User Recommenders, For Scottsdale AZ

Four Recommender from Yelp's Open Dataset

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https://bit.ly/3200bVk

Data Source: Yelp Open Dataset











6,685,900 reviews

192,609 businesses

200,000 pictures

10 metropolitan areas

1,223,094 tips by 1,637,138 users

Over 1.2 million business attributes like hours, parking, availability, and ambience Aggregated check-ins over time for each of the 192,609 businesses

Source: yelp.com/dataset

Motivation: Why Scottsdale?



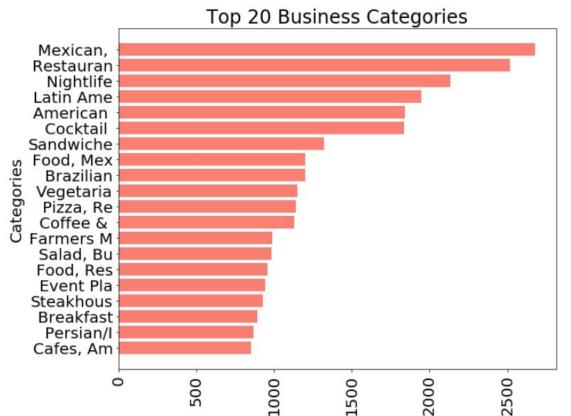




Source Forbes: https://bit.ly/2vAIXON

Businesses in Scottsdale





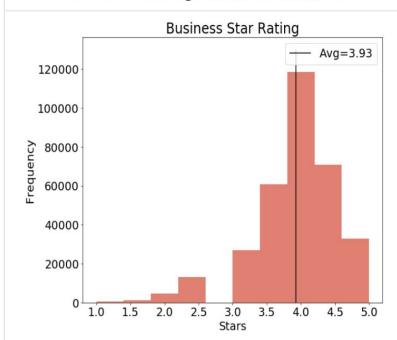
7,081

Total
Businesses in dataset
(Span multiple categories)

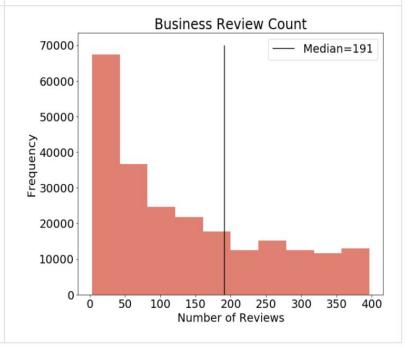
Businesses Ratings in Scottsdale



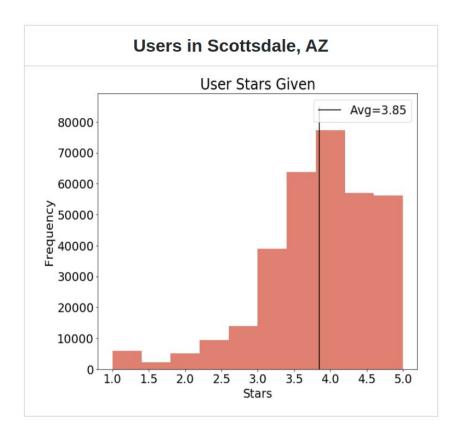




Business Review Count in Scottsdale, AZ



Users in Scottsdale





KEYNOTE:

Average *user rating* will be used as the *metric* for subsequent recommenders

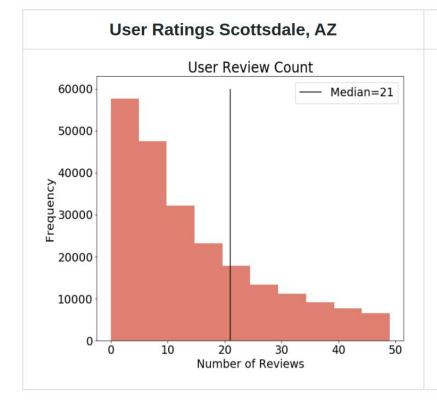
RATIONALE:

Business ratings can be used but some users patronize *poorly rated* businesses

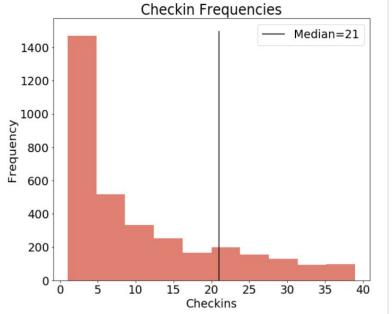
140,940 Unique User ID's

Users in Scottsdale



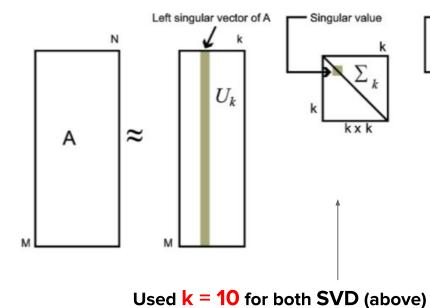


User Check-In Counts Scottsdale, AZ

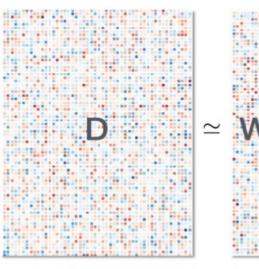


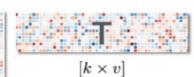
Math: SVD and NMF





Right singular vector of A N N k V_k^T





Matrix Factorization

and NMF (right)

SVD Image Source: https://bit.ly/3ctCYMi **NMF** Image Source: https://bit.ly/3coElqd

 $[n \times v]$

 $[n \times k]$

SVD and **NMF** Top 10 Predictions



SVD Recommendations in Scottsdale, AZ	NMF Recommendations in Scottsdale, AZ	Patronized Establishments in Scottsdale
('Kristin', ['True Food Kitchen', 'Cafe Monarch', 'The Herb Box', 'Sweet Republic', 'Talking Stick Resort', 'Roka Akor - Scottsdale', 'Sprinkles Cupcakes', "Portillo's Hot Dogs", 'iPic Theaters', 'Studio Movie Grill'])	('Kristin', ['True Food Kitchen', 'Hopdoddy Burger Bar', 'The Thumb BBQ', 'SOL Mexican Cocina', 'Butters Pancakes & Café', "Coconut's Fish Cafe", 'Salty Sow', 'North Italia', "Portillo's Hot Dogs", 'Sweet Republic'])	3360 Butters Pancakes & Cafe 312378 Wildflowe 600627 Flower Child 624904 Viet Kitche 744479 Wildflowe 746301 Original Breakfast Hous 771054 Andreoli Italian Groce 838710 Barrio Quee 1147492 Rocket Burger & Sub 1155989 Rustic Cafe

SVD and **NMF** Validations



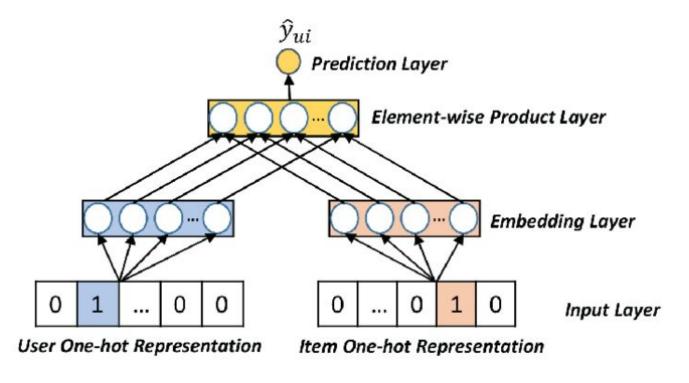
7 CV Validations with Surprise k=10			
	test_rmse	test_mae	
Algorithm			
SVD	0.691716	0.478392	
NMF	0.703249	0.536901	
BaselineOnly	0.715314	0.506353	
NormalPredictor	1.101105	0.865834	



SVD and **NMF** models are not off by much

Embedded Neural Network Model





Embed Image Source: https://bit.lv/2VEbDkF

Embedded Neural Network Results

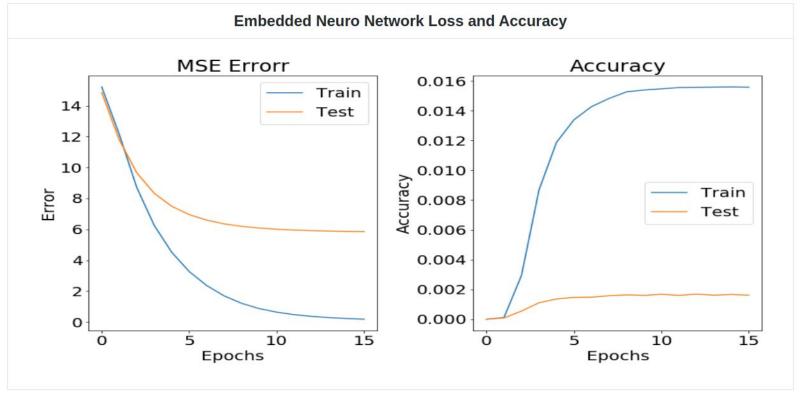
```
array(['Butters Pancakes & Café', 'Wildflower', 'Flower Child',
       'Andreoli Italian Grocer', 'Barrio Queen',
       'Grassroots Kitchen & Tap', 'La Fonda Del Sol', 'Diego Pops'
       "Jason's Deli", 'Zipps Sports Grill', 'Arrivederci', "Corlec
       'Jalapeno Inferno', 'Mozaik Skin & Body', 'NYPD Pizza',
       'NYPD Pizza', 'Naked BBQ', "Casella's Italian Delicatessen",
       "Casella's Italian Delicatessen", "D'Lite Healthy On The Go"
       'Dairy Queen', 'Asian Island', "Raising Cane's",
       'Wow Wow Lemonade Scottsdale', "Coconut's Fish Cafe",
       'Paradise Hills Dentistry', 'Paradise Hills Dentistry',
       'Connected Medical Center', dtvpe=object)
array(['Old Town Ink', 'Sitter4Paws', 'Precision Door Service',
       'Quick Mobile Repair', 'Bob The Psychic',
       'Mark Mitsubishi Scottsdale', 'JW Auto Care',
       "Dapper Dan's Barber Shop", 'AC by J', "TLC While You're Away",
       'Camelback CrossFit', 'Henna Shoppe', 'Public Storage',
       'Mac Masters Mac & iPhone Repair', 'Deka Lash',
       'Allison Woodworth, RN, MSN, FNP-C', 'WIPEOUTRUN Phoenix',
       'Hampton Inn & Suites Phoenix/Scottsdale',
       'First Impression Ironworks',
       'John Gluch - Platinum Living Realty',
       'Better Than New Furniture Repair', 'Banner Urgent Care',
       "Hiland's Cigar's", 'Skin Cabaret', 'Perfect Teeth',
       'Fins Up Scuba', 'Fixness Equipment', 'Sushi Roku'], dtype=object)
```

Kristin's Patronage

Kristin's Recommendations

Embedded Neural Network Results

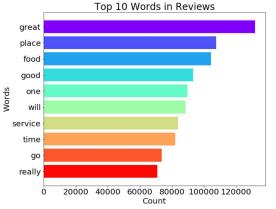


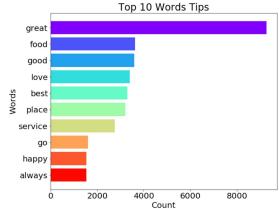


Recap and Next Steps



- 1. **SVD** and **NMF** models made better historical recommendations.
- 2. **Neural Network** model performance can be improved with more data or prior training
- Investigation into model accuracy for top n recommendations instead of just one





Questions:





