

Urban Analysis Through the Visualisation of the Geographic Concentration of Businesses

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Github: <https://github.com/m-bleasdale/Business-Heatmap>

Live demo: <https://business-heatmap.vercel.app/>

Introduction

This project maps the density of business locations in UK cities, using data from the Food Standards Agency to identify the general locations of urban city-centres, cultural hubs and commercial and entertainment districts. By visualising high density locations, this tool allows users to easily identify urban hotspots for the determination of potential areas for development or for tourists to decide on which areas are worth spending the most time in.

Methodology

Under the UK Food Standards Agency, all businesses that are registered with the UK Food Hygiene Rating Scheme (FHRS) in England and Wales are placed on a national register.¹ The name, location, and hygiene rating (a numeric score with 0 being the lowest and 5 being the highest) are available in XML format, grouped by local authority area, under the UK Open Government License.²

The initial idea was to produce a national heatmap of hygiene ratings. However, the visualisation was ineffective, as the concentration of business locations had a much greater impact on the heatmap than the hygiene ratings themselves. Instead, a more interesting visualisation was to look at the density of business locations.

Within the XML schema for each "Establishment", the "Geocode" field provided the latitude and longitude of the establishment and the "BusinessType" field identified its category. Both of these data points were used to map the geographic concentration of establishment locations, with an optional filter for the establishment type, to provide more specific data visualisation. The JavaScript Leaflet library was used to provide the mapping interface with two modes: a heatmap mode to show geographic concentration; and a points mode to highlight each individual establishment.

All businesses that serve, store, process, or transport food or drink are required to be registered with the FHRS. This includes retailers, pubs, factories, farms, schools, etc; all examples of establishments that one would not typically expect to be required to possess a hygiene rating.

¹ <https://www.food.gov.uk/business-guidance/how-food-hygiene-ratings-work>

² <https://ratings.food.gov.uk/open-data>

Examples of Usage

Figure 1 shows a heatmap of all business locations within the Cardiff local authority. Areas of high density are immediately visible and, based on local knowledge, correspond to regions with a high concentration of eating, shopping, and entertainment establishments. These are typically regarded as the city's social and cultural hubs. In Figure 2, these hubs have been annotated, and Cardiff's high streets and city centre commercial areas are clearly distinguishable through the business density data.

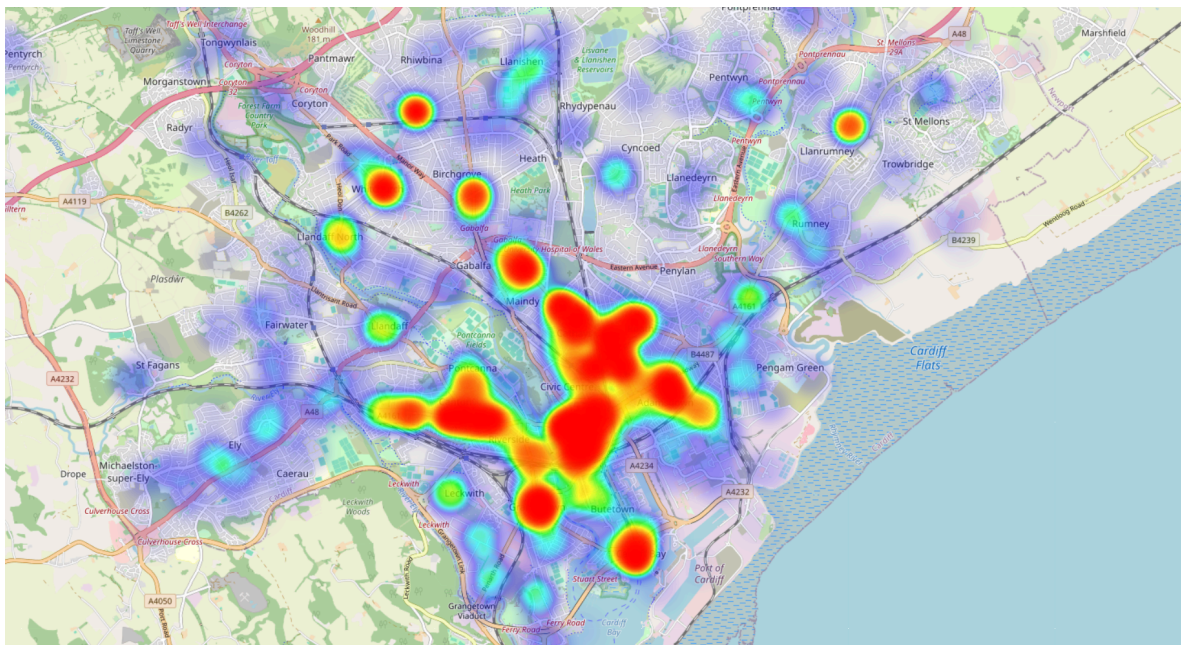


Figure 1: All businesses in the Cardiff region. Shown using a heatmap.

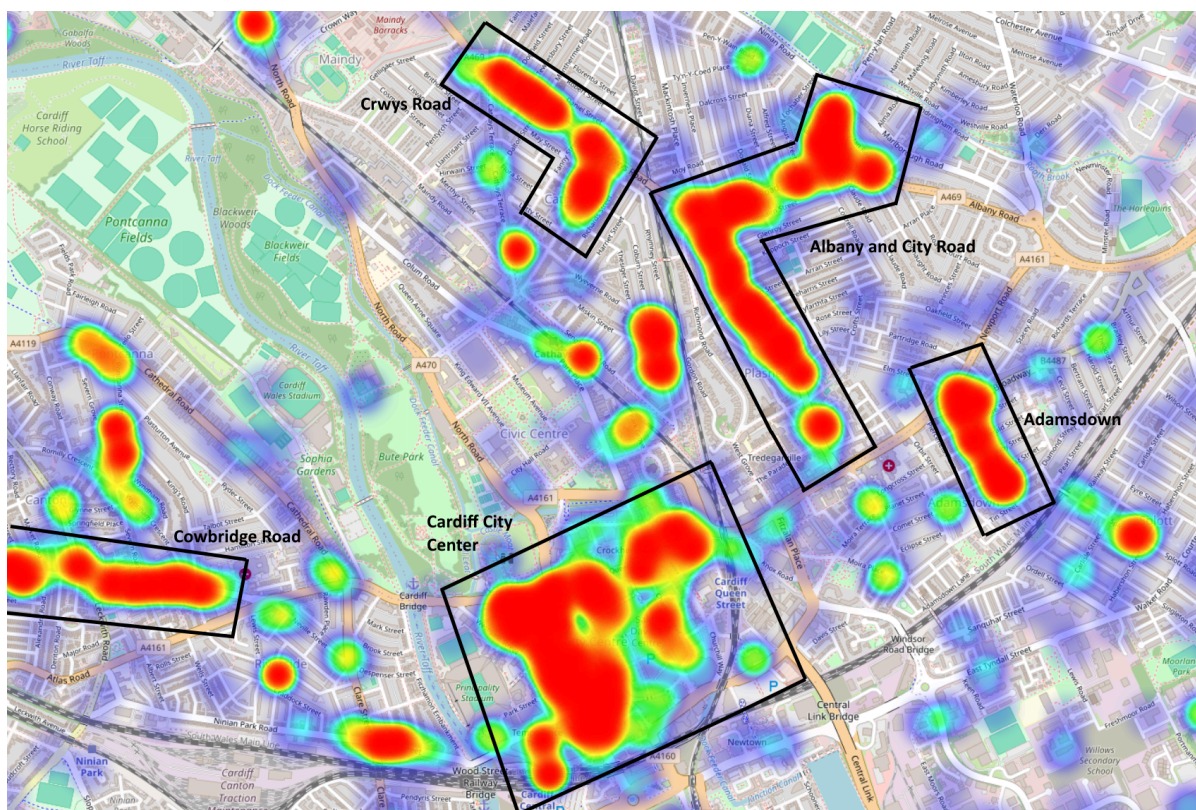


Figure 2: With the same settings as above, key eating and drinking areas can be clearly seen.

Another example can be seen by looking at Hotels in the Westminster local authority, this covers a large section of central London, including Mayfair, Soho and Paddington. There is a significantly high density of hotels in the surrounding area of Paddington Station. This pattern likely reflects demand from tourists and commuters staying at the station immediately before or after travel.

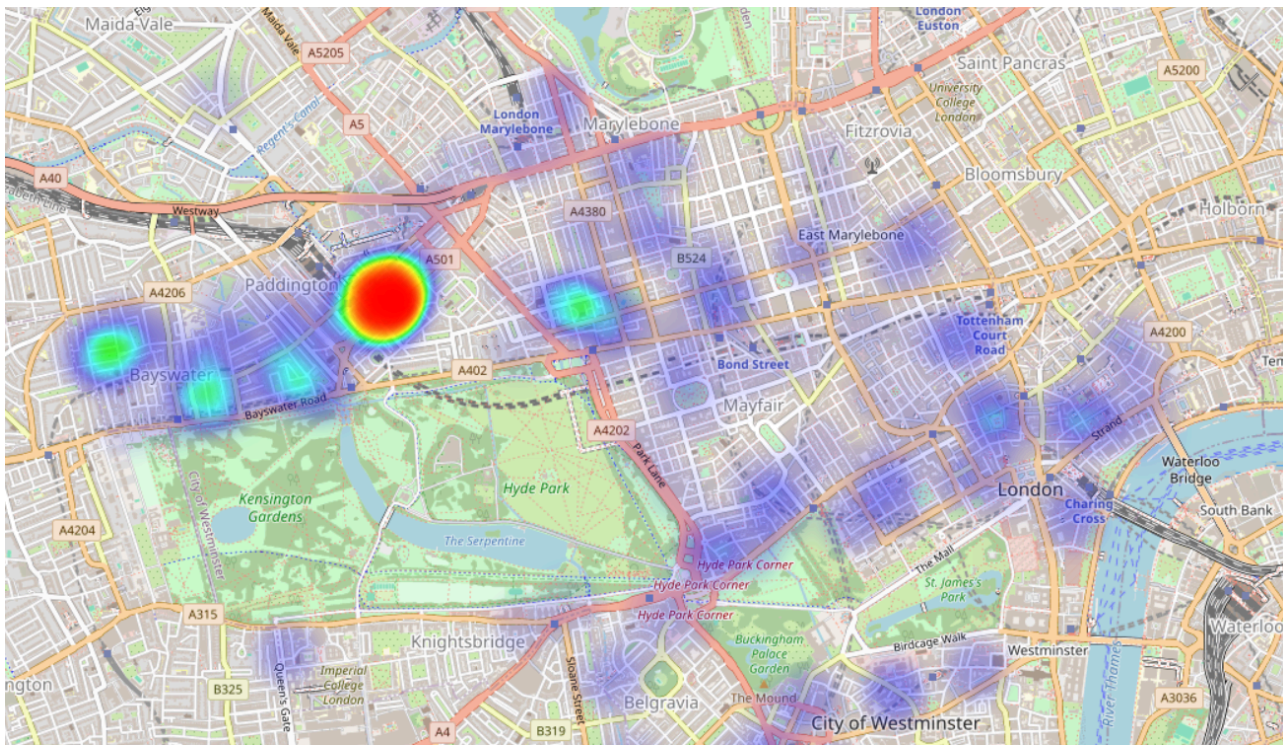


Figure 3: All hotels in the Westminster region of London. Hotels around Paddington Station are clearly visible.

By looking at a coastal region, such as Brighton and Hove, the density of businesses, and thus the location of the social hub, is instead focused around the coastline rather than the geographic centre of the city.

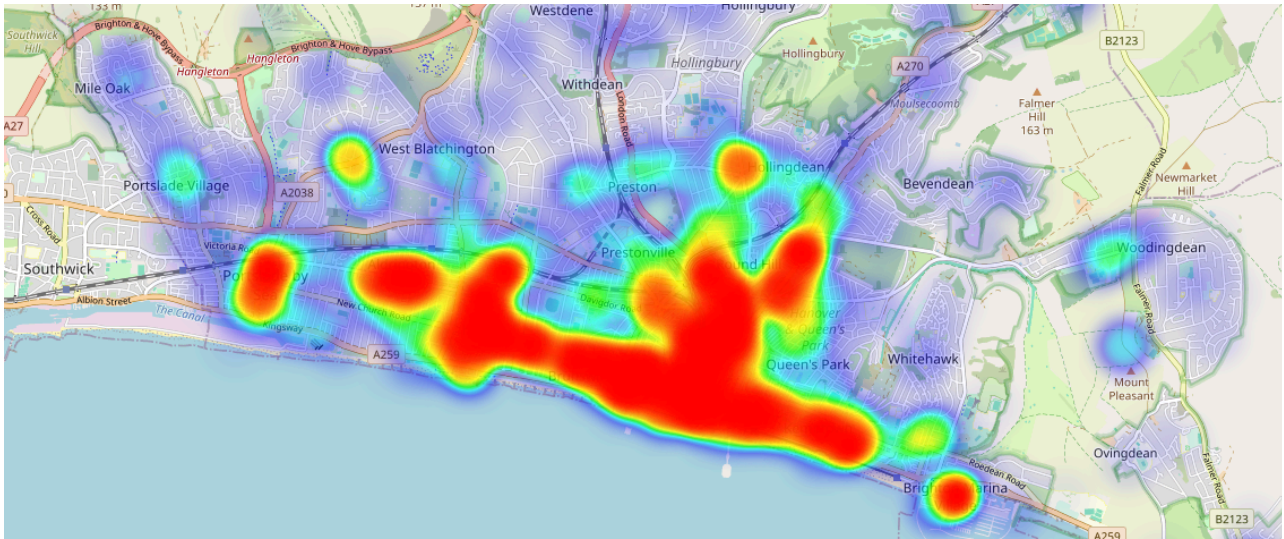


Figure 4: All businesses in the Brighton and Hove region. Shown using a heatmap.

By filtering specifically for restaurants, which are typically more common in social and cultural hubs, Brighton and Hove's city centre becomes more clearly defined and visibly concentrated.

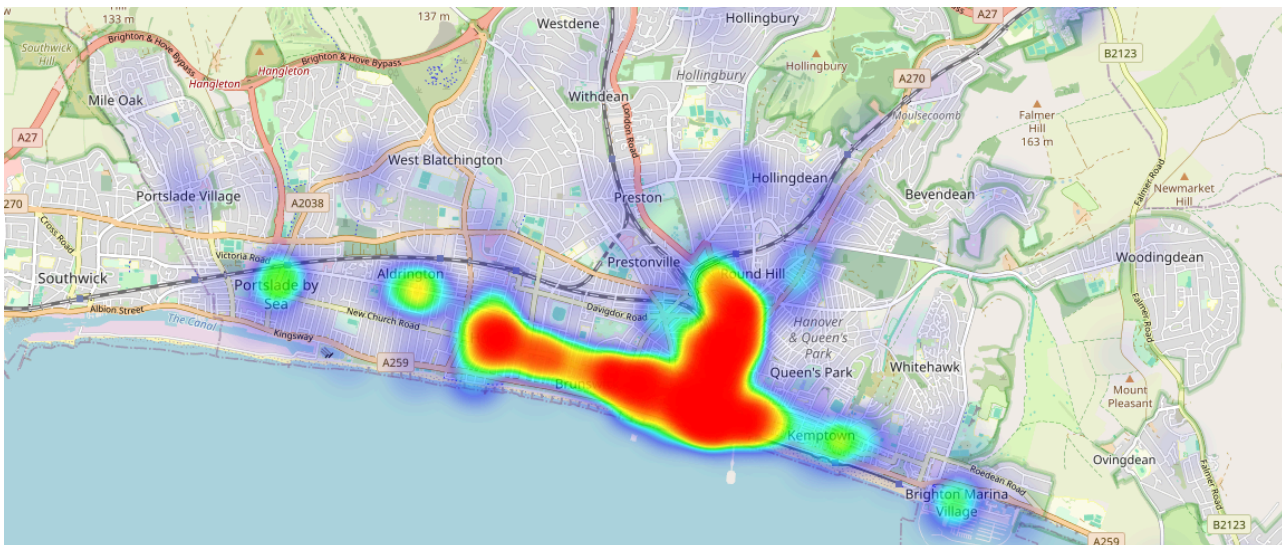


Figure 5: All restaurants/cafes in the Brighton and Hove region. Shown using a heatmap.

Difference Between Locations and Density

Figure 6 shows the Bath region in points mode, where each business is represented by a single point. This approach mirrors how mapping platforms like Google Maps display nearby amenities when searching for terms such as “restaurant”.³ While areas of high density can be roughly inferred, the heatmap (shown in Figure 7) provides a far clearer visualisation of business concentration. Points mode may be more suitable to users looking for specific establishments, but it quickly becomes overwhelming when attempting to view macro-level patterns.

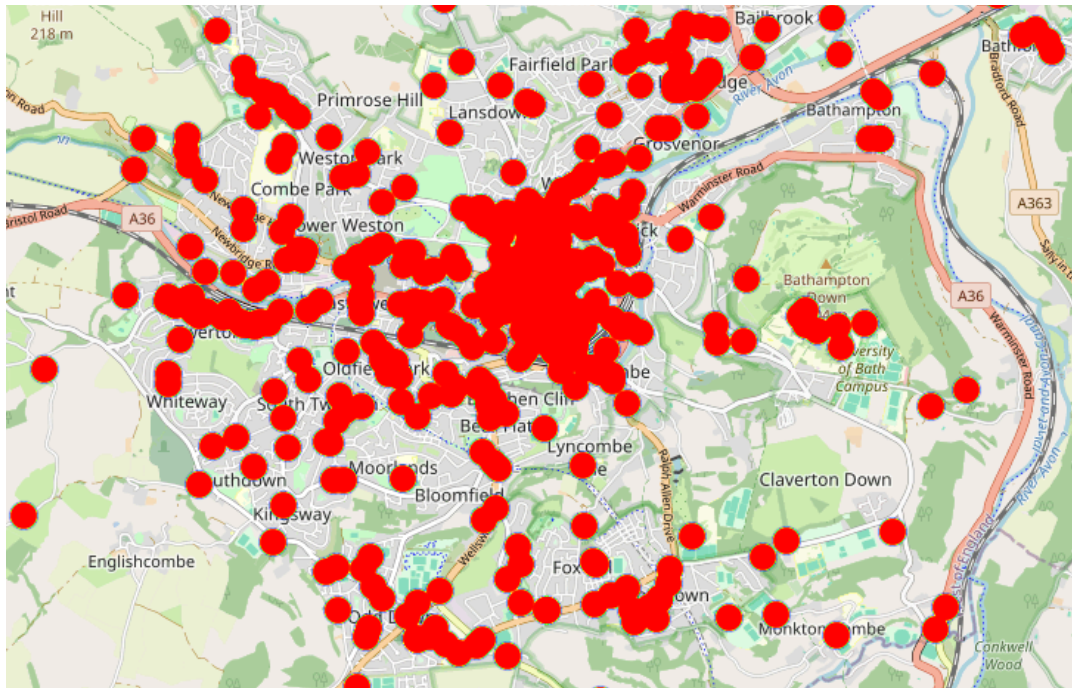


Figure 6: All businesses in the Bath region, shown using points. The centre is visible but hard to clearly identify.



Figure 7: Using the settings in Figure 6, but instead with a heatmap, the city centre becomes much clearer.

³ <https://developers.google.com/maps/documentation/places/web-service>

Impact and Conclusion

This tool can be used to identify urban structures, such as city centres or cultural hubs, based on the geographic concentration of businesses. While limited in functionality, it is a basic example of a Geographic Information System (GIS) with potential applications in urban planning, business and tourism. Urban planners or businesses could use this data to identify development opportunities or ideal locations for expansion. It could also be used by tourists, or tourism companies, to identify vibrant, high-activity areas in a region that are worth visiting.

In conclusion, this project has shown how real-world urban patterns can be identified from spatial data. In particular, how many businesses often choose to locate themselves in the close vicinity of others, in areas which become de-facto city centres with the most footfall. Through the analysis of business locations, these regions can be located, and used for decision making. A similar approach could be used across UK cities, or even other countries, where business location data is accurate enough to paint a picture of the structure of urban areas. Similar trends might exist between cities, or there may be some patterns that are unique to particular cities or countries.

It may also be interesting to use a similar mapping method to identify the locations of businesses on a single national heatmap, and compare the locations of high concentration areas with population density data to identify the location of cities on a national map.

Data accuracy is also imperative to this exercise. Unless one can be assured that all businesses within a region are registered with the data source, for example the FHRS, the heatmap may not be accurate. There may also be concerns around the accuracy of individual establishment data, some XML entries lacked complete geocoding information and were excluded from the visualisation. If this were to occur too frequently, data may become inaccurate.

Finally, this project reinforces the idea that data visualisation is a broad area, and has many applications outside of engineering where the data is processed.