London fire Brigade Data Analysis

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1 Exploratory analysis

In order to perform an accurate analysis of the data corresponding to the fire incidents registered between 2012 and 2015 a preliminary analysis was performed. [1]

First, the data was segmented by property category (see Figure 1). It became evident From this initial segmentation that the highest incidences correspond to the properties within the Dwelling category (which comprises but is not limited to houses, flat, maisonettes, and caravans). Also it is important to mention that all there is a pronounced decrease in all property categories, specially from 2014 to 2015.

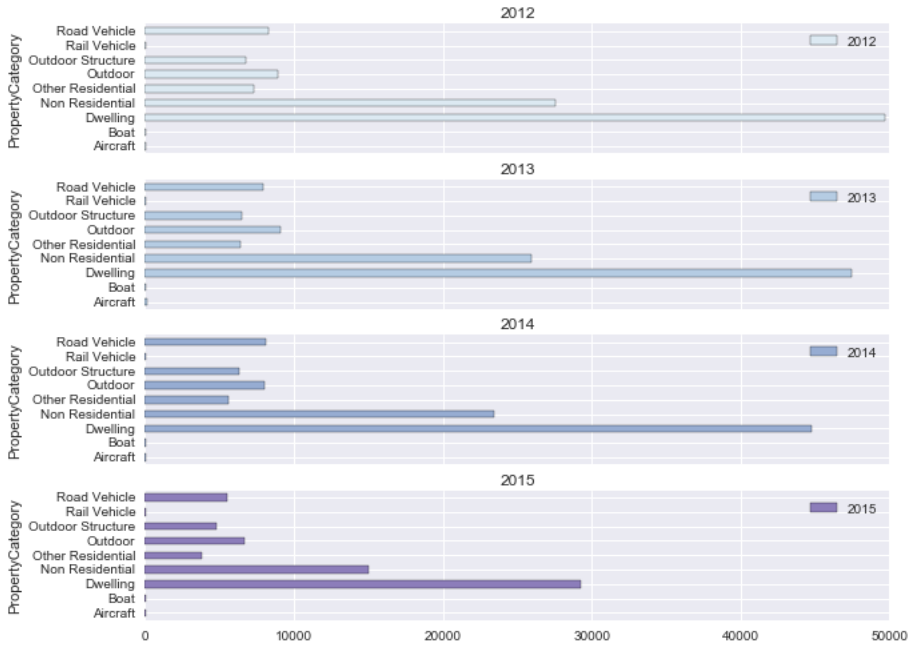


Figure 1: Number of fire incidents per property category per year (2012-2016).

Then the data was split to show the top ten type of properties ranked by the numbers of incidences registered per year (Figure 2). It is not surprising that most of those properties

[1] For a complete view of the codes other particularities the reader is referred to https://github.com/ixeksita/LFB-Analysis

correspond to the Dwelling category. However, cars despite not being included in such category, are ranked amongst the top ten properties according to the number of fires registered.

The top ten districts per number of incidents are shown in Figure 3 and Figure 4 shows the distribution of the top property types within each of the 10 district with the highest number of incidents reported within the considered time frame.

2 Risk analysis and model

In order to perform a predictive analysis of the fire risk per property and location a couple of assumptions were made. First, it is assumed that the fire really occurs at a location (or as close as 100m to) at which we have seen at least one fire over the last 4 years. Thus the location and fire geographical limits were calculated based on the British National Grid positions reported in the data provided. A Bayesian inference analysis was performed on the data. This means that the model computes the probability that a given property type is affected by fire within a specific area or location. Since a single fire can only occur in only one location, the class conditional densities are treated as multinomial. The total geographical area was divided in smaller sections that corresponded to squares of 0.02 degrees in latitude and longitude. It was established that for a property type to be classified as a 'high risk' type of property it had to be the most likely type of fire in at least 10 independent sections.

Firgure 5 shows the most likely type of fire (per property type) within the geographical limits of London. It can be observed that the types of properties with the highest likelihood to be involved in fire match to a great extent those reported previously in Figure 2. The properties with the highest fire incidences are particularly clustered within the centre of the geographical area,which is in further accordance to the districts reported in Figure 3.

Finally, the London area was divided in 4 regions, North East (NE), North West (NW), South East (SE) and South West (SE). The top property types were identified within each area and are shown in the set of Figures 8. The shown trends match perfectly the predicted high risk type of properties shown in Figure 5 being House-single occupancy one of the highest risk properties among all the different areas.

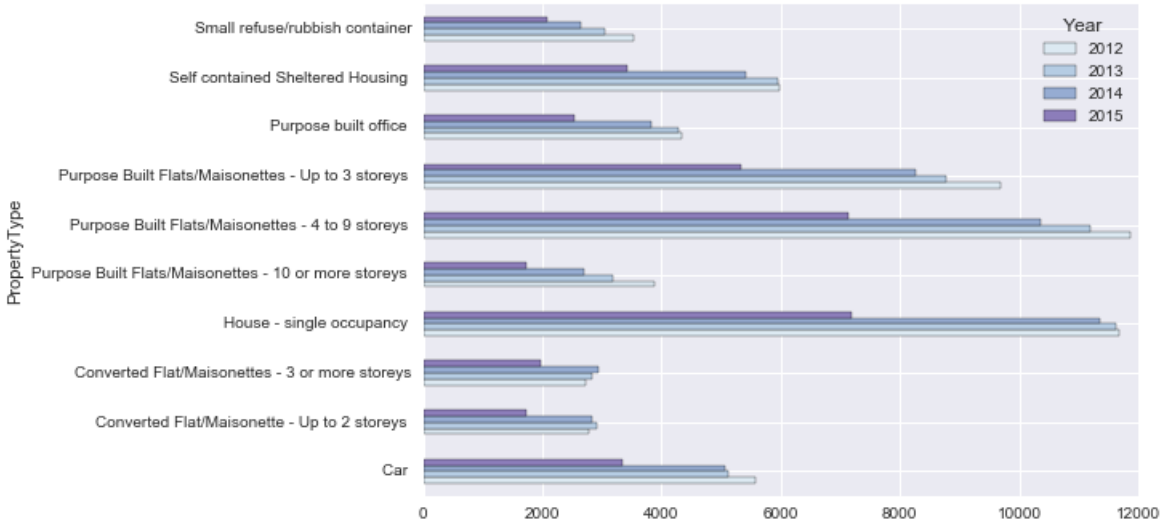


Figure 2: Top ten property types per number of incidences per year.

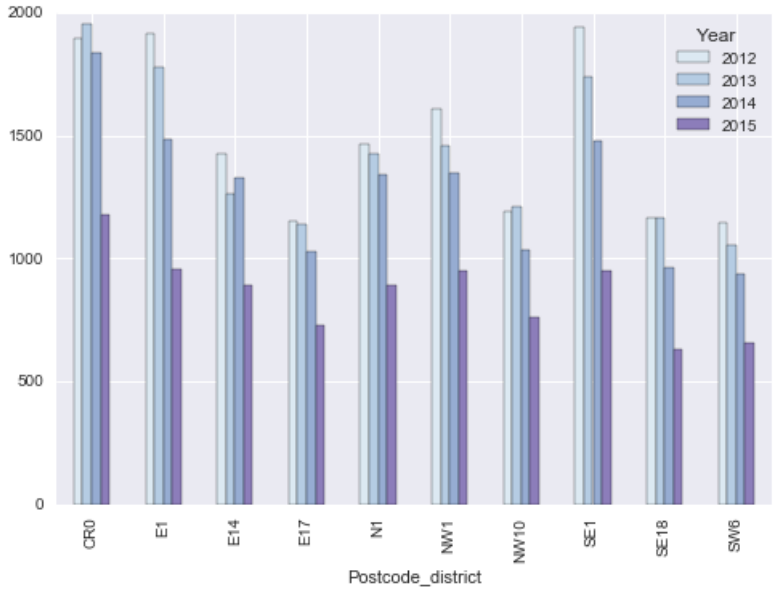


Figure 3: Top ten districts per number of fire incidents reported per year

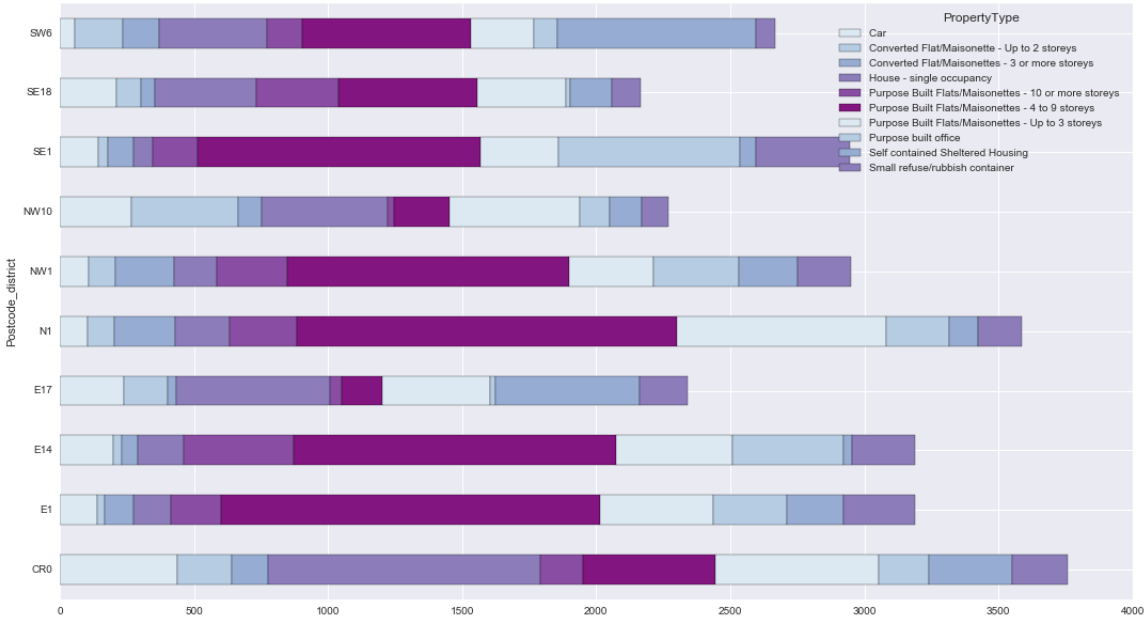


Figure 4: Number of incidents corresponding to the top 10 property types in each of the top 10 districts with the highest fire incidence reported between 2012 and 2015.

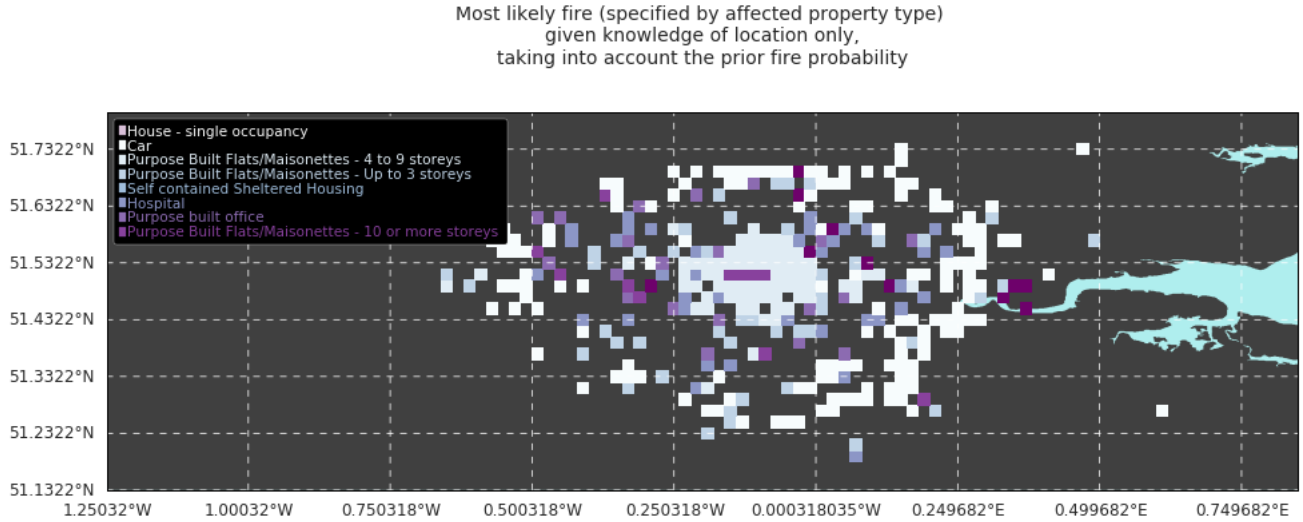


Figure 5: Most likely fire (type of property) by location only.

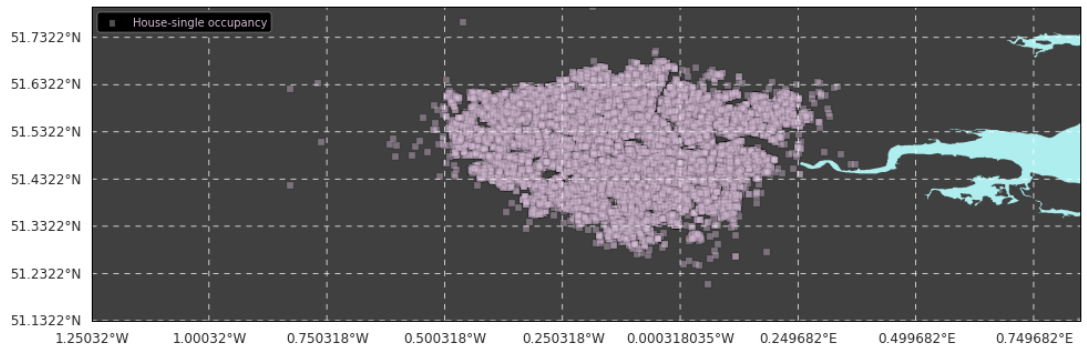


Figure 6: Top one property with the highest geographical probability: House-single occupation

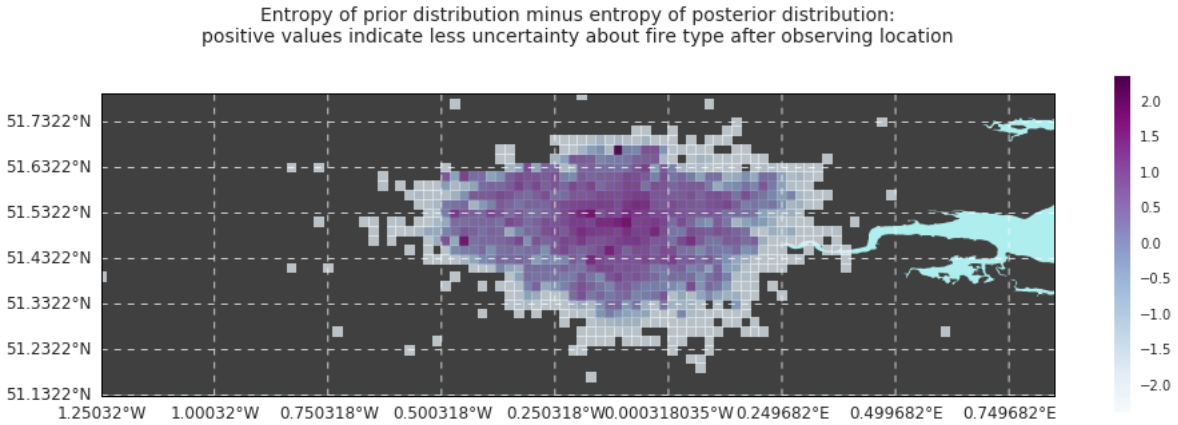
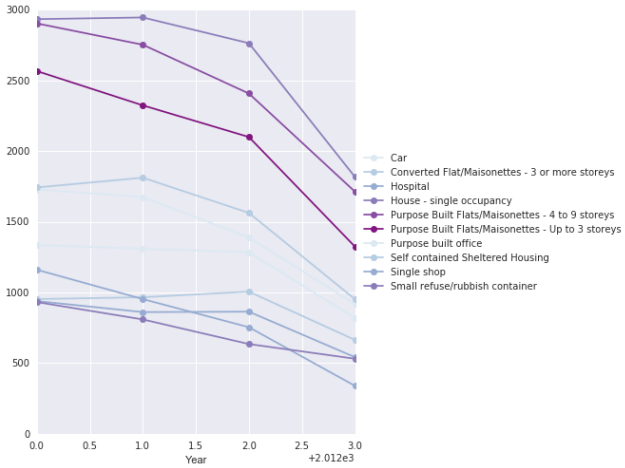
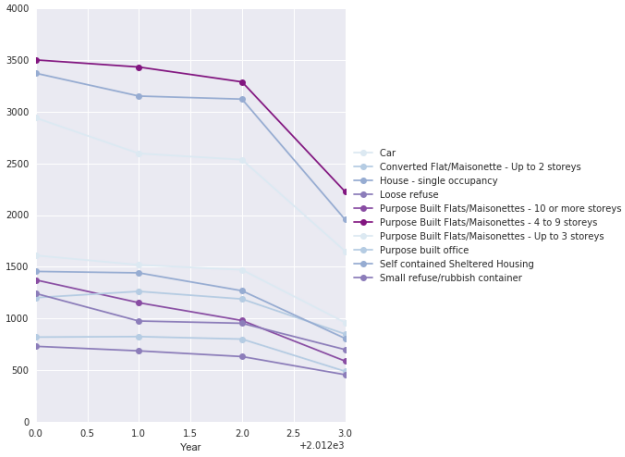


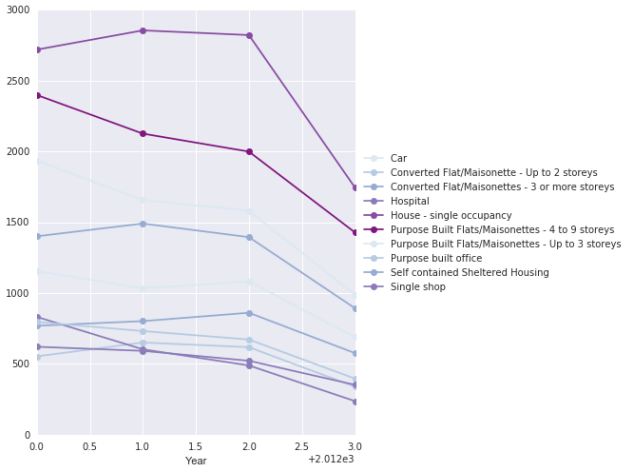
Figure 7: Level of certainty of the predictive analysis by location observation.



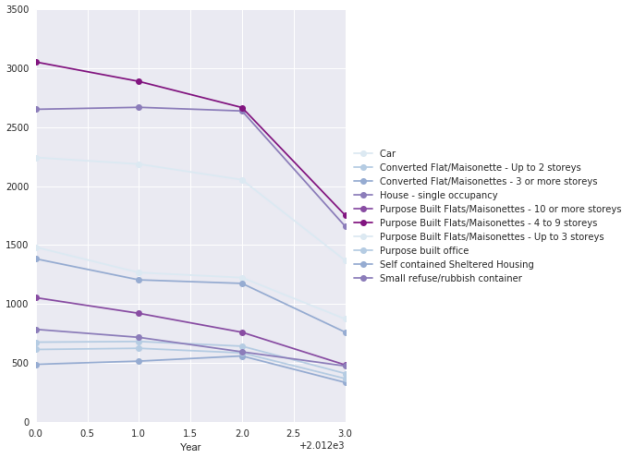
(a) NW London



(b) NE London



(c) SW London



(d) NE London

Figure 8: Top property types in the different main London areas, trends in the last