

# London Property Pricing Research

## *Problem Description and Overview*

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In the property investment, it is important to know the factors, which influence the property pricing. Some of them may not be obvious, but still highly significant. The current research was conducted in order to determine the impact of the nearby venues on the local property pricing in London.

The descriptive model was built for determining the property price influence factors in London. It analyzes the city's regions for their property price, their geographical location and the venues nearby. The model clusters the city by the property price to give the insight on the prices' spreading over the territory, acquires the venues list for each region and finds the correlation between different venues' presence and its impact on the property pricing.

This data will be of value for the property investments planning: it shows the indirect dependencies of price influencing factors, using which the stakeholders will be capable of finding the best area for buying property, and how they can influence it later by providing possibilities for certain venues to be opened in the vicinity.

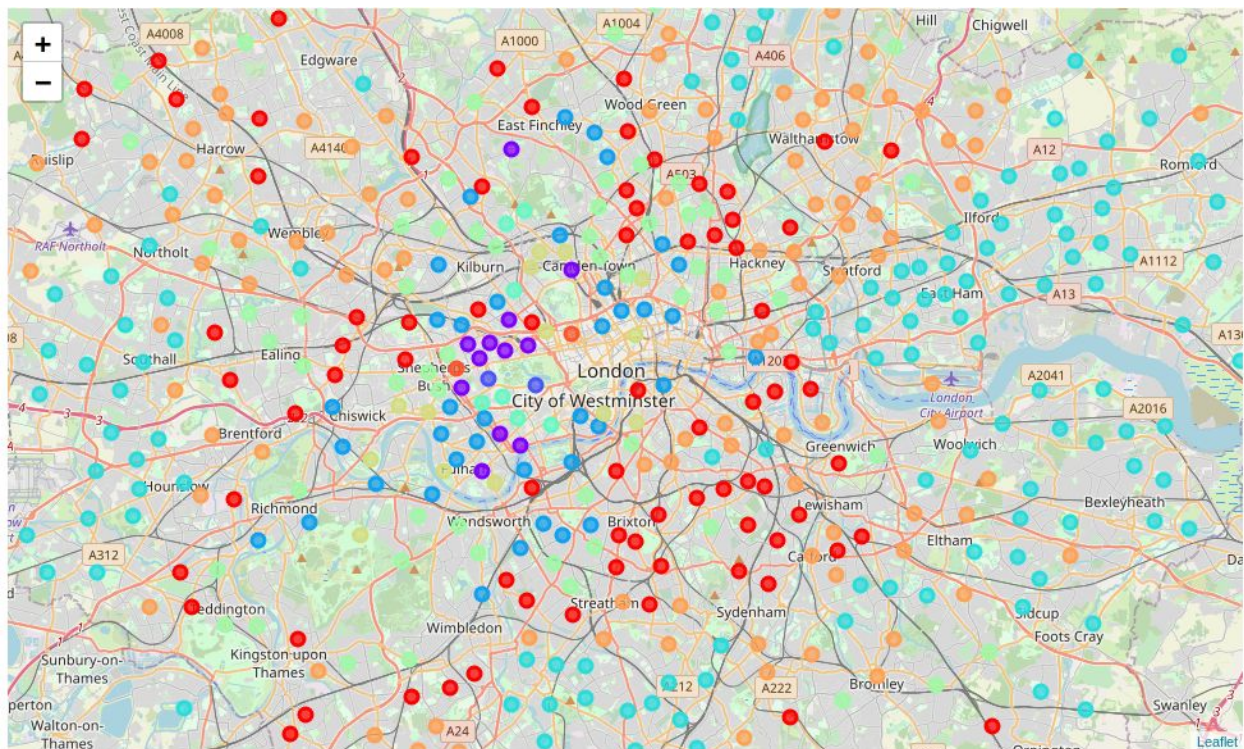
The data sources for the model are: the London Datastore website for the property pricing over the city regions, the ArcGIS Hub for the London regions' geodata, and the Forsquare API for venues' data.



## Ward's Clustering

Obviously, the region's location is among the key factors to determine its property prices. The wards were clustered using the K-Mean algorithm by their property price to make it possible to visually estimate the prices' variation. It was empirically determined that the optimal clusters' amount to show the prices' spread was 10.

The following picture shows the London wards separated by the clusters.



*Pic. 2 - The Clusters' Visualization*

**Legend:**

$0$	$1$	$2$	$3$	$4$	$5$	$6$	$7$	$8$	$9$



By analyzing the average prices by clusters, we can clearly see a significant difference of prices by the clusters. The following table gives the average price for each cluster in the descending order.

Cluster		Price
2	2	4.079424e+06
9	9	2.891610e+06
5	5	2.091560e+06
1	1	1.547812e+06
7	7	1.176190e+06
3	3	9.299517e+05
6	6	7.218964e+05
0	0	5.787742e+05
8	8	4.617621e+05
4	4	3.467885e+05

*Table 1 - The Clusters' Average Property Prices*

Taking a look at the above table and the clusters' map, we can see a clear pattern of prices spreading: the geographical spreading is concentric. The most expensive property is located slightly to the north - west from the City of Westminster (clusters 2 and 5) and radially to the south, north-west and north-east from the centre (cluster 9). The cheapest property concentrates circularly just around the priciest one (cluster 0) and at the outskirts of the city (8 and 4).

## Exploring the Venues

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There are 8070 venues in total for every ward, which form 398 categories. The following table gives the top 50 most frequent venue categories

	Categories	Average Frequencies
0	Pub	0.070385
1	Café	0.054670
2	Coffee Shop	0.051463
3	Hotel	0.041896
4	Grocery Store	0.032031
5	Italian Restaurant	0.031080
6	Park	0.024935
7	Indian Restaurant	0.022677
8	Pizza Place	0.020743
9	Bakery	0.020083
10	Gym / Fitness Center	0.019494
11	Restaurant	0.019261
12	Sandwich Place	0.015060
13	Garden	0.014732
14	Chinese Restaurant	0.012869
15	Bus Stop	0.012861
16	Supermarket	0.012035
17	Bar	0.011954
18	French Restaurant	0.011813
19	Clothing Store	0.011799
20	Fast Food Restaurant	0.011039
21	Burger Joint	0.010511
22	Japanese Restaurant	0.010296
23	Pharmacy	0.009257
24	Bookstore	0.008533
25	Juice Bar	0.008475

<b>26</b>	Turkish Restaurant	0.007886
<b>27</b>	Art Gallery	0.007776
<b>28</b>	Thai Restaurant	0.007721
<b>29</b>	Breakfast Spot	0.007702
<b>30</b>	Cocktail Bar	0.007382
<b>31</b>	Gastropub	0.007114
<b>32</b>	Convenience Store	0.007065
<b>33</b>	Middle Eastern Restaurant	0.006926
<b>34</b>	Fish & Chips Shop	0.006724
<b>35</b>	Gym	0.006686
<b>36</b>	Deli / Bodega	0.006531
<b>37</b>	Train Station	0.005983
<b>38</b>	Ice Cream Shop	0.005982
<b>39</b>	English Restaurant	0.005847
<b>40</b>	Asian Restaurant	0.005756
<b>41</b>	Sushi Restaurant	0.005706
<b>42</b>	Mediterranean Restaurant	0.004992
<b>43</b>	Furniture / Home Store	0.004833
<b>44</b>	Greek Restaurant	0.004742
<b>45</b>	Yoga Studio	0.004683
<b>46</b>	Wine Bar	0.004660
<b>47</b>	Department Store	0.004621
<b>48</b>	Plaza	0.004548
<b>49</b>	Farmers Market	0.004413

*Table 2 - The Most Frequent Venues' Categories*

Looking at this table, it can be presumed that these categories contain the most influential ones. In order to check that, it's required to find the correlations of the venue categories' frequencies to the wards' property prices.

## ***Obtaining the Correlation***

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The following table gives the Pearson correlations of the above venues' frequencies and the wards' property prices

	<b>Categories</b>	<b>Average Frequencies</b>
<b>0</b>	Pub	0.070385
<b>1</b>	Café	0.054670
<b>2</b>	Coffee Shop	0.051463
<b>3</b>	Hotel	0.041896
<b>4</b>	Grocery Store	0.032031
<b>5</b>	Italian Restaurant	0.031080
<b>6</b>	Park	0.024935
<b>7</b>	Indian Restaurant	0.022677
<b>8</b>	Pizza Place	0.020743
<b>9</b>	Bakery	0.020083
<b>10</b>	Gym / Fitness Center	0.019494
<b>11</b>	Restaurant	0.019261
<b>12</b>	Sandwich Place	0.015060
<b>13</b>	Garden	0.014732
<b>14</b>	Chinese Restaurant	0.012869
<b>15</b>	Bus Stop	0.012861
<b>16</b>	Supermarket	0.012035
<b>17</b>	Bar	0.011954
<b>18</b>	French Restaurant	0.011813
<b>19</b>	Clothing Store	0.011799
<b>20</b>	Fast Food Restaurant	0.011039
<b>21</b>	Burger Joint	0.010511
<b>22</b>	Japanese Restaurant	0.010296
<b>23</b>	Pharmacy	0.009257
<b>24</b>	Bookstore	0.008533
<b>25</b>	Juice Bar	0.008475
<b>26</b>	Turkish Restaurant	0.007886

<b>27</b>	Art Gallery	0.007776
<b>28</b>	Thai Restaurant	0.007721
<b>29</b>	Breakfast Spot	0.007702
<b>30</b>	Cocktail Bar	0.007382
<b>31</b>	Gastropub	0.007114
<b>32</b>	Convenience Store	0.007065
<b>33</b>	Middle Eastern Restaurant	0.006926
<b>34</b>	Fish & Chips Shop	0.006724
<b>35</b>	Gym	0.006686
<b>36</b>	Deli / Bodega	0.006531
<b>37</b>	Train Station	0.005983
<b>38</b>	Ice Cream Shop	0.005982
<b>39</b>	English Restaurant	0.005847
<b>40</b>	Asian Restaurant	0.005756
<b>41</b>	Sushi Restaurant	0.005706
<b>42</b>	Mediterranean Restaurant	0.004992
<b>43</b>	Furniture / Home Store	0.004833
<b>44</b>	Greek Restaurant	0.004742
<b>45</b>	Yoga Studio	0.004683
<b>46</b>	Wine Bar	0.004660
<b>47</b>	Department Store	0.004621
<b>48</b>	Plaza	0.004548
<b>49</b>	Farmers Market	0.004413

*Table 3 - The Venues' Categories' Frequency to Property Prices Correlation*

Looking at this table, we can determine, which venues' presence may cause the local property price go up and down.



The venues' categories of the highest positive influence are shown at the table below.

	Venue	Correlation
0	Juice Bar	0.964597
1	Garden	0.877125
2	Restaurant	0.875747
3	Art Gallery	0.814109
4	Farmers Market	0.774828
5	Greek Restaurant	0.774135
6	Italian Restaurant	0.759050
7	Chinese Restaurant	0.739535
8	French Restaurant	0.705209
9	Japanese Restaurant	0.702539

*Table 4 - The Top 10 Strongest Positive Correlation Venue Categories*

And the strongest negative correlation is given by the following ones:

	Venue	Correlation
0	Grocery Store	-0.874103
1	Park	-0.845409
2	Convenience Store	-0.771125
3	Pub	-0.766895
4	Train Station	-0.712171
5	Fast Food Restaurant	-0.695274
6	Coffee Shop	-0.633679
7	Supermarket	-0.630858
8	Bus Stop	-0.575454
9	Bar	-0.523705

*Table 5 - The Top 10 Strongest Negative Correlation Venue Categories*

## **Conclusion**

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For buying the cheapest property in London, the investor should consider the wards of clusters 0, 8 and 4 (please see the notebook for the exact wards) and / or in the vicinity of the venues of the categories given at the table 5. The investor also can potentially influence the property prices' growth by providing the conditions for opening the new venues of the categories, given at the table 4

## **Notebook**

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[https://github.com/Sake-no-oni/Coursera\\_Capstone\\_Hello\\_World/blob/master/London%20Property%20Pricing.ipynb](https://github.com/Sake-no-oni/Coursera_Capstone_Hello_World/blob/master/London%20Property%20Pricing.ipynb)