



Data-Driven Suggestions for Pizza Hut and Shiny App

Stats 628 Module 3 Group 8

Recall from last time

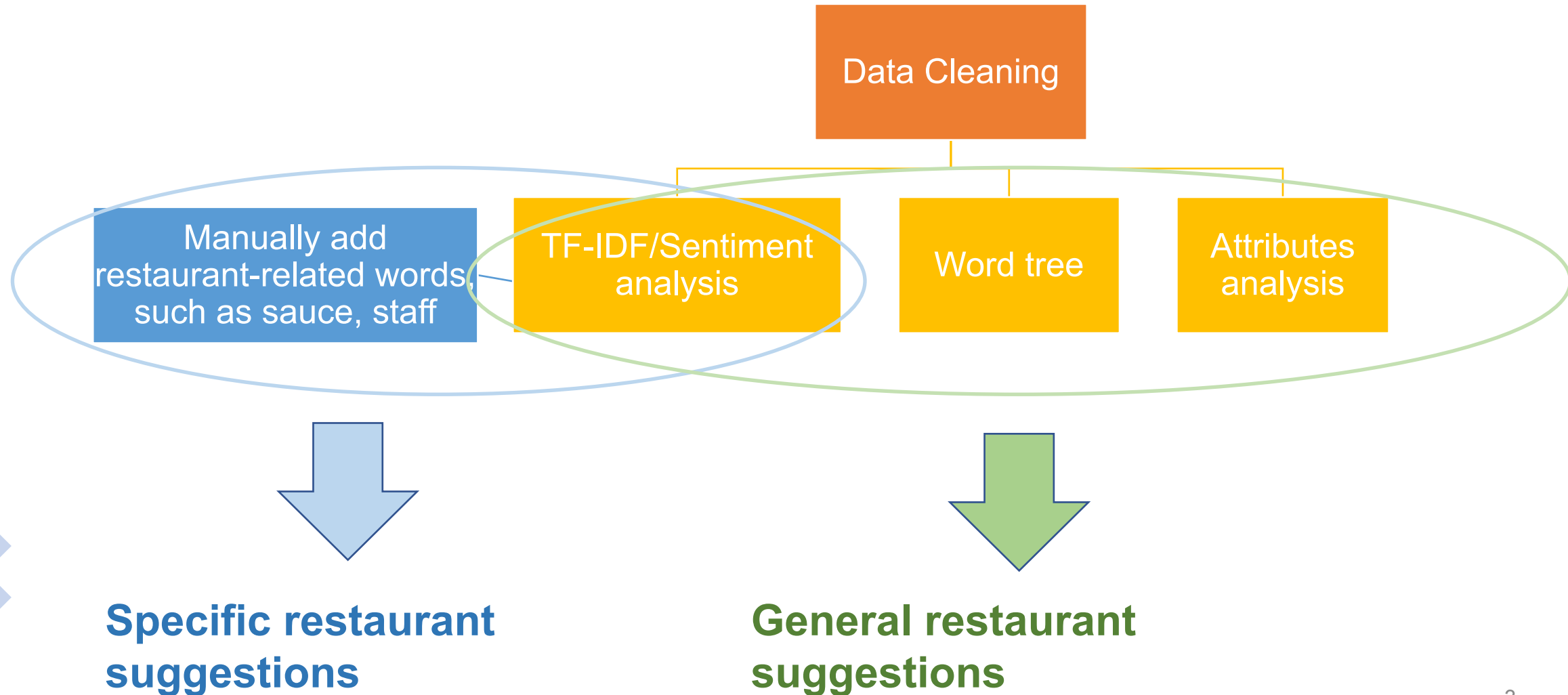
Sentiment Analysis:

- Extract sentences from reviews with important features
- Analyze each sentence's sentiment level by Nltk package in Python
- **Calculate the average compound sentiment score for each features**
- Compound score is a metrics to measure the sentiment between -1(most extreme negative) and +1(most extreme positive)
- Generally Pizza Hut has the lowest scores!

	Location	Delivery	Service
Dominos	0.054	0.039	-0.032
Pizza Hut	0.019	-0.014	-0.064
Little Caesars	0.108	0.144	0.141
Papa Johns	0.045	0.061	0.007
California Pizza Kitchen	0.255	0.162	0.278
Papa Murphy's	0.224	0.167	0.302
Sbarro	0.189	0.266	-0.045
Marco's Pizza	0.19	0.142	0.188
Chuck E. Cheese	0.276	-0.01	0.186
Cici	0.183	-0.157	0.361

New Target : Give suggestions to help Pizza Hut

Our project overview



Data Cleaning

- Filter business names with keyword “Pizza Hut”
- Merge business, review and attributes datasets by business_id
- Review's part: find suitable stop words; lemmatization; Only keep nouns and adjectives
- 145 different Pizza Hut restaurants in 64 cities with 3186 reviews

Extract Detailed Attributes



High Ratings (stars > 2.5)



Low Ratings (stars ≤ 2.5)

TF-IDF/Sentiment analysis

business_id	service	rude	management	wing
kqhHw_9KA30_RYk66mMbJA	-0.37615	-0.5709	None	0
hWRZaOk4JWUPFhcomdOLwA	-0.196945	-0.2386	-0.8481	-0.31415
6EwA03Jcw5VaPc8BNiwrpw	-0.170167	-0.89144	0	0.109283
HUEZLPIM64cDZnfHE1H3AA	0.333382	-0.7184	None	0.00128667
_zy93iWV8Z-YmfvjWPcfAQ	0.0113625	-0.743	-0.5267	0.0695571
I_x49glkQuAz9kg-Cw4RXA	-0.135733	-0.700633	None	0.3951
grYs6eZRJnQFts_6lZfSpw	-0.0910667	0.0258	None	-0.13775
iWslEebATlwbQXa4VIYOaQ	-0.266025	-0.50375	-0.7702	-0.38585
8xbSg5zjg9Z92hPjEsXy4w	-0.526636	-0.73326	-0.6122	-0.148
cNil4ExqTvXBkd9arVGx1g	-0.397475	-0.7717	None	-0.5106

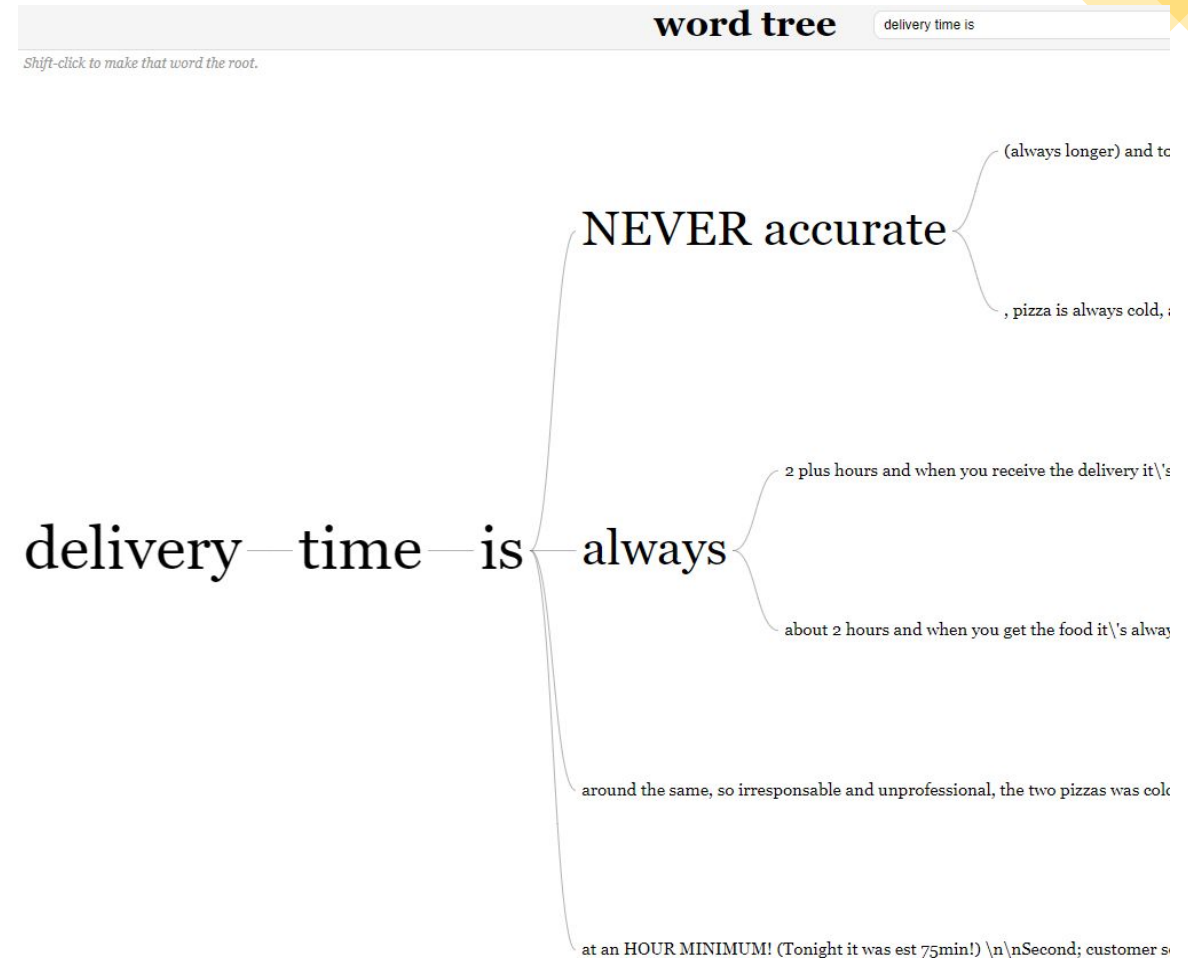
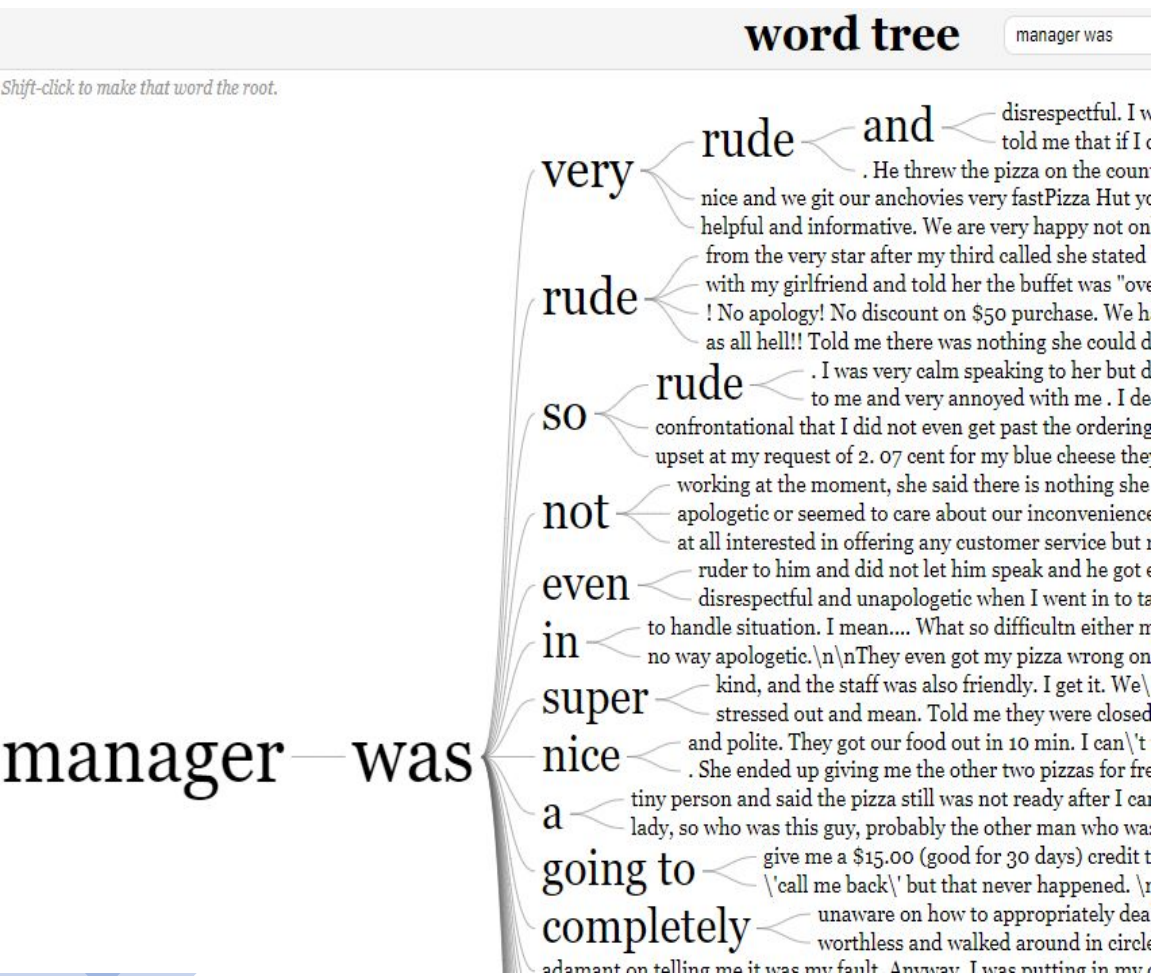
TF-IDF

- Help us find keywords in reviews, not just the most frequently occurring words

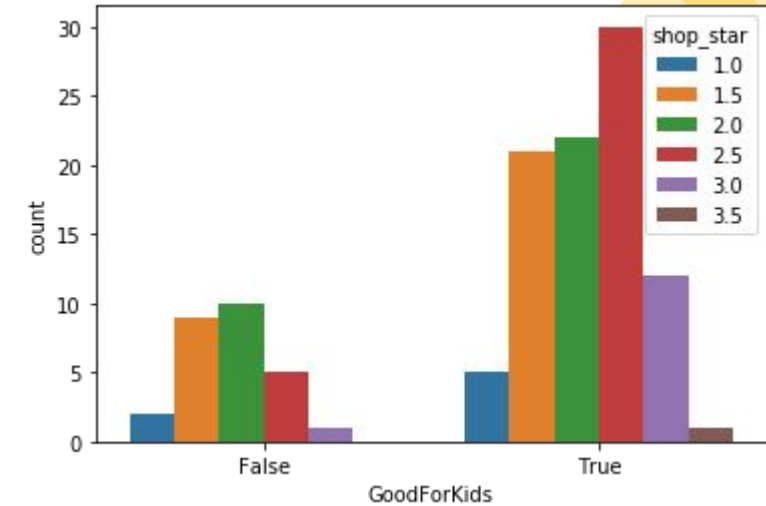
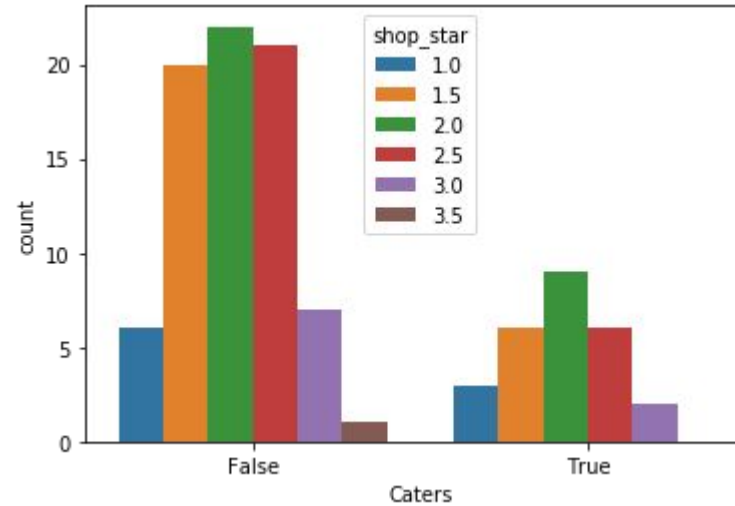
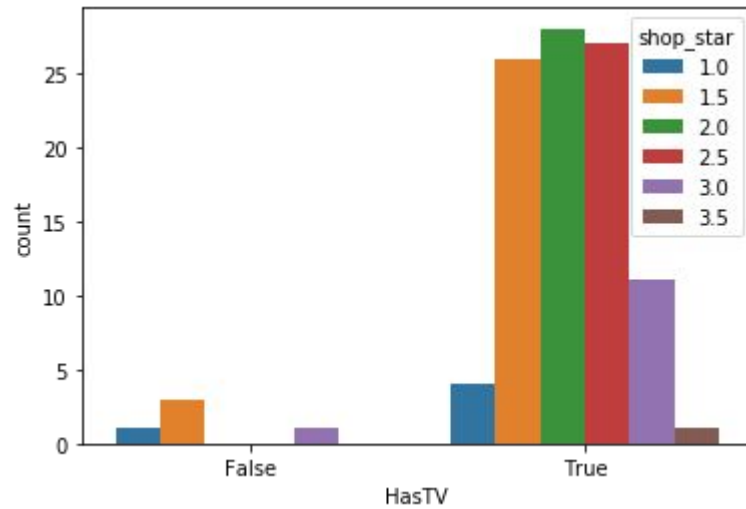
Results

Sentiment analysis

Word Tree : find connection between words



Attributes analysis



- Only retain attributes with a missing rate below 20%
- Some attributes are almost the same in all shops, such as “HasTV”
- For some features, the distributions of restaurant ratings are very similar, such as “Caters”
- Finally, we choose two attributes, **“GoodForKids”** and **“GoodForGroups”**, as for these two, the distributions of restaurant ratings are quite different

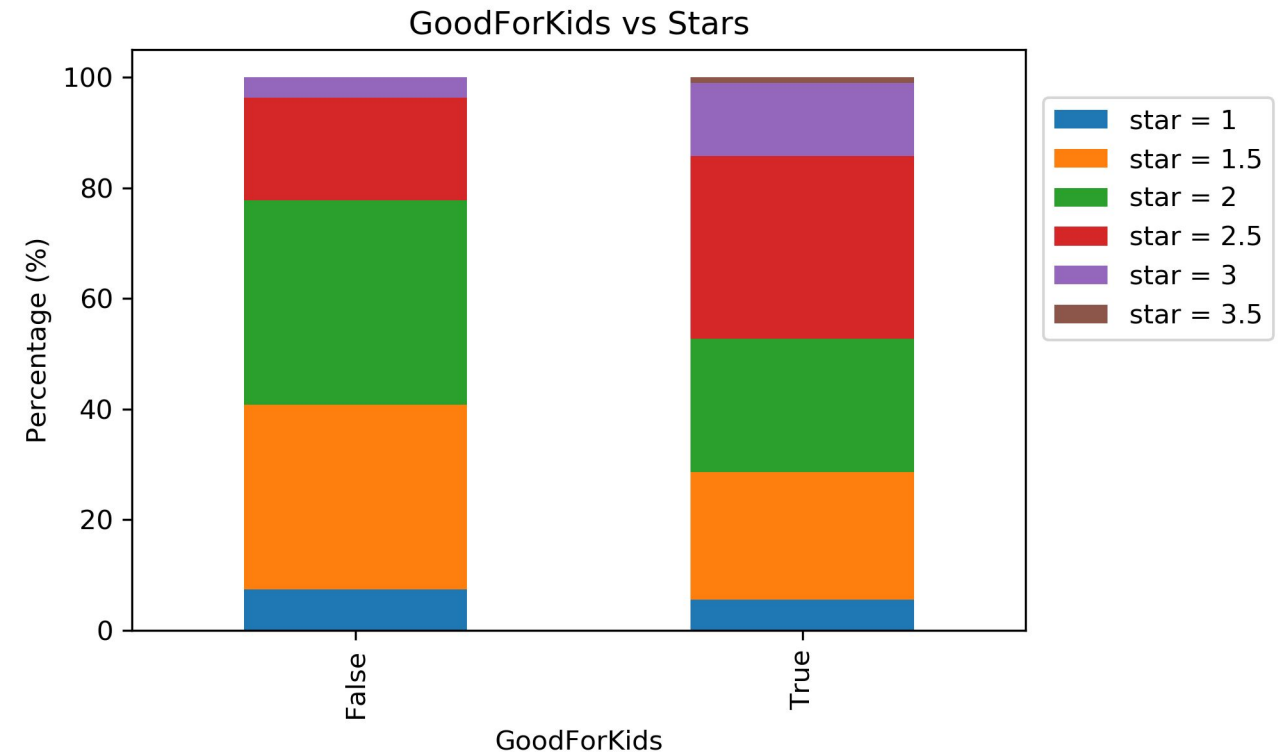
General Action Plan for Service

Make the Restaurants Kids Friendly:

	GoodForKids	NotGoodForKids
average ratings	2.14	1.89
t-test p-value	0.014	

recommendations:

- children's seats in the store
- set up a children's play area
- enrich types of children's meals
- set up family toilets



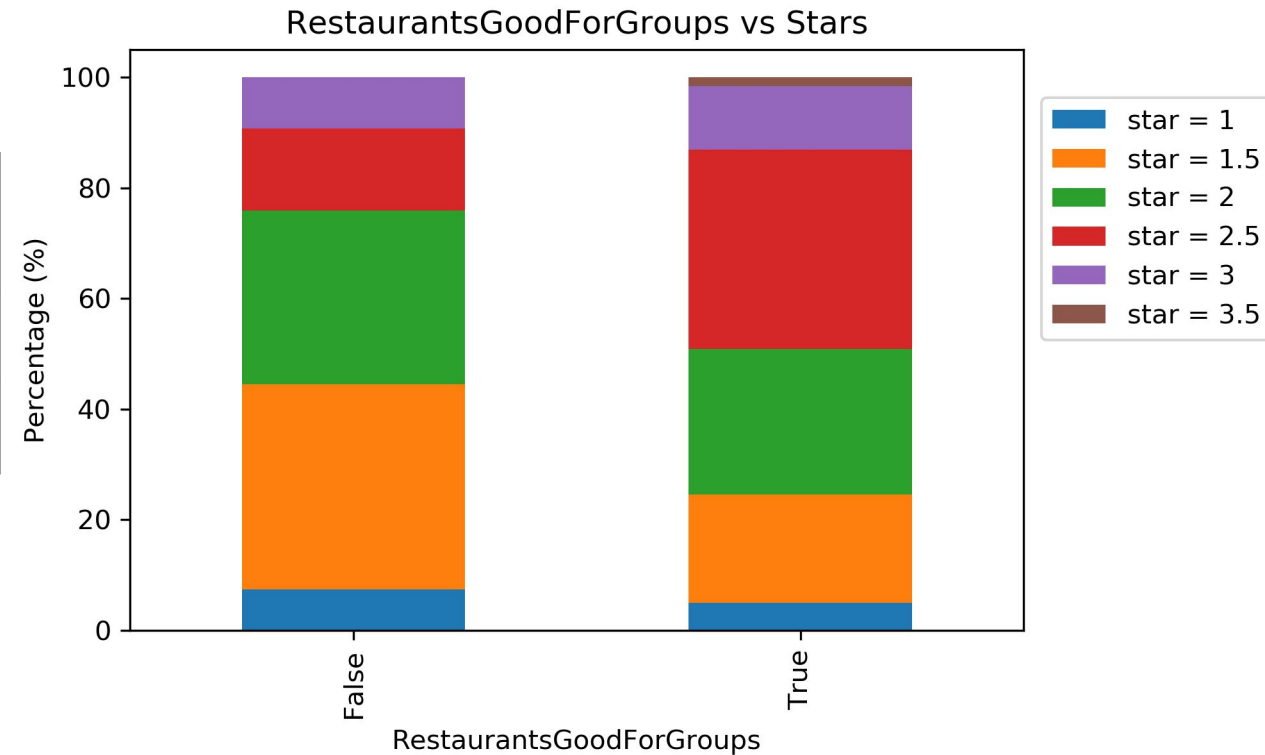
General Action Plan for Service

Make the Restaurants Groups Friendly:

	GoodForGroups	NotGoodForGroups
average ratings	2.17	1.91
t-test p-value	0.006	

recommendations:

- the number of large tables in the store
- launch a set menu for groups



General Action Plan for Service

Train Managers More Friendly:

	manager	with “friendly” in “manager”
average ratings	1.41	3.04
p-value	10^{-4}	

- A representative review from customer:

“Their manager is rude and obnoxious.”

recommendations:

- Strengthen the training of restaurant managers
- organize the selection of the friendliest employees



General Action Plan for Delivery

Make Delivery Faster and On-time:

	deliver	with “wait/slow” in “deliver”
average ratings	1.75	1.33

- A representative review from customer:

“ZERO PERCENT RECOMMENDED. Very slow service. Took 34 minutes to get my breadsticks 50 minutes to for my pizza.”

recommendations:

- better food delivery platforms
- own delivery team



General Action Plan for Food

Keep the Food Warm for Eating:

- 358 out of 3186 reviews mention the adjective “cold” (11.2%)
- The average sentiment score associated with “cold” is -0.096
- A representative review from customer:

“There is no way I want a discount for cold pizza. It is unacceptable and really upsets me.”

recommendation:

- Use an incubator during delivery



Specific Action Plan Example

Except above 5 significant features, we also find some features having differentiation ability and including enough reviews like “wing”, “cheese”, “pepperoni”, “bread”.

	wing	cheese	pepperoni	bread
example restaurant	-0.31	-0.16	0.64	0.35
average sentiment score	0.07	0.02	0.09	0.11

Weaknesses and Future work

- normality assumption in hypothesis test
- Subjectively selected features
- Use other Pizza chains' data

Shiny App:

- <https://wangcongming95.shinyapps.io/PizzaHut/>





Thank you!