Yelp Review
Web Scraping, Sentiment Analysis and ML prediction

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Yelp review scrapy, Sentiment Analysis and NB Prediction

This Project first scrapy yelp review data, then we do Sentiment Analysis, prediction using Naive Bayes Frank Lanfa Wang, 5/2016, FrankWanglf@gmail.com

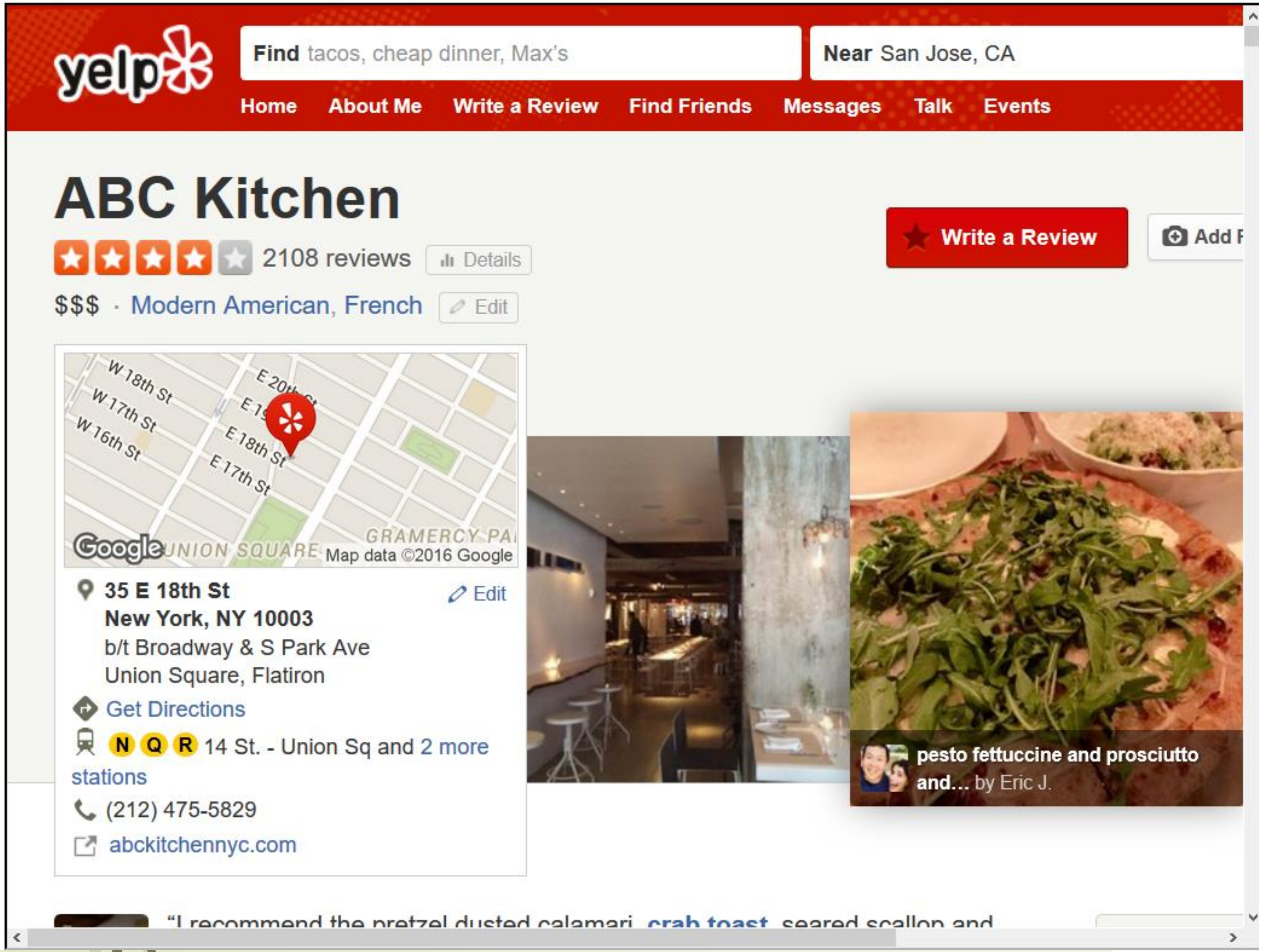
This section is app for Yelp review download

Tool: beautifulSuop

In [1]:

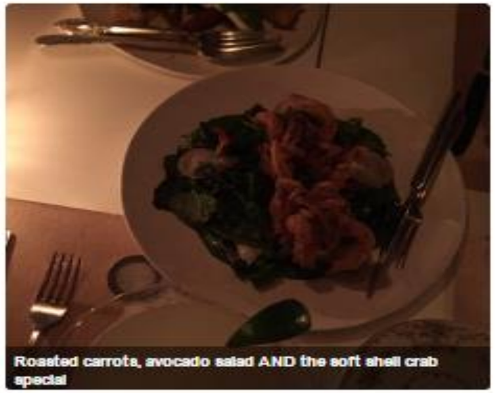
```
## Project 3 Web scraping
%matplotlib inline
import pandas as pd
from bs4 import BeautifulSoup
from urllib.request import urlopen
import re

queries = 0
tot_reviews=0
tot_authors=0
tot_ratings=0
authors_rev=[]
ratings_rev=[]
Features=[]

f=open("summary_auth_rating_tmp.txt", encoding='utf-8', mode="w")
f1=open("reviews_tmp.txt", encoding='utf-8', mode="w")
f2=open("author_tmp.txt", encoding='utf-8', mode="w")
f3=open("rating_tmp.txt", "w")

while queries <2020:
    stringQ = str(queries)
    page =urlopen('http://www.yelp.com/biz/abc-kitchen-new-york?start=' + stringQ)
    soup = BeautifulSoup(page,"lxml")
    reviews = soup.findAll('p', attrs={'itemprop':'description'})
    authors = soup.findAll('meta',attrs={'itemprop':'author'})
    ratings=  soup.findAll('meta',attrs={'itemprop':'ratingValue'})
    flag = True
    indexOf = 1
    for it,review in enumerate(reviews):
        dirtyEntry = str(review)
        tot_reviews+=1
```

example



But there's always room for dessert!
We got the Basil and Mint Panna cotta with Meyer Lemon Sorbet! The Panna Cotta was soft and light. It came out looking like an egg because of the thinly sliced lemon on top. The lemon sorbet was a good palette cleanser and keep your mouth guessing. Will I get the tart sorbet or the creamy panna cotta this time.

P.S. They have a gender neutral bathroom!


Roasted carrots, avocado salad AND the soft shell crab special


Confitim with mash potatoes


Lemon Panacotta with lemon sorbet with

See all photos from Joanne K. for ABC Kitchen

Was this review ...?

Useful 2 Funny Cool

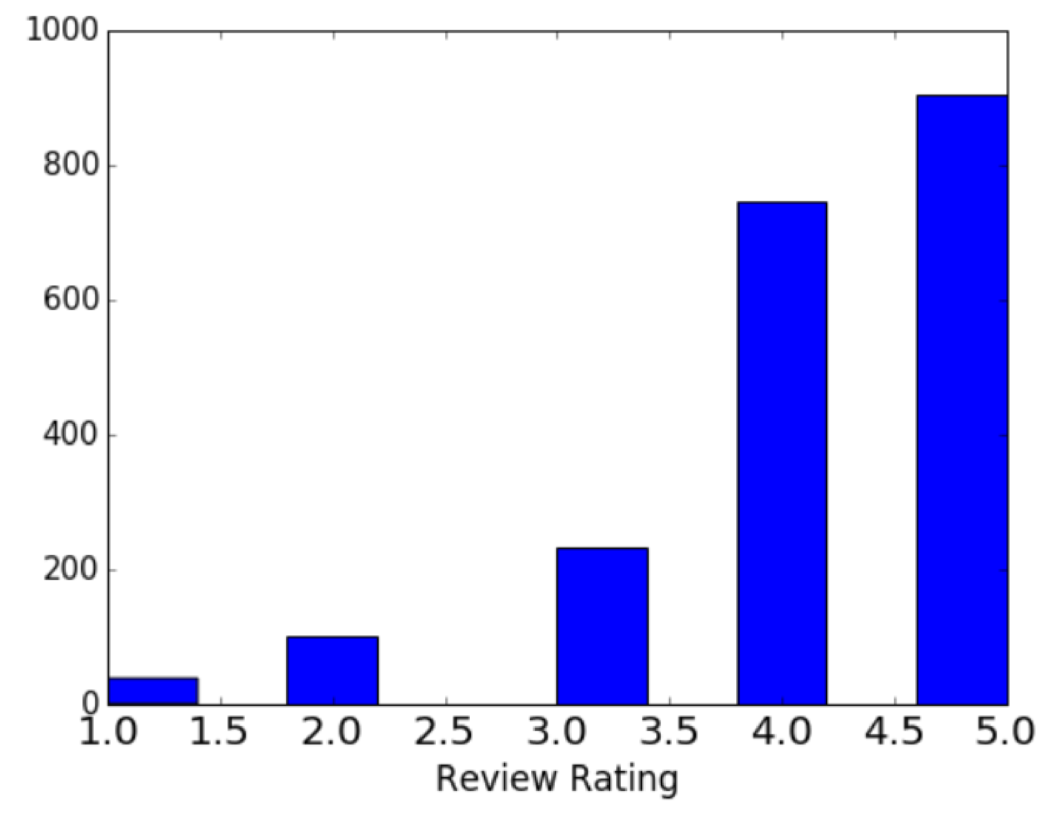
Kelly P.
Jersey City, NJ
360 friends
128 reviews

5/19/2016
2 check-ins

The fresh closures of Telepan, Perilla, and Fishtail exhibit the caliber of New York's restaurant scene. It is not only over saturated but also dense with merciless critics. Even Michelin celebrity chefs are unable to persevere. Spaces are quickly transformed with new successors that share the same doomed fate... and eventually they become a Chase bank branch.

ABC Kitchen's business is booming. Jean Georges Vongerichten, the Michelin awarded chef pleases the eager palettes of his patrons at this establishment, located minutes away from Union Square. Like a speakeasy, there is a back entrance through a home furniture store. All décor is furnished courtesy of ABC Carpet and Home which expresses their passion for "green" through sustainable furnishings. Brick walls are painted with thick layers of milky white lacquer. Pillars of dark wood, untouched by varnish are piped throughout the dining room for a striking contrast. Simple metal pendant light fixtures, bare bulbs, and traditional Victorian chandeliers dot the ceiling. After sunset, flickering candles materialize on white table surfaces illuminating the dining room with a romantic dim luminescence. The environment compliments the restaurant's ingredients perfectly: strictly local and fair trade farm-to-table. Pesticides, antibiotics, and hormones

	Name	Rating
0	Joanne K.	5
1	Kelly P.	4
2	Jane R.	3
3	Qian H.	4
4	Serena A.	5
5	Eugenia L.	5
6	Sheila R.	5
7	Jason H.	3
8	Julia K.	4
9	Jenn P.	4



Sentiment Analysis

```
from textblob import TextBlob
from textblob.sentiments import NaiveBayesAnalyzer
sa_score=[]
for ir in range(len(reviewers.Rating)):
        testimonial = TextBlob(Features[ir])
        sc=testimonial.sentiment.polarity
        #sc=sc*2.5+2.5
        sc=sc*2+3
        sa_score.append(sc)
reviewers['Sa_score']=sa_score
```

```
accuacy_sa=[1 for x in sa_score if x>3]
accuacy_sa=sum(accuacy_sa)/len(sa_score)
print('The accuracy of SA prediction is : {}'.format(accuacy_sa))
```

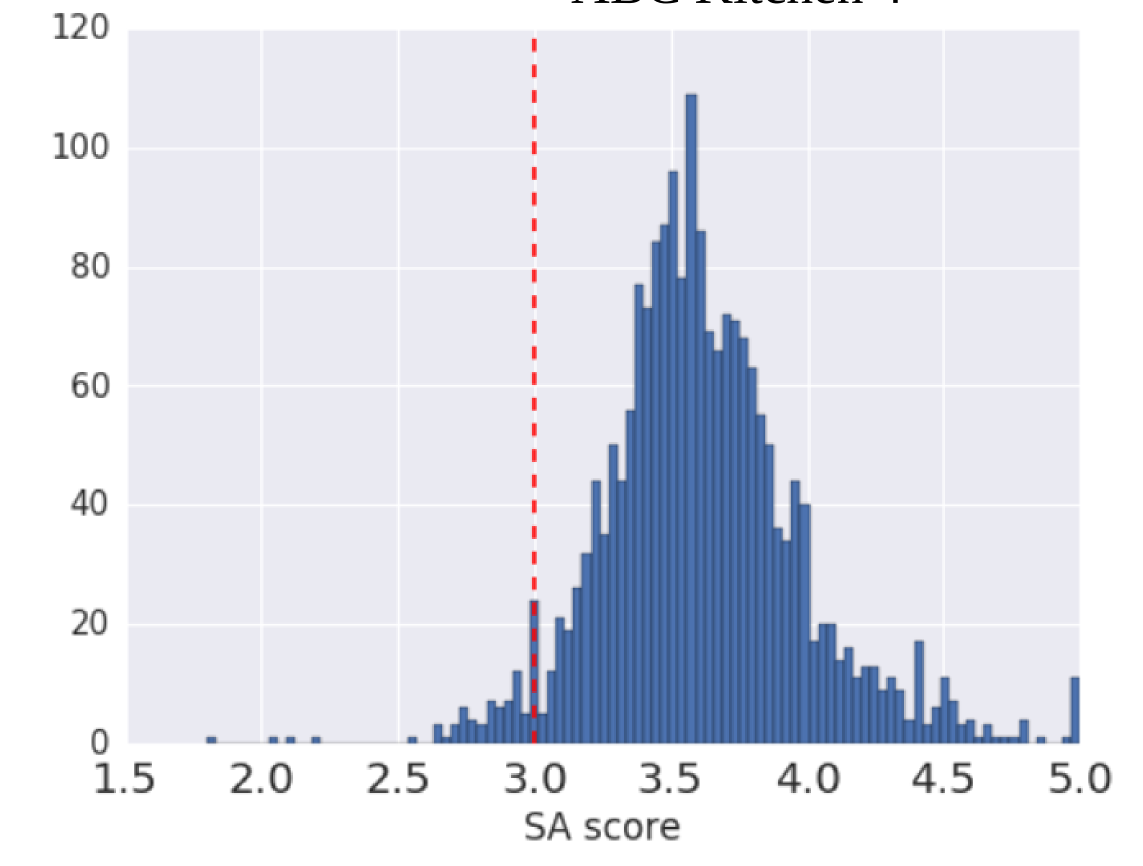
```
The accuracy of SA prediction is : 0.9589108910891089
```

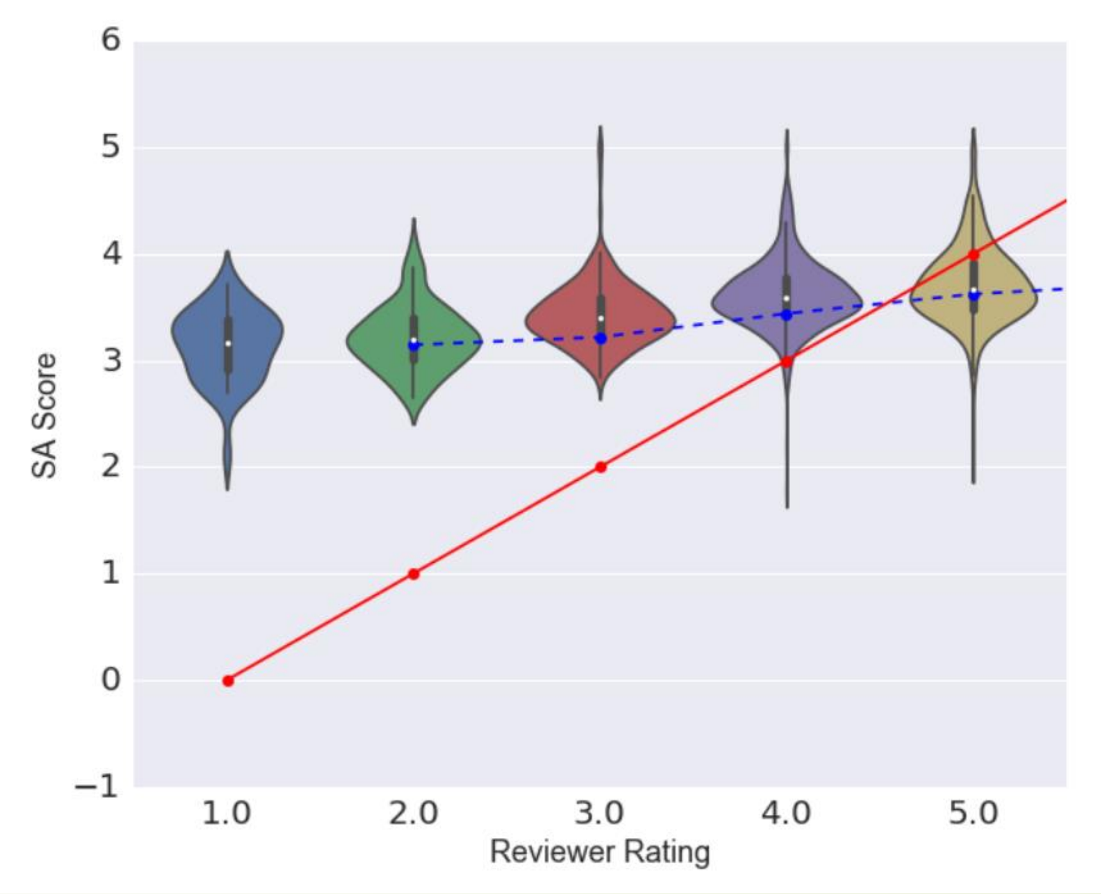
The accuracy of SA prediction is : 0.9589

SA for restaurant review

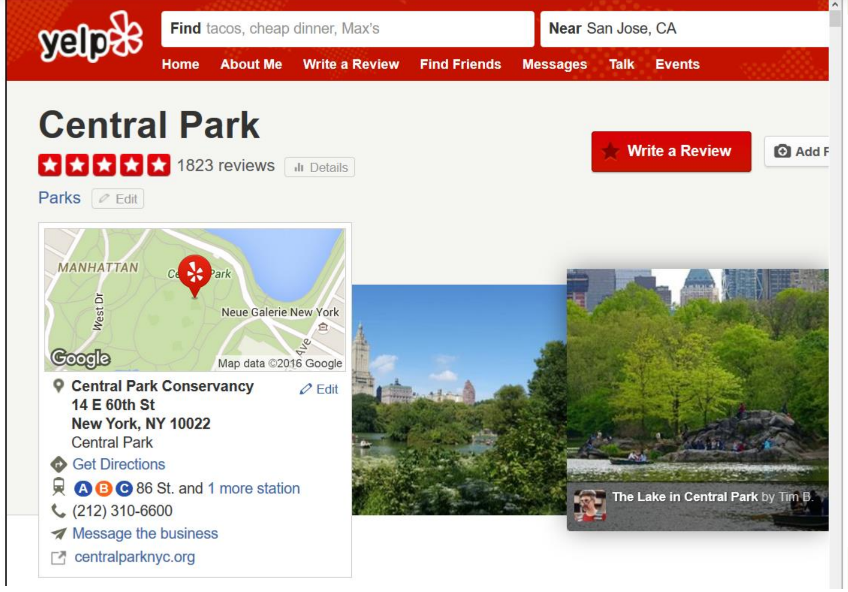
The accuracy of SA prediction is : 0.9589

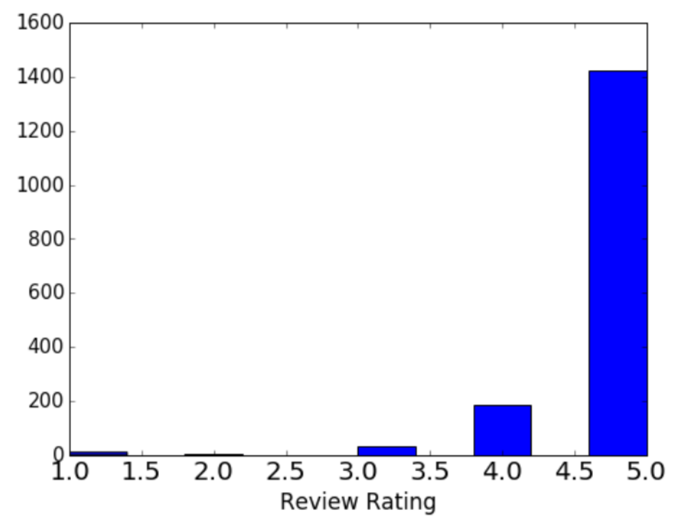
ABC Kitchen 4*****

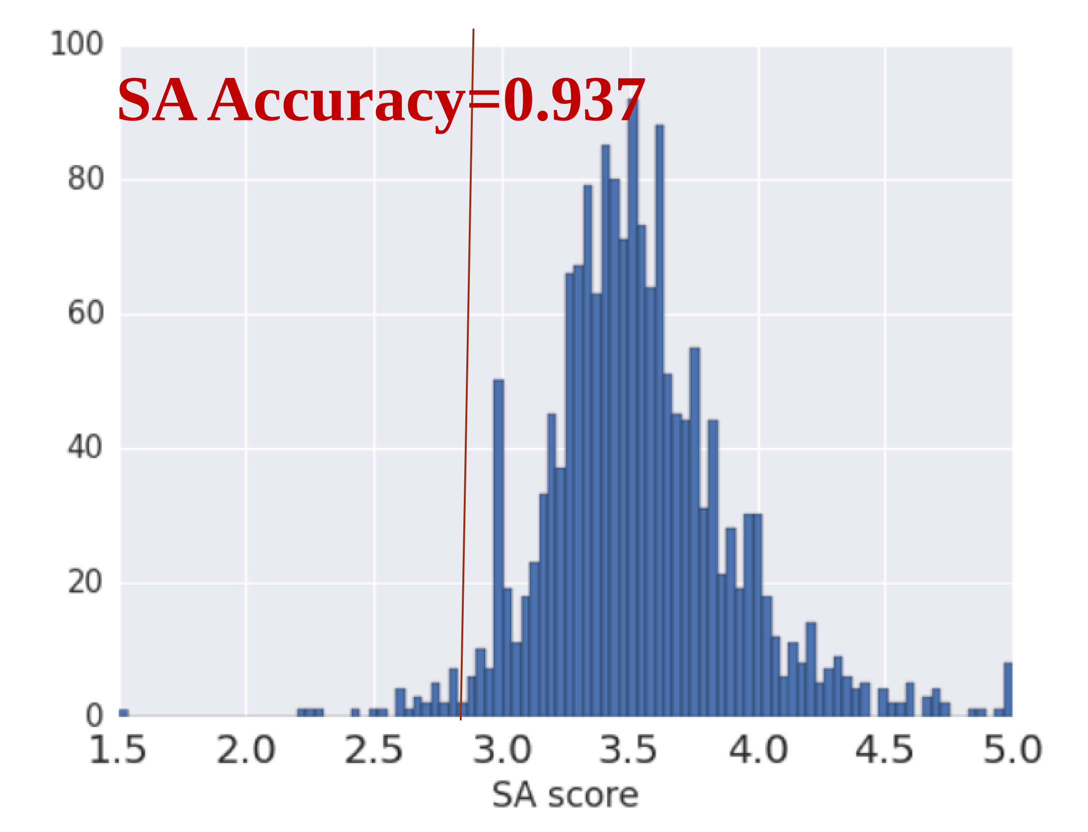


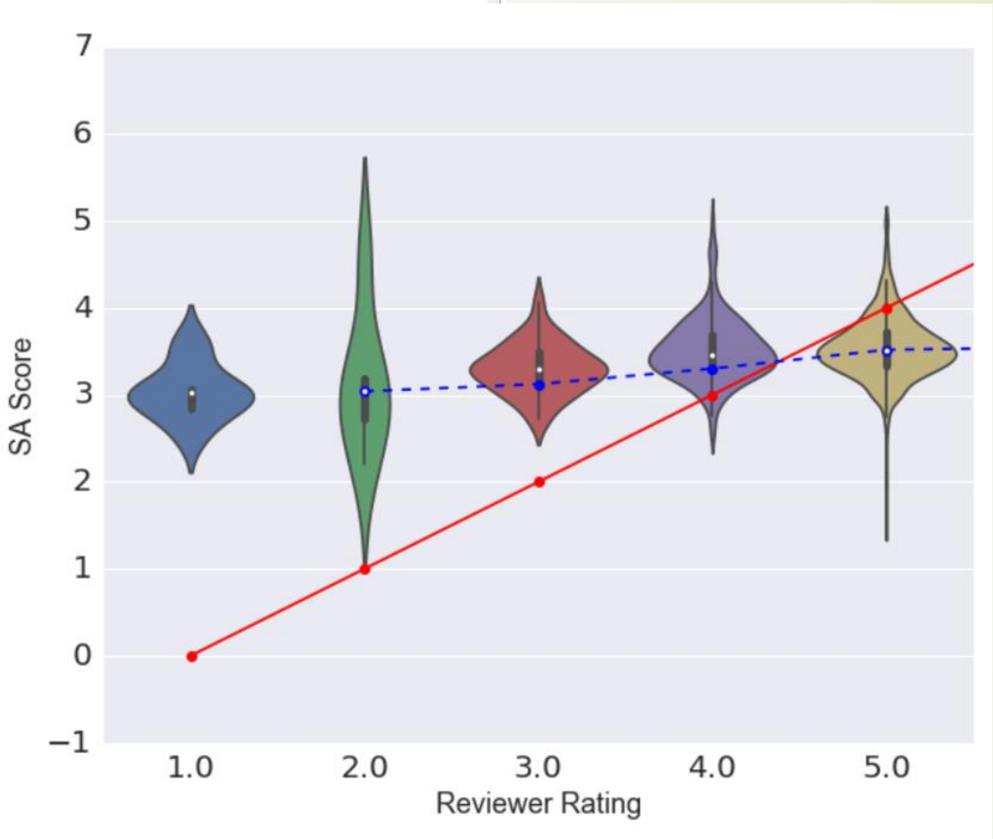


Example 2:


yelp
Find tacos, cheap dinner, Max's
Near San Jose, CA
Home About Me Write a Review Find Friends Messages Talk Events
Central Park
1823 reviews
Details
Parks
Edit
Write a Review
Central Park Conservancy
14 E 60th St
New York, NY 10022
Central Park
Get Directions
86 St. and 1 more station
(212) 310-6600
Message the business
centralparknyc.org
The Lake in Central Park


Review Rating


SA Accuracy=0.937
SA score


SA Score
Reviewer Rating

Prediction using Navie Baye

10]:

```
def features_extra(Features,reviewers):
    yelpFeatures=[]
    for ir,feature in enumerate(Features):
        Words = re.findall(r"[\w']+|[.,!?;]", feature.rstrip())
        wordb=dict([(word.lower(), True) for word in Words])
        if (reviewers.Rating[ir]>=3):
            Words = [wordb, 'pos']
        else:
            Words = [wordb, 'neg']
        yelpFeatures.append(Words)
    return yelpFeatures
## test for greeting is treated as a negative word
def features_extra_mod(Features,reviewers):
    yelpFeatures=[]
    postive_words=['greeting','ultimately','politely']
    for ir,feature in enumerate(Features):
        Words = re.findall(r"[\w']+|[.,!?;]", feature.rstrip())
        wordb=dict([(word.lower(), True) for word in Words])
        pol='neg'
        if (reviewers.Rating[ir]>=3):
            pol='pos'
        for wor  in wordb.keys():
            if wor in postive_words:
                print('positiveword corrected={} in reviwer {}'.format(wor,ir))
                pol='pos'
        Words = [wordb, pol]
        yelpFeatures.append(Words)
    return yelpFeatures
```

Prediction of yelp feature

```
import re, math, collections, itertools, os
import nltk, nltk.classify.util, nltk.metrics
from nltk.classify import NaiveBayesClassifier
from nltk.metrics import BigramAssocMeasures
from nltk.probability import FreqDist, ConditionalFreqDist
import random

random.shuffle(yelpFeatures)
Cutoff = int(math.floor(len(yelpFeatures)*3/4))
trainFeatures = yelpFeatures[:Cutoff]
testFeatures = yelpFeatures[Cutoff:]

classifier = NaiveBayesClassifier.train(trainFeatures)
referenceSets = collections.defaultdict(set)
testSets = collections.defaultdict(set)
for i, (features, label) in enumerate(testFeatures):
    referenceSets[label].add(i)
    predicted = classifier.classify(features)
    testSets[predicted].add(i)
print ('train on %d instances, test on %d instances' % (len(trainFeatures), len(testFeatures)))
print ('accuracy:', nltk.classify.util.accuracy(classifier, testFeatures))
classifier.show_most_informative_features(20)
```

```
train on 4500 instances, test on 1500 instances
accuracy: 0.72
Most Informative Features
               apologies = True              neg : pos    =     32.7 : 1.0
                horribly = True              neg : pos    =     27.7 : 1.0
                  ripped = True              neg : pos    =     27.7 : 1.0
                mistakes = True              neg : pos    =     27.7 : 1.0
                 message = True              neg : pos    =     27.7 : 1.0
              compensate = True              neg : pos    =     22.6 : 1.0
              dismissive = True              neg : pos    =     22.6 : 1.0
```

Small number of dataset

```
train on 1515 instances, test on 505 instances
accuracy: 0.6237623762376238
Most Informative Features
                greeting = True              neg : pos    =     38.4 : 1.0
              Ultimately = True              neg : pos    =     38.4 : 1.0
               tasteless = True              neg : pos    =     29.8 : 1.0
                      55 = True              neg : pos    =     29.8 : 1.0
                   Sadly = True              neg : pos    =     29.8 : 1.0
                politely = True              neg : pos    =     29.8 : 1.0
                     WAY = True              neg : pos    =     21.3 : 1.0
             photographs = True              neg : pos    =     21.3 : 1.0
                    2016 = True              neg : pos    =     21.3 : 1.0
                  liquor = True              neg : pos    =     21.3 : 1.0
                     act = True              neg : pos    =     21.3 : 1.0
                    pity = True              neg : pos    =     21.3 : 1.0
               Nougatine = True              neg : pos    =     21.3 : 1.0
                  they'd = True              neg : pos    =     21.3 : 1.0
                    hell = True              neg : pos    =     21.3 : 1.0
                   dirty = True              neg : pos    =     21.3 : 1.0
                   acted = True              neg : pos    =     21.3 : 1.0
                 Walking = True              neg : pos    =     21.3 : 1.0
                improved = True              neg : pos    =     21.3 : 1.0
               redeeming = True              neg : pos    =     21.3 : 1.0
```

- Really disappointed to our dining experience tonight. Thursday night, 6:30PM for 2 people.We made reservation 1 month earlier for the birthday dinner.---Environment---*Dining area:The decoration and ambiance of main area was beautiful and great, HOWEVER, they sat us in the back bar area, which was a passage between ABC Kitchen, ABC Cocina, and abcmkt. It had no decoration at all. While we ate, some people were walking on the stairs above us (we were eating under the edge of stairs. I felt some dust were falling into our dishes from it...). The customers of abcmkt also randomly walked to our area and peaked into our dishes. I felt really uncomfortable about it. I understand they didn't want to waste the space and put more tables to make money, but they should probably make it only for the bar guests, not the customers who have the full dinner.*----------.*Sundae: good idea to put salted caramel ice cream and popcorn together. It was tasty but it got very sweet at the end. The portion was big, so it's ideal to share it between 2-3 people.---Service---The staff were friendly. However, they were not attentive. It might be a busy night, so our waiter disappeared for a while time to time when we needed him. We waited for 20 mins to order dessert and 30 mins to get the bill. Some of the serving ways were also odd. Most of our dishes were dropped without any words. **No greeting** (we were still in the middle of conversation), no explaining, no "bon appetit". They just came and left like we were air...If you ask questions, they would answer politely. But it was really awkward.I've been to many high-end or Michelin starred restaurants. By the dining experience tonight, I don't think ABC Kitchen deserved Michelin 3 stars. Foods were good but not excellent, and the service, back bar area, and bathroom were not on the level. Overall, it was a

```
train on 4500 instances, test on 1500 instances
accuracy: 0.722
Most Informative Features
             message = True              neg : pos    =     32.8 : 1.0
           poisoning = True              neg : pos    =     32.8 : 1.0
            mistakes = True              neg : pos    =     27.7 : 1.0
           apologize = True              neg : pos    =     24.8 : 1.0
              ripped = True              neg : pos    =     22.7 : 1.0
            horrible = True              neg : pos    =     19.7 : 1.0
              snotty = True              neg : pos    =     19.7 : 1.0
               hater = True              neg : pos    =     17.6 : 1.0
              rudely = True              neg : pos    =     17.6 : 1.0
             applies = True              neg : pos    =     17.6 : 1.0
        increasingly = True              neg : pos    =     17.6 : 1.0
           appalling = True              neg : pos    =     17.6 : 1.0
            remotely = True              neg : pos    =     17.6 : 1.0
          compensate = True              neg : pos    =     17.6 : 1.0
               sauna = True              neg : pos    =     17.6 : 1.0
            behavior = True              neg : pos    =     17.6 : 1.0
                curt = True              neg : pos    =     17.6 : 1.0
             updated = True              neg : pos    =     17.6 : 1.0
        conservative = True              neg : pos    =     17.6 : 1.0
              warmer = True              neg : pos    =     17.6 : 1.0
```

The following run Yelp prediction with Movie review traning data!

The accuaracy is pretty high 0.811

```
Cutoff = int(math.floor(len(Features)*3/4))
trainFeatures1 = Features[:Cutoff]
testFeatures1 = Features[Cutoff:]

referenceSets = collections.defaultdict(set)
testSets = collections.defaultdict(set)
for i, (features, label) in enumerate(testFeatures):
    referenceSets[label].add(i)
    predicted = classifier.classify(features)
    testSets[predicted].add(i)
print ('train on %d instances, test on %d instances' % (len(trainFeatures1), len(testFeatures1)))
print ('accuracy:', nltk.classify.util.accuracy(classifier, testFeatures1))
classifier.show_most_informative_features(20)
```

```
train on 1515 instances, test on 505 instances
accuracy: 0.8118811881188119
Most Informative Features
             magnificent = True              pos : neg    =     15.0 : 1.0
             outstanding = True              pos : neg    =     13.6 : 1.0
               insulting = True              neg : pos    =     13.0 : 1.0
              vulnerable = True              pos : neg    =     12.3 : 1.0
               ludicrous = True              neg : pos    =     11.8 : 1.0
                  avoids = True              pos : neg    =     11.7 : 1.0
             uninvolving = True              neg : pos    =     11.7 : 1.0
              astounding = True              pos : neg    =     10.3 : 1.0
             fascination = True              pos : neg    =     10.3 : 1.0
                 idiotic = True              neg : pos    =      9.8 : 1.0
               affecting = True              pos : neg    =      9.7 : 1.0
                  symbol = True              pos : neg    =      9.7 : 1.0
```

Summary

- The Yelp review text is downloaded.
- Sentiment Analysis for positive and negative prediction show good agreement with review rating.
- Supervised machine learning (Naive Bayes here) has a prediction accuracy is about 72% with 6000 features
- This is very preliminary study. Further improvements with bigram and other technics is planned.