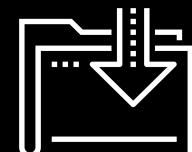




Zen of Data

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

Find a Table

Start Order

Laurel Heights

3226 Geary Blvd
San Francisco, CA 94118
(415) 379-4549

Find a Table

Start Order

1. Aracy Cafe

★★★★★ 113 reviews

\$\$ · American (New), Venues & Event

This restaurant takes reservations

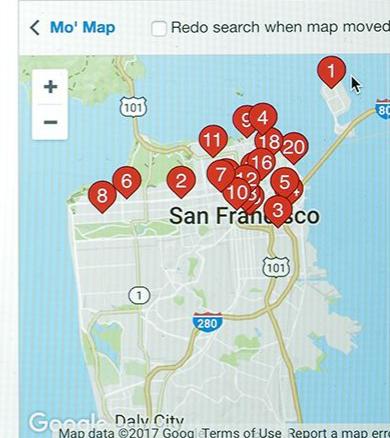
Get 7% Cash Back when you dine here

Order Delivery

Order Pickup

Make a Reservation

All Filters



salutemarinabay.com ▾

Salute E Vita - Italian Food - Waterfront DinningEnjoy authentic Italian dishes with breathtaking views of San Francisco Bay.
1900 Esplanade Dr. Richmond, CA

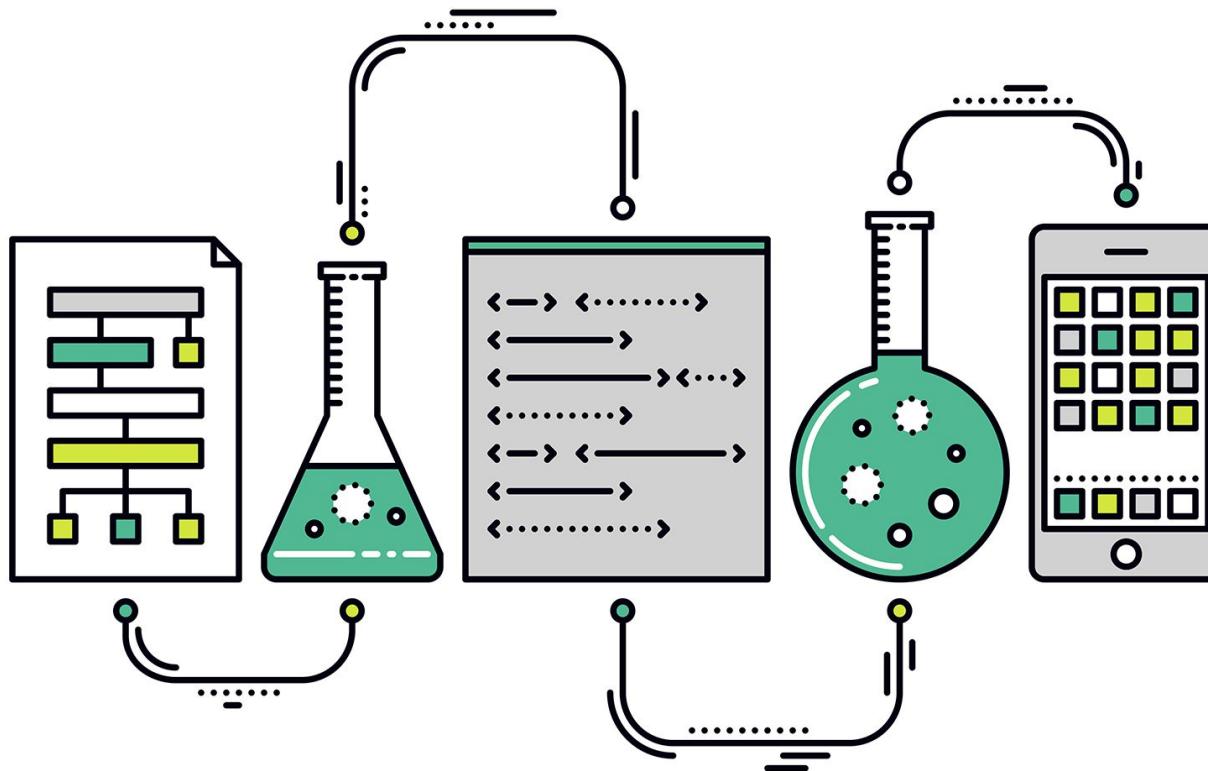
What does the term
data mean?



Perhaps you
are picturing
an Excel
spreadsheet.



Data Science Involves Spreadsheets and Formulas

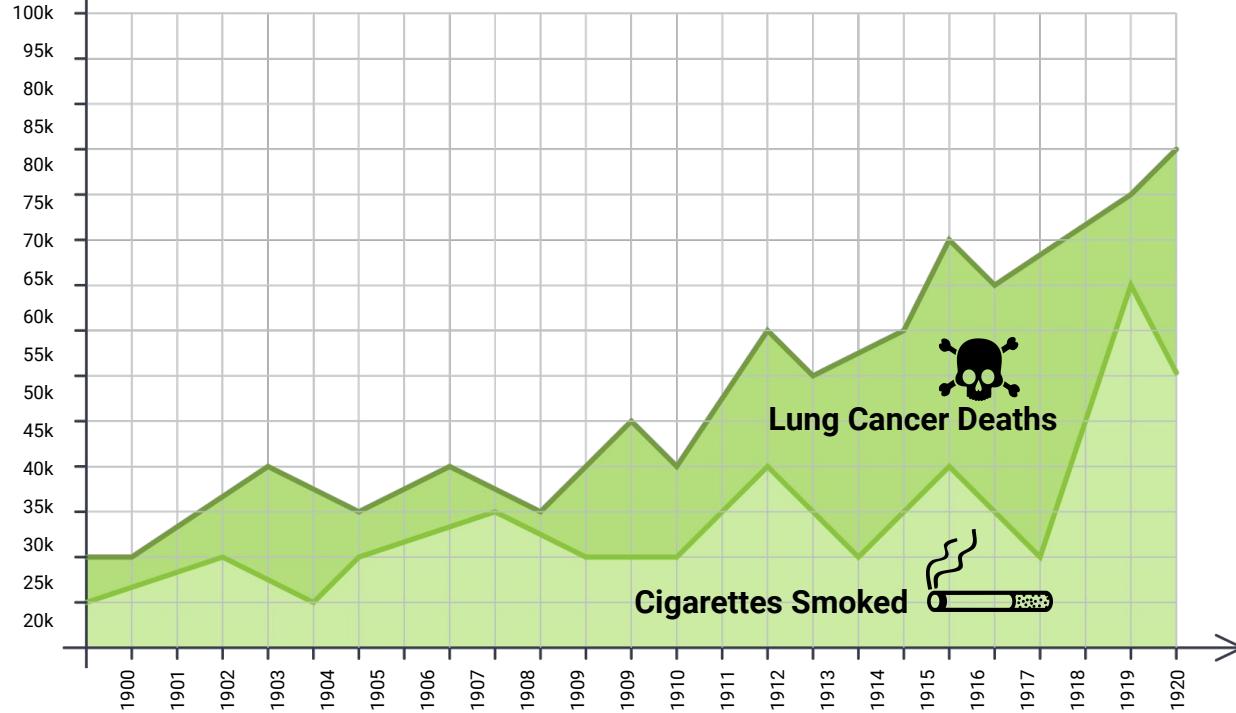




Fundamentally, data science
is about **storytelling** and
truth-telling.

Data as Truth-Telling

Lung Cancer Deaths per 100,000



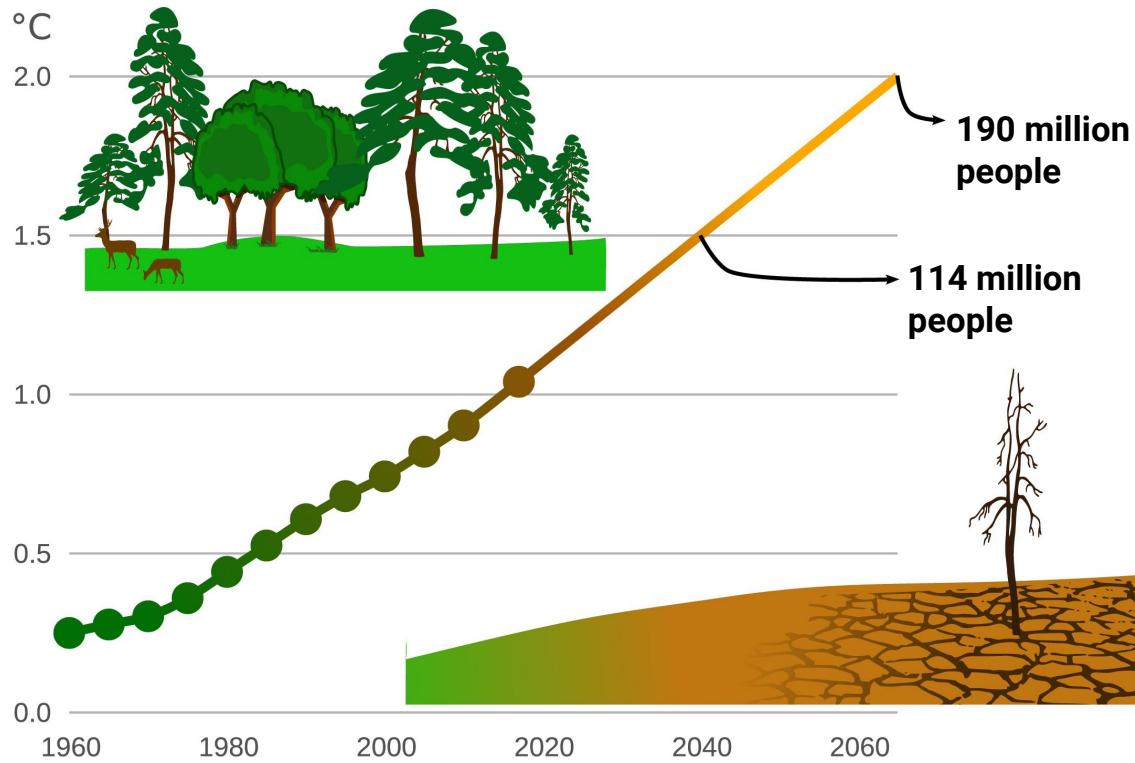
Data as
Truth-Telling
—
Unearthing
Relationships



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

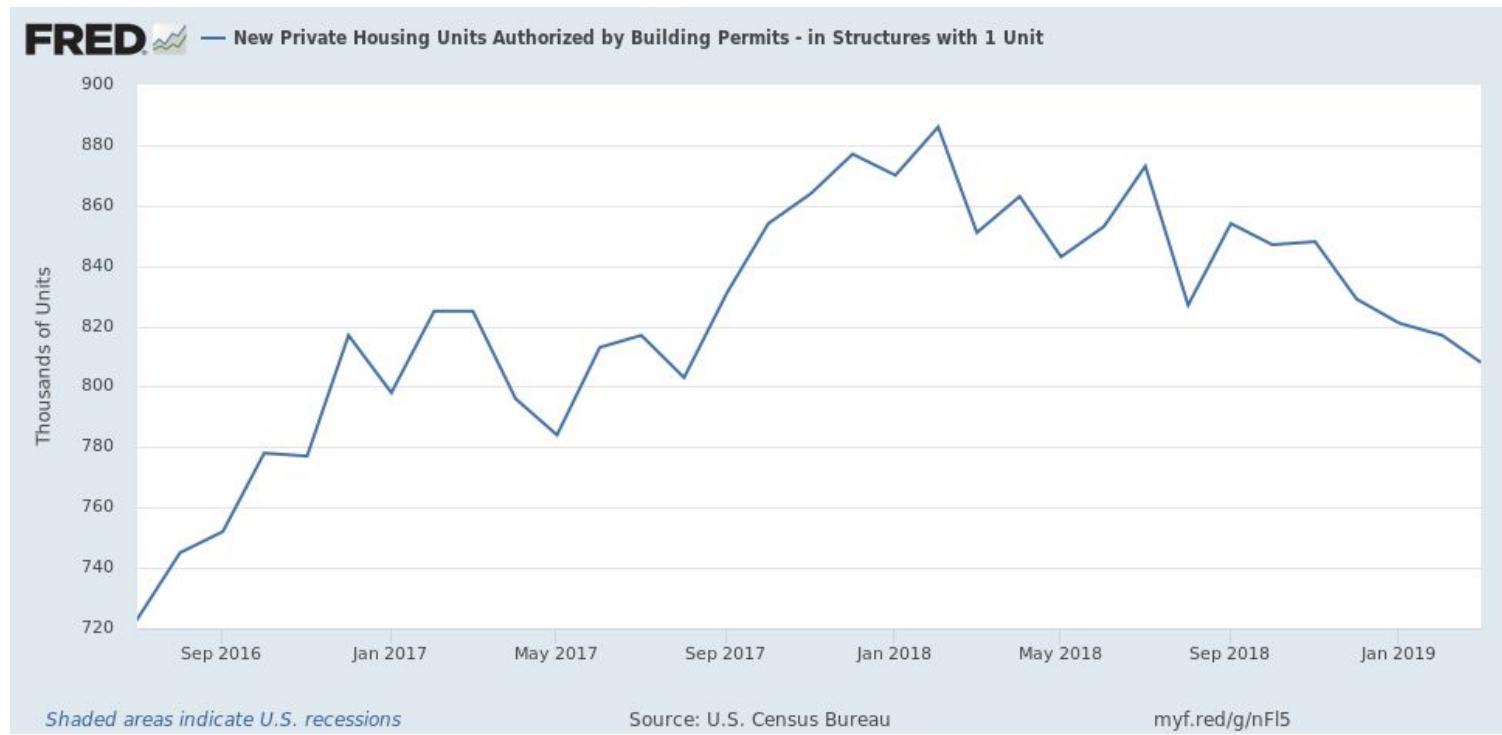
1790	29.6%	1835	0.0	1880	18.4	1925	21.6	1970	28.0
1791	29.2	1836	0.0	1881	16.8	1926	19.0	1971	28.1
1792	28.0	1837	0.2	1882	14.3	1927	18.0	1972	27.4
1793	24.4	1838	0.6	1883	13.5	1928	17.0	1973	26.0
1794	21.8	1839	0.2	1884	13.3	1929	14.9	1974	23.9
1795	18.7	1840	0.3	1885	13.2	1930	16.5	1975	25.3
1796	16.4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



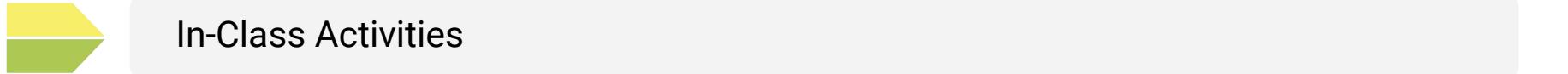
Instructor Lecture



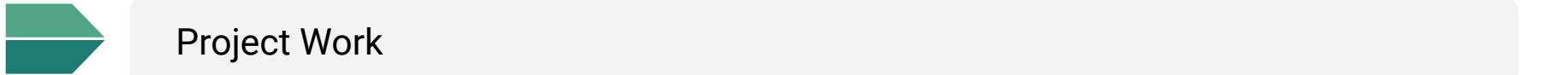
Instructor Demonstration



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 BeautifulSoup.

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

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

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 13–17

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

Week 11

Week 12

Week 13

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 14

Week 15

Week 16

Week 17

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

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 18–24

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.

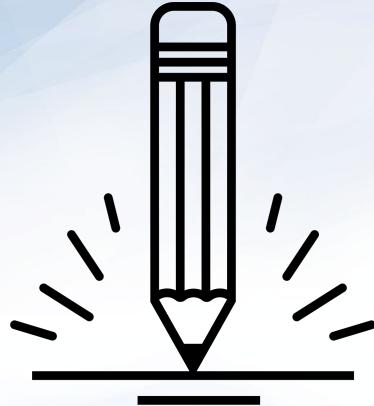
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Example Activity



Example Activity:

Banking Deserts

In this activity, you will use a variety of public demographic data and APIs to explain many real-world social phenomena. Utilize data from sources like the U.S. Census, Google Maps, and more to find insights on poverty, discrimination, and the impact of changing economies.

Suggested Time:
20 minutes

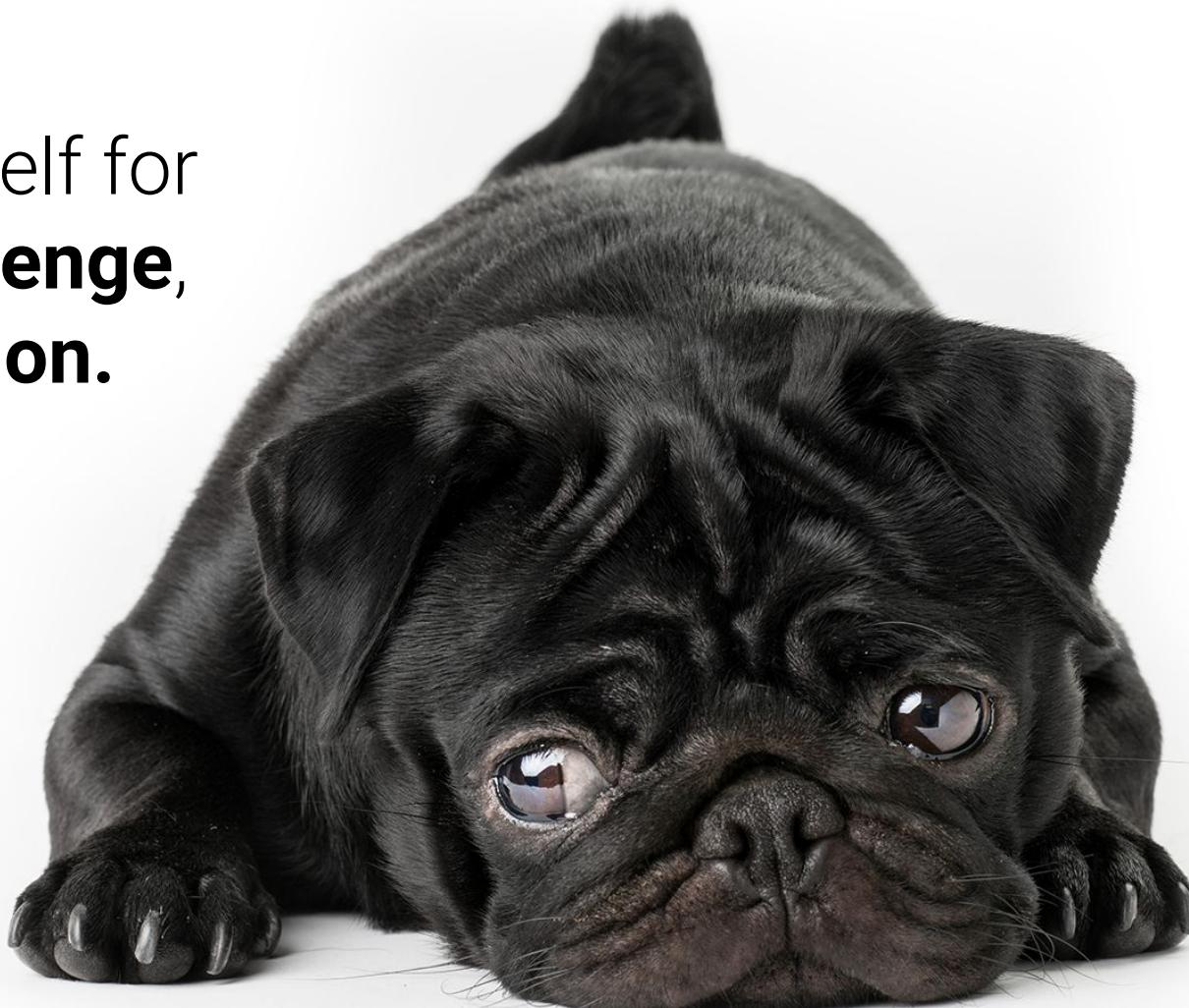


Helpful Tips

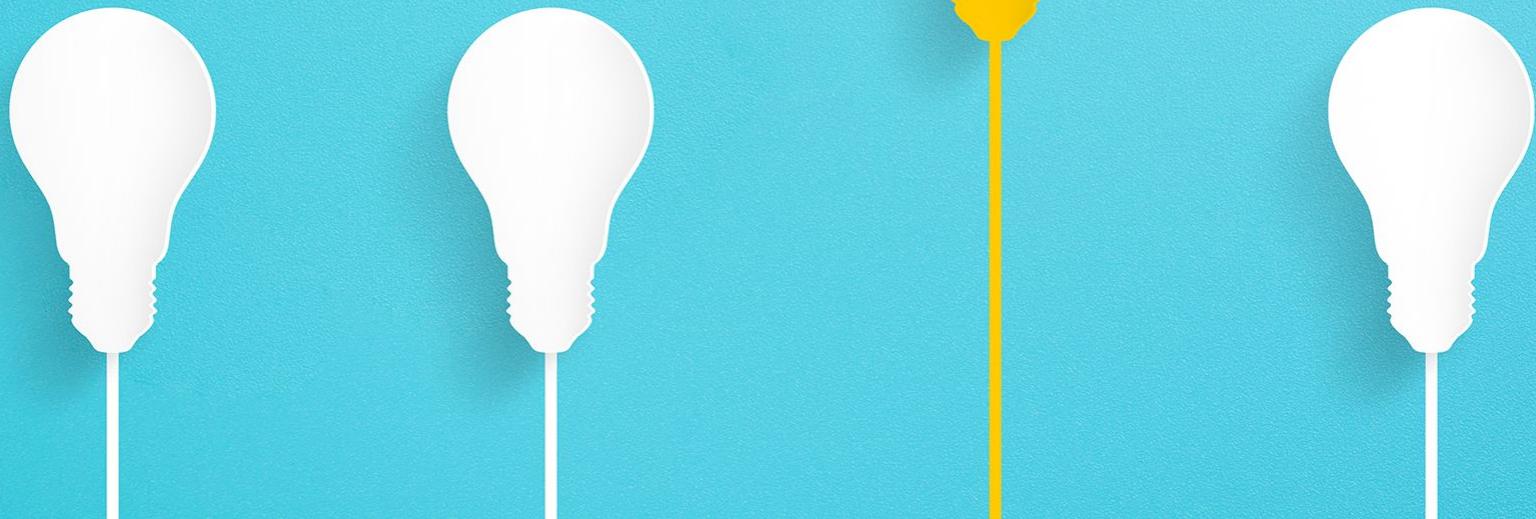
A close-up photograph of a baby with light blue eyes and a wide-open mouth, wearing a bright pink zip-up jacket. The baby is positioned behind a dark, wet surface with numerous water droplets. The baby's hands are placed flat against the surface, with water droplets visible on the fingers and palms.

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.

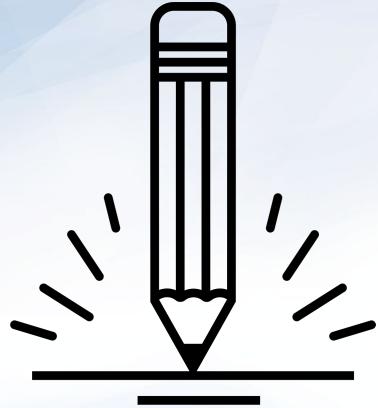


There is no shortcut.
You've got to **put in the hours!**



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

Celebrate your successes!



Group Activity:

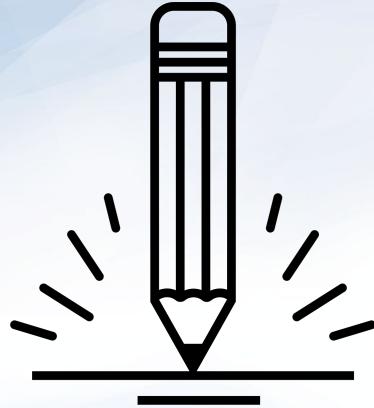
Form groups of 3 or 4 people. Get up from your seats and walk around.
Don't be shy!

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?

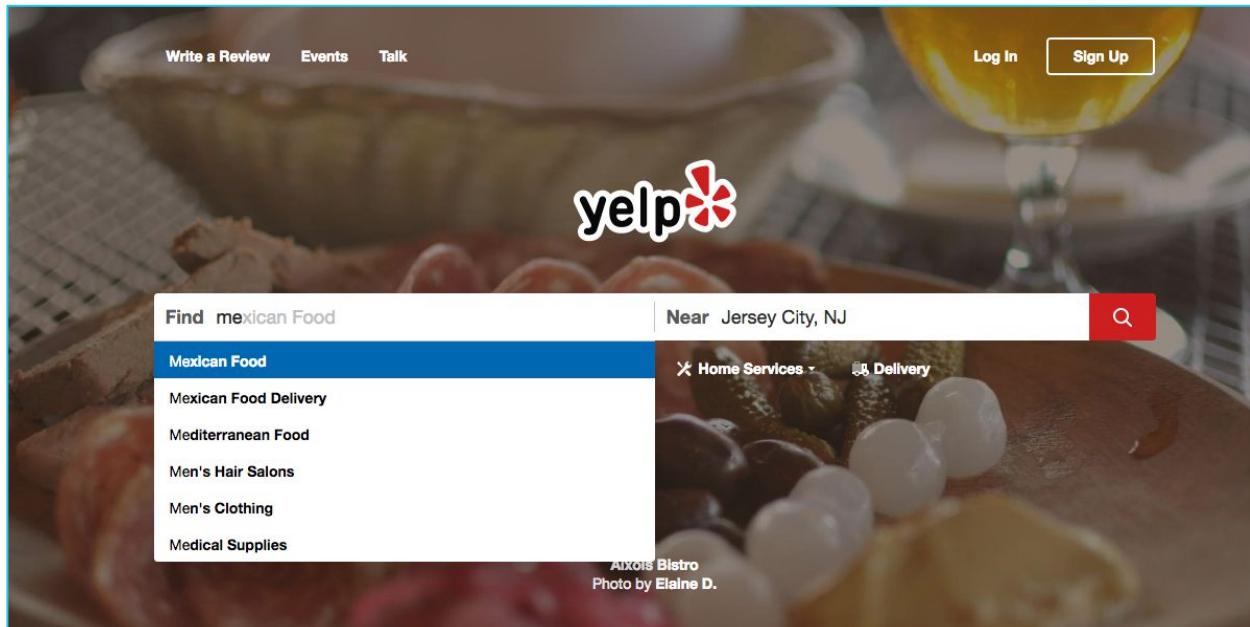


Italian and Mexican are **broad categories** we are pursuing. We will have to narrow the scope.

Step 2: Identify Data Sources

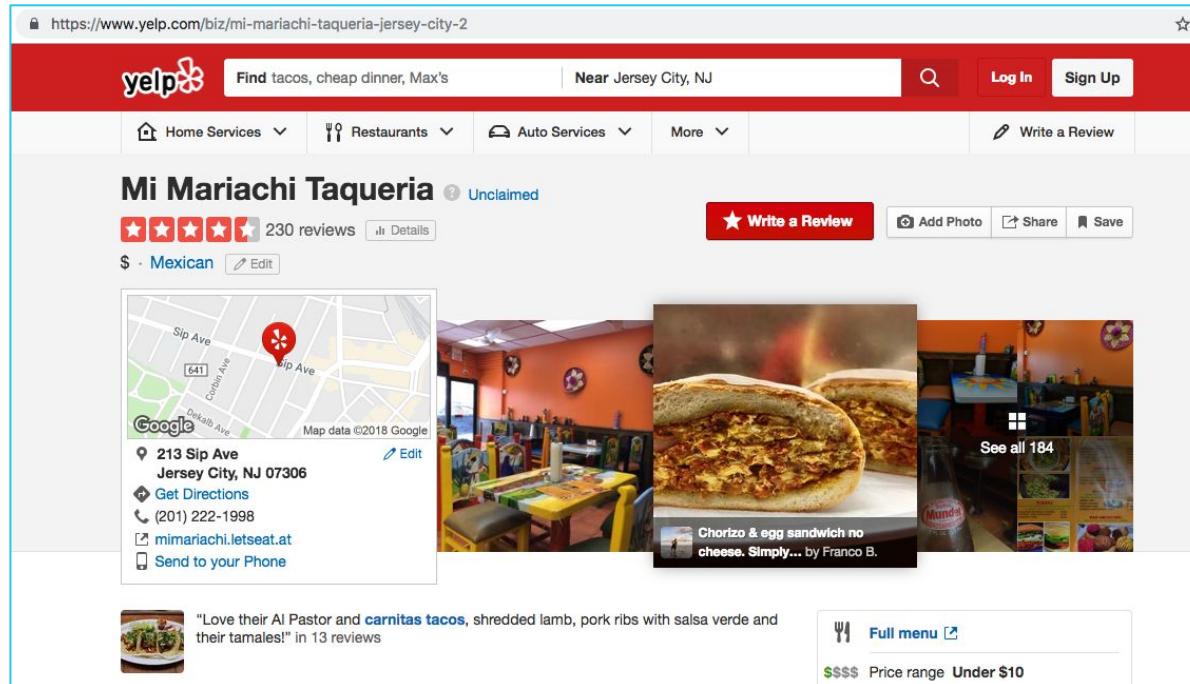
Step 2: Identify Data Sources

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 the Yelp logo, a search bar with the query 'Find tacos, cheap dinner, Max's Near Jersey City, NJ', and buttons for 'Log In' and 'Sign Up'. Below the search bar are category filters for 'Home Services', 'Restaurants', 'Auto Services', and 'More', along with a 'Write a Review' button. The main content area features the business name 'Mi Mariachi Taqueria' with an 'Unclaimed' status, a 4-star rating from 230 reviews, and a 'Write a Review' button. To the right are buttons for 'Add Photo', 'Share', and 'Save'. The business is categorized as '\$ Mexican'. A map shows the location at 213 Sip Ave, Jersey City, NJ 07306, with a red pin. Below the map are buttons for 'Get Directions' and 'Send to your Phone'. A large image of a sandwich is displayed, with a caption: 'Chorizo & egg sandwich no cheese. Simply... by Franco B.' Below the image are reviews, including one from a user who loves the Al Pastor and carnitas tacos. A 'Full menu' button is shown, along with price information: '\$\$\$' and 'Price range Under \$10'. A 'See all 184' button is also present.

Step 2: Identify Data Sources

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



zomato

Step 2: Identify Data Sources

Food Type



Find Best Italian Food

Near Jersey City, NJ

Log In Sign Up

Home Services Restaurants Auto Services More Write a Review

Best Italian Food Jersey City, NJ

Showing 1-30 of 3356

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

Ad 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](#)

Ad 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](#)

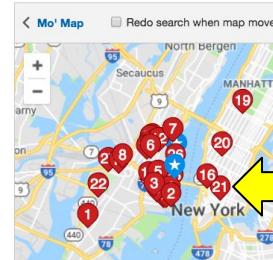
Offers takeout and delivery [Start Order](#)

Review Count



Lots of Data!

Rating



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

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

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

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

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

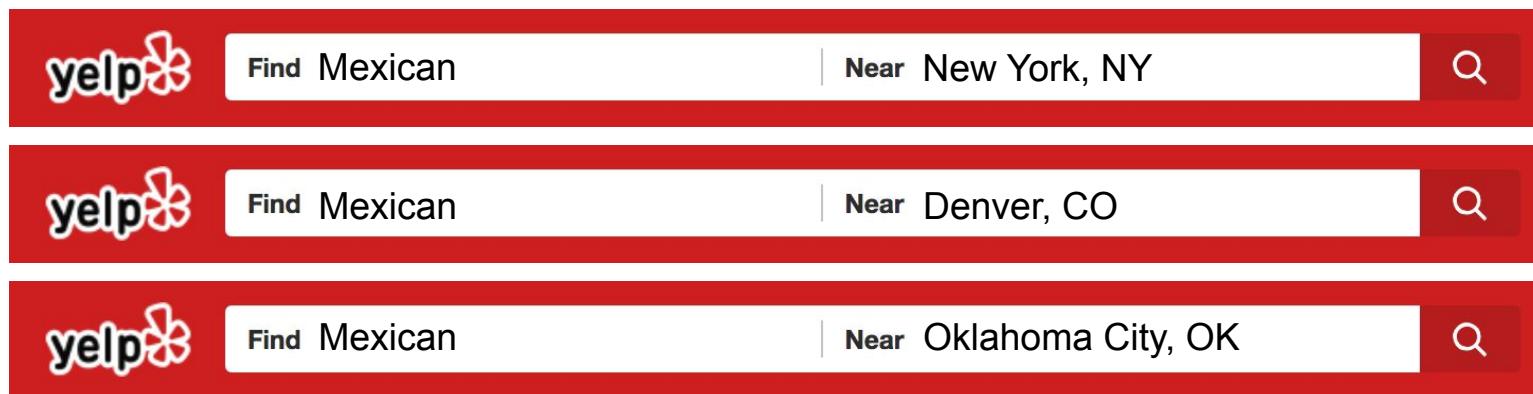
Atlanta, GA	
Italian	Mexican
Restaurant	Restaurant
Restaurant	Restaurant
Restaurant	VS.
Restaurant	Restaurant
Restaurant	Restaurant

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 identical Yelp search interface mockups, each showing results for Mexican restaurants. The interface includes a red header with the Yelp logo, a search bar with 'Find Mexican', a location input 'Near New York, NY', and a search button. The results section is hidden behind a red overlay.

Find Mexican

Near New York, NY

Find Mexican

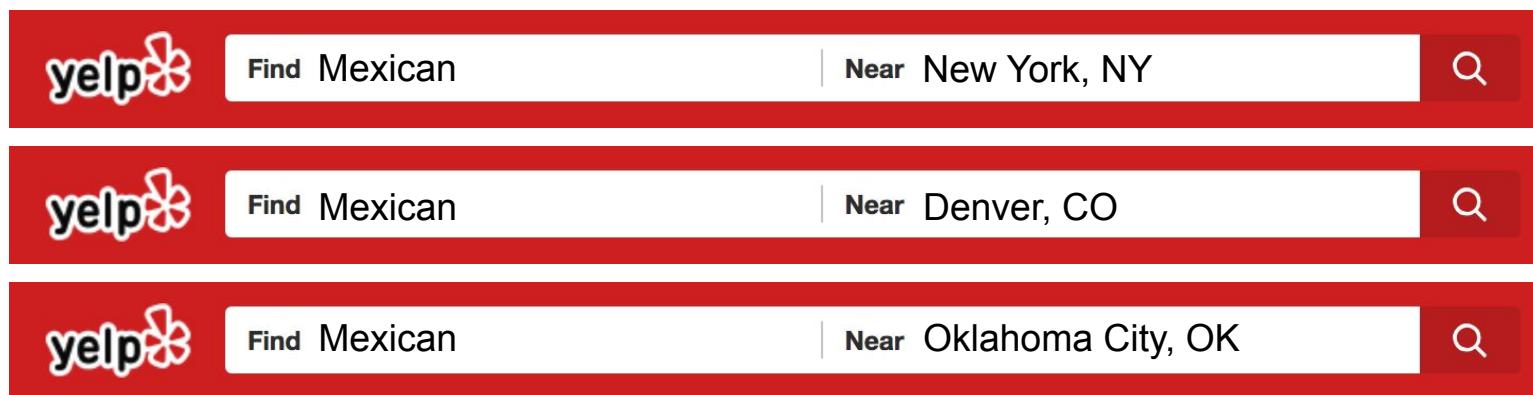
Near Denver, CO

Find Mexican

Near Oklahoma City, OK

Step 4: Build Data Retrieval Plan

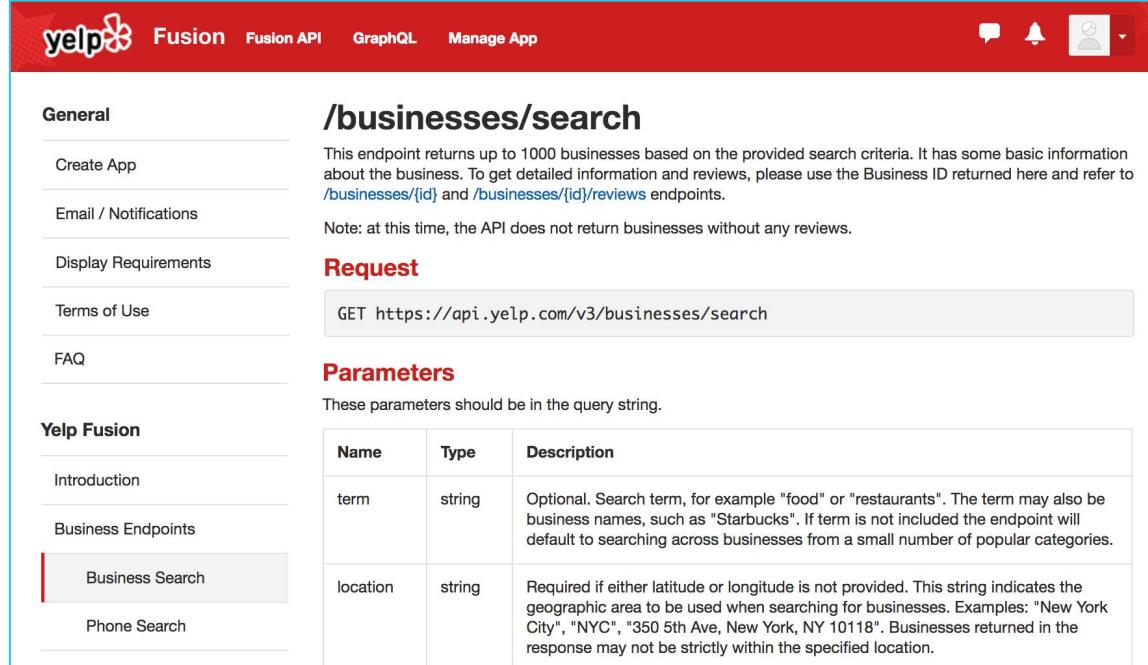
Basically, it would be nearly impossible.



The image displays three identical search interface mockups for the Yelp website, arranged vertically. Each interface features a red header with the Yelp logo on the left. To the right of the logo is a search bar with the placeholder text "Find Mexican". Further to the right is another search bar with the placeholder text "Near New York, NY". On the far right of each interface is a dark red search button containing a white magnifying glass icon. The three interfaces represent different search queries: the top one for New York, NY; the middle one for Denver, CO; and the bottom one for 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 for the `/businesses/search` endpoint. The left sidebar has a 'General' section with links to 'Create App', 'Email / Notifications', 'Display Requirements', 'Terms of Use', and 'FAQ'. Under 'Yelp Fusion', 'Business Search' is selected, while 'Phone Search' is also listed. The main content area has a red header with the endpoint name. It describes the endpoint as returning up to 1000 businesses based on search criteria. It notes that the API does not return businesses without reviews. A 'Request' section shows the GET method and URL: `https://api.yelp.com/v3/businesses/search`. The 'Parameters' section lists two required parameters: 'term' (string, search term like 'food' or 'restaurants') and 'location' (string, geographic area like 'New York City', 'NYC', '350 5th Ave, New York, NY 10118').

/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!

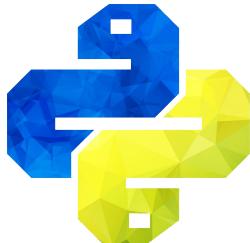
Response Body

```
{  
  "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/HmgtaSP31_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

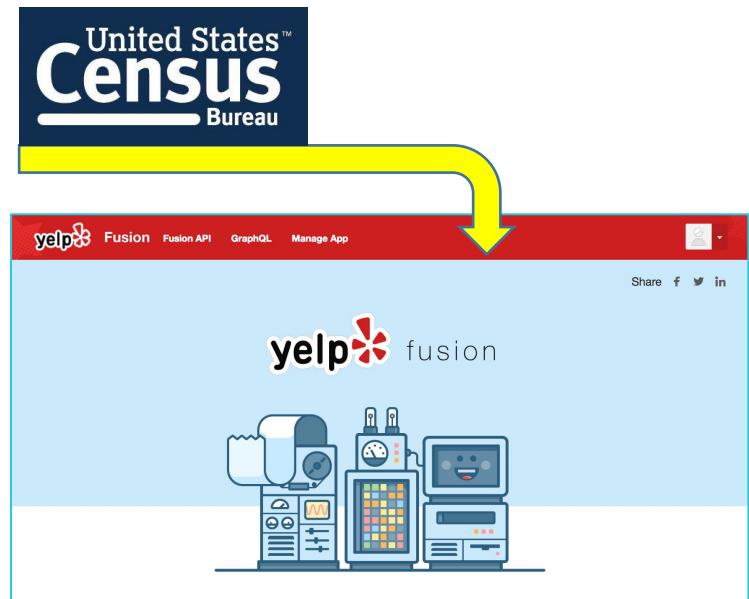
07360	
Italian	Mexican
Restaurant	Restaurant

20001	
Italian	Mexican
Restaurant	Restaurant

68007	
Italian	Mexican
Restaurant	Restaurant

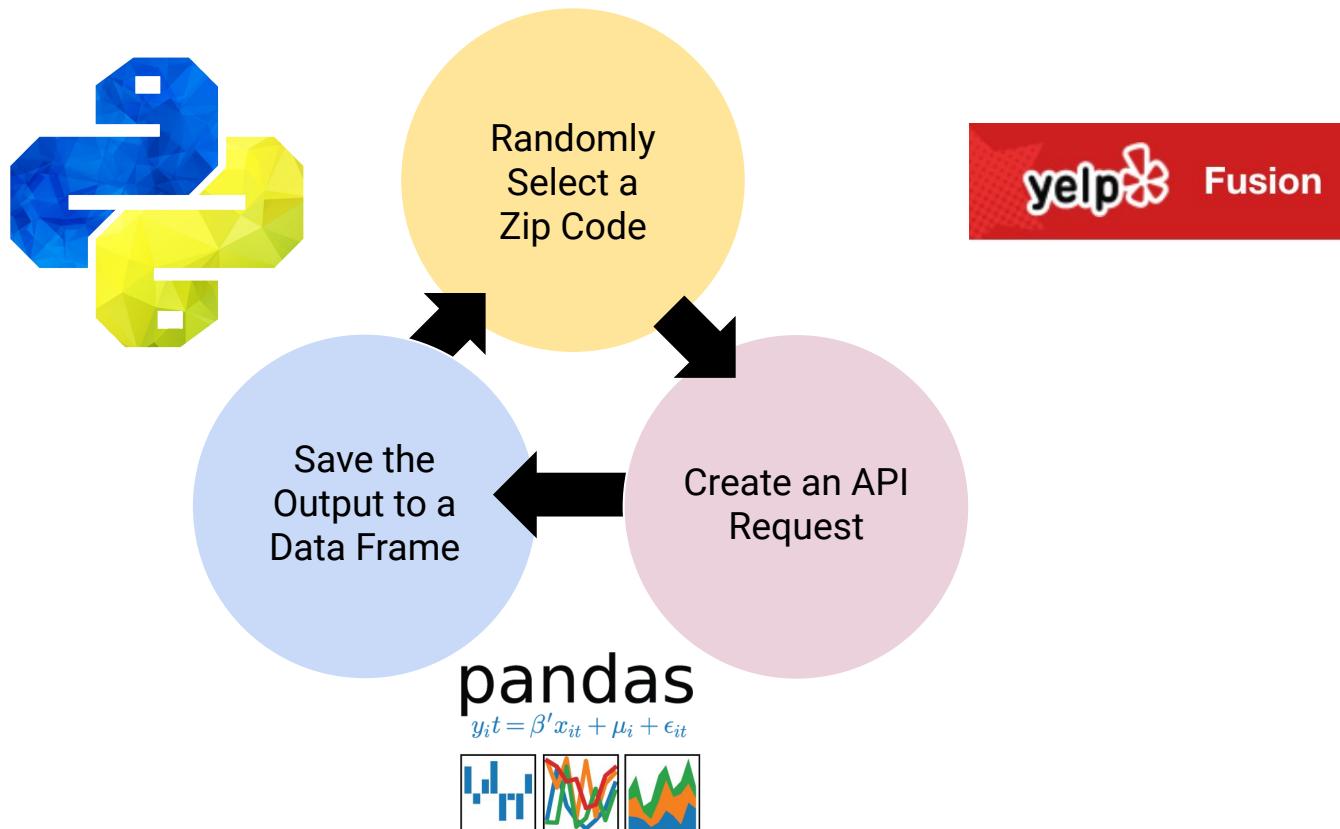
22434	
Italian	Mexican
Restaurant	Restaurant

30301	
Italian	Mexican
Restaurant	Restaurant



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...>

Headers (1) Body Pre-request Script Tests

Key	Value	Description	...	Bulk Edit	Presets
<input checked="" type="checkbox"/> Authorization	Bearer gl6k6JmewUhjMVbvo12x4Bz_NRIEggSjIjGbTaejmbzvBJXgj36F...				
New key	Value	Description			

Body Cookies Headers (10) Tests

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/364BqQt0qtVHV1f0t_xznA/o.jpg",  
7       "is_closed": false,  
8       "url": "https://www.yelp.com/biz/two-brothers-italian-pizza-kodak?adjust_creative=1GwZyE0zIjSujpHtlMnodQ&utm_campaign=yelp_api_v3&utm_medium=  
9         api_v3_business_search&utm_source=1GwZyE0zIjSujpHtlMnodQ",  
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 Peachtree Street NW",  
34        "address2": "Ste 1000",  
35        "city": "Atlanta",  
36        "state": "GA",  
37        "zip": "30309",  
38        "country": "US",  
39        "display_address": ["1000 Peachtree Street NW", "Ste 1000", "Atlanta", "GA 30309", "US"]  
40      }  
41    }  
42  ]  
43}  
44
```



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)

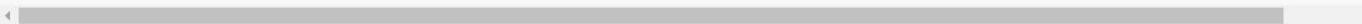
It's Close:

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"]}

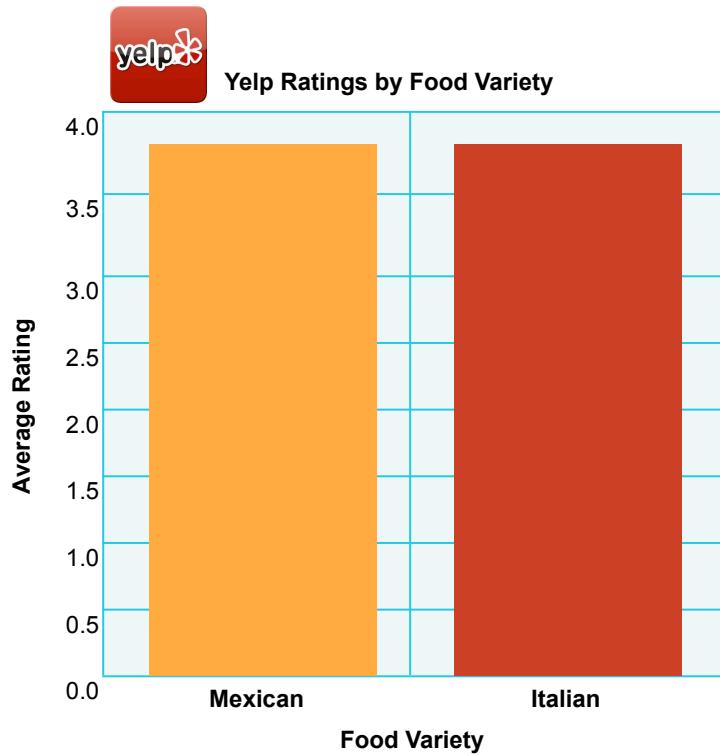
final_summary = pd.concat([mexican_summary, italian_summary])
final_summary
```



	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**.

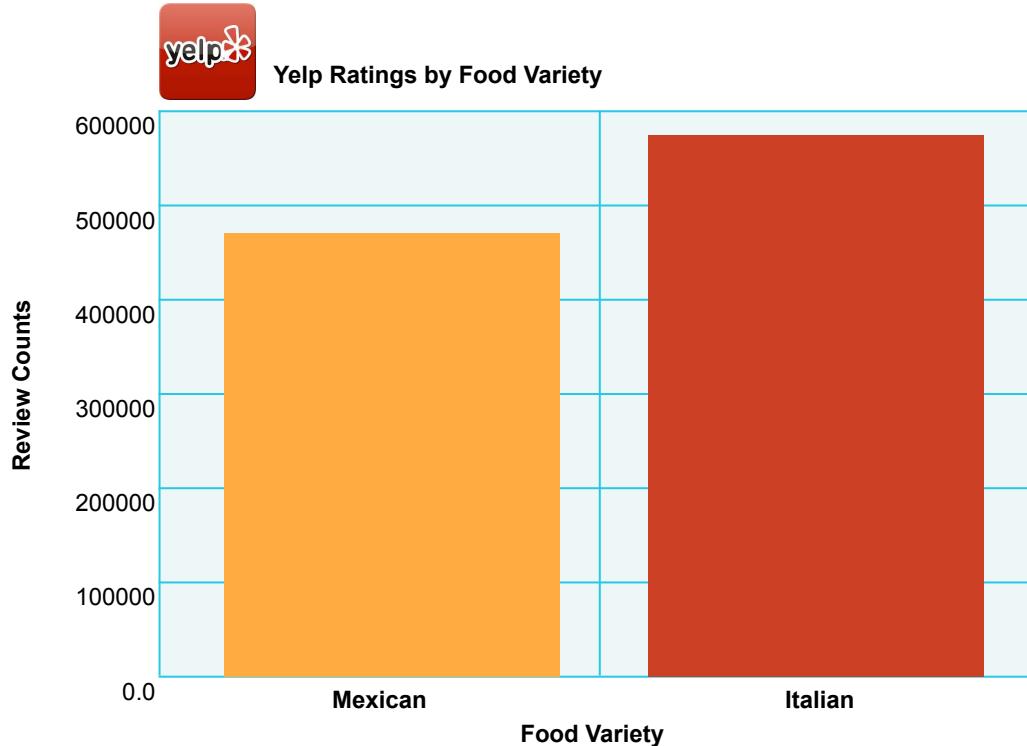


=



Analyze for Trends (Ratings)

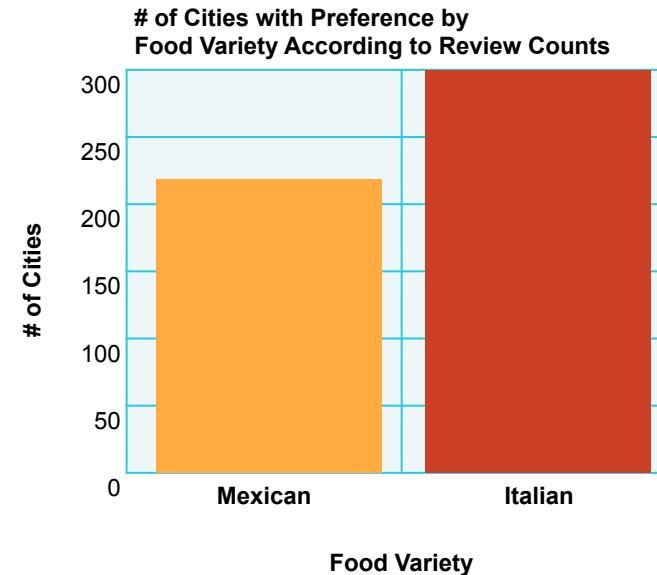
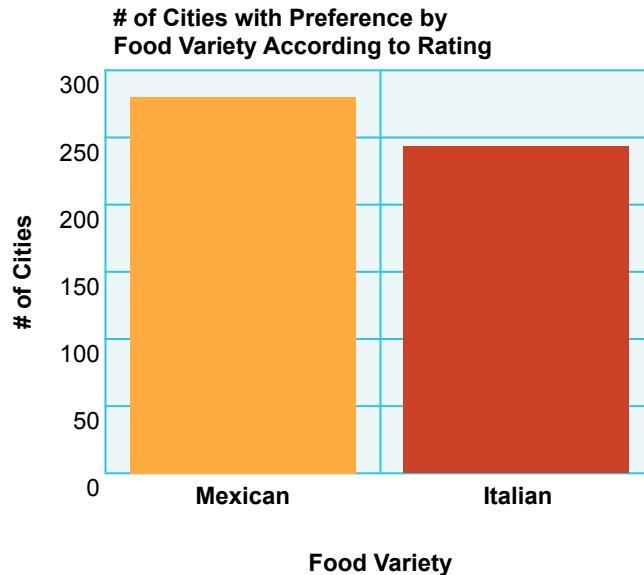
Yelpers seem to significantly **review more Italian** restaurants.



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

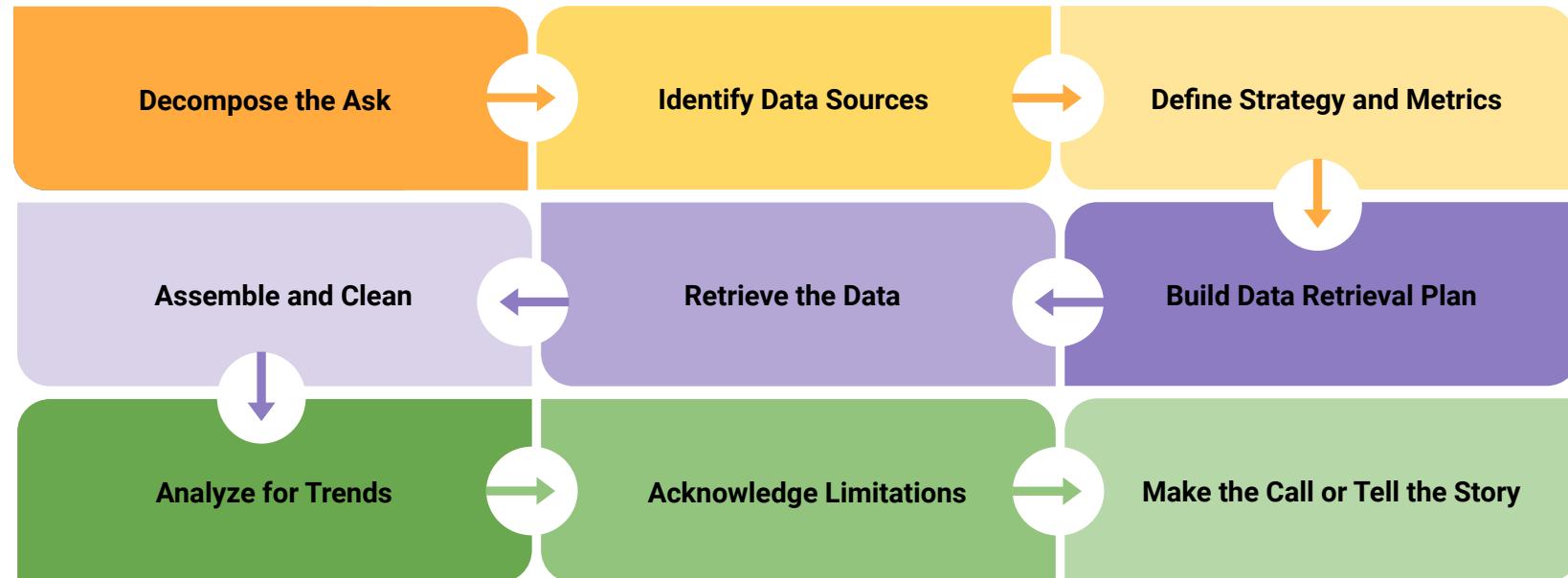
The “Let’s Be Real” Conclusion: Italian (but it’s going to be close).

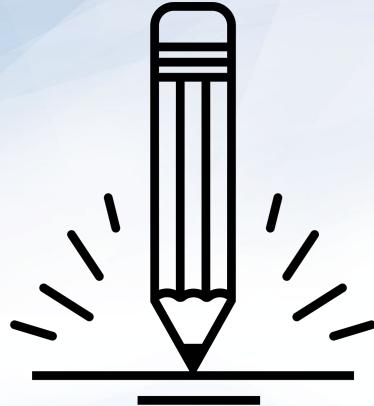


An Analytics Paradigm

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?