A Research on Yelp.com – What Affects Restaurants' Ratings?

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Background and Introduction

- Previous literature indicates strong positive correlation between a business's customer review and revenue, both in traditional "viva voce" (oral) form (Mahajan et al., 1984) and more recent online reviews (Chevalier and Mayzlin, 2006).
- Geological location is the main factor that I will further analyze in this research. "Contagion effect" is a concept in psychology (Hartfield et al., 1993), and it has been deeply investigate in behavioral economics, especially in behavioral finance (Hirshleifer and Teoh, 2003).

Methods

- Data collection – web scraping with *BeautifulSoup* library in Python. Collected data of top 1000 restaurants in Chicago.
- Model building
  - Basic Model: linear regression with *sklearn* in Python with star rating as dependent variable
  - Build restaurant pairs to analyze contagion effect (about ½ million pairs
    - Compute cosine similarity of each pair
    - For each pair, compute the correlation between 1. star rating difference and geographical distance (calculated from latitude and longitude), and 2. cosine similarity and geographical distance
- Validation – K-fold cross validation

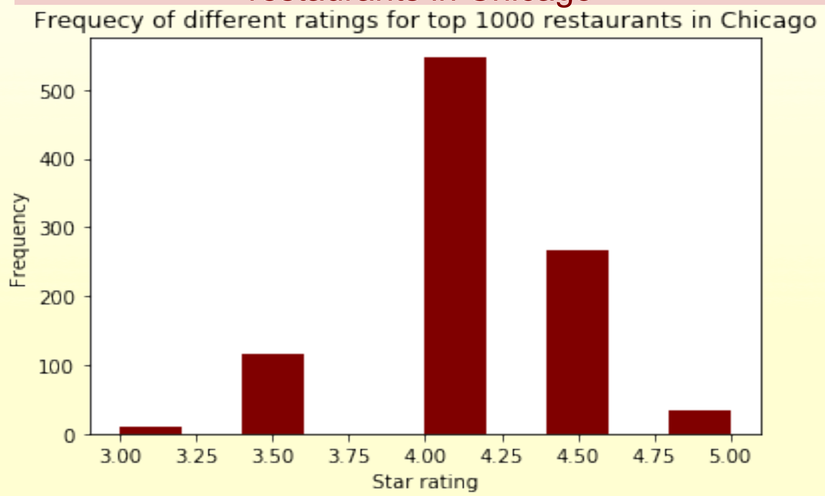
Research questions

- What affect a restaurant's Yelp.com rating stars?
- Is there "contagion effect" in catering industry?

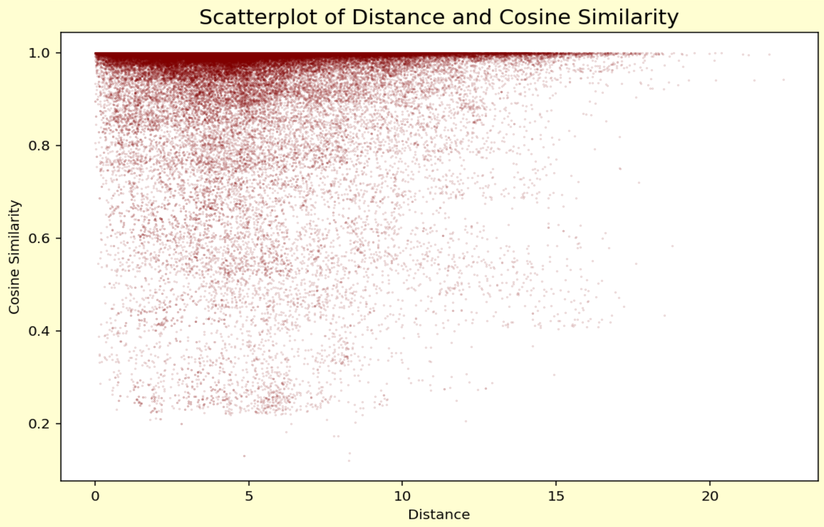
Results

- In linear regression, I include number of reviews, operating hours throughout a week, neighborhood dummy variables and about 20 attribute dummy variables (including ambience, parking availability, loudness, category, etc.)
- Features to notice:
  - Restaurants in some neighborhood performs better, (e.g. West Town)
  - Higher price is associated with lower rating.
  - The louder the restaurant, the lower the ratings.
  - R-squared: 0.325, which is reasonable, since there are some outside features that are not included in Yelp.com but can affect star ratings (e.g. taste of customers).
- Concerning contagion effect, the correlation between geographical distance in km and star rating in each restaurant pair is 0.051.
- To analyze the reason, I compute the cosine similarity of each pair, and found out that the correlation between cosine similarity and geographical distance in km is -0.055
- K-fold Cross validation with K=4 shows that the linear regression yields mean squared error of 0.1.

Frequency of different ratings for top 1000 restaurants in Chicago



Distance and cosine similarity



Conclusion

- There are some attributes of a restaurant that are associated with its rating, for example, neighborhood, what type of food, operating hours, etc.
- There exhibits some contagion effect among restaurants in Chicago. Restaurants that are closer in geographical distance are more similar, and they also have closer Yelp.com ratings.
- There are still some factors which affect the ratings, but they are hard to collect and/or quantify (e.g. taste of customers)

Limitations

- Omitted Variable Bias – some factors cannot be easily collected and/or quantify
- Only included top 1000 restaurants in Chicago. Other restaurants in Chicago and restaurants in other areas may exhibit different behaviors.

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