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Project Background

HammersmithLondon BID seeks, as part of its aims as a Business Improvement District, to promote the attractiveness of the Hammersmith area. A result of the promotion includes an improved visitor count, which is understood to offer local businesses greater selling opportunities. One way it aims to increase the appeal of the area is through locally-hosted events that occur mainly in the summer and winter periods. This project is responsible for organising temporal fluctuations in footfall, in such a way that HammersmithLondon may recognise how their events could be contributing to the cause of pattern changes. This project is an exploratory analysis that applies a range of tools in order to make inferences from a set of time series data. The tools used are implemented effectively in the existing literature in a wide range of applications.

Data and Methods

The data consists of an hourly count of pedestrians, captured throughout one year, across 6 wi-fi sensors located across the central and western areas of the BID. The data can be presented as a time series, which sees fluctuations, as well as observations that may be considered anomalies.

The 6 tools applied to the data are 1. Time series decomposition, 2. Change point detection (via a binary segmentation algorithm), 3. Anomaly detection, 4. Point data mapping and animation 5. Point data interpolation and 6. Principal component analysis. These tools were employed through packages on R Studio software and ArcGIS.

The first 3 of these tools compose a time series analysis, which allowed the comparison of positive anomalous footfall events to a calendar of HammersmithLondon events, in order to analyse for correlations. This allowed the project to make inferences about which events, or types of events, served as a part of the cause of high footfall counts. The final 3 tools made up the spatial analysis element. These 3 methods allowed us to see the relative importance of the sensor data in each location, and justified the omission of 3 sensors from the time series analysis.

Key Findings

Figure 1 presents an example of those positive anomalies detected from the time series data of one sensor. Through joining these results with corresponding specific events falling within the anomalous dates and times, and change point detection results to specific weeks and seasons in the year, the project was able to determine the most important events that HammersmithLondon hosts.

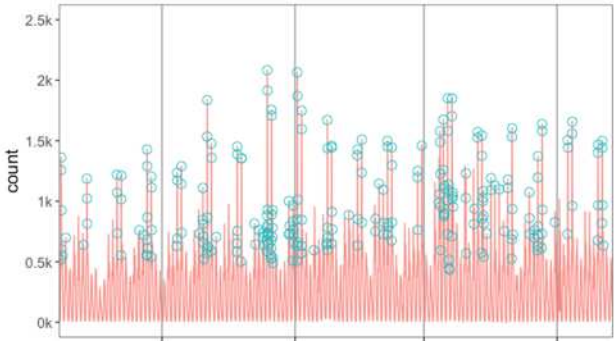

Figure 1. Anomaly detection graph for the 'Lyric Square' sensor

The empirical results indicate that BID-hosted 'Yoga in the Square' and 'Wimbledon in the Square' events are most likely to cause abnormally high footfall rates. Results are also explained in the context of categories. Of these categories, 'Big Screen' and 'Fitness, Health and Wellbeing' contained the most significantly correlated events to positive anomalous footfall results. 'Virtual Reality Cabin' and 'Hammersmith Movie Hub' events, in particular, were found to correlate the least with anomalous results. Change point detection in the Lyric Square trend level also indicated improvements in the footfall counts during the BID Summer Festival period.

Value of the Research

The results of this study have given the partner some evidence to suggest that certain events are drawing in more visitors than others, helping to justify spending in specific areas. HammersmithLondon can also justify investment into an increased number of footfall sensors in the area to improve the spatial analysis. The study also provides a positive case for the implementation of electronic footfall sensors for industries which are concerned with visitor counts as a response to promotional activities or events.