Predicting Local Business Popularity during the Olympics through Geospatial Features

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Executive Summary

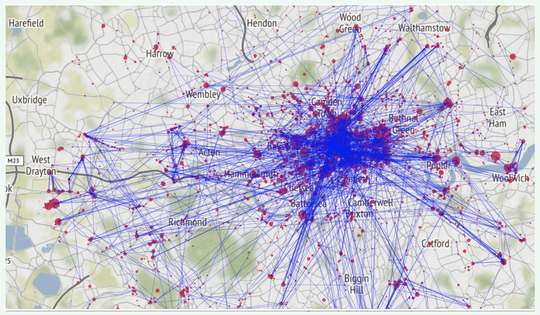
- Transport connectivity is the most important factor
- Diversity of neighborhood is the second most important factor
- Jensen Attractiveness alpha is the third most important factor
- Closeness to Olympic event locations is the least important factor

Background

By understanding which factors impact a local business' popularity during the Olympics, business owners can properly adapt to changes in customer flow during major event.

Data

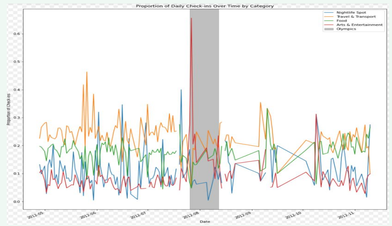
Foursquare checkin data for London local businesses (venues) in period around Olympics 2012. Also used Olympic events' location data and London underground station data. To quantify the neighborhood quality of the venue we extracted features like Olympic Distance, Station Connectivity,neighborhood diversity and accessed the attractiveness of neighborhood using Jenson Quality Alpha. The plot below shows the transitions among venues before the Olympics. to determine effect on local businesses. The larger the dot, the more check-ins that venue had. Comparing the transitions before and during the game, we proposed four hypotheses.



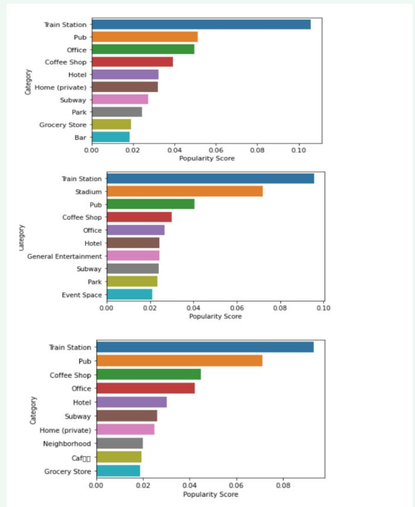
Hypotheses

1. Close to travel station should increase popularity.
2. Close to Olympic event location should increase popularity.
3. Diversified neighborhood offers different activities and people will tend to stay longer and check more places.
4. The more attractive the venue is compared to its peers, the more traffict it will get during major event.

Exploratory Data Analysis



People are engaging in entertainment activities during olympics. This thrives the impact on local business around those venues

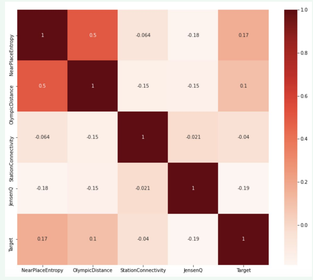


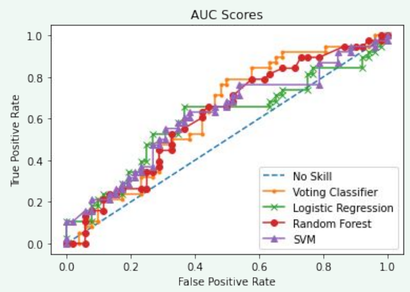
Pre,During,Post Olympics Analysis for granular venues with relative popularity score calculation

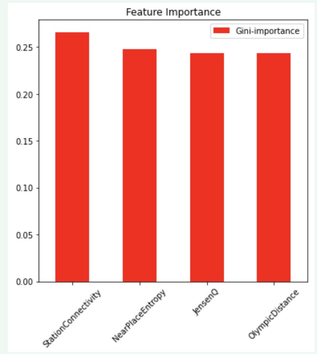
Model

We perform a binary classification task. We experimented with SVM, Random Forest and Logistic Regression classifiers. Finally, we achieved the best AUC score using random forest. We prioritized the AUC score for analysis.

Model Results







====== Test AUC Scores ======	
No Skill:	0.500
SVM:	0.539
Random Forest:	0.689
Logistic:	0.559
Voting:	0.664

The diagrams above show that we were able to create a soft-voting classifier that is able to somewhat accurately identify which local businesses will see an increase in popularity from the Olympics

We also see that *StationConnectivity* feature seems to have the greatest importance while *OlympicDistance* has the least, suggesting that at a major even like this, more traffic is coming from transport stations instead of walking. Also it's worth exploring other kinds of geospatial features, mobility features and user social network features.

During major event, better transport station connectivity may contribute more to foot traffic than short walking distance from event location, since we see more longer distance transitions. Besides spatial distance factors, neighborhood quality factors like diversity and venue attractiveness also contribute to change in popularity of a business.