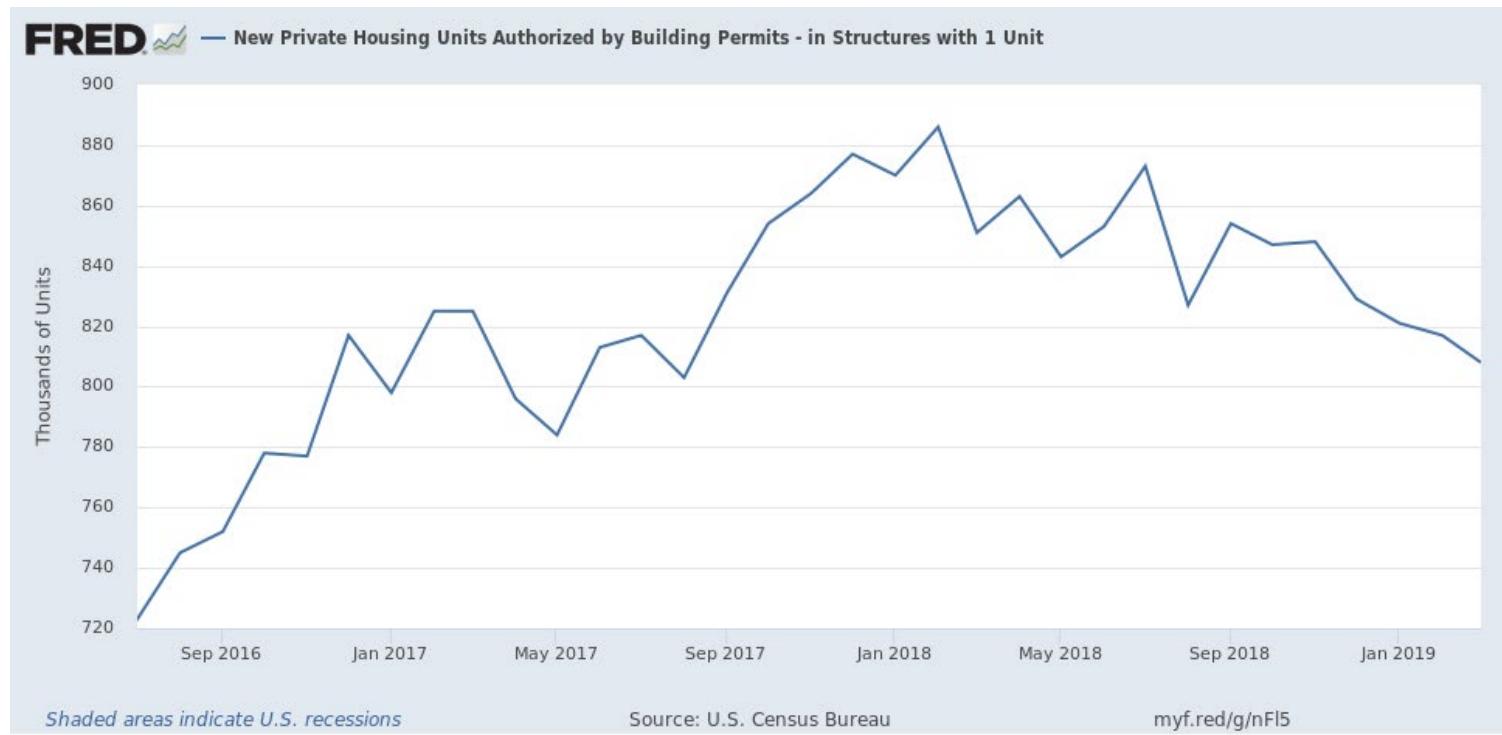
1790	29.6%	1835	0.0	1880	18.4	1925	21.6				
1791	29.2	1836	0.0	1881	16.8	1926	19.0				
1792	28.0	1837	0.2	1882	14.3	1927	18.0				
1793	24.4	1838	0.6	1883	13.5	1928	17.0				
1794	21.8	1839	0.2	1884	13.3	1929	14.9				
1795	18.7	1840	0.3	1885	13.2	1930	16.5				
1796	16.4	1841	0.8	1886	12.4	1931	22.3				
1797	16.5	1842	1.2	1887	11.2	1932	34.5				
1798	16.0	1843	1.5	1888	10.2	1933	39.1				
1799	15.8	1844	1.0	1889	8.6	1934	44.0				
1800	15.1	1845	0.7	1890	7.8	1935	42.9				
1801	13.3	1846	1.2	1891	7.0	1936	43.0				
1802	13.9	1847	1.7	1892	6.6	1937	40.1				
1803	14.1	1848	2.2	1893	6.8	1938	42.8				
1804	13.2	1849	2.5	1894	7.9	1939	43.0				
1805	10.9	1850	2.3	1895	7.9	1940	42.7				
1806	10.0	1851	2.4	1896	8.5	1941	43.3				
								1970	28.0		
								1971	28.1		
								1972	27.4		
								1973	26.0		
								1974	23.9		
								1975	25.3		
								1976	27.5		
								1977	27.8		
								1978	27.4		
								1979	25.6		
								1980	26.1		
								1981	25.8		
								1982	28.7		
								1983	33.1		
								1984	34.0		
								1985	26.4		
								1986	38.5		

The Great Depression & World War II

Reagan Tax Cuts

Data = Drama

New Housing Construction: Making A Bottom, At Close To Recessional Levels



Course Overview

Tools for Truths, Skills for Stories:

Our Goals: 

Truth-telling
Storytelling

Our Means: 

Microsoft Excel	SQL
Python	MongoDB
pandas	HTML/CSS
Matplotlib/Seaborn	JavaScript
APIs	D3.js
Beautiful Soup	Leaflet.js/Google
Machine Learning	Maps
	Tableau
	Hadoop

Course Overview

Each class will include the following:



Overview of Lesson Topics



Instructor Lecture



Instructor Demonstration



Class Discussions



In-Class Activities



Project Work

Weekly Breakdown by Subject

Weeks 1–2

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Week 11

Week 12

Week 13

Week 14

Week 15

Week 16

Week 17

Week 18

Week 19

Week 20

Week 21

Week 22

Week 23

Week 24

Intro to Data Analytics & Excel Masters: Introduction to the high-level concepts of data analytics and real-world data crunching with Excel formulas, pivot tables, and conditional formatting.

Python Data Analytics and Visualization: Thorough crash course on Python programming, followed by multiple weeks of data processing using advanced libraries like NumPy, pandas, Matplotlib, Seaborn, and Beautiful Soup.

Deep Dive into Databases: Immersion into introductory and advanced work with SQL (PostgreSQL) and noSQL databases (MongoDB).

Web-Based Data Visualization: Introduction to the fundamental tools of web development (HTML, CSS, JavaScript) and advanced libraries that are useful for data visualization (D3.js, Leaflet.js).

Final Projects & Advanced Topics: Introduction to Tableau and R as well as advanced topics like Hadoop and Machine Learning. Develop a real-world data visualization project.

Weeks 3–9

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Week 11

Week 12

Week 13

Week 14

Week 15

Week 16

Week 17

Week 18

Week 19

Week 20

Week 21

Week 22

Week 23

Week 24

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Weeks 10–12

Week 1

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Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Python Data Analytics and Visualization: Thorough crash course on Python programming, followed by multiple weeks of data processing using advanced libraries like NumPy, pandas, Matplotlib, Seaborn, and Beautiful Soup.

Week 11

Week 12

Deep Dive into Databases: Immersion into introductory and advanced work with SQL (PostgreSQL) and noSQL databases (MongoDB).

Week 13

Week 14

Week 15

Week 16

Week 17

Week 18

Week 19

Week 20

Week 21

Week 22

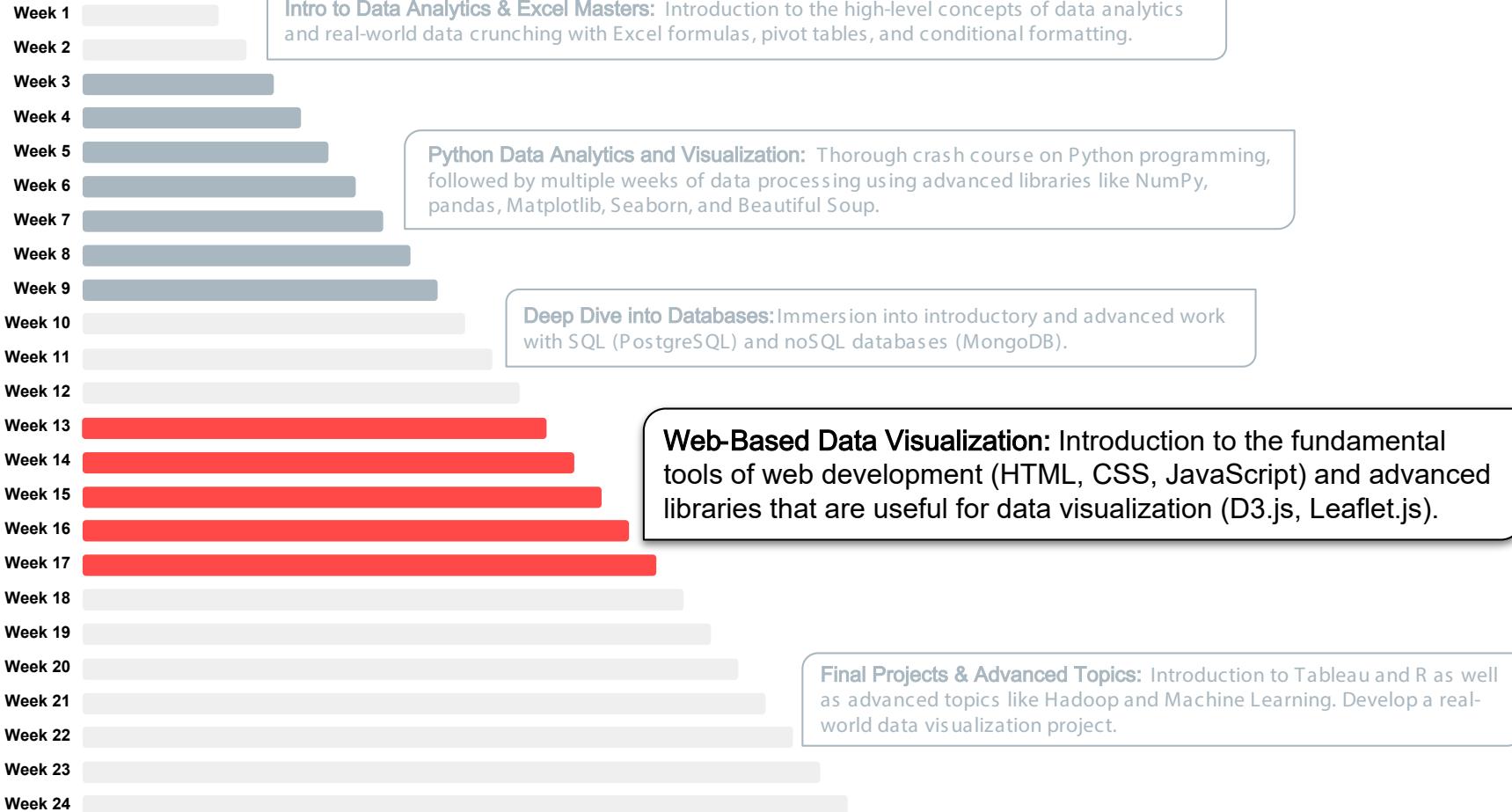
Week 23

Web-Based Data Visualization: Introduction to the fundamental tools of web development (HTML, CSS, JavaScript) and advanced libraries that are useful for data visualization (D3.js, Leaflet.js).

Week 24

Final Projects & Advanced Topics: Introduction to Tableau and R as well as advanced topics like Hadoop and Machine Learning. Develop a real-world data visualization project.

Weeks 13–17



Weeks 18–24

Week 1

Intro to Data Analytics & Excel Masters: Introduction to the high-level concepts of data analytics and real-world data crunching with Excel formulas, pivot tables, and conditional formatting.

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Python Data Analytics and Visualization: Thorough crash course on Python programming, followed by multiple weeks of data processing using advanced libraries like NumPy, pandas, Matplotlib, Seaborn, and BeautifulSoup.

Week 11

Deep Dive into Databases: Immersion into introductory and advanced work with SQL (PostgreSQL) and noSQL databases (MongoDB).

Week 12

Week 13

Week 14

Week 15

Week 16

Week 17

Week 18

Week 19

Week 20

Week 21

Week 22

Week 23

Week 24

Web-Based Data Visualization: Introduction to the fundamental tools of web development (HTML, CSS, JavaScript) and advanced libraries that are useful for data visualization (D3.js, Leaflet.js).

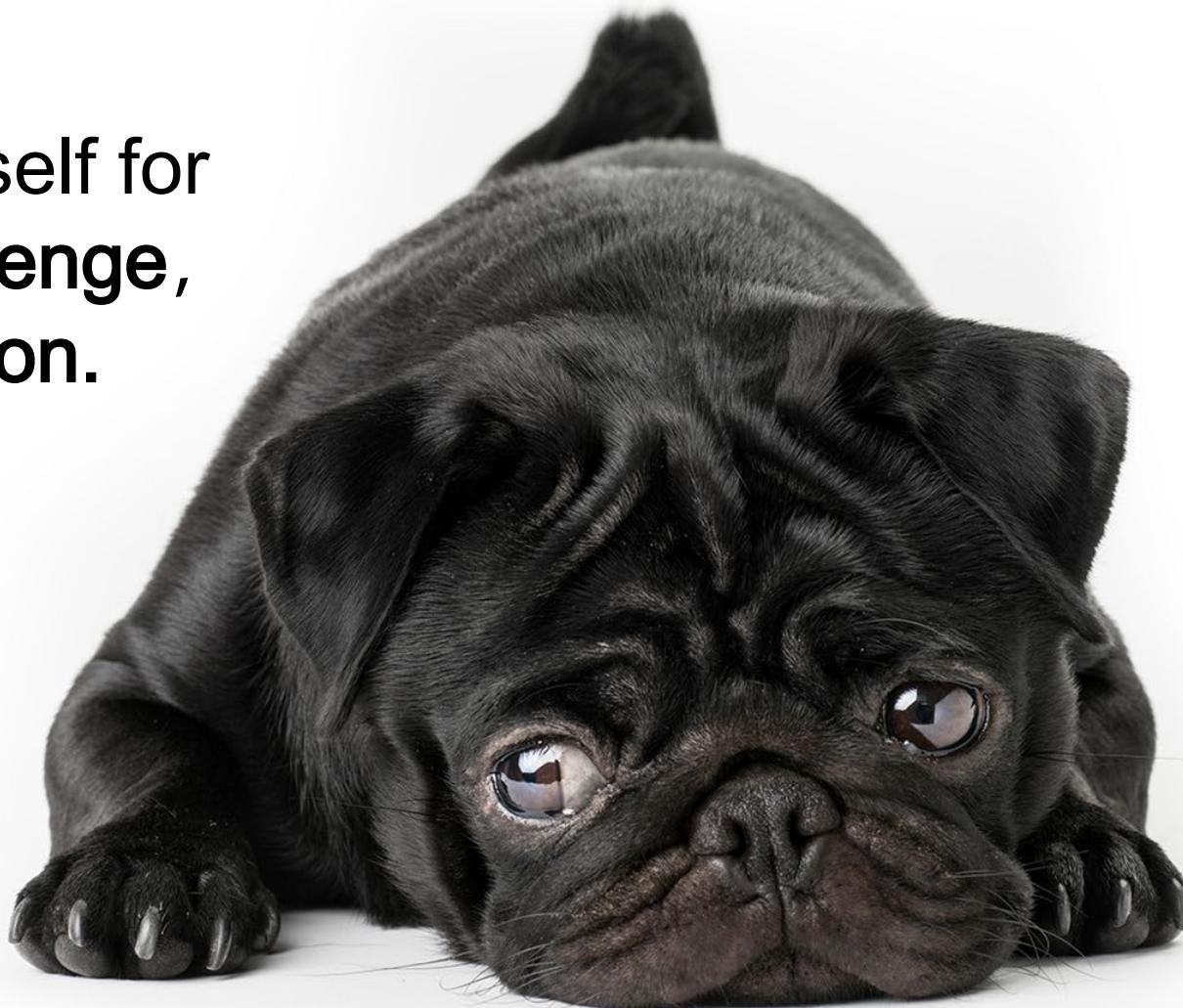
Final Projects & Advanced Topics: Introduction Tableau and R as well as advanced topics like Hadoop and Machine Learning. Develop a real world data visualization project.

Helpful Tips

A close-up photograph of a baby with light blue eyes and an open mouth, wearing a bright pink zip-up jacket. The baby is positioned behind a dark, textured surface, likely glass, which is covered in numerous small water droplets. The baby's hands are placed flat against the glass, creating a sense of interaction with the viewer.

Embrace your
inner toddler.

Brace yourself for
doubt, challenge,
and confusion.



**Relish the novice experience
and expect a lot of
lightbulb moments.**



Form a community
with your classmates.

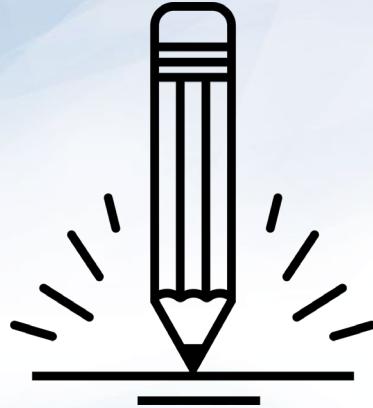


**There is no shortcut.
You've got to put in the hours!**



A close-up photograph of a fluffy orange and white cat lying on its back on a light-colored, textured surface. The cat's eyes are closed, and it has a content expression. Its front paws are raised, and its pink paw pads are visible. The background is slightly blurred.

Celebrate your successes!



Group Activity:

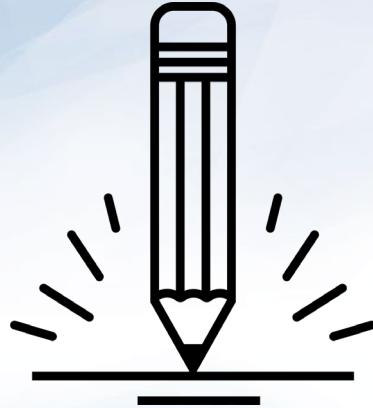
Form groups of 3 or 4 people. Get up from your seats and walk around.
Don't be shy!

Suggested Time:
5 minutes



Take a Break!





Group Activity: The Great Debate

Find your group you formed before the break. Together ponder the following question.

Suggested Time:
20 minutes



Group Activity: The Great Debate

Which do Americans prefer:
Italian or Mexican food?



Group Activity: The Great Debate

With your group, develop a strategy for answering this question with as much confidence possible. Specifically, answer questions like:



What data will you attempt to gather?



What relationships will you be looking for?



How will you ensure your answer is most likely “true”?

Assumptions:

You are given 5 hours and a budget of \$10 to accomplish this.

Your answer will be tested by randomly selecting 9 Americans who will each be asked the question—with 0 qualifiers.

You only have your team.

Suggested Time: 20 minutes



The Great Debate (Analyzed)

Step 1: Decompose the “Ask”

Step 1: Decompose the “Ask”

Which do **Americans** prefer:
Italian or Mexican food?



Step 1: Decompose the “Ask”

Which do **Americans** prefer: Italian or Mexican food?



Who exactly is an American?



Are Americans just homeowners?



Do Americans just live in big cities?



Are Americans just millennials?



How can we get a
representative sample
of Americans?

Step 1: Decompose the “Ask”

Which do Americans **prefer**:
Italian or Mexican food?



Step 1: Decompose the “Ask”

Which do Americans **prefer**: Italian or Mexican food?



How do we define “preference”?



Do people prefer the foods they eat most frequently?



Do people prefer the foods they wish they could eat if cost was not an issue?



How uniform is the preference? Is it regionalized? Is it different by demographic?



Inherently, preference is **subjective**. We are going to need to make it **objective**.

Step 1: Decompose the “Ask”

Which do Americans prefer:
Italian or Mexican food ?



Step 1: Decompose the “Ask”

Which do Americans prefer: **Italian or Mexican food** ?

01

How do we categorize foods?
Is pizza Italian? Is Taco Bell Mexican?

02

How do we categorize food?
Does making pasta at home constitute Italian? Or are we just talking about restaurants?

03

Are we just talking about “best experiences”? Or are we including poorer renditions of these foods?

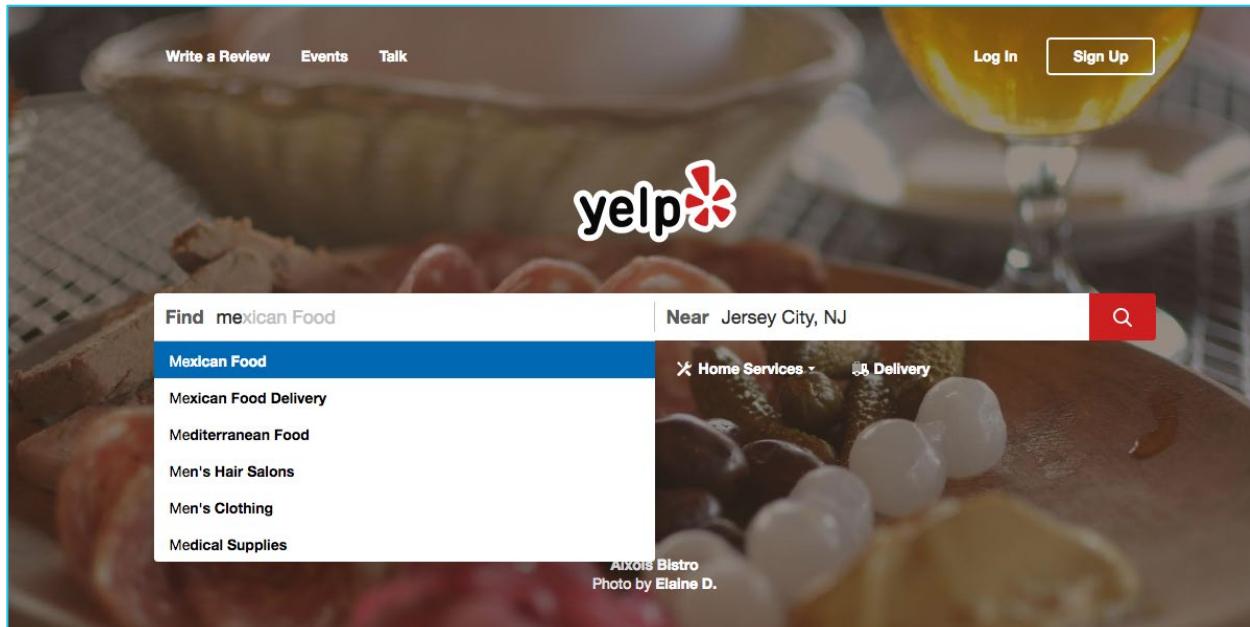


Italian and Mexican are **broad categories** we are pursuing. We will have to narrow the scope.

Step 2: Identify Data Sources

Step 2: Identify Data Sources

As everyday consumers, we are **regularly** getting a pulse of everyday American food preferences to inform our own decisions. Perhaps we can make use of the same approach.



Step 2: Identify Data Sources

Web services like Yelp provide an almost encyclopedic amount of information about the eating preferences of Americans.

The screenshot shows a Yelp business profile for "Mi Mariachi Taqueria". The top navigation bar includes a lock icon, the URL https://www.yelp.com/biz/mi-mariachi-taqueria-jersey-city-2, the Yelp logo, a search bar with the query "Find tacos, cheap dinner, Max's Near Jersey City, NJ", and "Log In" and "Sign Up" buttons. Below the bar are category filters: Home Services, Restaurants (selected), Auto Services, More, and a "Write a Review" button. The main section features the restaurant's name, "Mi Mariachi Taqueria", with an "Unclaimed" status, a 4-star rating from 230 reviews, and a "Write a Review" button. It also shows a "\$ Mexican" price range and an "Edit" link. To the left is a map showing the location at 213 Sip Ave, Jersey City, NJ 07306, with "Get Directions", phone number (201) 222-1998, email (mimariachi.letsseat.at), and "Send to your Phone" options. The right side displays a large image of a sandwich, a smaller image of the interior, and a callout for a "Chorizo & egg sandwich no cheese. Simply... by Franco B.". Below these are links to "See all 184 photos" and "Full menu". At the bottom, it indicates a price range of "Under \$10".

Step 2: Identify Data Sources

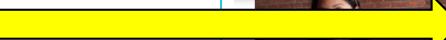
Why poll an audience when there already exist enormous databases of information about Americans' food preferences —readily available online?



Step 2: Identify Data Sources

Food Type 

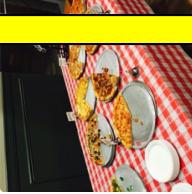
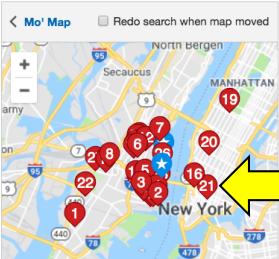
Review Count 

Rating 

Best Italian Food Jersey City, NJ

Showing 1-30 of 3356

\$ \$ \$ \$\$\$\$ Open Now Order Delivery Order Takeout Make a Reservation All Filters

Lorad Nia's Family Pizzeria  108 reviews (551) 247-0754 126 River Dr S Jersey City, NJ 

"One of the best tasting pizza around Jersey City. Perfect sauce seasoned perfectly (not sweet out of the can taste) thin crust.... Finest cheese you can even order the Whole wheat..." [read more](#)

Offers takeout and delivery [Start Order](#)

Zero Otto Uno Cafe  54 reviews (201) 683-5593 502 Washington St Hoboken, NJ

"Really good staff, neither too intrusive nor too dismissive, Brought our two year old and they handled it well. Ordered the pizza, met expectations. Nice to write a good review." [read more](#)

Offers takeout and delivery [Start Order](#)



Lots of Data!

Locations

Step 3: Define Strategy and Metrics

Step 3: Define Strategy and Metrics

Here we created a blueprint for what we're targeting:

Americans:

- Ideally, we need thousands of records from Americans in hundreds of different cities. (Large samples)

Preference:

- Number of Yelp Reviews (More = Preference)
- Average Aggregated Ratings (Higher = Preference)

Italian and Mexican Food:

- Top 20 Italian and Mexican restaurants in every city

Step 3: Define Strategy and Metrics

Repeat this analysis for as many cities as possible.

New York, NY	
Italian	Mexican
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	VS.
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	Restaurant

Tucson, AZ	
Italian	Mexican
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	VS.
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	Restaurant

Washington, D.C.	
Italian	Mexican
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	VS.
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	Restaurant

Omaha, NE	
Italian	Mexican
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	VS.
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	Restaurant

San Diego, CA	
Italian	Mexican
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	VS.
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	Restaurant

Atlanta, GA	
Italian	Mexican
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	VS.
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	Restaurant

Step 4: Build Data Retrieval Plan

Step 4: Build Data Retrieval Plan

We could retrieve this data by brute force, but it would be:

- Extremely time consuming
- Skewed by our city familiarity
- Labor intensive

The image displays three separate instances of a Yelp search interface, each with a red header and a white search bar. Each instance shows the Yelp logo on the left, followed by the text "Find Mexican" and a search bar containing "Near [city, state]". The first instance is for New York, NY; the second for Denver, CO; and the third for Oklahoma City, OK. Each instance also features a red search button with a white magnifying glass icon.

Step 4: Build Data Retrieval Plan

Basically, it would be nearly impossible.

The image displays three separate instances of a red-themed Yelp search interface. Each instance includes the Yelp logo, a search bar with the text "Find Mexican", a location selector with "Near" followed by a city and state (e.g., "New York, NY"), and a search button. The three instances represent different geographical locations: New York, NY; Denver, CO; and Oklahoma City, OK.

Thank You, Yelp!

Thankfully, we can take advantage of the **Yelp Fusion API** to programmatically run our queries. (#ThankGoodnessForProgramming)

The screenshot shows the Yelp Fusion API documentation page. The left sidebar has sections for General (Create App, Email / Notifications, Display Requirements, Terms of Use, FAQ), Yelp Fusion (Introduction, Business Endpoints, Business Search, Phone Search), and a search bar. The main content area is titled '/businesses/search' and describes the endpoint for returning up to 1000 businesses based on search criteria. It includes a note about reviews and a 'Request' section with a GET method and URL. The 'Parameters' section lists 'term' and 'location' with their descriptions.

/businesses/search

This endpoint returns up to 1000 businesses based on the provided search criteria. It has some basic information about the business. To get detailed information and reviews, please use the Business ID returned here and refer to [/businesses/{id}](#) and [/businesses/{id}/reviews](#) endpoints.

Note: at this time, the API does not return businesses without any reviews.

Request

```
GET https://api.yelp.com/v3/businesses/search
```

Parameters

These parameters should be in the query string.

Name	Type	Description
term	string	Optional. Search term, for example "food" or "restaurants". The term may also be business names, such as "Starbucks". If term is not included the endpoint will default to searching across businesses from a small number of popular categories.
location	string	Required if either latitude or longitude is not provided. This string indicates the geographic area to be used when searching for businesses. Examples: "New York City", "NYC", "350 5th Ave, New York, NY 10118". Businesses returned in the response may not be strictly within the specified location.

Thank You, Yelp!

Response Body

```
{  
  "total": 8228,  
  "businesses": [  
    {  
      "rating": 4,  
      "price": "$",  
      "phone": "+14152520800",  
      "id": "four-barrel-coffee-san-francisco",  
      "is_closed": false,  
      "categories": [  
        {  
          "alias": "coffee",  
          "title": "Coffee & Tea"  
        }  
      ],  
      "review_count": 1738,  
      "name": "Four Barrel Coffee",  
      "url": "https://www.yelp.com/biz/four-barrel-coffee-san-francisco",  
      "coordinates": {  
        "latitude": 37.7670169511878,  
        "longitude": -122.42184275  
      },  
      "image_url": "http://s3-media2.fl.yelpcdn.com/bphoto/MmgtASP3l_t4tPCL1iAsCg/o.jpg",  
      "location": {  
        "city": "San Francisco",  
        "country": "US",  
        "address2": "",  
        "address3": "",  
        "state": "CA",  
        "address1": "375 Valencia st",  
        "zip_code": "94103"  
      },  
      "distance": 1604.23,  
      "transactions": ["pickup", "delivery"]  
    },  
    // ...  
  ],  
  "region": {  
    "center": {  
      "latitude": 37.767413217936834,  
      "longitude": -122.42828739746094  
    }  
  }  
}
```



Step 4: Build Data Retrieval Plan

We will build a Python script to randomly select over 700 zip codes from the U.S. Census, and then acquire review data from the top 20 Mexican and Italian restaurants for each zip code using the Yelp API.



11101	
Italian	Mexican
Restaurant	Restaurant

07360	
Italian	Mexican
Restaurant	Restaurant

20001	
Italian	Mexican
Restaurant	Restaurant

68007	
Italian	Mexican
Restaurant	Restaurant

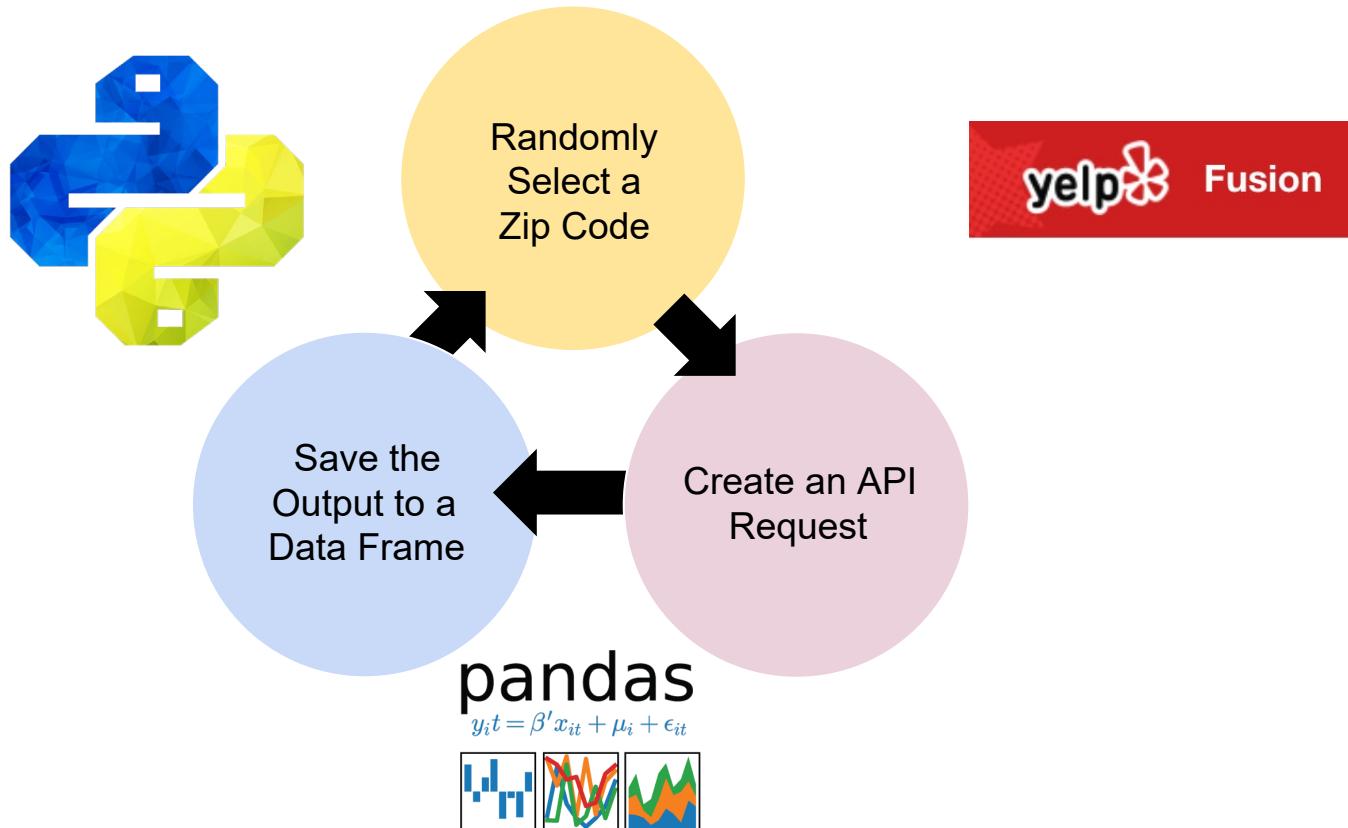
22434	
Italian	Mexican
Restaurant	Restaurant

30301	
Italian	Mexican
Restaurant	Restaurant

A diagram illustrating the data retrieval process. It starts with the "United States Census Bureau" logo, which has a yellow arrow pointing down to a red header bar of a web application. The header bar includes the "yelp fusion" logo, "Fusion", "Fusion API", "GraphQL", and "Manage App". Below the header is a light blue main area featuring the "yelp fusion" logo and an illustration of three computer monitors with various data visualizations. A user icon is visible in the top right corner of the main area.

Step 5: Retrieve the Data

Pulling with Python



Pulling with Python

```
# Use Try-Except to handle errors
try:

    # Loop through all records to calculate the review count and weighted review value
    for business in yelp_reviews_italian["businesses"]:

        italian_review_count = italian_review_count + business["review_count"]
        italian_weighted_review = italian_weighted_review + business["review_count"] * business["rating"]

    for business in yelp_reviews_mexican["businesses"]:
        mexican_review_count = mexican_review_count + business["review_count"]
        mexican_weighted_review = mexican_weighted_review + business["review_count"] * business["rating"]

    # Append the data to the appropriate column of the data frames
    italian_data.set_value(index, "Zip Code", row["Zipcode"])
    italian_data.set_value(index, "Italian Review Count", italian_review_count)
    italian_data.set_value(index, "Italian Average Rating", italian_weighted_review / italian_review_count)
    italian_data.set_value(index, "Italian Weighted Rating", italian_weighted_review)

    mexican_data.set_value(index, "Zip Code", row["Zipcode"])
    mexican_data.set_value(index, "Mexican Review Count", mexican_review_count)
    mexican_data.set_value(index, "Mexican Average Rating", mexican_weighted_review / mexican_review_count)
    mexican_data.set_value(index, "Mexican Weighted Rating", mexican_weighted_review)

except:
    print("Uh oh")
```



This funky code...

Pulling with Python

```
1 https://api.yelp.com/v3/businesses/search?term=Italian&location=76556  
https://api.yelp.com/v3/businesses/search?term=Mexican&location=76556  
2 https://api.yelp.com/v3/businesses/search?term=Italian&location=72039  
https://api.yelp.com/v3/businesses/search?term=Mexican&location=72039  
3 https://api.yelp.com/v3/businesses/search?term=Italian&location=61606  
https://api.yelp.com/v3/businesses/search?term=Mexican&location=61606  
4 https://api.yelp.com/v3/businesses/search?term=Italian&location=47232  
https://api.yelp.com/v3/businesses/search?term=Mexican&location=47232  
5 https://api.yelp.com/v3/businesses/search?term=Italian&location=60565  
https://api.yelp.com/v3/businesses/search?term=Mexican&location=60565  
6 https://api.yelp.com/v3/businesses/search?term=Italian&location=20634  
https://api.yelp.com/v3/businesses/search?term=Mexican&location=20634  
7 https://api.yelp.com/v3/businesses/search?term=Italian&location=71046  
https://api.yelp.com/v3/businesses/search?term=Mexican&location=71046
```



...will make all of
these URLs.

Pulling with Python

GET https://api.yelp.com/v3/businesses/search?term=Italian&location=37764... Params Send Save

Headers (1) Authorization Body Pre-request Script Tests Code

Key	Value	Description	...	Bulk Edit	Presets ▾
<input checked="" type="checkbox"/> Authorization	Bearer gl6k6jnewUhjMVbvoI2x4Bz_NRIEggSjIGbTaejmzbvBJXgJ36F...				
New key	Value	Description			

Body Cookies Headers (10) Tests Status: 200 OK Time: 665 ms

Pretty Raw Preview JSON

```
1 {  
2   "businesses": [  
3     {  
4       "id": "two-brothers-italian-pizza-kodak",  
5       "name": "Two Brothers Italian Pizza",  
6       "image_url": "https://s3-media3.fl.yelpcdn.com/bphoto/364BqQt0qtVH1f0t_xznA/o.jpg",  
7       "is_closed": false,  
8       "url": "https://www.yelp.com/biz/two-brothers-italian-pizza-kodak?adjust_creative=1Gw2yE0zIjSujpHtlMnodQ&utm_campaign=yelp_api_v3&utm_medium=  
9         _api_v3_business_search&utm_source=1Gw2yE0zIjSujpHtlMnodQ",  
10      "review_count": 8,  
11      "categories": [  
12        {  
13          "alias": "pizza",  
14          "title": "Pizza"  
15        },  
16        {  
17          "alias": "italian",  
18          "title": "Italian"  
19        },  
20        {  
21          "alias": "pastashops",  
22          "title": "Pasta Shops"  
23        },  
24      ],  
25      "rating": 2,  
26      "coordinates":  
27        {  
28          "latitude": 35.9638662447754,  
29          "longitude": -83.5926620147413  
30        },  
31      "transactions": [],  
32      "location": {  
33        "address1": "1000 W Broad St",  
34        "address2": null,  
35        "city": "Columbus",  
36        "state": "OH",  
37        "zip_code": "43228",  
38        "country": "US",  
39        "cross_streets": "Highland Ave & Broad St",  
40        "display_address": ["1000 W Broad St", "Columbus, OH 43228"],  
41        "distance": 1000, "lat": 35.9638662447754, "lon": -83.5926620147413, "latlng": [35.9638662447754, -83.5926620147413],  
42        "neighborhood": "University District",  
43        "postcode": "43228",  
44        "region": "Columbus, OH",  
45        "regionality": "Columbus",  
46        "street": "1000 W Broad St",  
47        "unit": null  
48      }  
49    }  
50  }  
51 }
```



Each of these URLs holds a piece of our answer.

Step 6: Assemble and Clean the Data

Cleaning with Pandas

No data comes out intrinsically the way you want it to.

In our case, we needed multiple steps to aggregate the data along our channels of interest.

```
# Combine DataFrames into a single DataFrame  
combined_data = pd.merge(mexican_data, italian_data, on="Zip Code")  
combined_data.head()
```

	Zip Code	Mexican Review Count	Mexican Average Rating	Mexican Weighted Rating	Italian Review Count	Italian Average Rating	Italian Weighted Rating
0	76556	97	4.1134	399	63	3.78571	238.5
1	72039	256	4.11133	1052.2	266	3.81955	1016
2	61606	378	3.64286	1377	66	3.2197	212.5
3	47232	222	4.16892	925.5	420	3.77857	1587
4	60565	2842	3.94053	11199	2829	3.92824	11113

Step 7: Analyze for Trends

Analyze for Trends (Table)

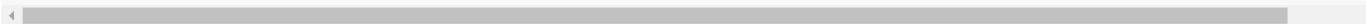
It's Close:

Display Summary of Results

```
# Model 1: Head-to-Head Review Counts
italian_summary = pd.DataFrame({"Review Counts": italian_data["Italian Review Count"].sum(),
                                 "Rating Average": italian_data["Italian Average Rating"].mean(),
                                 "Review Count Wins": combined_data["Review Count Wins"].value_counts()["Italian"],
                                 "Rating Wins": combined_data["Rating Wins"].value_counts()["Italian"], index=["Italian"]})

mexican_summary = pd.DataFrame({"Review Counts": mexican_data["Mexican Review Count"].sum(),
                                 "Rating Average": mexican_data["Mexican Average Rating"].mean(),
                                 "Review Count Wins": combined_data["Review Count Wins"].value_counts()["Mexican"],
                                 "Rating Wins": combined_data["Rating Wins"].value_counts()["Mexican"], index=["Mexican"]})

final_summary = pd.concat([mexican_summary, italian_summary])
final_summary
```



	Rating Average	Rating Wins	Review Count Wins	Review Counts	
Mexican	3.826588	273	220	476889	
Italian	3.806869	245	298	573733	

Analyze for Trends (Ratings)

Yelpers rate Italian and Mexican relatively **equally**.

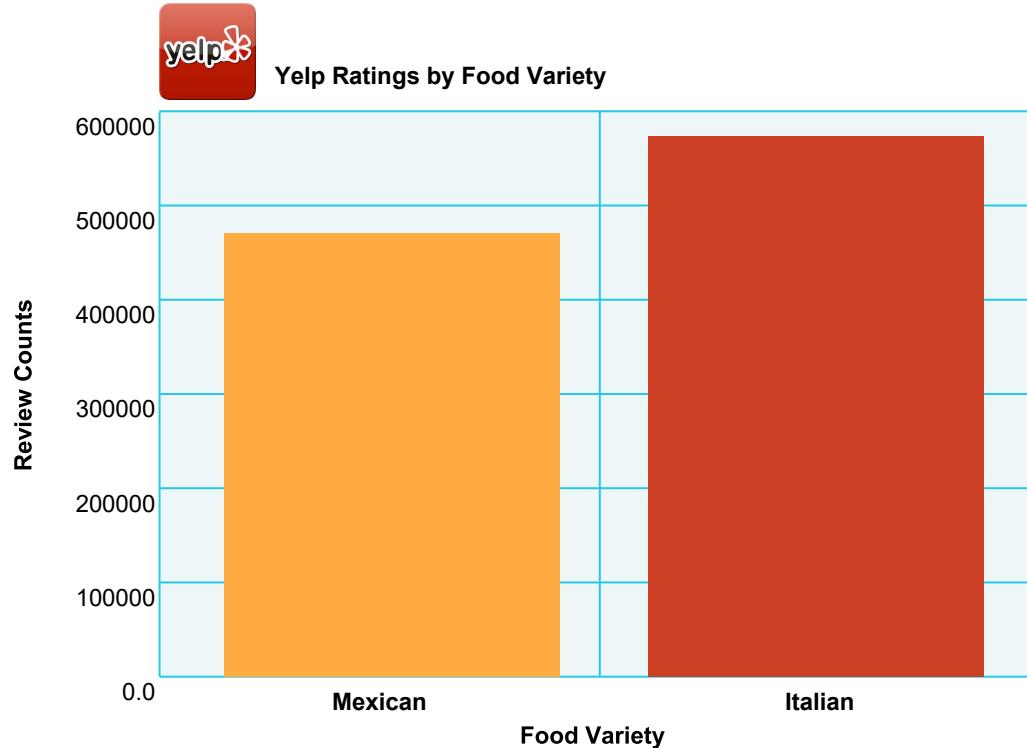


=



Analyze for Trends (Ratings)

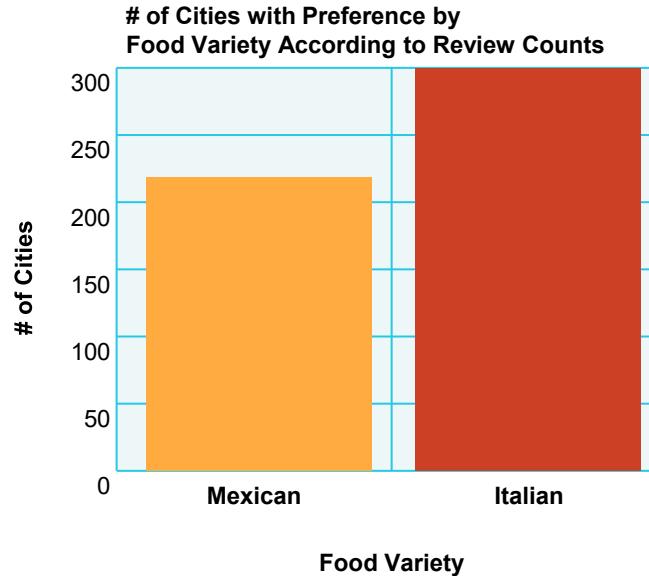
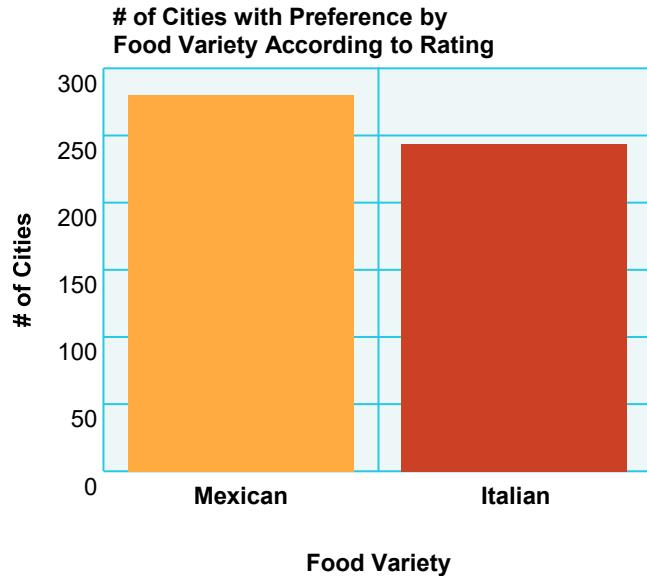
Yelpers seem to significantly **review more Italian** restaurants.



Analyze for Trends (Winner Take All)

Just for kicks, let's throw in an analysis that aggregates the data from all cities using a winner-take-all approach.

It's sort of a wash.



Analyze for Trends (Statistical Analysis)

Because of how close the numbers appear, we utilized a Student's t-test to quickly assess if the perceived differences are not statistically significant but could be considered substantial.

Metric	Italian	Mexican	p-Value (t-test)
Average Rating	3.806	3.826	0.284
Review Counts	573k	476k	0.057



The difference in review count is **not statistically significant**.

Step 8: Acknowledge Limitations

Limitations of Analysis

Yelp demographics may not match the American demographic.



Limitations of Analysis

Restaurant experiences do not equate to home-cooked meals.



Limitations of Analysis

Fine-dining effect?



Step 9: Make the Call

Making the Call

The “Proper” Conclusion:

Based on our analysis, it's clear that Americans' preferences for Italian and Mexican food are similar in nature. As a whole, Americans rate Mexican and Italian restaurants at non-statistically similar scores (avg. score: 3.8, p-value: 0.285). Although there are more reviews for Italian restaurants, we have shown that the difference isn't statistically significant (+96k, p -value: 0.057).



This may indicate there is an increased interest in visiting Italian restaurants at an experiential level. Or it may merely suggest that Yelp users enjoy writing reviews of Italian restaurants more than Mexican restaurants.

Making the Call

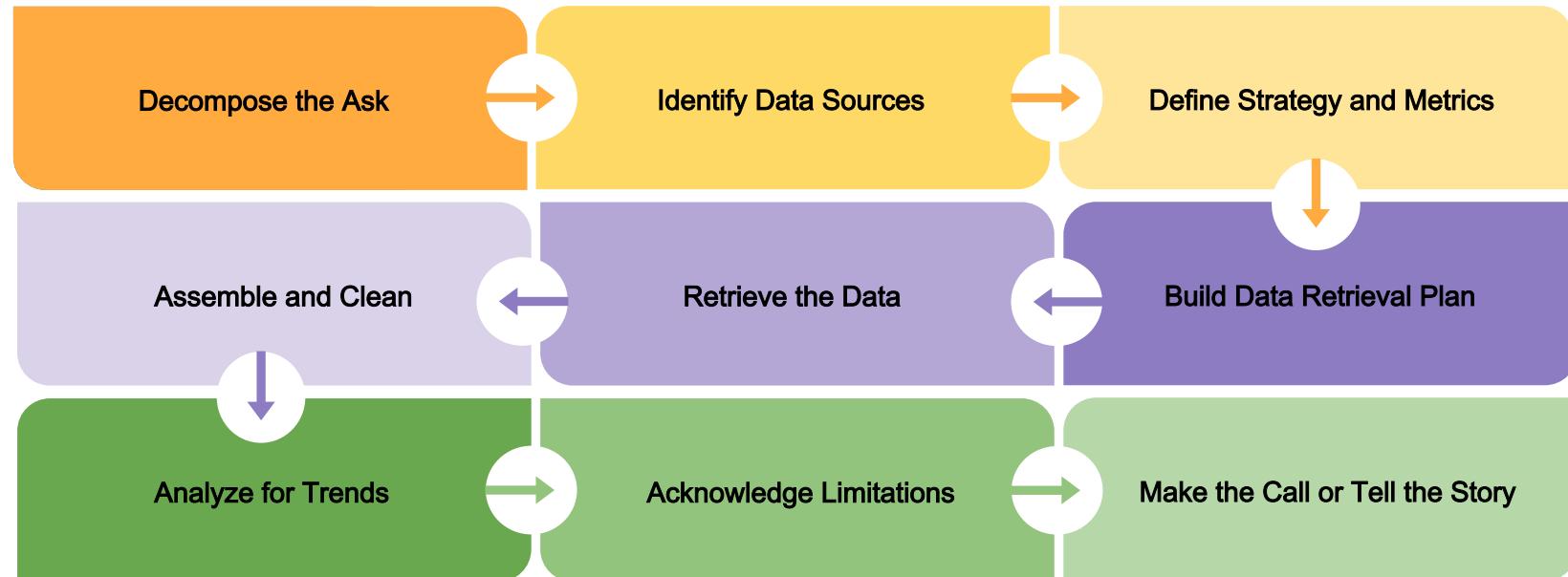
The “Let’s Be Real” Conclusion: Italian (but it’s going to be close).

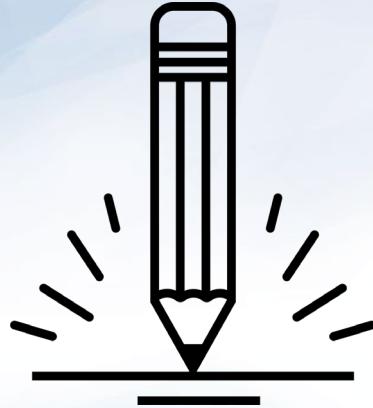


An Analytics Paradigm

Analytics Paradigm

Regardless of type or industry, this paradigm provides a repeatable pathway for effective data problem solving.





Group Activity: Predicting Gentrification

Using the Analytics Paradigm as a framework, outline a strategy by which you would identify which neighborhoods in our city are seeing signs of gentrification.

Suggested Time:
13 minutes



Group Activity: Predicting Gentrification

Specifically, how would you answer these questions:



What observable signs can we detect to suggest gentrification is happening?



What means can we use to determine how long the trend has been happening?



What proxies might we use to identify gentrification in non-obvious ways?



How might you create a visualization of this data to best “tell the story”?

Pay special attention to details like:



What data will you use to build your model?



How will you retrieve the data?



What does your final “story” look like?

Suggested Time: 13 minutes





Time's Up! Let's Review.

Homework: Kickstart My Chart

Prepare for Next Class

By Next Class:

01

Make certain that you have Microsoft Excel installed.

02

Make certain that you have Slack installed and are actively looking at it.

03

Figure out where the Git repository for our class is.

04

Figure out where class videos will be posted.

Questions?