



# True Review

A Personalized Restaurant Recommender

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# Scope



PROBLEM



EXPLORE THE  
DATA



MODELING



RESULTS

# Problem

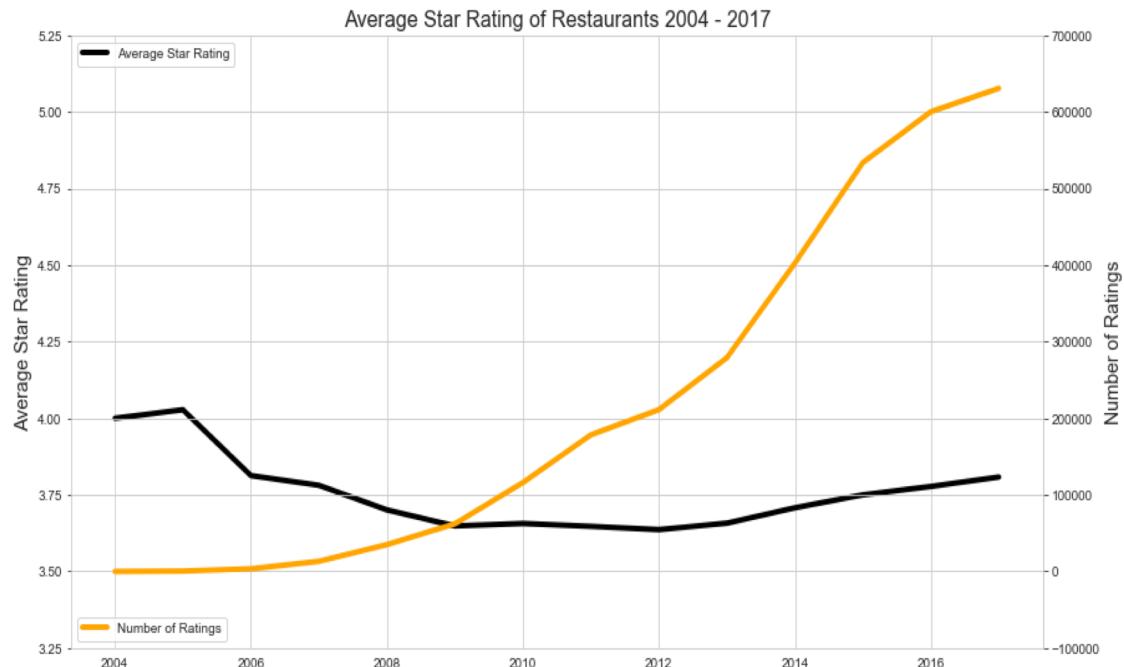


- What are users in Yelp reviews saying?
- Why should I trust Yelp reviewers, I'm different!?
- There are thousands of reviews for many restaurants



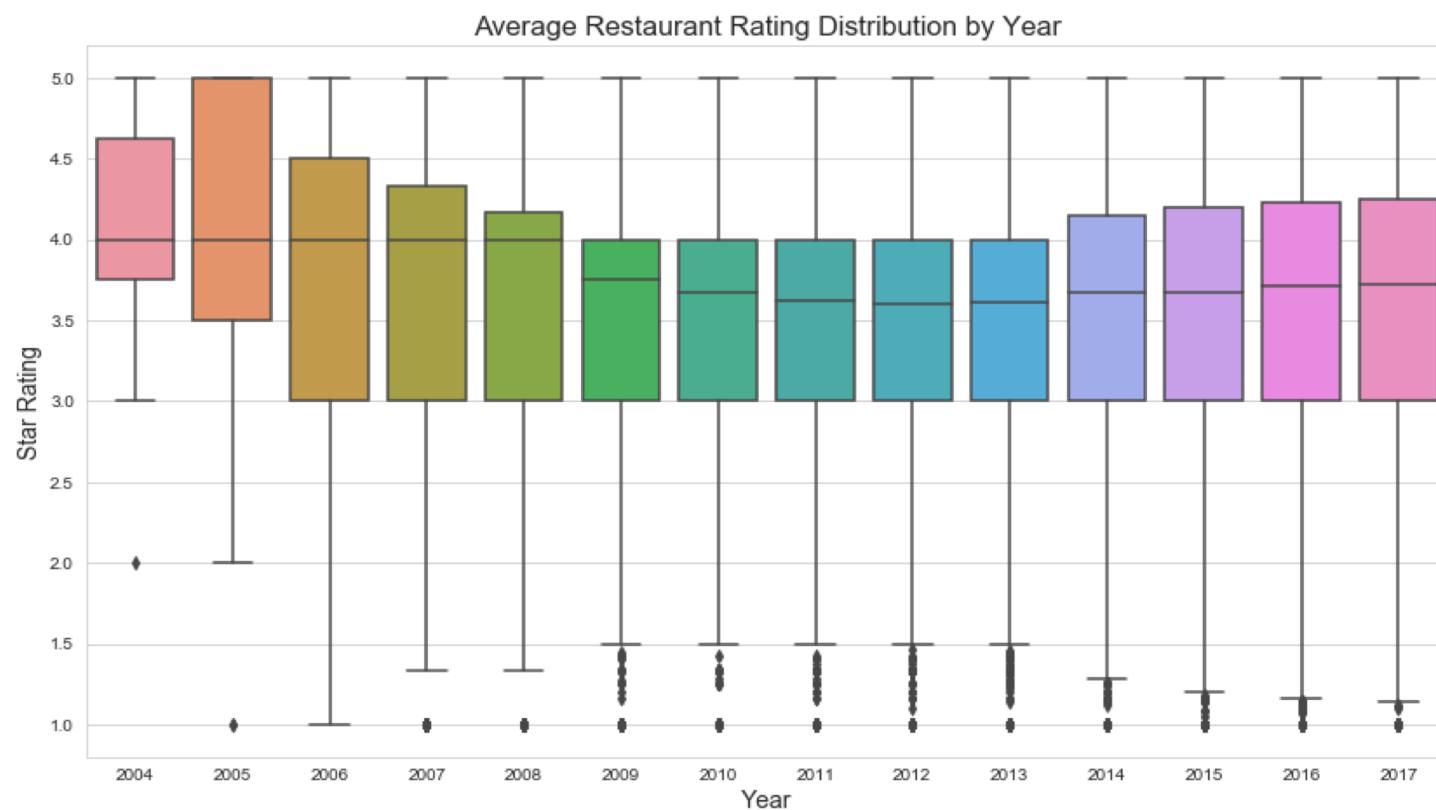
# Explore the Data – Reviews Over Time

- Average star rating and number of reviews over the years

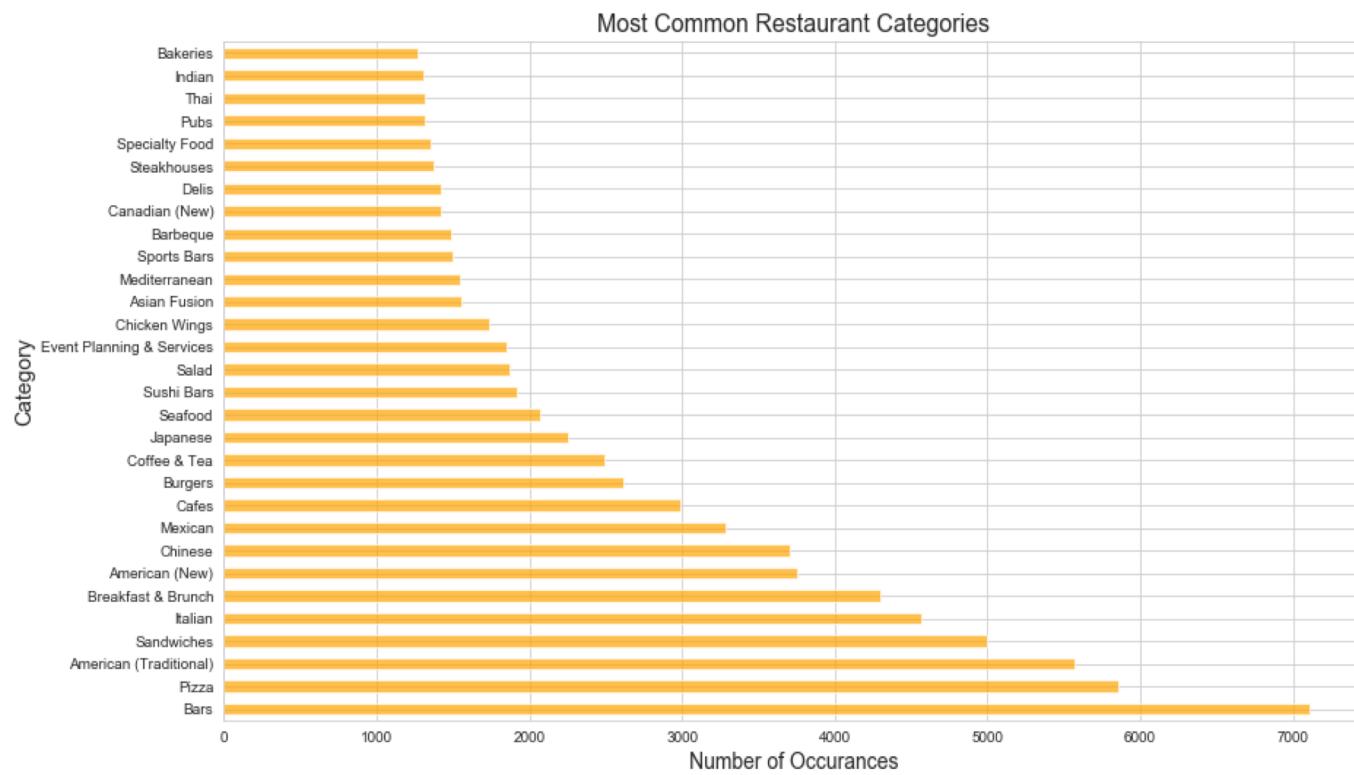




# Explore the Data – Distribution of Ratings

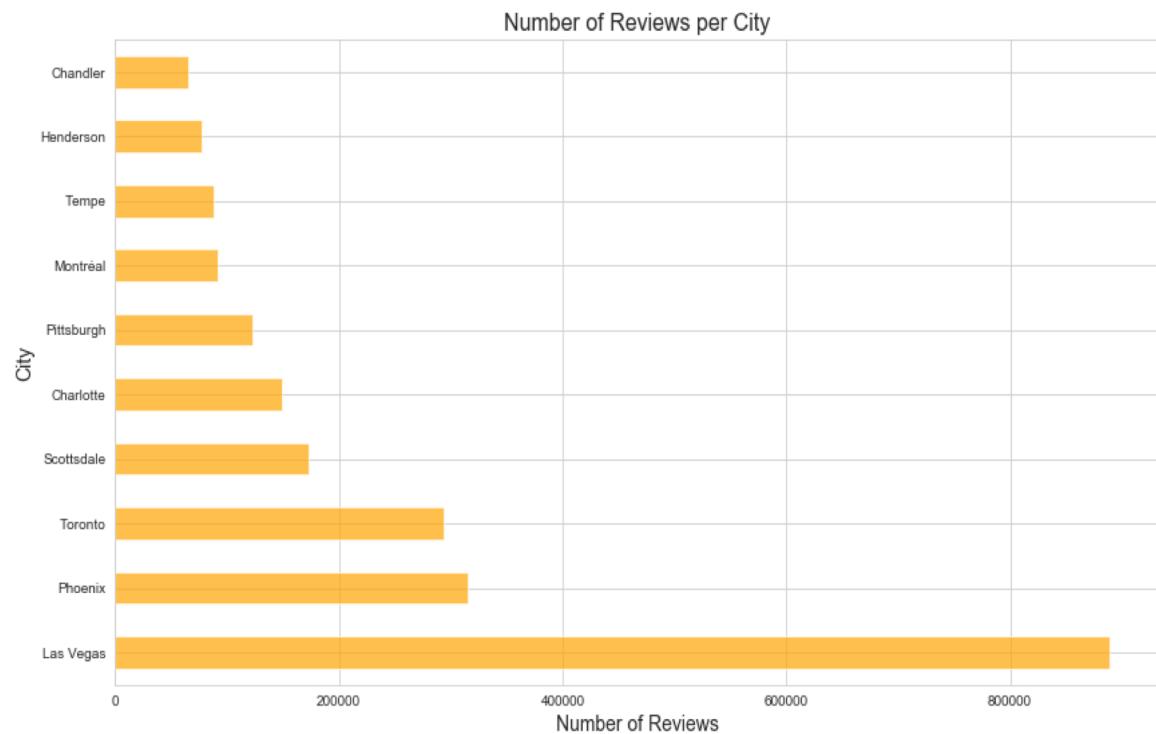


# Explore the Data – Common Categories



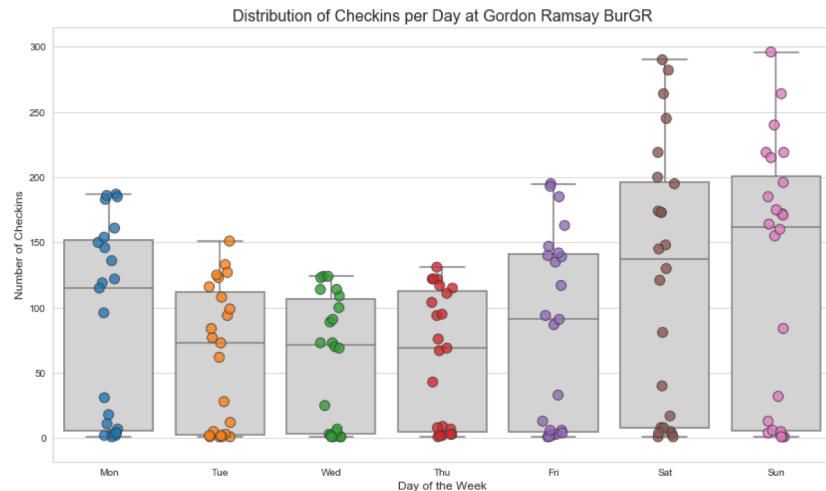


# Explore the Data – Number of Reviews



('Henderson', 0.145)  
('Chandler', 0.14)  
('Tempe', 0.12)  
**('Scottsdale', 0.076)**  
('Pittsburgh', 0.049)  
('Charlotte', 0.048)  
('Phoenix', 0.032)  
('Montréal', 0.031)  
('Las Vegas', 0.02)  
('Toronto', 0.015)

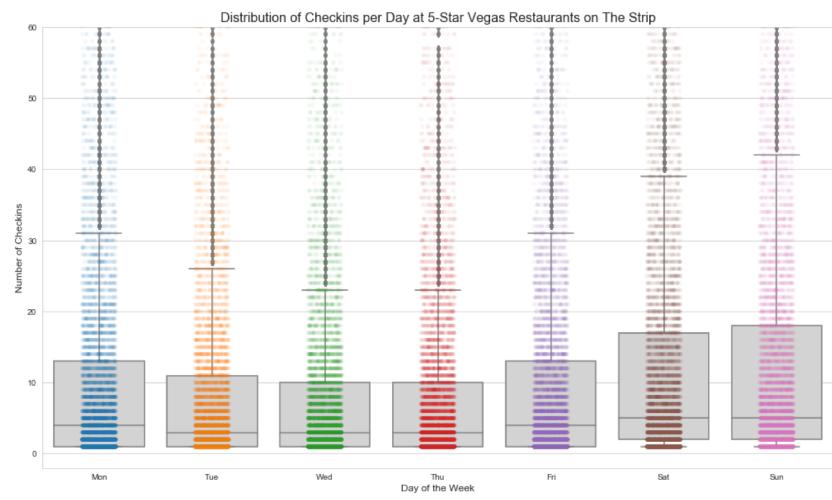
# Explore the Data – Check-in Distribution



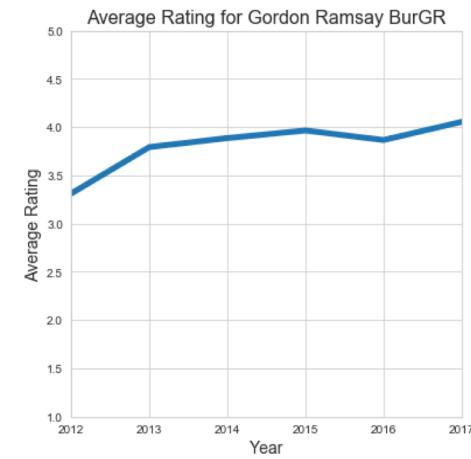
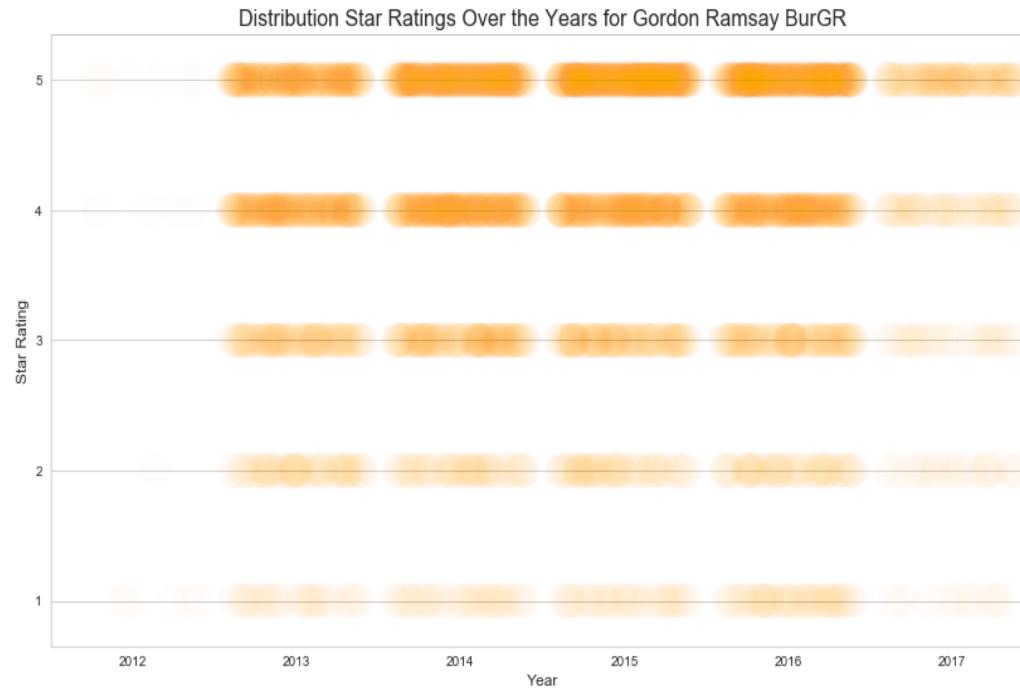
Gordon Ramsay BurGR

vs

Other Vegas Strip Restaurants



# Explore the Data – Ratings Over Time





# Explore the Data – NLP

Random review for Eddie's House in Scottsdale, AZ:

'I really like this place. I have been numerous amt of times and I keep wanting more. The friendly bartenders, the exciting chef (Eddie). The best part of this place besides the good food and comfort level is their ALL Night Happy Hour. Yes All night \$5 dollar specialty cocktails like an espresso martini or wines of the day. All first courses (apps) are half off too. The apps includes, lambchops (\$19), Tuna tartar with wonton chips (\$9) and so much more. Great slot and yearning for more since last night.'



- Remove symbols, characters, etc.
- Remove small words
- Form bigrams and trigrams

'numerous amt time keep want friendly bartender exciting chef good\_part  
comfort level night dollar specialty\_cocktail espresso\_martini wine day  
first\_course app half app include lambchop tartar wonton\_chip much  
great yearning last\_night'



# Explore the Data – LDA

Random review for Eddie's House in Scottsdale, AZ:

'I really like this place. I have been numerous amt of times and I keep wanting more. The friendly bartenders, the exciting chef (Eddie). The best part of this place besides the good food and comfort level is their ALL Night Happy Hour. Yes All night \$5 dollar specialty cocktails like an espresso martini or wines of the day. All first courses (apps) are half off too. The apps includes, lambchops (\$19), Tuna tartar with wonton chips (\$9) and so much more. Great s[ot and yearning for more since last night.'



- LDA Topics Extracted

dinner	0.21
happy hour, drinks	0.18
cheap, good, service	0.18
lunch	0.16
buffet	0.11
healthy	0.06

# Modeling – Objective

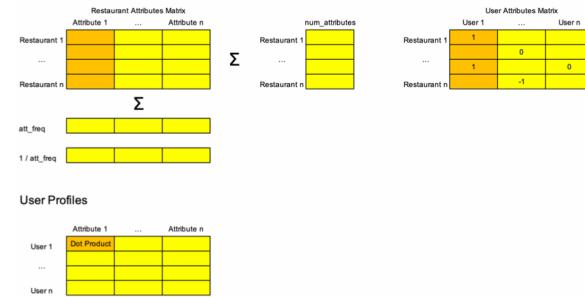


SVD

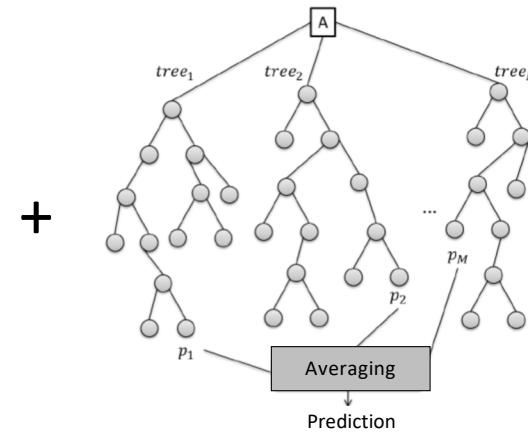
$$\begin{aligned} M &= U \Sigma V^* \\ m \times n &\quad m \times m \quad m \times n \quad n \times n \\ U &U^* = I_m \\ V &V^* = I_n \end{aligned}$$

+

Content Filter



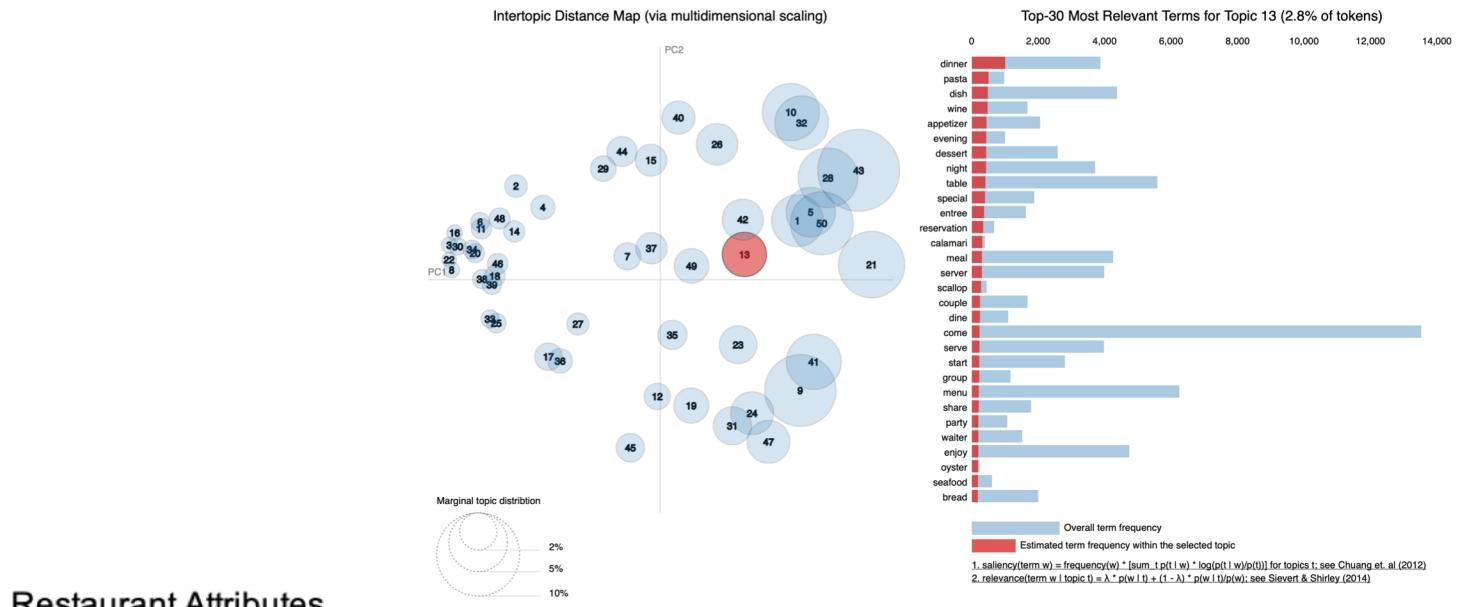
Stacked Ensemble



Final Rating



# Modeling – LDA Topic Modeling



## Restaurant Attributes

Matrix 1 - Restaurant Categories		
Category 1	...	Category n
Restaurant 1		
...		
Restaurant n		

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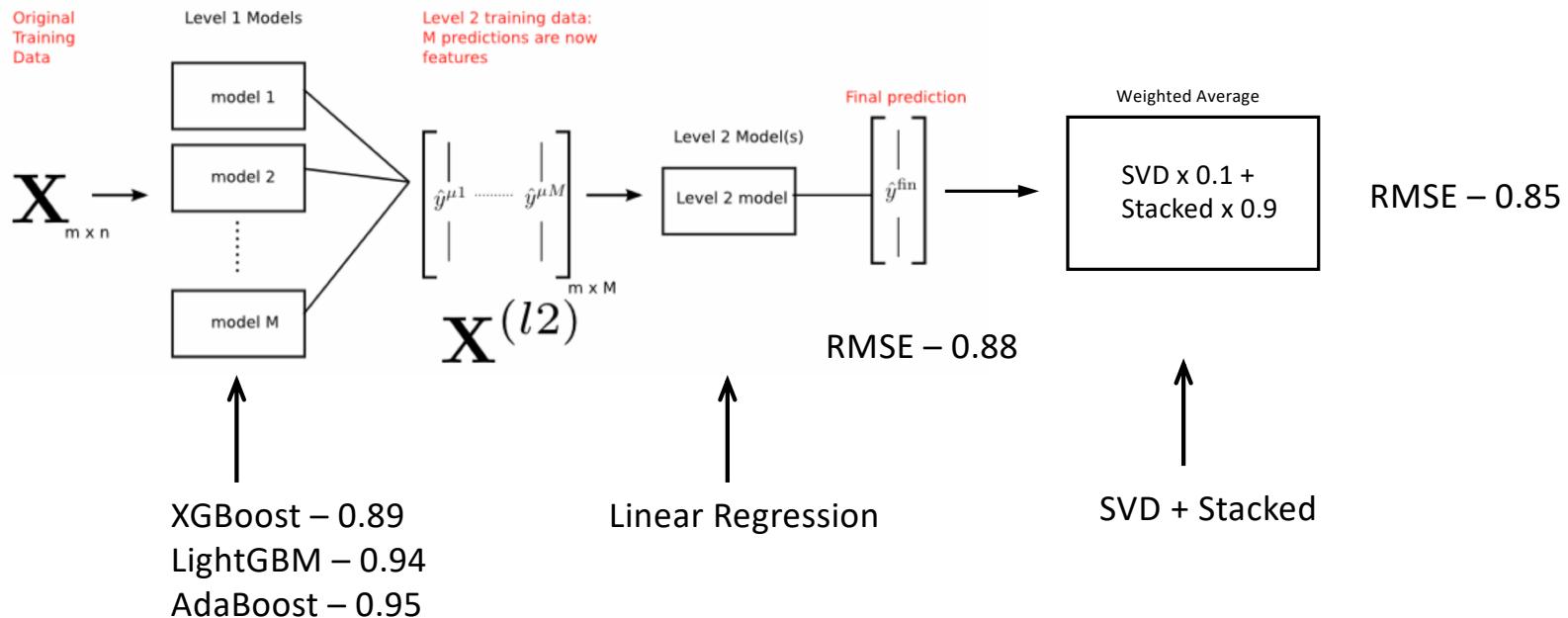
Matrix 2 - Restaurant Attributes		
Attribute 1	...	Attribute n
Restaurant 1		
...		
Restaurant n		

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Matrix 3 - User Review Topics Aggregate		
Topic 1	...	Topic n
Restaurant 1		
...		
Restaurant n		

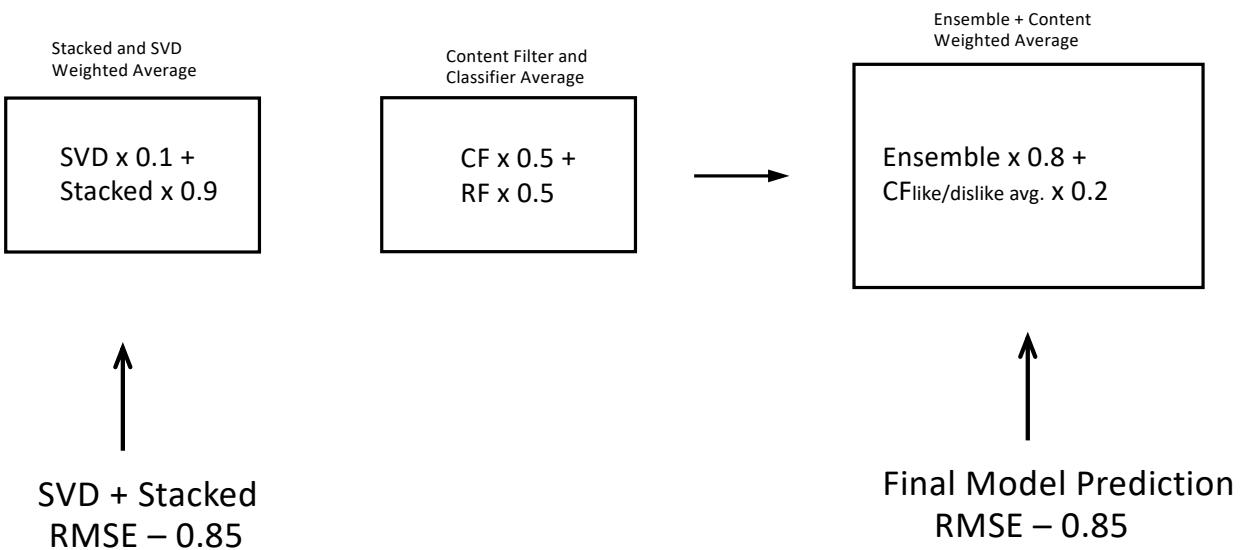


# Modeling – Stacked & Avg. Ensemble





# Modeling – Combining Models



# Results – Combined Predictor



RMSE Improvement	RMSE
Stacked Ensemble	0.88
SVD	0.99
SVD + Stacked Ensemble	0.85
SVD + Stacked Ens. + CF	0.85

## Results – Next Steps



- Add Features – LDA Topic Model on entire dataset
- Tune model ensemble through GridSearch
- Extract latent features from SVD model
- Utilize H2O Stacked Ensemble learning to improve model