



The Ultimate Survival Guide to Operating Restaurants

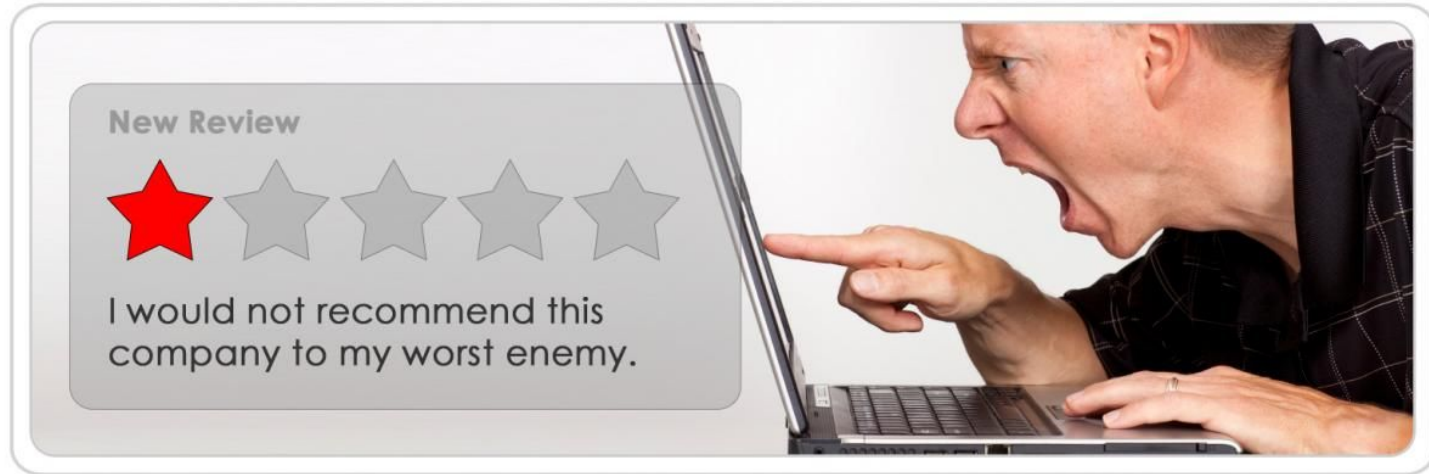
- Las Vegas Edition



Welcome to Las Vegas!



Impact of Yelp Review



Upscale vs Cheap Cheap



[illegible]

Data Collection

- Yelp Dataset Challenge
- Converted from Json file
- Limited to restaurants in Las Vegas
- 5,431 data points

yelp_academic_dataset_business.json

```
{
  "business_id": "encrypted business id",
  "name": "business name",
  "neighborhood": "hood name",
  "address": "full address",
  "city": "city",
  "state": "state -- if applicable --",
  "postal code": "postal code",
  "latitude": latitude,
  "longitude": longitude,
  "stars": star rating, rounded to half-stars,
  "review_count": number of reviews,
  "is_open": 0/1 (closed/open),
  "attributes": ["an array of strings: each array element is an attribute"],
  "categories": ["an array of strings of business categories"],
  "hours": ["an array of strings of business hours"],
  "type": "business"
}
```

Feature Engineering

| | attributes |
|-------|---|
| Order | |
| 37 | [Alcohol: full_bar, BusinessAcceptsCreditCards... |
| 71 | [Alcohol: none, Ambience: {'romantic': False, ... |
| 72 | [Ambience: {'romantic': False, 'intimate': Fal... |
| 102 | [Alcohol: full_bar, Ambience: {'romantic': Fal... |
| 103 | [Alcohol: none, Ambience: {'romantic': False, ... |
| 154 | [Alcohol: none, BusinessAcceptsCreditCards: Tr... |
| 177 | [Alcohol: beer_and_wine, BusinessAcceptsCredit... |
| 179 | [Alcohol: none, Ambience: {'romantic': False, ... |
| 184 | [Alcohol: beer_and_wine, Ambience: {'romantic'... |
| 260 | [Alcohol: beer_and_wine, Ambience: {'romantic'... |

| | categories |
|-------|---|
| Order | |
| 37 | [Persian/Iranian, Restaurants, Ethnic Food, Fo... |
| 71 | [Restaurants, Vegetarian, Indian] |
| 72 | [American (New), Cafes, Restaurants] |
| 102 | [Nightlife, Bars, Restaurants, Thai, Sports Bars] |
| 103 | [Chicken Wings, Fast Food, Restaurants] |
| 154 | [Barbeque, Restaurants, Southern] |
| 177 | [Restaurants, Burgers, Local Flavor, Barbeque] |
| 179 | [Desserts, Food, Pizza, Restaurants, Bakeries] |
| 184 | [Restaurants, Pizza] |
| 260 | [Restaurants, Chinese] |

Feature Engineering

- For columns containing lists of lists and dictionaries
 - created columns for common items
 - iterated through rows and appended '1' if row contains the item
- Replaced missing categorical data with **mode**
- Scaled with **Standard Scalar**

Target Variable

- Binary variable 'is_open'
 - **1** if the restaurant is operating
 - **0** if the restaurant is permanently closed
- 3,849 open, 1,582 closed



Features - Numeric

- Review counts
- Yelp stars
- Price range


Wicked Spoon

★ ★ ★ ★ ★

5257 reviews

Details

\$\$\$ · Buffets, Breakfast & Brunch



Google Map data ©2017 Google

Located in [Edit](#)

The Cosmopolitan of Las Vegas

The Cosmopolitan Of Las Vegas
3708 Las Vegas Blvd S
Las Vegas, NV 89109
The Strip

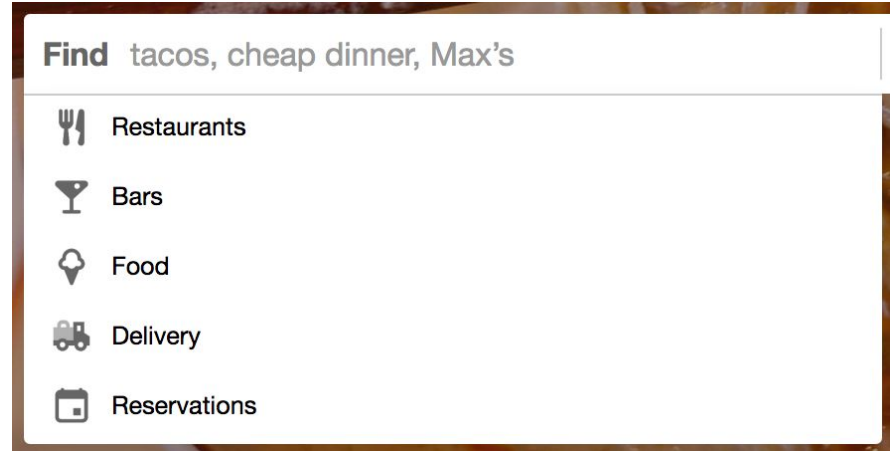
[Get Directions](#)

[\(702\) 698-7000](#)

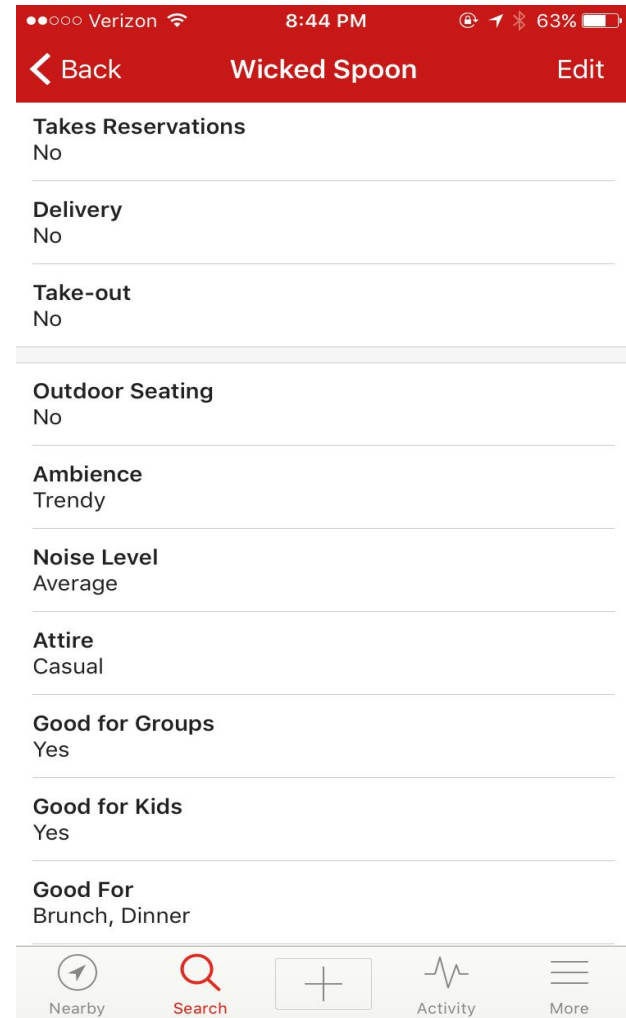
[cosmopolitanlasvegas.com](#)

Features - Categorical

- Type of Meal
 - Dessert
 - Late night
 - Lunch
 - Dinner
 - Breakfast



Sample Page from Yelp (mobile version)



Features - Categorical

- Restaurant Attributes
 - Downtown
 - Good For Groups
 - Take Out
 - Good For Kids
 - Attire (casual or not)
 - Reservations
 - Outdoor Seating
 - Delivery
 - Alcohol
 - Has TV
 - Noise Level
 - Wifi (no, free or paid)
 - Ambience (casual or not)

Features - Categorical

- Restaurant Categories
 - Nightlife
 - Bars
 - Fast Food
 - Burgers
 - Pizza
 - American
 - Chinese
 - Mexican
 - Japanese
 - Italian
 - Sandwiches
 - Seafood
 - Breakfast & Brunch

Building Classifiers

- Splitting scaled data into train and test set
- GridSearch cross validated models to tune parameters
 - **Logistic Regression**
 - **K Nearest Neighbors**
 - **Gaussian and Bernoulli Naive Bayes**
 - **Support Vector Machine**
 - **Decision Tree and Random Forest**

Evaluating Classifiers

- Compared in sample and out of sample performance
 - Avoid overfitting
- Compared out of sample accuracy score of the best model from GridSearch for each algorithm

And the winners are...

Best Classifiers

1. Logistic Regression (L1)
2. SVM
3. KNN

Ensemble

Used **Voting Classifier** to combine these 3 algorithms and smooth out some individual variances

| | Dummy Classifier | Voting Classifier |
|----------|------------------|-------------------|
| Accuracy | 61% | 75% |
| Recall | 74% | 95% |

Voting Classifier in Work

Kabob Palace

- Greek/Persian/Iranian, 15 reviews, 2.5 stars
- Predicted **closed**

⊘ Yelpers report this location has closed. Find a [similar](#)

Kabob Palace



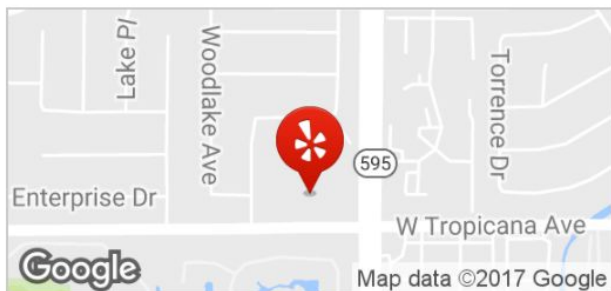
15 reviews

Details

★ Write a Review

\$\$ · [Greek](#), [Persian/Iranian](#)

Edit



📍 **4811 S Rainbow Blvd**
Las Vegas, NV 89103
Spring Valley

Edit

📍 [Get Directions](#)

📞 (702) 367-3315



Voting Classifier in Work

Presto Calzone Bakery

- Dessert, 138 reviews, 4.5 stars
- Predicted **open**

Presto Calzone Bakery Claimed



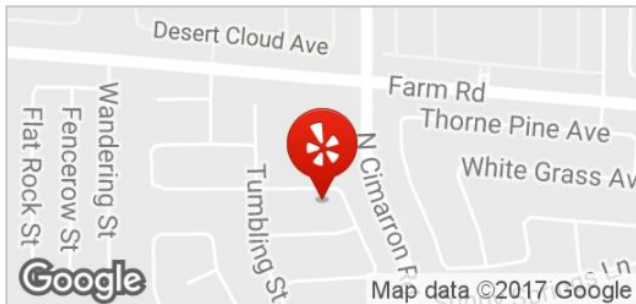
138 reviews

 Details

 Write a

\$ · [Bakeries](#), [Desserts](#), [Pizza](#)

 Edit



 **7501 N Cimarron Rd
Ste 108
Las Vegas, NV 89131
Centennial**

 Edit

 [Get Directions](#)

 (702) 331-4975

 prestocalzonebakery.com

 Message the business



**new salad!
pecan! by B**

Voting Classifier in Work

Bailey's Sports Bar & Eatery

- Sports bar, 9 reviews, 3.5 stars
- Predicted **open**

Yelpers report this location has closed. Find a [similar spot](#).

Bailey's Sports Bar & Eatery ✓ Claimed



9 reviews

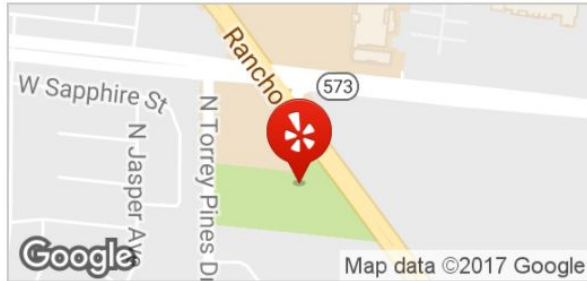
Details

[Write a Review](#)

Add

\$ • [Sports Bars](#), [Thai](#)

Edit



4341 N Rancho Dr
Las Vegas, NV 89130
Northwest

Edit

[Get Directions](#)

(702) 655-7373



Add

Implications - Logistic Coefficients

- Review counts +
- Is downtown +
- Free Wifi +
- Take out + and reservation -
- Dessert and breakfast +
- Ambience casual -
 - romantic , classy, hipster, etc +
- Fast food, nightlife, pizza, sandwich, mexican +



“Let’s open a hipster fast food place located in downtown Las Vegas, offers milkshake as dessert and hang a huge sign of “FREE WIFI” by the door!”

Future Work

- Interactive Visualization
- Other features
- NLP of Yelp Reviews
- Different cities
- Submit to Yelp Challenge

Supporting Slides - Logistic Coef

| | | | |
|--|--|---|---|
| ['review_count', 1.6796259633553636, 'stars', 0.016046647841766223, 'RestaurantsPriceRange2S', -0.0014136174164024096, 'RestaurantsGoodForGroups', -0.083467014425517086, 'RestaurantsTakeOut', 0.065855273898838426, 'GoodForKids', -0.038559377744888455, 'RestaurantsAttire', -0.10130848270734759, 'RestaurantsReservations', -0.24019537125987675, 'OutdoorSeating', -0.12651453293793954, 'RestaurantsDelivery', -0.025117876085646765, 'Alcohol', | -0.15532795290311166, 'HasTV', 0.029384740555112795, 'is_dt', 0.028278272264585916, 'noise_loud', 0.011457301706683194, 'quiet', -0.086452768420441709, 'wifi_free', 0.20254911100867978, 'wifi_paid', 0.009279141818524626, "'dessert': True", 0.15070107352726309, "'latenight': True", 0.078410448220778264, "'lunch': True", 0.070398532275563225, | "'dinner': True", 0.081619680299880065, "'breakfast': True", 0.12530781487762088, "'casual': True", -0.17424131573673546, 'Nightlife', 0.21342636330047504, 'Bars', 0.022050521323724131, 'Fast Food', 0.5544480101861643, 'Burgers', -0.046353880363286561, 'Pizza', 0.17274839420009444, 'Chinese', 0.065623140621783635, , | Mexican', 0.15478972866888965, 'Japanese', -0.066051049211714508, 'Italian', -0.092850110952429468, 'Sandwiches', 0.1668041807049824, 'Seafood', 0.05278048044085866, 'Breakfast & Brunch', 0.028901964932381598, 'American', 0.0044602078270046686] |
|--|--|---|---|

Supporting Slides - Algorithm Comparison

| Accuracy | LR (L1) | LR (L2) | KNN | GNB | BNB | SVM | DT | RM |
|--------------------|------------|------------|------|------|------|------|------|------|
| Best Out of Sample | 0.744 | 0.74 | 0.73 | 0.61 | 0.72 | 0.74 | 0.56 | 0.71 |
| In Sample | 0.747 | 0.747 | 0.79 | 0.61 | 0.73 | 0.80 | 0.99 | 0.99 |