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CS591 L1 - Written Report
Evaluating Boston Restaurants Based on Cleanliness, Transportation, and Safety Metrics

Many restaurant ratings are based on the quality of food or service, two important things to consider when choosing an eatery. However, there are also many other factors that influence a diner's overall experience at a restaurant, including cleanliness, safety in the nearby neighborhood, and distance to public transportation. These metrics aren't often considered as a major part of a restaurant's rating. For this project, we sought to quantify some of these metrics into an overall retaurant score that attempted to rate a restaurant based on some of the smaller things that can make or break a restaurant experience.

The datasets used in this project were drawn from or derived from data available on the City of Boston Data Portal. In many cases, we used particular parts of existing datasets, or combined several different datasets to get an overall picture of a restaurant's health or safety.

To determine a cleanliness rating for restaurants, we used incidents of rodents at the site of the restaurant or very nearby. While the presence of rodents is not necessarily a definite indicator of a dirty restaurant, it seemed to be a good way to quantify whether or not a restaurant was likely to be dirty or unsanitary. This data was gathered from a dataset of 311 Service Requests[1], from which we pulled records of rodent sightings. Each sighting is marked by the geolocation of the incident. The way we assigned each restaurant is by proximity by rounding the latitude and longitude to three decimal places and any building in that regions would be deemed to have a rodent problem if any of the builds have reported rodent problems. We also used restaurant inspection data to determine if a restaurant was likely to be clean. If a restaurant failed inspection, it received a lower score in our rating metric. This data was drawn from a Food Establishment Inspections[2] dataset. Each restaurant entry is tagged by the business name of the restaurant. Together these two pieces of information about a restaurant helped us determine whether the restaurant in question was clean and sanitary.

[1] https://data.cityofboston.gov/City-Services/311-Service-Requests/awu8-dc52
[2] https://data.cityofboston.gov/Health/Food-Establishment-Inspections/qndu-wx8w

Our transportation metric was determined by the distance between each restaurant and the closest MBTA T stop. A lower distance meant the restaurant received a higher score in that category. For this project, we chose to only focus on subway stops and not include bus stops; since the subway accesses all parts of the city via a single entry point - that is, you can make free transfers between subway lines once you enter the system - assessing the accessibility of a restaurant to public transportation is better served with the subway than with the bus system, where you can only make one transfer for free.

In order to determine the distance from each restaurant to the closest T stop, several datasets were aggregated. We began with a dataset of all the restaurants in Boston, obtained from the Active Food Establishment Licenses[3] dataset on the City of Boston Data Portal. We also used a dataset listing the names and locations of all the T stops; this was derived by a classmate from MBTA data. For each restaurant we found any nearby T stops by truncating the latitude and longitude of both the restaurant and all T stops to a certain accuracy and selecting T stops that matched the location of the restaurant after truncation. From these nearby T stops, we computed the distance to the restaurant for each; this calculation was performed with Great Circle distance, which, while it doesn't compute walking distance by streets, computes an accurate distance with the curve of the Earth's surface to find the most precise distance between two geographic points. The T stop that had the least distance to each restaurant is the closest T stop. We also used this data to generate information about how many restaurants were at each T stop (i.e. how many restaurants had each T stop as their closest stop) and later, to aggregate the restaurant scores for each T stop.

The safety rating we assigned to each restaurant was based on a specific type of crime occurring in the neighborhood of a restaurant. We used the City of Boston Crime Incident Report [4] dataset and selected vehicle larcenies as the type of crime to focus on. This type of crime would affect restaurant goers who drove to the restaurant and would likely make the experience unpleasant. Vehicle larcenies could also be a good metric for overall crime in the area of the restaurant or the overall safety of the area. For each occurrence of a vehicle larceny, we performed a similar calculation to that of a restaurant's closest T stop to determine the closest T

[3] https://data.cityofboston.gov/Permitting/Active-Food-Establishment-Licenses/gb6y-34cq
[4] https://data.cityofboston.gov/Public-Safety/Crime-Incident-Reports/7cdf-6fgx

stop for the larceny. Then, by matching T stops across the two datasets, we determined which restaurants the larceny occurred near. While this is not an especially accurate measure, since there are many restaurants at each T stop, it gives a general idea of the crime measures in the neighborhood surrounding the T stop, which are likely to be similar at many of the restaurants in that neighborhood. The number of larcenies near a restaurant determined the restaurant's safety score, with fewer crimes netting the restaurant a higher score in that category.

The metric we used to determine a restaurant's overall score was based on crime (measured in vehicle larcenies), distance to public transportation, and cleanliness, which was broken into rodent reports and inspection failures. Scores were computed as follows:

3 points were given for distance to T stop - restaurants less than 200 feet were awarded 3 points, between 200 and 700 feet were awarded 2 points, and over 700 feet were awarded 1 point.

1 point was given for vehicle larcenies - restaurants with less than 60 larcenies were awarded 1 point, while restaurants with 60 or more larcenies received no points.

0.5 points were awarded for rodent reports - restaurants with no rodent reports received 0.5 points, while restaurants with one or more rodents reports received no points.

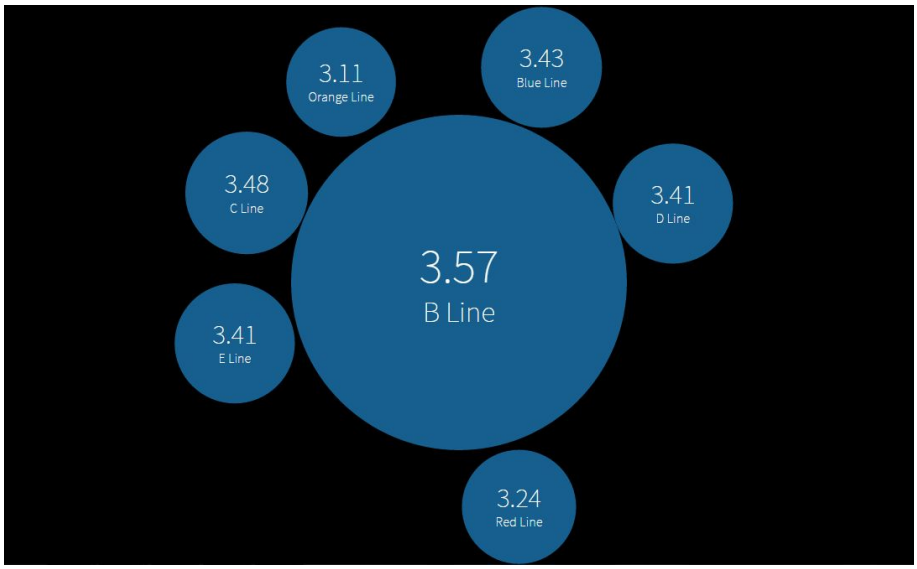
0.5 points were awarded for inspection failures - restaurants with no inspection failures received 0.5 points, while restaurants with one or more inspection failures received no points.

Overall, the results of the metric being applied to Boston restaurants was positive. Many restaurants scored well.

<u>Average Restaurant Rating by T-Line:</u>

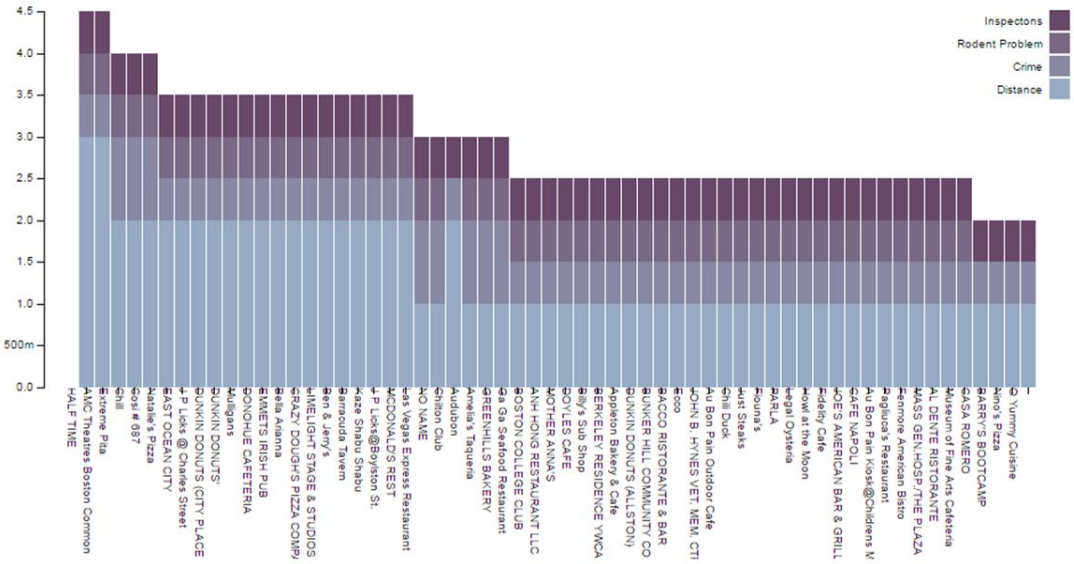
In the graph below, we are showing the average restaurant rating of each colored MBTA line as well as individual lettered lines for the Green Line. The results were aggregated by taking a simple average of all the stops on each line. If a stop runs through more than one line, the results are added to each line separately. Originally the intent was to plot all of the stops regardless of lines, but with 88 stops, d3's graph was not able to produce the graph with a reasonable running

time. The graph shows that the lines have very similar scores with the B Line having the highest score and the Orange Line having the lowest score. The reason that the averages are so similar is probably because of the large number of restaurants that reside on these lines.



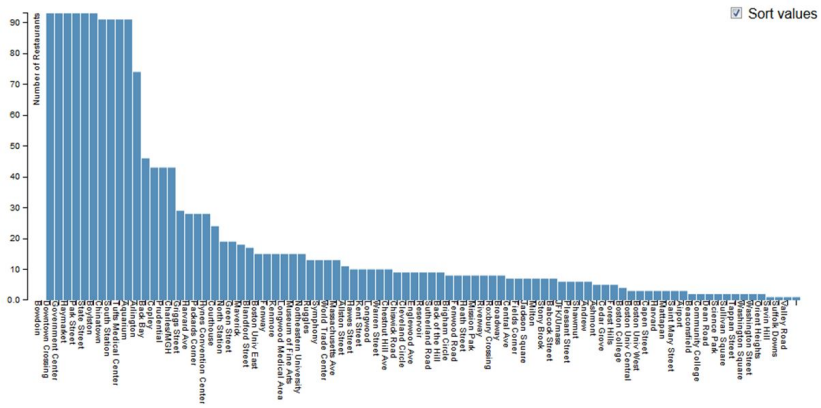
Sample Restaurant Rating Breakdown:

In the graph below, we have selected 60 random restaurants of the hundreds in the Boston area out of 657 restaurants. The scores are broken down into the four categories of our metric and displayed as a composite of those categories. Note that Extreme Pita, our very own late night stop in West Campus, is one of the highest rated restaurants in this sample.



Restaurants by T Stop:

The graph below shows the number of restaurants located at each T stop. While this graph doesn't figure into our metric, it was a stepping stone to the later figures that we computed. Additionally, it shows at a glance which stops on the subway system have the most restaurants, which could be useful in determining where to go to find restaurants. The graph could also be combined with the restaurant ratings metric to find the ratings for only a specific T stop's restaurants - the below graph would be used to determine which T stops to pick to narrow down the ratings metric computation.



Obviously the results of this preliminary attempt to score restaurants are not perfect. Many of the datasets we used were imprecise or lacking in information that would make our metric more accurate. We were also limited by the datasets available. When choosing the categories we would measure restaurants on, we were forced to categories that corresponded to the data available.

Future attempts to continue this project should try to include more robust data in the scoring process. In our project, we would have liked to have included more crime statistics in our measure of safety but were limited by time. A more comprehensive analysis of crime statistics near each restaurant would help to evaluate the overall safety of restaurant's neighborhood better than just the one crime metric we chose. Another interesting angle to this project would look at these metrics and existing restaurant ratings, for example, those on Yelp or other restaurant review sites. It would be extremely interesting and worthwhile to combine this measure of safety,

accessibility, and cleanliness with other measures of diner experience and satisfaction to create a more holistic view of how good each restaurant really is.

This analysis leaves much unsaid, but helps illuminate some often overlooked but important parts of a restaurant experience that contribute to a positive or negative view of a restaurant. While food and service quality is a large part of diner satisfaction when visiting a restaurant, there are other factors that contribute to the overall experience. This project was just one preliminary attempt to quantify other elements of the overall experience and hopefully more work can be done in the future to further refine restaurant reviews and ratings.