

FIVE STARS

An NLP analysis of Yelp reviews

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TECHNOLOGY

Slight Changes in Yelp Ratings Can Mean Huge Losses for Small Businesses

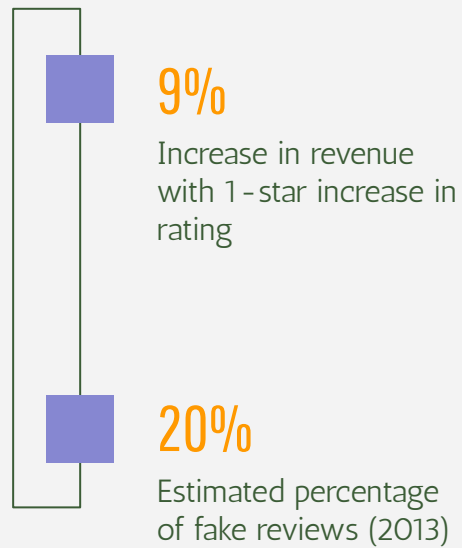
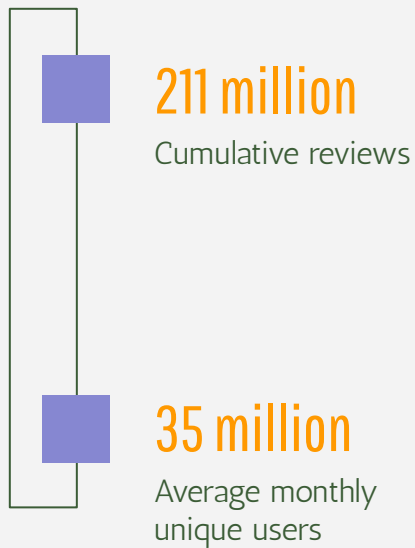
REBECCA J. ROSEN SEPTEMBER 4, 2012

Researchers exploit a crack in the data to answer the question of just how much Yelp reviews affect consumer behavior.



INTRODUCTION

The Power of Yelp

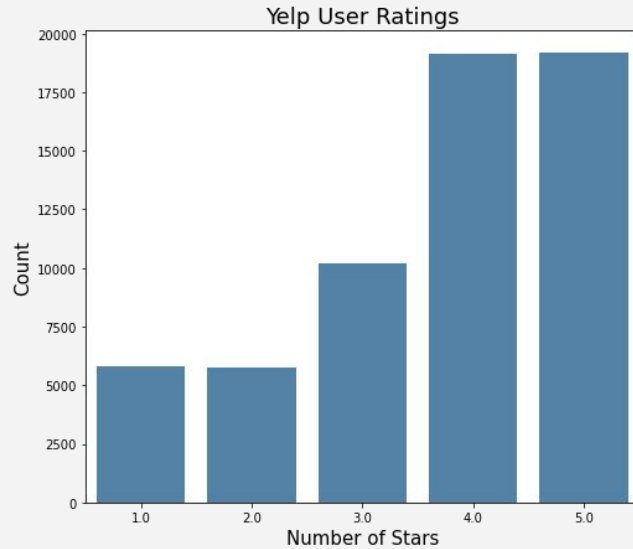


GOAL

Find insights into achieving a 5-star Yelp rating through text analysis



Yelp Open Dataset



60,000

Random sample of user reviews

4,838

Unique open restaurants

One

Metropolitan area - Toronto

PROCESS

CLASSIFIER

Logistic Regression
Feature Importance

DATA COLLECTION

MongoDB
AWS

TOPIC MODELING

NMF
50 Topics

VECTORIZATION

TF-IDF
Bigrams and Trigrams

TEXT PROCESSING

NLTK
Snowball Stemmer

STOP WORDS

Food objects



5-STAR TOPICS

Amazing Food/Service

food amaz, amaz servic, food amaz servic, great food amaz, amaz food amaz, amaz price, food amaz price, friend food amaz, amaz staff, amaz order

Excellent Food/Service

excel servic, food excel, servic excel, excel food, food excel servic, servic excel food, realli nice, great food excel, excel price, excel servic great

Must Try Food

must tri, food must, food must tri, go wrong, food alway, must tri like, comfort food, delici must tri, amaz must tri, must tri also

Delicious Food

delici food, servic delici food, delici food great, servic delici, absolut delici, food wonder, delici food friend, staff delici food, staff delici, absolut delici food

Friendly Staff

super friend, staff super, staff super friend, super friend help, friend help, super friend staff, super nice, server super, server super friend, super friend servic

NOT 5-STAR TOPICS

Long Wait

even though, wait minut, long time, wait time, take order, seem like, order food, long wait, right away, told us

Pretty Good Food/Service

pretti good, food pretti, food pretti good, servic pretti, servic pretti good, pretti good food, tast pretti, tast pretti good, pretti good servic, also pretti

Bland Taste

tast like, sauc tast, sauc tast like, food tast, food tast like, realli tast, like water, tast like water, realli tast like, good tast

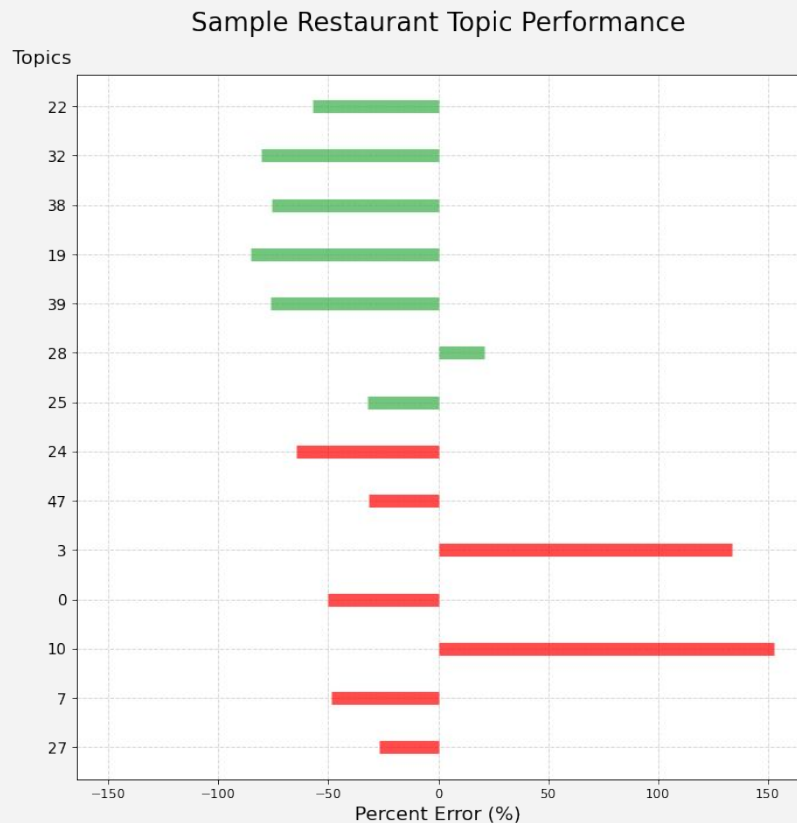
Portion Size

portion size, good portion, good portion size, lunch special, small portion, size great, price portion, portion size great, great portion, price portion size

Good Food

food good, good price, food good servic, good food good, food good price, great food good, food good portion, servic food good, good atmospher, time food good

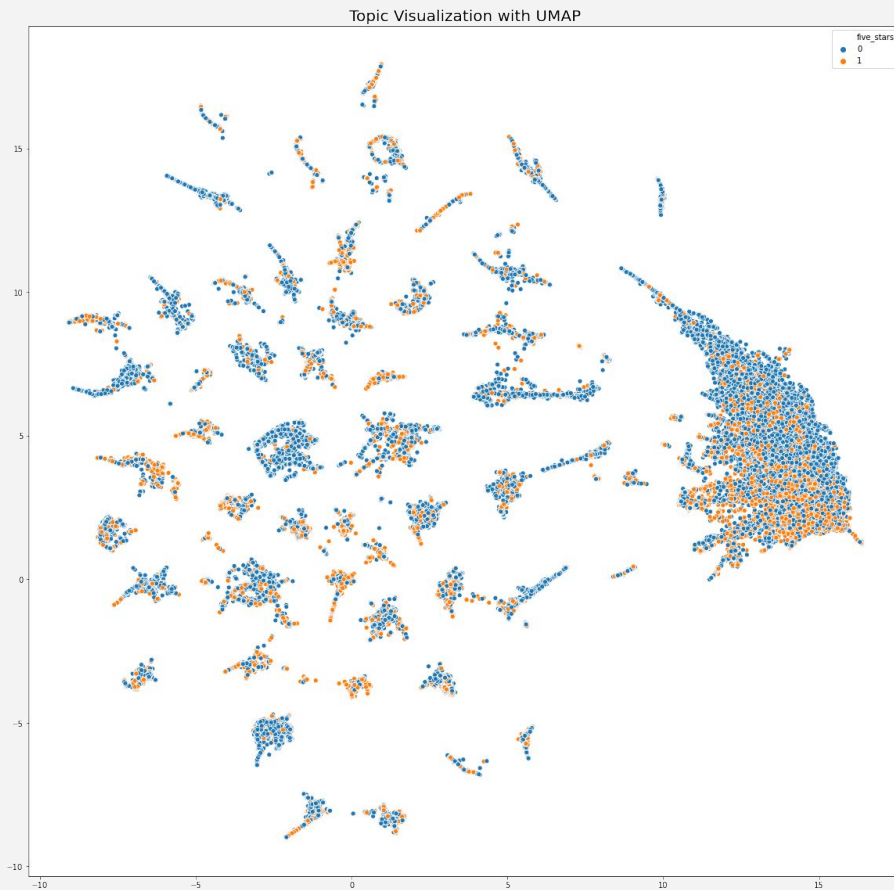
FUTURE WORK - Individualized Insights



Colombian Restaurant Example

- 4.5 avg rating, 33 reviews
- Aggregate topic scores
- Compare scores to 5-Star avg
- Topic 3 = "Good Food"
- Topic 10 = "Bland Taste"

APPENDIX - Topic Visualization



APPENDIX - Topic List

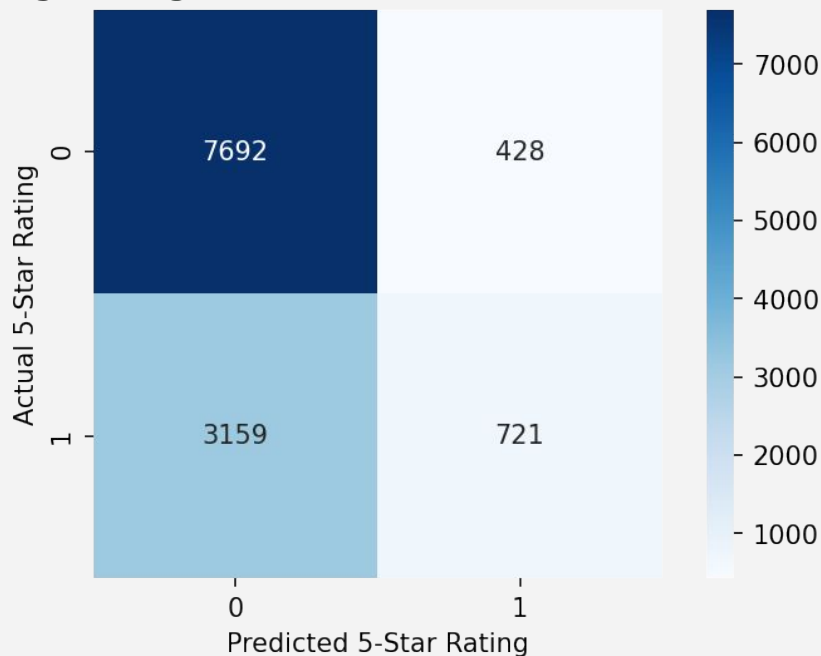
- Topic 0 - portion size, good portion, good portion size, lunch special, small portion, size great, price portion, portion size great, great portion, price portion size
- Topic 1 - food great, food great servic, great food great, great price, food great price, good food great, food great atmospher, delici food great, amaz food great, servic food great
- Topic 2 - veri good, also veri, also veri good, food veri good, veri good food, servic veri good, veri good servic, good veri, veri good price, tast veri good
- Topic 3 - food good, good price, food good servic, good food good, food good price, great food good, food good portion, servic food good, good atmospher, time food good
- Topic 4 - great food, great food great, servic great food, great food servic, great food good, staff great food, staff great, great food amaz, great food awesom, atmospher great food
- Topic 5 - realli good, food realli, food realli good, also realli, realli good food, servic realli, also realli good, realli nice, servic realli good, realli realli
- Topic 6 - veri friend, staff veri, staff veri friend, veri friend staff, veri friend help, friend help, veri friend food, veri friend servic, veri friend attent, friend food
- Topic 7 - pretti good, food pretti, food pretti good, servic pretti, servic pretti good, pretti good food, tast pretti, tast pretti good, pretti good servic, also pretti
- Topic 8 - good food, servic good food, good food good, realli good food, veri good food, good food servic, pretti good food, good food great, good food veri, good food price
- Topic 9 - reason price, veri reason price, food reason, food reason price, veri reason, price good, servic reason price, reason price good, servic reason, good reason price
- Topic 10 - tast like, sauc tast, sauc tast like, food tast, food tast like, realli tast, like water, tast like water, realli tast like, good tast
- Topic 11 - custom servic, great custom, great custom servic, good custom servic, good custom, custom servic great, poor custom, poor custom servic, excel custom servic, excel custom
- Topic 12 - great servic, food great servic, great servic great, great servic good, great servic friend, great servic veri, great servic food, great servic amaz, great food great, delici great servic
- Topic 13 - gluten free, gluten free option, free option, vegan gluten, vegan gluten free, free vegan, gluten free vegan, bake good, realli nice, also gluten
- Topic 14 - first time, time tri, first time tri, second time, time went, tri first time, tri first, first time went, time order, went first time
- Topic 15 - friend staff, veri friend staff, staff great, friend staff great, super friend staff, food friend staff, food friend, veri friend, servic friend staff, great friend staff
- Topic 16 - food servic, great food servic, good food servic, food servic great, qualiti food servic, food servic excel, amaz food servic, food servic atmospher, servic atmospher, excel food servic
- Topic 17 - servic great, servic great food, great servic great, food servic great, custom servic great, good servic great, friend servic great, delici servic great, great price, amaz servic great
- Topic 18 - good servic, food good servic, good servic good, veri good servic, good servic great, realli good servic, pretti good servic, price good, good servic food, price good servic
- Topic 19 - must tri, food must, food must tri, go wrong, food alway, must tri like, comfort food, delici must tri, amaz must tri, must tri also
- Topic 20 - veri nice, server veri, staff veri nice, server veri nice, nice atmospher, nice friend, veri nice friend, restaur veri, veri nice atmospher, decor veri
- Topic 21 - next time, tri next, tri next time, next time go, next time tri, time tri, time go, come next time, come next, want tri
- Topic 22 - food amaz, amaz servic, food amaz servic, great food amaz, amaz food amaz, amaz price, food amaz price, friend food amaz, amaz staff, amaz order
- Topic 23 - friend servic, fast friend, fast friend servic, veri friend servic, food friend servic, food friend, quick friend, quick friend servic, friend servic great, friend servic food
- Topic 24 - servic good, servic good food, good servic good, great servic good, custom servic good, servic good price, good price, good atmospher, friend servic good, servic good atmospher

APPENDIX - Topic List

- Topic 25 - super friend, staff super, staff super friend, super friend help, friend help, super friend staff, super nice, server super, server super friend, super friend service
- Topic 26 - would come, come tri, would come tri, overall would, overall would come, tri dish, good would, good would come, come tri dish, tri item
- Topic 27 - even though, wait minut, long time, wait time, take order, seem like, order food, long wait, right away, told us
- Topic 28 - food delici, delici servic, food delici servic, friend food delici, friend food, servic quick, great experi, great food delici, delici great, food delici great
- Topic 29 - would go, go tri, would go tri, food would go, food would, good would go, go way, go sure, good would, would go sure
- Topic 30 - fri rice, deep fri, stir fri, sweet sour, order fri, rice fri, pan fri, hot sour, sour soup, fri dumpl
- Topic 31 - mac chees, grill chees, order mac chees, order mac, late night, comfort food, chees good, chees ever, chees perfect, truffl mac
- Topic 32 - amaz food, servic amaz, amaz food great, amaz food servic, servic amaz food, amaz food amaz, amaz food veri, great servic amaz, staff amaz food, food order
- Topic 33 - qualiti food, good qualiti, high qualiti, good qualiti food, qualiti food servic, high qualiti food, servic qualiti, servic qualiti food, great qualiti, great qualiti food
- Topic 34 - feel like, make feel, make feel like, like eat, made feel, made feel like, feel like eat, like home, onli thing, feel like home
- Topic 35 - veri reason, price veri, price veri reason, veri reason price, good price, good price veri, great price, top notch, veri fair, also veri
- Topic 36 - staff friend, friend food, good staff, staff friend food, good staff friend, staff friend help, friend help, clean staff friend, staff friend attent, wait staff
- Topic 37 - make sure, make reserv, sure get, make sure get, sure tri, make sure tri, sure make, sure make reserv, make sure make, make sure order
- Topic 38 - excel servic, food excel, servic excel, excel food, food excel servic, servic excel food, realli nice, great food excel, excel price, excel servic great
- Topic 39 - delici food, servic delici food, delici food great, servic delici, absolut delici, food wonder, delici food friend, staff delici food, staff delici, absolut delici food
- Topic 40 - realli enjoy, realli like, enjoy food, realli enjoy food, enjoy meal, realli enjoy meal, also realli, also realli enjoy, veri fresh, overall realli
- Topic 41 - food veri, veri tasti, food veri good, food veri tasti, veri fresh, good food veri, food veri reason, veri delici, veri much, amaz food veri
- Topic 42 - servic food, food ok, food qualiti, great servic food, friend servic food, good servic food, servic food great, servic food qualiti, servic food good, custom servic food
- Topic 43 - hot sauc, sauc hot, sauc hot sauc, homemad hot sauc, homemad hot, burrito boyz, sauc realli, ask hot sauc, hot sauc realli, ask hot
- Topic 44 - great atmospher, atmospher great, great atmospher great, food great atmospher, beer select, staff great, great beer, atmospher food, great atmospher food, great staff
- Topic 45 - servic veri, servic veri good, servic veri friend, veri slow, servic veri slow, great servic veri, veri fresh, veri friend, veri attent, servic veri attent
- Topic 46 - everi time, time go, everi time go, time come, everi time come, food alway, servic alway, alway get, time food, time everi
- Topic 47 - look like, look like much, like much, chees look, menu look, look like someone, coffe shop, like someone, tast good, littl bit
- Topic 48 - servic friend, coffe shop, great servic friend, friend attent, servic friend attent, servic friend staff, friend food, servic friend food, friend fast, servic friend fast
- Topic 49 - fast food, food court, servic fast, tast good, food tast, fast friend, servic fast food, servic fast friend, food restaur, fast food restaur

APPENDIX - Classification Modeling

Logistic Regression Confusion Matrix (Test Data)



MODEL

Binary classification with logistic regression

ACCURACY

70.1%

F1

28.7%

RESOURCES

- <https://www.kaggle.com/yelp-dataset/yelp-dataset>
- Luca, Michael. "Reviews, reputation, and revenue: The case of Yelp. com." *Com (March 15, 2016). Harvard Business School NOM Unit Working Paper 12-016 (2016).*



THANKS

Does anyone have any questions?

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