

Data_Science_Capstone

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November 22, 2015

title: Predicting Restaurants that will appeal to Local Consumers

intro

Local consumers information has always had an important connotation both for people traveling to an area and for successful businesses. The popular phrase "when in Rome" refers to the idea that when travelling to a foreign land you can't go wrong if you do what the locals do. From a different standpoint, businesses generally consider it cheaper to retain a customer than to acquire a new one. Therefore the benefits of knowing the local market will be an important factor towards driving repeat business. With these concepts in mind the questions that will be addressed in this paper will be the following:

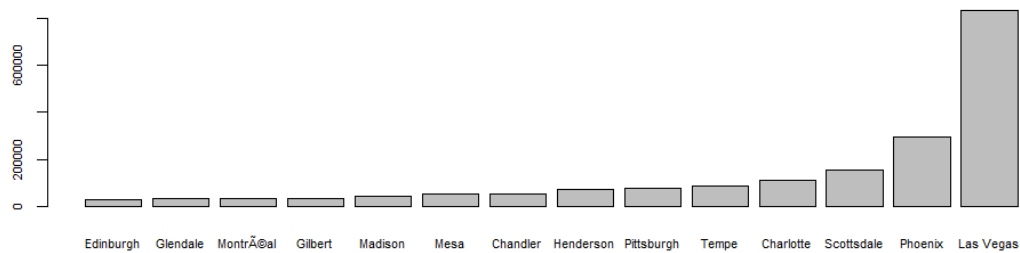
- Can a population of local consumers be identified?
- Is there a pattern to the restaurants that local consumers prefer?

Answering these questions are preliminary steps towards understanding a local marketplace and helping businesses identify opportunities for investment and avoid making changes that may lose their local customers.

methods

A large portion of the population of reviews and tips come from the Phoenix area (Phoenix, Scottsdale, Tempe, Mesa, Gilbert and Glendale) as seen in the graph below. These bordering cities may not have as many reviews as Las Vegas, but together they are comparable and represent an area that has a more stable population than sin city.

Figure 1: Cities with the most reviews and tips

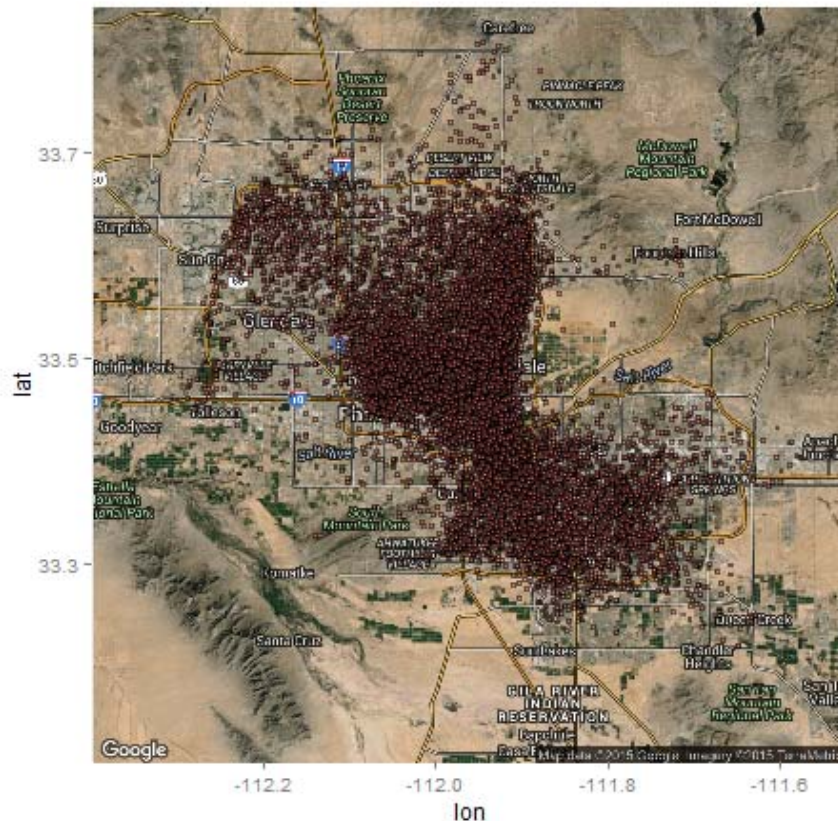


Using google maps it appeared that Arizona State University (ASU) is located in the middle of these selected cities. Using a 25 miles radius around ASU, the majority of the area of these cities are included in the area around ASU.

The first step was isolating businesses and reviewers within this area. The businesses could be identified using the latitudes and longitudes that were already provided. There were no locations provided for users and therefore assumptions had to be made to define and identify "local" users writing reviews within the geographic area selected.

Local Users were defined by using the following assumptions: - The centroid of the users reviews will be used as their current location - The Users current location falls within a 25 mile radius of ASU's main campus - The radius of 99% of the user's reviews are a short driving distance away by drive (15min away at 45mph) - The user has reviewed or left a tip for at least 3 different businesses

Figure 2: Geographic distribution of local users



The reviews from local users was used to identify local businesses were "Highly_Liked" within that group of local users. The following criteria were used to identify these businesses: - An Avg rating in the 80 percentile of local user ratings (4.363636 stars) - 10 or more ratings from local reviewers

A flag was created to to differentiate between "Highly_Liked" and non "Highly_Liked" businesses. The businesses in the population were then limited to restaurants based on the the category column. The other categories from the lists in that column were then extracted and flags were created to indicate which of these businesses were assigned that category. These flag fields were then merged with the times and attributes from the original business table to use for a random forest analysis. before running the analysis the following methods were used to limit columns run through the analysis: - Remove columns with NA values that consist of $\geq 99\%$ of the columns population - Remove near Zero Variance fields -

results

I was able to find a significant number of "local" users that only rate businesses within a fixed distance from their calculated location. In total there were 12,762 users that fit my definition for local users.

The results of the random forest were not very conclusive with the fields used. The sensitivity indicates that the model is not very accurate at predicting what specifically makes a restaurant highly liked. On the other hand the sensitivity of the model indicates that the model has a fairly decent ability to track what local users do not like in restaurants and could be used by businesses in this area to make improvements.

Confusion Matrix:

Prediction	Reference	
	N	Y
N	451	20
Y	98	24

Other Statistics:

Accuracy: 0.801

Specificity: 0.5455

Sensitivity: 0.8215

'Positive' Class: N

Discussion

I was actually pleasantly surprised that there were so many users that only rated restaurants in such a small area. I travel frequently and probably would not fit the criteria of a "local" user by my own definition. This gave me a good sample of reviews from users that could reliably be linked to the local market.

The results show that the data can predict what restaurants will receive bad ratings fairlywell; however, the predictions for good ratings are not very helpful. In the future additional items could be considered such as geographical location. Also, my analysis used 53 variables for the random forest and with limited memory I also used limited trees which may have affected my results. In the future it may be more effective to consider clustering these users prior to the analysis to stratify them into specific neighborhoods and tastes to create a more valuable market segmentation. This also may make my model's predictions more accurate.

In the future I would like to see if I can create a better prediction model for this. Also it would be interesting to compare the ratings of people that stay local to those that travel farther and also to consider how those ratings from those that are local are significantly different from the overall rating of businesses.