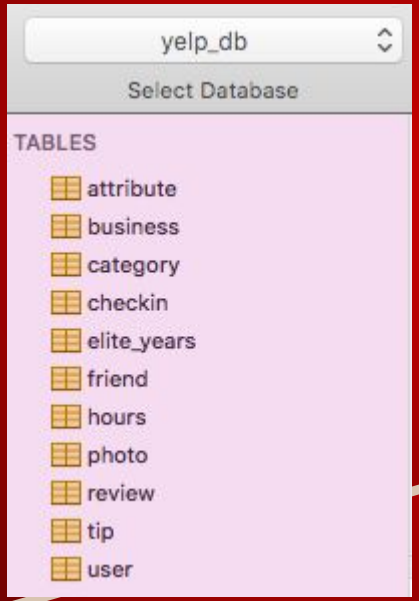
Analyzing Yelp Restaurant Reviews

By Cole Evans, Gustavo Grinsteins, Stephanie Stieber and Ruth Densamo

The Data Set



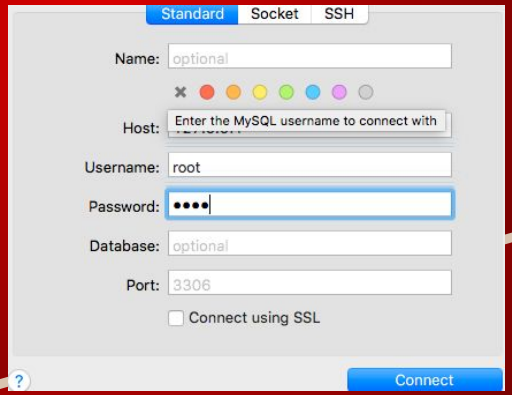
- Dataset: Yelp Dataset Challenge SQL Dataset
- Dataset consisted of businesses, users, reviews and other numerous tables
- Focus: restaurant reviews

yelp DATASET CHALLENGE

Goal

Improve Yelp's reviewing process by analyzing the reviews using text mining techniques.

Data Extraction



- Large Yelp database
- Used Sequel Pro to extract exact data needed
- Created a SQL database connection in R for specific query extraction

Data Extraction

```
select review.id, stars, review.text, review.date, review.useful,
review.funny, review.cool, business_id, review.user_id, fans
from review left outer join user on review.user_id = user.id
where business_id in
                  (select distinct business_ID
                   from category
                   where business_id in
                    (select business_id
                     from category
                     where category like "%estaurants")
                     and category like "Mexican")
        order by useful DESC
        limit 100
```

Focused on four popular types of restaurants

- Mexican
- Indian
- Chinese
- Korean

100 most useful reviews

Data Cleansing

- Created a corpus of the 100 most useful reviews - needs to be cleaned
- Cleaning revolved around text
- Took out punctuation, numbers, symbols and stopwords
- Normalized the text by putting it all in lowercase and stemming the words to prevent duplicate words

Data Handling

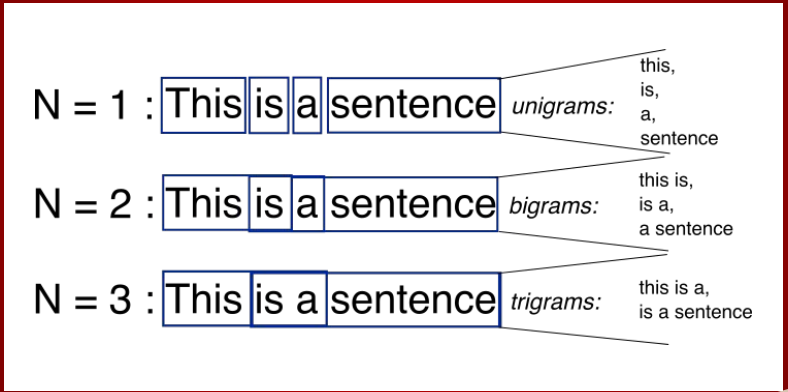
- Unsupervised approach in handling data
- Created a document term matrix to isolate individual words
- Performed a TF-IDF: term frequency and inverse document frequency analysis
- Created new data frame of the cross product values
- Normalized the values to reduce document length bias: divided each value by the square root of the total sum of each corresponding row of the new data frame

$$\text{tf-idf}_{(t,d)} = \text{tf}_{(t,d)} \times \text{idf}_{(t)}$$

t = term
d = document

Word Cloud: TF-IDF

Analysis



- Used the clean corpus to create a tokenizer and break up words into unigrams, bigrams and trigrams
- Rather than just ranking the n-grams based on frequency we weighed it using the useful value for each review
- The useful value is an integer value given to reviews
- Useful = measures usefulness that increases as people upvote it
    - Does not matter if review is positive

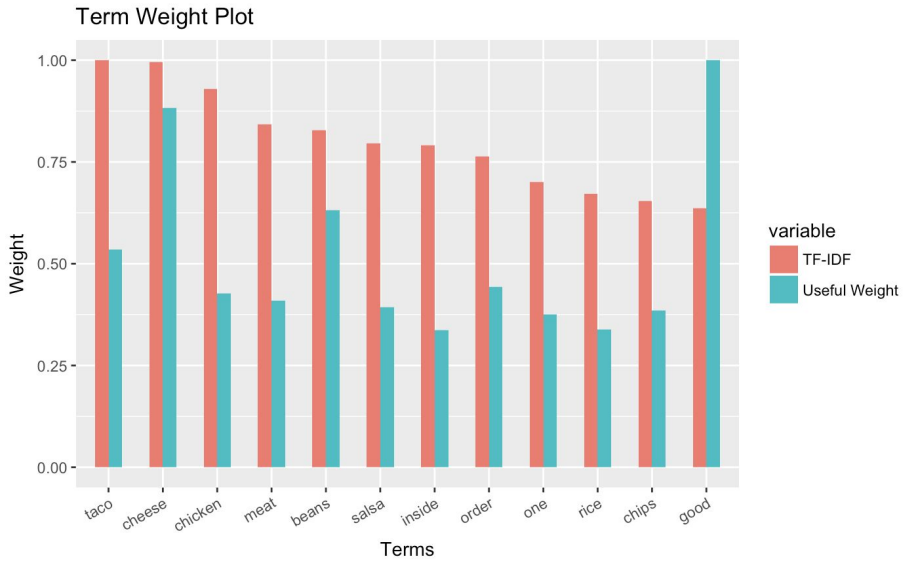
stars	text	date	useful	funny	cool
2	The tasty cheese crisp app was 4 or...	2017-04-03 00:00:00	200	143	179
4	Chain eateries are good once in a w...	2017-06-24 00:00:00	175	115	168
4	The service is amazing at the Border...	2017-06-15 00:00:00	92	46	90

Analysis

- Weight = useful value X frequency of n-grams
- Final weight is sum of the products across all documents in the term document matrix
- Ex.
  - Review useful value = 10
  - “Taco” in review twice
  - Taco useful value = 20 (for document)
  - Sum all documents in corpus
- Final data frame consisted of the n-gram with its associated total weight

Weighted Unigrams - Mexican Restaurants

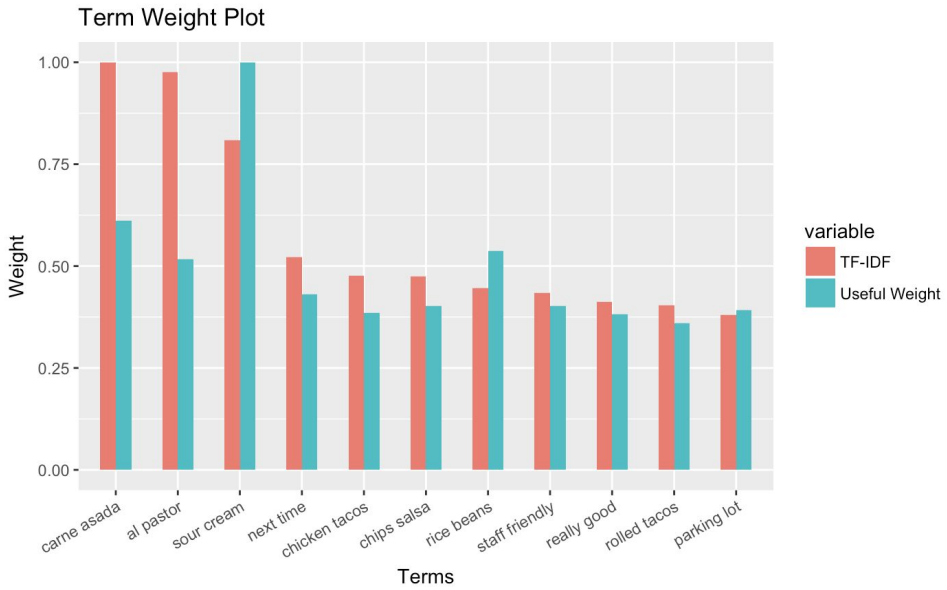
Weighted Unigrams-Mexican



- Ranking terms from highest to lowest TF-IDF compared to usefulness value
- Trivial words such as “good” are weighted less using TF-IDF
- Words like taco, cheese, and chicken high TF-IDF value → indicative of Mexican restaurants
- Unigrams alone don’t account for context → look at word sequences

Weighted Bigrams - Mexican Restaurants

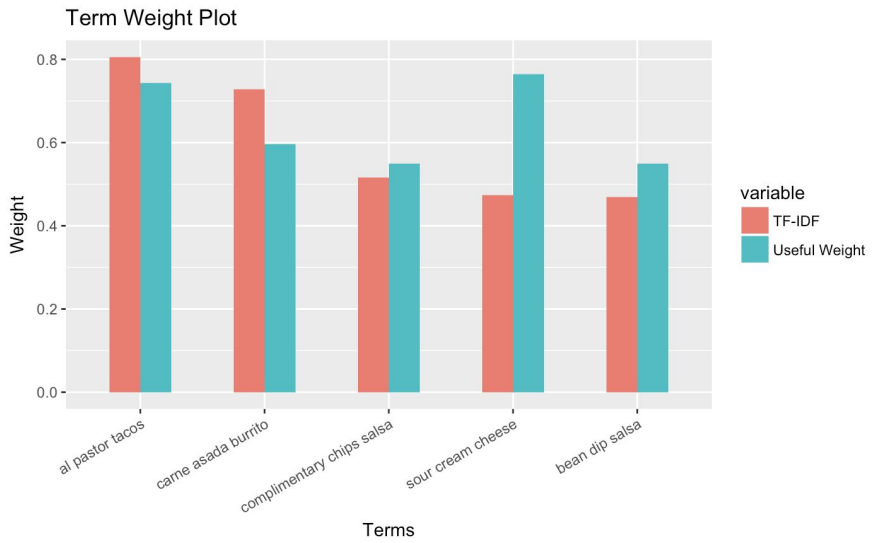
Weighted Bigrams-Mexican



- Top three terms in this graph for TF-IDF:
  - Carne asada
  - Al pastor
  - Sour cream
- Same three values also ranked highly using “weighted” value

Weighted Trigrams - Mexican Restaurants

Weighted Bigrams-Mexican



- Top three terms in this graph are
  - Al Pastor Tacos
  - Sour Cream Cheese
  - Complimentary Chip Salsa
- May not always be best to use more words
- Ideally want to be more general to pertain to all restaurants in category
  - Ex. bean dip salsa too specific
  - Generic, salsa would be better

Results

Mexican:		
Taco	Rice and Beans	Chips and Salsa
Indian:		
Chicken Masala	Naan	Buffet
Chinese:		
Dim Sum	Fried Rice	Hot pot
Korean:		
Hot tofu soup	Pork Belly	Short Rib

Proposal

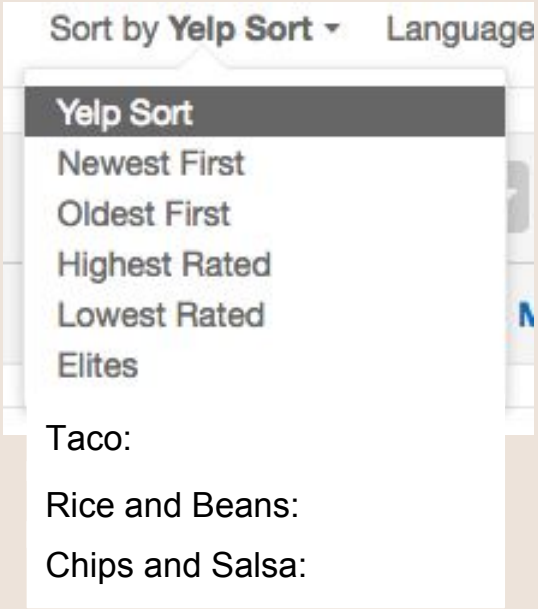
Taco:

Rice and Beans:

Chips and Salsa:

- Report back to Yelp:
- Implement “Quick Checks”
- Three textboxes per category of restaurant containing 3 most important word(s)
- Reviewers must leave comment for all 3
- Short comment: size of tweet
- Free text response optional

Proposal



- Implement new filter for sorting the reviews
- Add Taco, Rice and Beans, and Chips and Salsa as 3 new sorts (for Mexican restaurants)
- Now can filter reviews to only view comments on the chips and salsa

Benefits

- Leaves more helpful reviews → targeting what people want to know about
- Allows a quick glance at reviews without having to invest time
- Filter out specific item you want to read about (from Quick Check values)
    - Ex. want best chips and salsa around
- Suggest Yelp apply our text analysis to other restaurant categories/businesses as well to better understand what customers value

Questions?

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