

Analysing Customer Behaviour for Shopping Centres in London Using GPS Data

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Project Background

Shopping centres are an important component of large cities. They provide jobs, wealth and social spaces. One of the challenges the retail industry is facing, is the increased competition from online retailers. Understanding the decisions behind why people choose to visit a shopping centre is therefore vital for shopping centres to remain successful. While shopping centres benefit local economies, the impacts on nearby town centres have been variable and depend on their health and strength. Furthermore, potential adverse effects have rarely been fully analysed. There is a need for more informed decisions about customer behaviour and the performance of shopping centres. The emergence of location-aware sensors and GPS, combined with the adoption of mobile phones, provide opportunities to improve the understanding of human behaviour at a global scale.

Data and Methods

This research aims to develop a conceptual framework on how to use GPS data to capture customer behaviour for shopping centres. The study used anonymised GPS data for Greater London for the month December 2017. Data for December 19 was missing due to errors. After deleting duplicates, 393 million records were left. The dataset contained information about the userid, date, latitude and longitude. Trajectories were created per day, consisting of at least 10 points. This resulted in more than 9.5 million journeys created by 810 thousand unique users. Events were triggered when a user moved through a hexagon of level 8, with a radius between 140 and 150 metres. Customer behaviour was analysed for the following shopping centres: Bluewater (large), Broadway (small), Lewisham (small) and Westfield Central London (large).

Home locations were inferred from the GPS data by clustering start and end-journey points. The centroid of the cluster with the most points was defined as home location. Shopping centre polygons were manually created. The user events that fell in or within 1 metre of the shopping centre polygons were extracted. Based on the userid and date, the remaining points that each user created were obtained. The following behaviours were analysed: dwell time, total customers per 15 minutes, total customers per day and the shopping centres' catchment areas. For the latter, the number of unique customers in December were aggregated at Ward level.

Key Findings

There is a higher variation in intensities for dwell time and customer counts for the large shopping centres compared to the small shopping centres. Furthermore, the dwell time and customer counts profile are much higher for larger shopping centres (see fig 1).

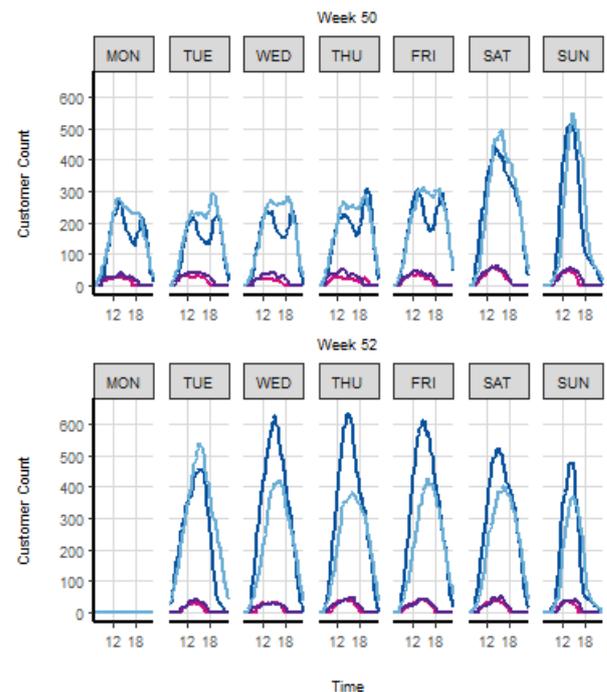


Figure 1: Average Customer Count per 15 Min for Week 50 and Week 52

While in week 50 there are two peaks visible during the week for the large shopping centres, in week 52 there is only one single peak, similar to that visible during the weekends. Regarding the shopping centres' catchment areas, small shopping centres depend more on customers living in nearby located wards compared to large shopping centres. Furthermore, the catchment areas of large shopping centres cover more wards therefore have a greater extent.

Value of the Research

Through the identification of shopping centre visits and home locations from GPS data, it was possible to analyse customer behaviour at a high spatio-temporal granularity and define the retail catchment areas. In week 52 people usually take vacation and therefore not constrained by their working hours so they can visit the shopping centre anytime, resulting in similar behaviours to that of weekends. GPS data can therefore capture shopping centre activities that are logical.