



Michelin Star Restaurant Locations According to Economic and Demographic Factors

CS573 Final Process Book

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Overview and Motivation

Our project idea stemmed from our appreciation for fine restaurants and interest in those deemed worthy enough of Michelin stars. We were curious to see what makes a restaurant well-run enough to award it with Michelin stars, one of the highest honors a restaurant can receive.

The restaurant industry is a difficult one to enter, much less excel in. There are numerous variables that affect much of a restaurant's success. Those that are able to surpass their competitors and provide an exceptional dining experience may be awarded with a Michelin star. This badge of honor is presented to restaurants that are judged to be of high-caliber, which may be awarded up to three stars.

It is also interesting to look into the average housing cost, gross disposable household income, and population density surrounding these Michelin restaurants. Looking at those demographics may help a new aspiring restaurant owner make a better judgment about where to open up a new location.

In this project, we will be presenting all the Michelin starred restaurants in the United Kingdom. The country will be split up into local authorities and the user will be able to click into them to see more details about the average housing cost, gross disposable household income, and population density. By selecting a country, the user will also be indicating that they wish to open a restaurant in that local authority and will be told what the chances of it being selected as a Michelin star restaurant based on those factors is.

Related Work

We were inspired by various different maps that exist out there. We had seen many examples of maps in class and wanted to replicate some of that work. We then looked up some examples of different maps and how they displayed different markers. Airbnb's map feature is very similar to what we were thinking of creating.

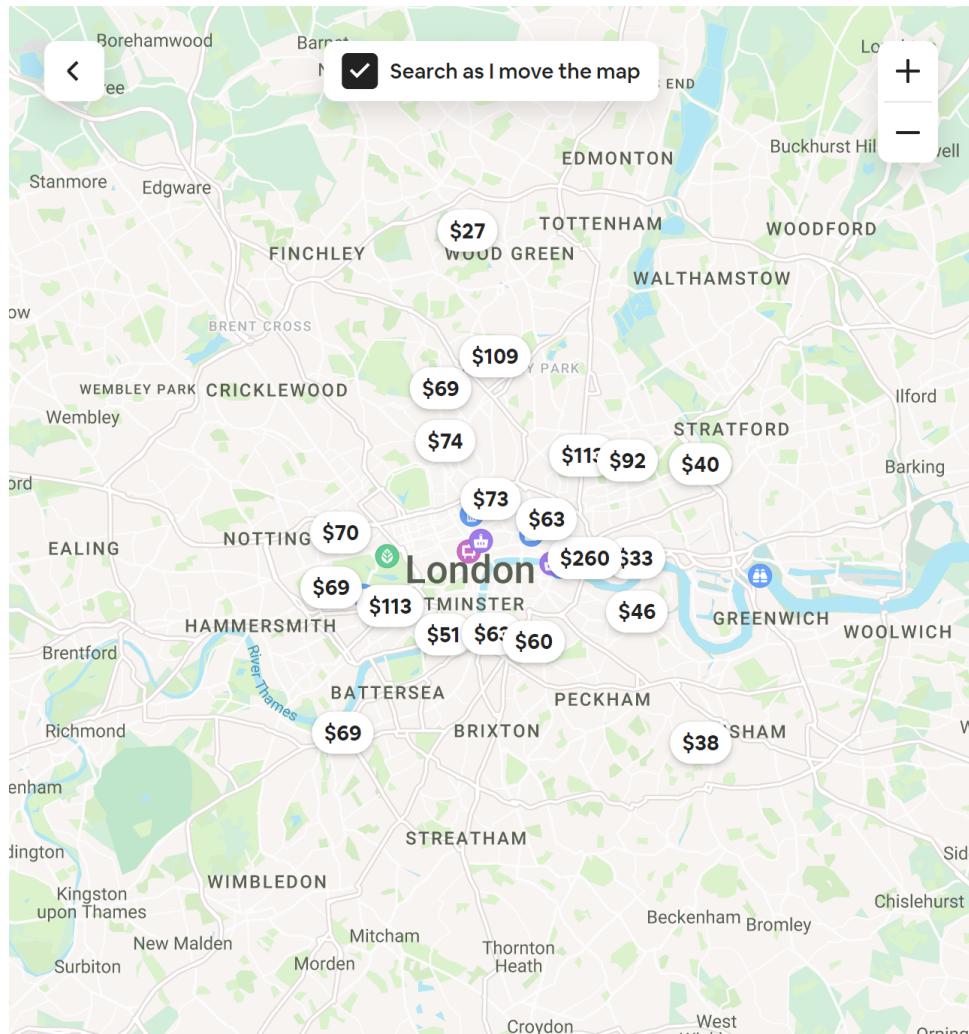


Figure 1. Airbnb example.

We also found an example very similar to what we wanted to create with a map of the UK and markers at certain locations. The link to it is here

<https://gist.github.com/samuelleach/5130413>.

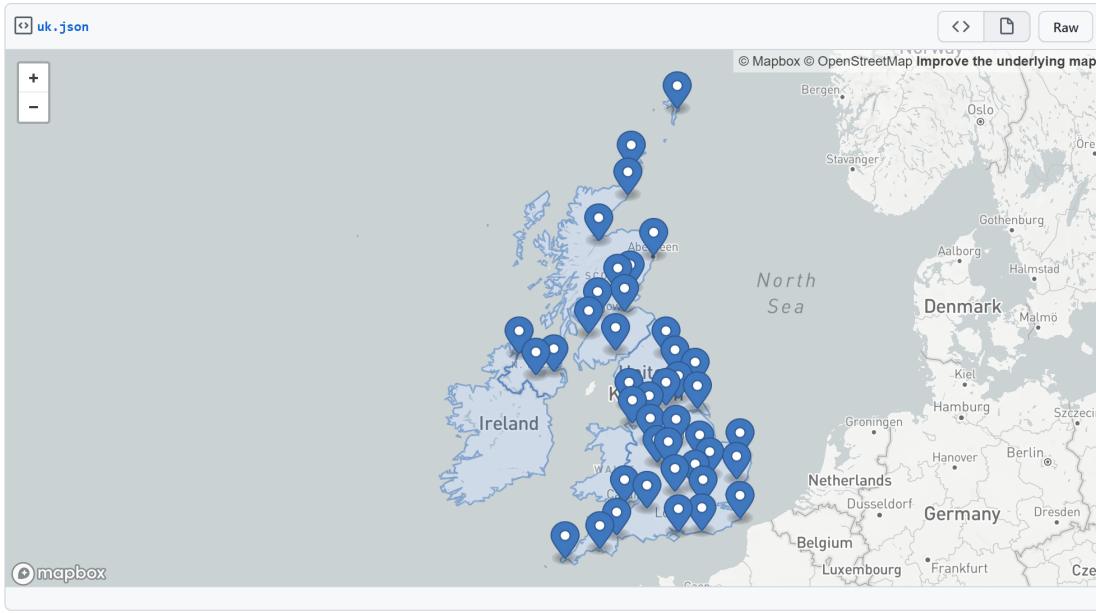


Figure 2. Github UK map example.

In this example, a user is able to zoom in on the map and click on the markers to see more information about that location. In our case we would display a similar map of the UK and have the markers indicate Michelin star restaurants.

Questions

There are several questions we hope this visualization will be able to help answer.

- 1) If someone were to open a new restaurant in a local authority in the UK which does not already have a Michelin star restaurant, how many Michelin stars is it likely to get according to that area's demographics?
- 2) How do a local authority's demographics relate to the number of Michelin star restaurants in it?

Data

It was slightly challenging to find some of the data necessary to this project. The demographic data was fairly simple to locate because the UK provides public records of the housing cost, income, and population of each local authority across multiple years. We were able to download the csv files after a bit of searching and manipulate the data for our needs. The housing cost data can be found at

<https://www.gov.uk/government/statistical-data-sets/uk-house-price-index-data-do>

[wnloads-december-2019](#), the population data can be found at <https://www.nomisweb.co.uk/query/2002.1/advanced.aspx>, and the gross disposable household income data can be found at [https://www.ons.gov.uk/economy/regionalaccounts/grossdisposablehouseholdincomegdhi/1997to2019](https://www.ons.gov.uk/economy/regionalaccounts/grossdisposablehouseholdincome/bulletins/regionalgrossdisposablehouseholdincomegdhi/1997to2019).

The Michelin star restaurant data proved much more difficult to find. There are no downloadable records of all the restaurants available online, so we have to use a web scraper to pull that information from the official Michelin star restaurant website. We were able to find a tool that did it for us <https://github.com/NicolaFerracin/michelin-stars-restaurants-api>. After getting all the restaurants we filtered out all the ones that were not in the uk.

The Geo-json data that we used for creating the map it self comes from 4 different files that we found here:

<https://martinjc.github.io/UK-GeoJSON/>

We got a Geojson file for each one of the four countries, more specifically we were looking for map information that contained the boundaries for the different local authorities.

Once we collected all the different data sources we worked on combining them by local authority into a json file, in order to combine these we used python and pandas. We also needed to generate predictions for the number of stars a local authority would have based on the other features (income, housing price and population). To generate these predictions we used a simple sklearn linear regression model that we trained using the data of the places that did have restaurants. And created a json file containing information about each of the local

Initial Design

Our initial mockup design can be found below.



Figure 3. Initial mockup.

We wanted the map of the UK to be in the center of the screen as it is the main focus of the visualization. We included some instructions on the left panel. On the right side of the screen the gray panel includes information that will change as a user selects a local authority in the UK. The local authority's demographics will be displayed at the top. Beneath that is the list of all the Michelin star restaurants in that local authority. At the bottom of the panel, there are some small multiples which show how the demographics change over time in that local authority.

We selected a blue color scheme for the visualization because it was a clean and soothing color to look at.

Exploratory Data Analysis

We thought a map would be a great visual display of all the Michelin star restaurant locations. As we explored the demographic data, we realized that because we have several year's worth, we could add some small multiples to show how those trends occurred over time. We added them to the gray panel along with the rest of the local authority's information.

There is also a shortcoming with the demographics data. We used the data from 2019, but were unable to find a list of Michelin star restaurants from only that year, so our list is from 2022. There may be some restaurants that are displayed that did not exist on the list in 2019, but this was the best we could do with this data.

Design Evolution

As we were working through the project, we decided we wanted to add some buttons to help filter the map by specific color. This allows the user to easily filter the whole thing based on the criteria that they are interested in. If the user selects a local authority without any restaurants in it currently, then the panel will also include the predicted number of stars that a new restaurant could receive there based on the demographics.



Figure 4. Final mockup.

Map

This was our initial map of the UK. The colors were random and used just to help with differentiating between the different local authorities. It also includes very small black dots which indicate the exact location of the restaurant, plotted there using their latitude and longitude.

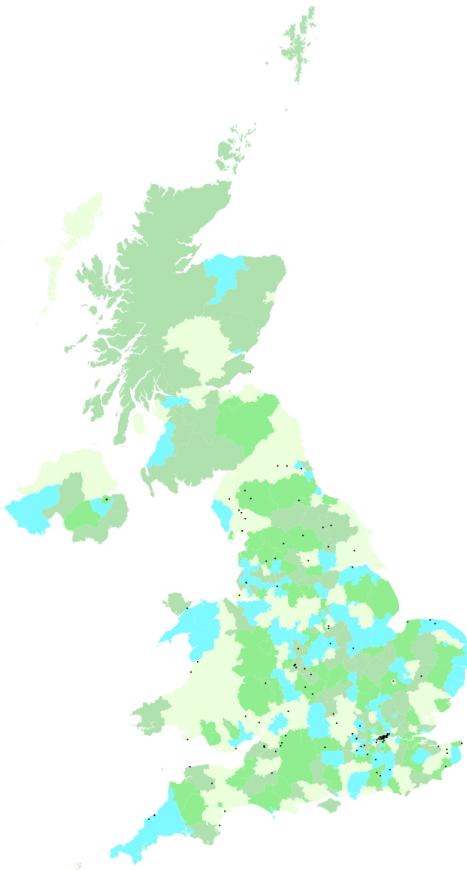


Figure 5. Initial d3 map.

We then added in logic for the color choices. The new color of each local authority was determined by the number of restaurants that there were. This was accomplished using a rainbow scale as a starting point.

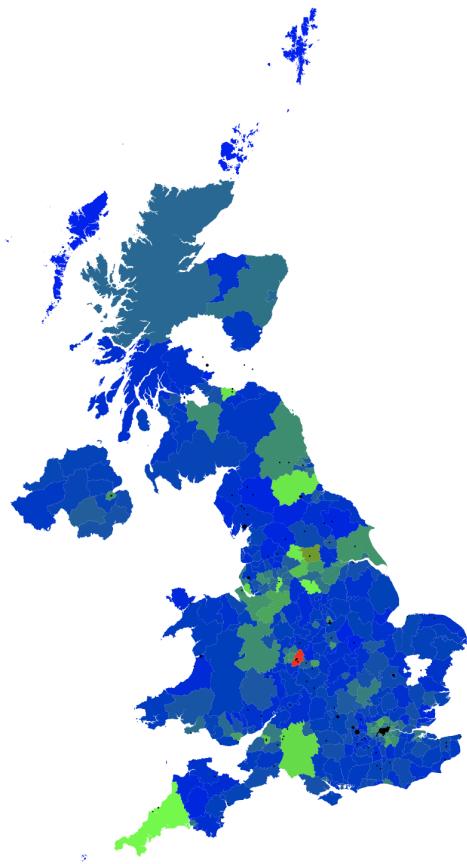


Figure 6. UK d3 map initial color by number of restaurants

This color scheme did not make much sense and it was difficult to differentiate between the shades of blue, so we switched the color scheme to one where the colors ranged from a darker to lighter shade of blue. The more restaurants in a local authority, the darker the color which also makes it look more saturated. We followed the guidelines provided in Feng, etc. paper [1].

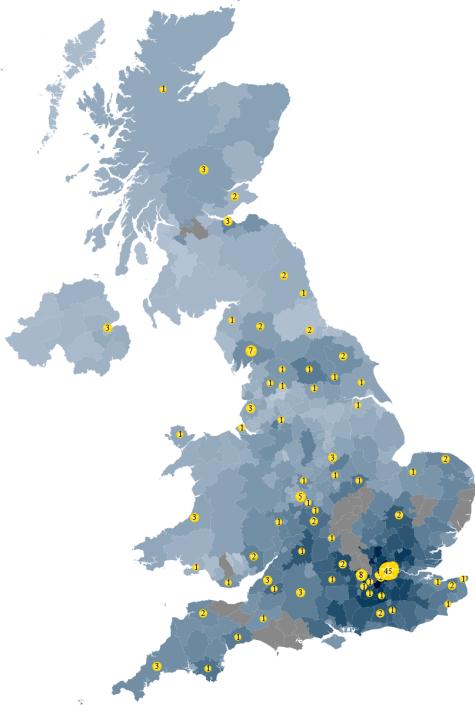


Figure 7. UK d3 map final colors.

This is how the map design had changed over the course of the project. The implementation section will offer more details about how the design evolved throughout the course of the project.

Implementation

Our first steps in implementing this visualization was to start a Github repo and go through the data. We had to clean up the demographics data and pull out the information about just the income, population and housing cost for 2019. We then created a map of the UK, as can be seen in the design evolution section.

From there we added in the demographic data and applied it to the map. In order to plot the restaurants, we took the coordinates of them and plotted them. In order to assign the demographics to the correct local authority and connect the two datasets, we had to write a python script to create a larger csv file. The demographics information was also split up by local authority IDs and those had to be connected to the coordinates of the restaurants.

We then added the left side blue panel with the instructions as well as the gray panel which included the local authority name, along with its population, income, and

housing. The local authority name was still being displayed as the local authority ID and the housing data still needed to be figured out.

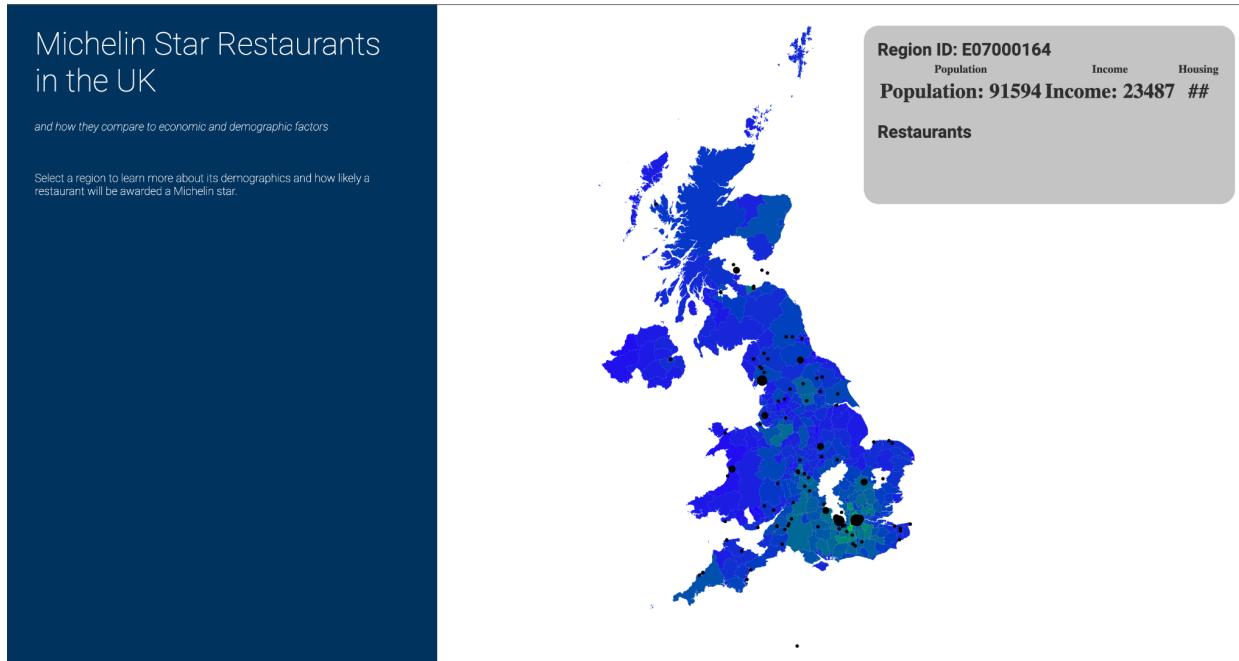


Figure 8. Initial mockup replication

The next update edited the map's colors. We selected a lighter blue theme to make it easier to look at and replaced the black dots with yellow ones to help highlight them and have them stand out.

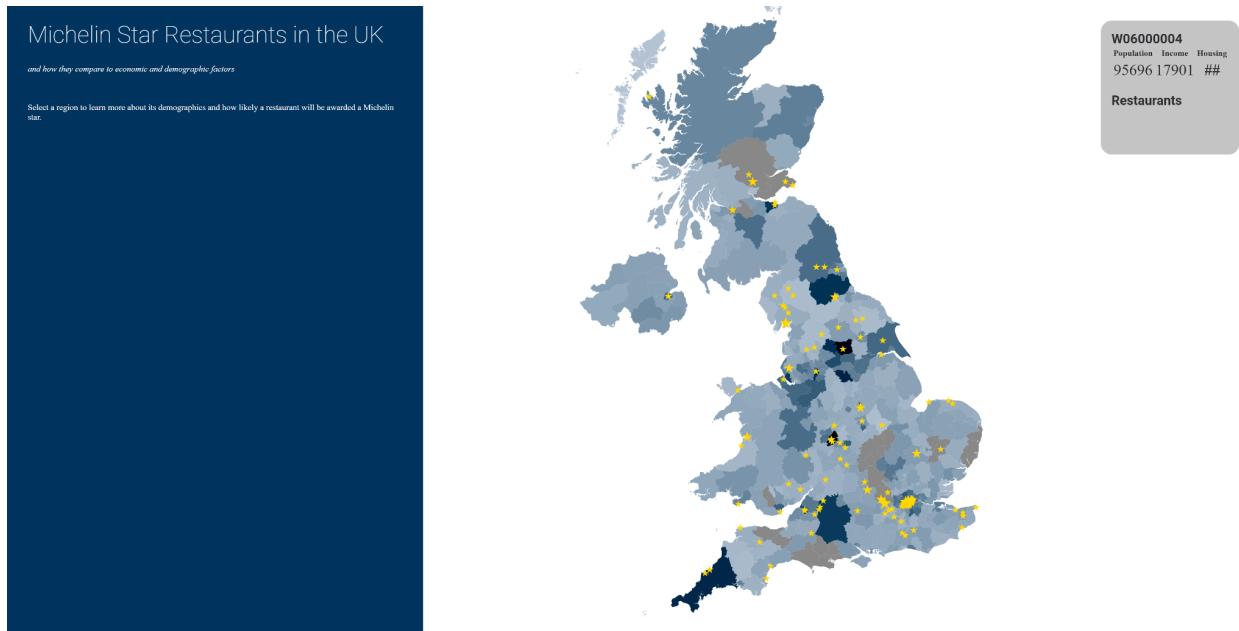


Figure 9. Updated map color.

We then updated the dots on the map to stars. The restaurants in each local authority were grouped together so that one star would show up per local authority.

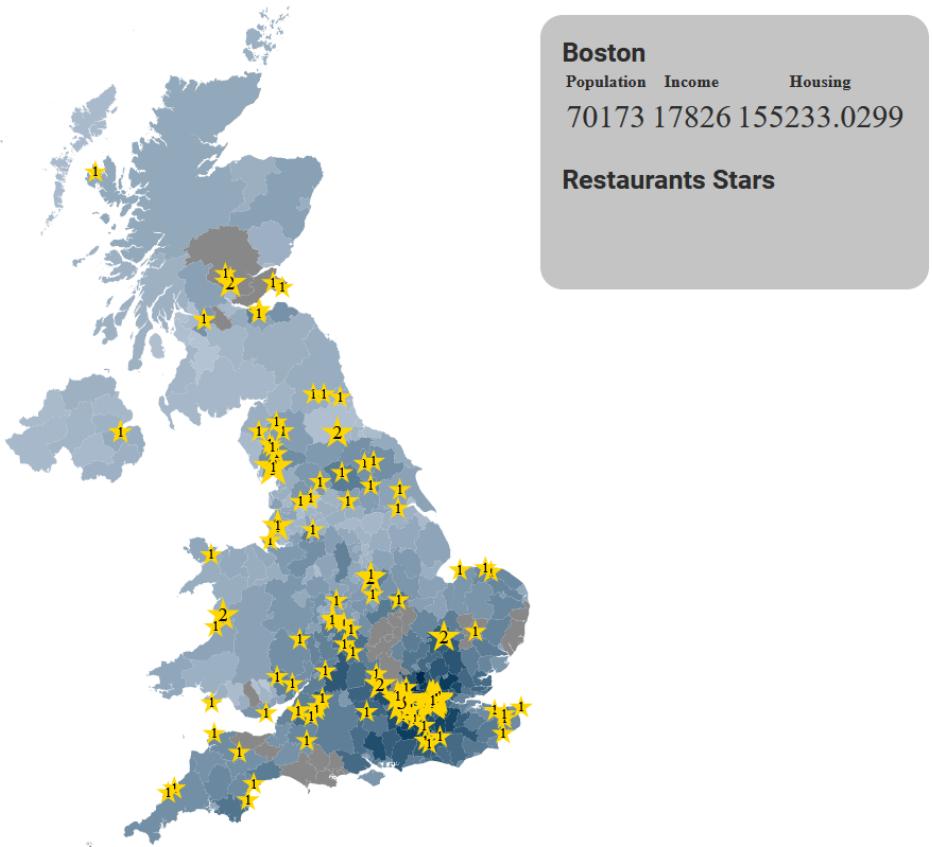


Figure 10. Updated dot to stars.

This was to make it easier to see the map rather than having many stars cover it up. The more restaurants in a local authority, the larger the star on the map. The following is an example of the map zoomed in on London. The user can easily zoom into any area of the map in order to see more detail.

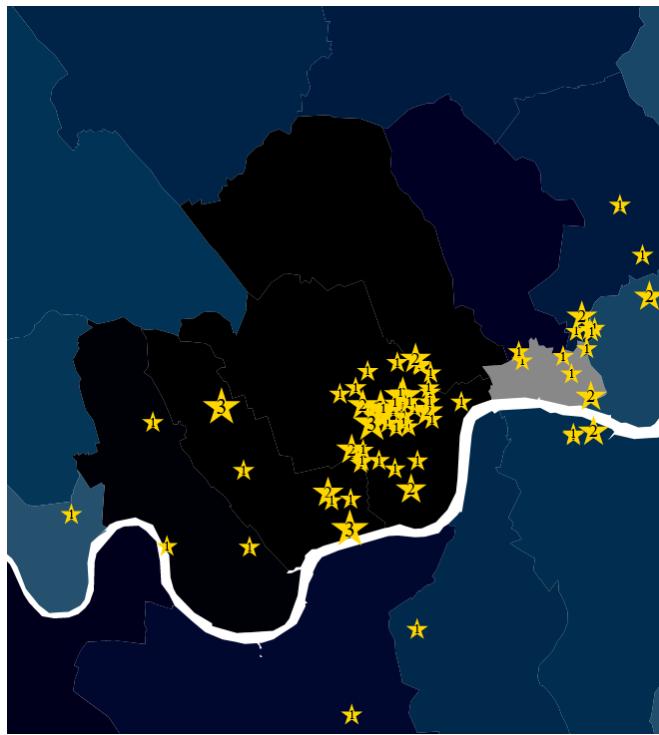


Figure 11. Zoom in capability.



Figure 12. Addition of filter bar.

We then added a filter bar, where the user can select how the map is colored. If they select Population, then the map's local authorities will get darker where there is a higher population. This changed from the original design of filtering by one color since we thought this would provide a better use case.



Figure 13. Addition of region details in gray panel.

In this iteration, we fixed the restaurants list and added placeholder stars next to each restaurant. The demographics values were also fixed.



Figure 14. Updated order of restaurants based on star count.

We then displayed the restaurants in order of star count and properly displayed the number of stars.



Figure 15. Updated font of demographic text.

As some final cosmetic fixes we updated the local authority stats spacing to allow for easier readability of the demographics values.

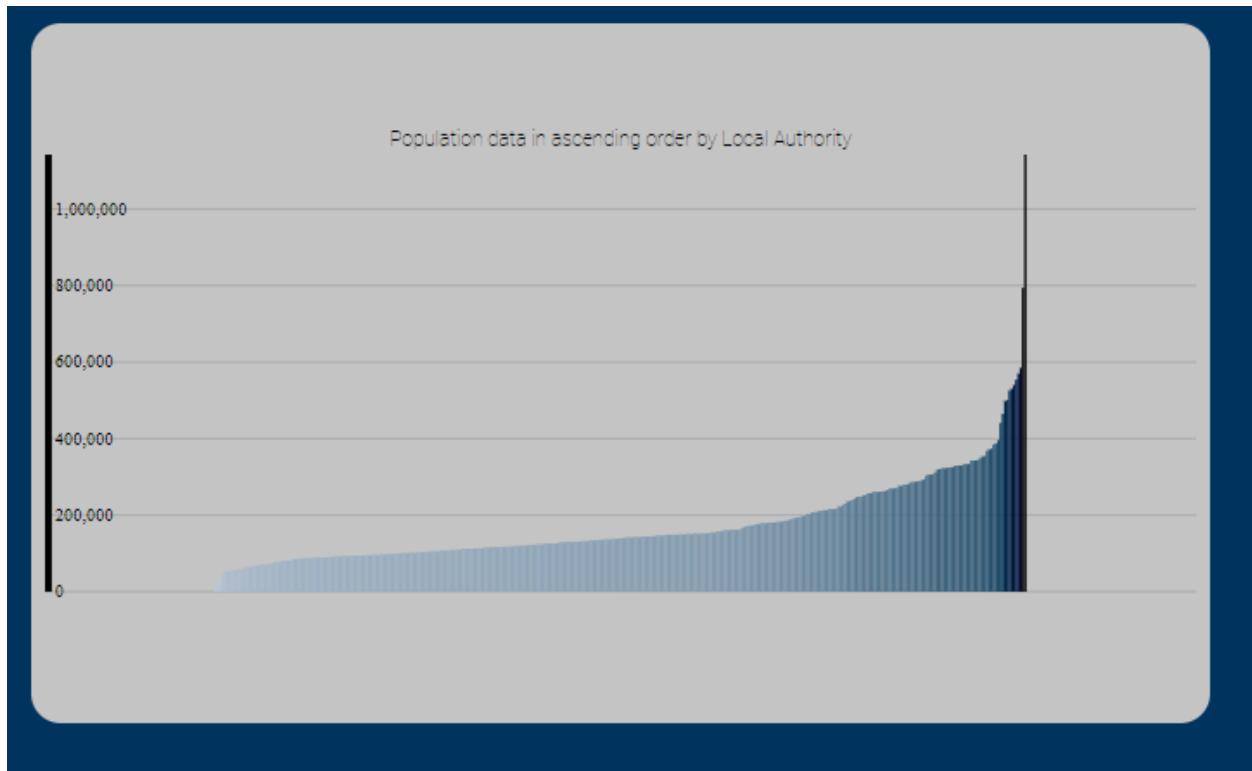


Figure 16. Added bar chart explaining color breakdown.

We realized that we also wanted to add a key of sorts to show what the colors of the map represent. We decided on building a bar chart in which the x-axis represents each local authority on the map and the y-axis shows the value. This chart updates along with the map when the filter buttons are selected. Due to time constraints we did not end up implementing the small multiples and instead demonstrate another visualization with this chart. The filter buttons were updated as well and can be seen below.



Figure 17. Updated filter buttons.

The “Stars” option allows the user to see the whole map with each point indicating an existing star restaurant. These are indicated with stars with a number inside each one indicating the number of existing Michelin star restaurants in that area.

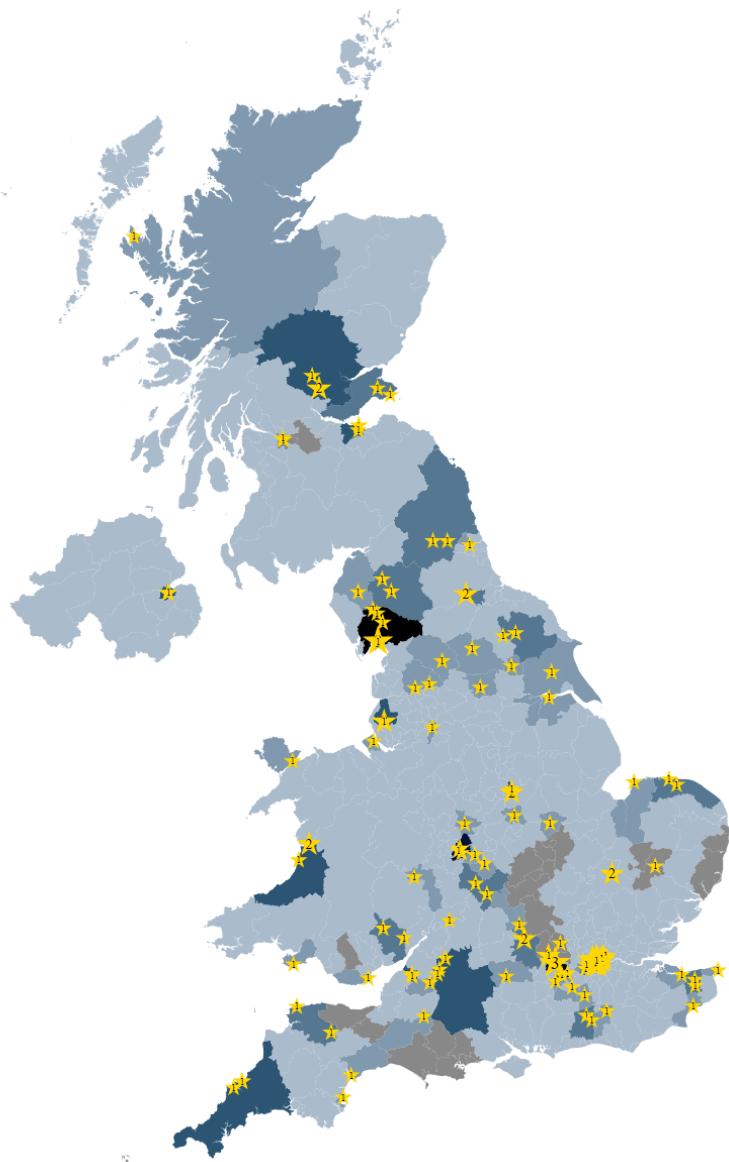


Figure 18. "Stars" filter.

The "Population" option filters the map based on the population in each local authority. On this map the local authorities are marked with a circle and a number inside of them indicating how many stars are in that local authority.

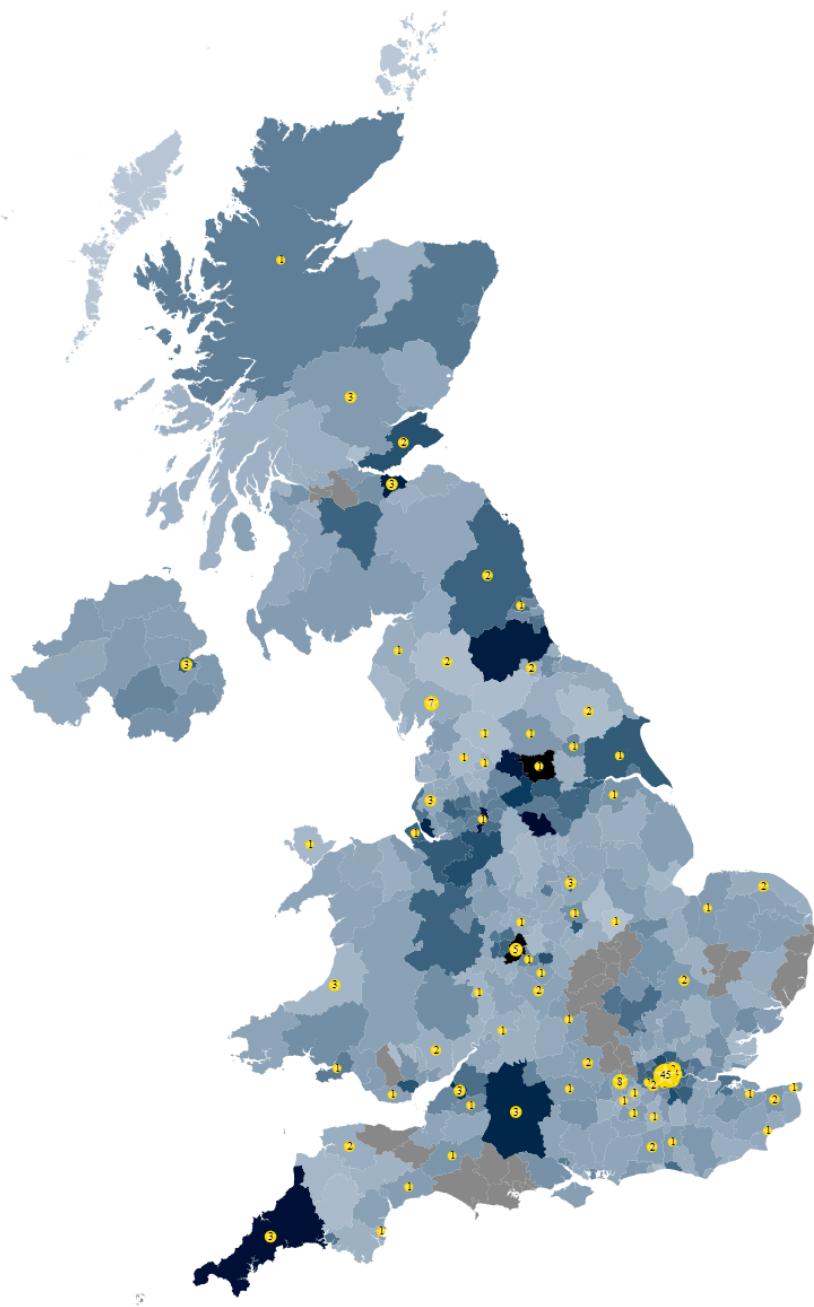


Figure 19. “Population” filter.

A user can zoom into an area, for example London, and click on that local authority to see the exact location of each restaurant.

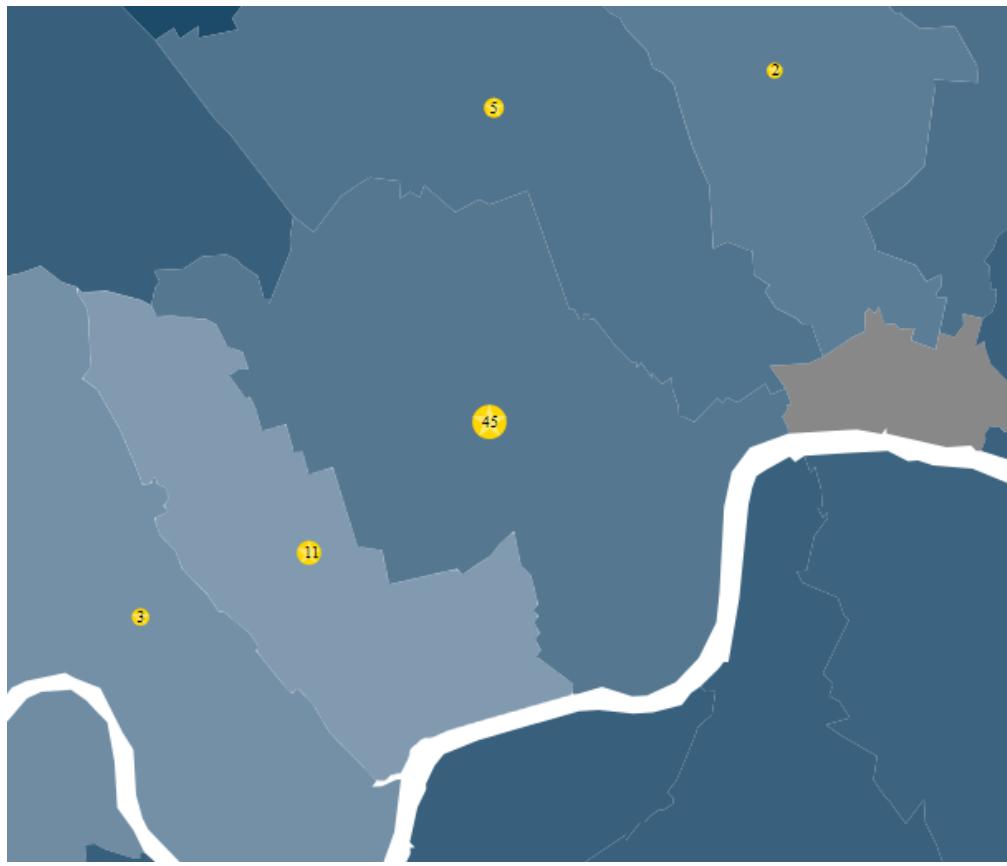


Figure 20. Zoomed-in circle marker, pre-click.

So this image will turn into the following. This allows for easier readability with the circle point and still allows the user to see where each restaurant is located.

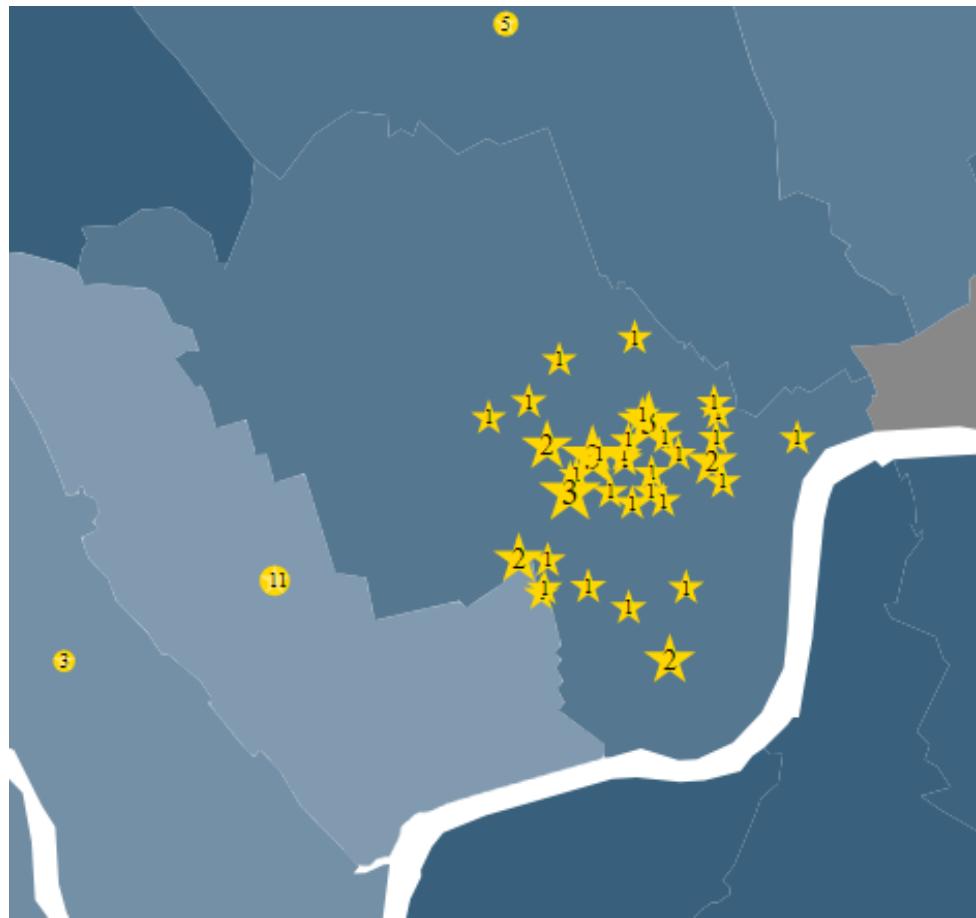


Figure 21. Zoomed in with star markers, post-click.

The “Housing” option updates the map to show each local authority colored based on housing information.

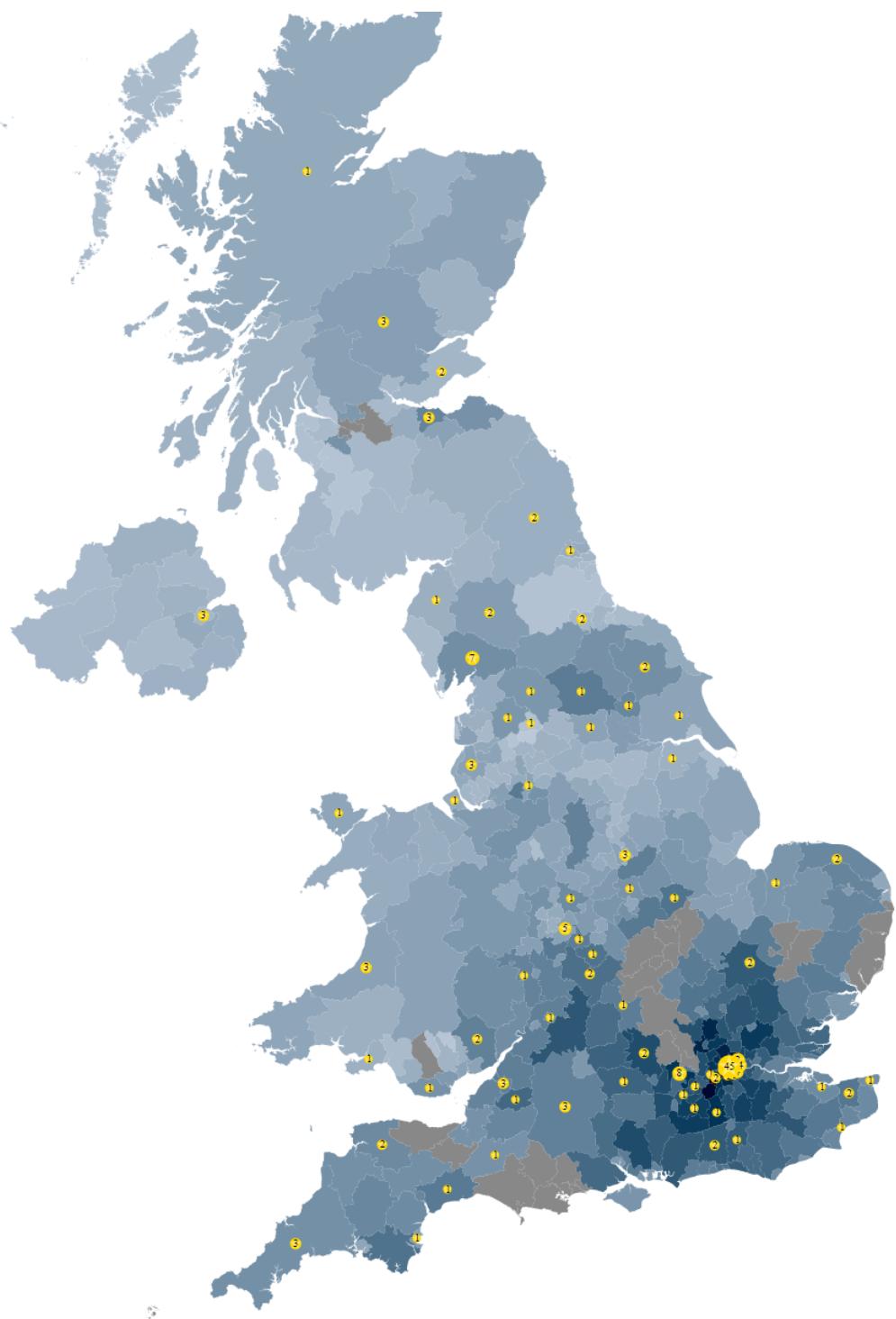


Figure 22. “Housing” filter.

The “Income” option filters by income.

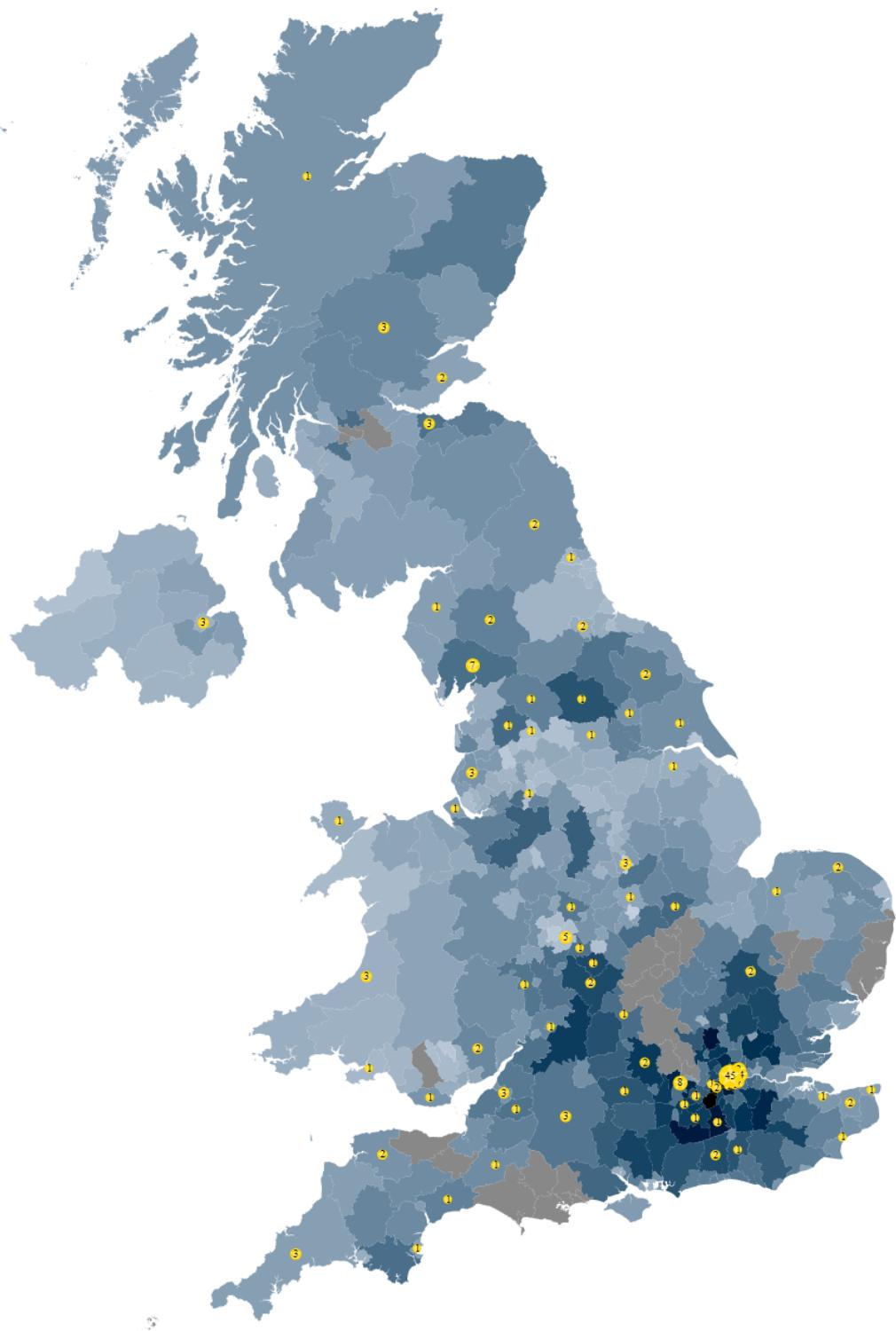


Figure 23. "Income" filter.

And finally, the “Predicted” option shows our machine's prediction of how many stars a local authority can get if a new restaurant is opened. This map includes a yellow circle with a number in it representing the predicted number of stars in the local authority.

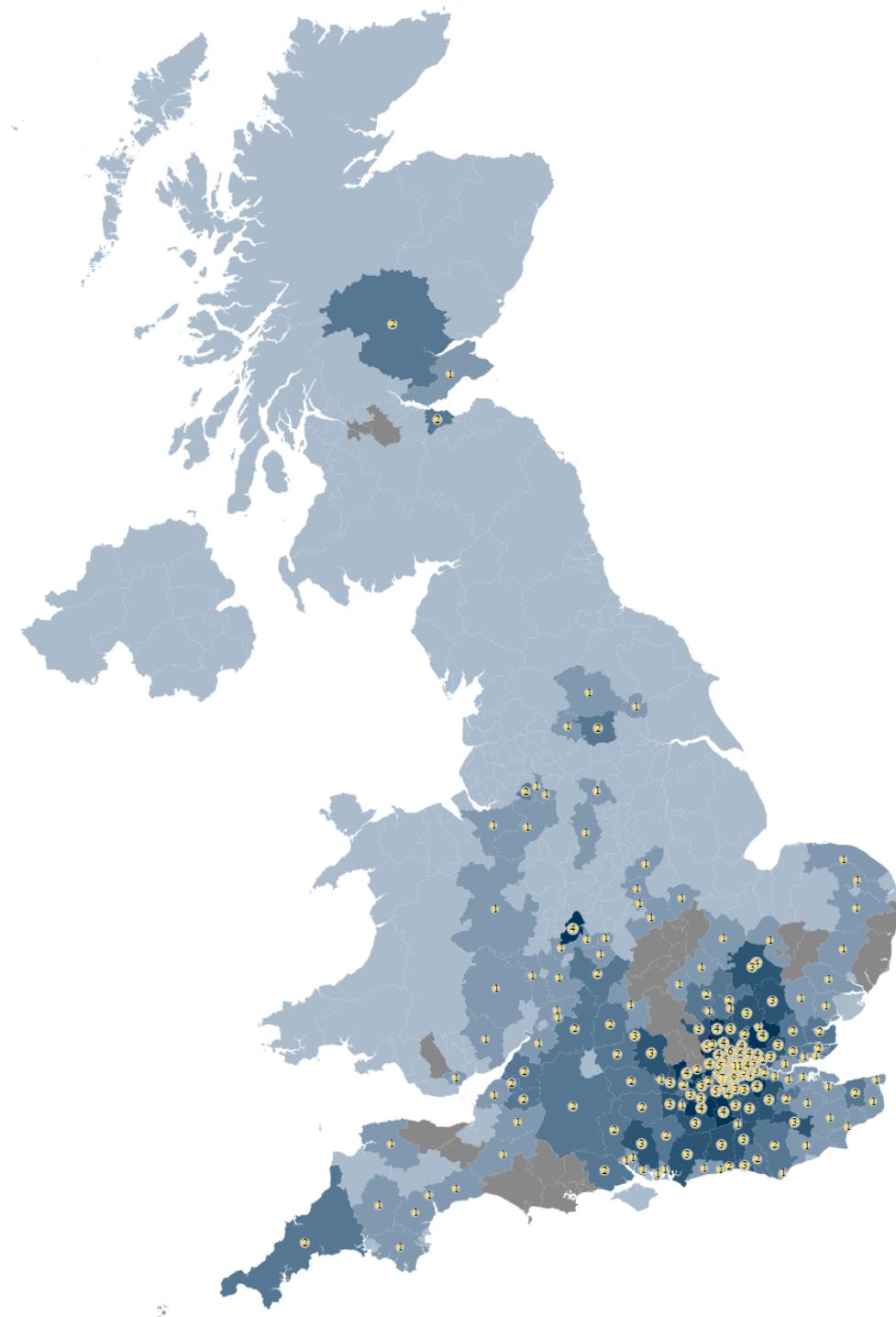


Figure 24. “Predicted” filter.

In this map, if a user selects a local authority, the gray pane will update as follows.



Figure 25. Final UI of gray details panel.

In this case, if a new restaurant owner wants to open a restaurant in Camden, we predict that in the next couple years the local authority will gain 5 more stars and have 10. The list of the existing stars, along with the demographics is still displayed as well.

Evaluation

In the end we were able to set up a visualization that included a map of the UK which showed which local authorities had Michelin star restaurants and the demographics for those local authorities. A user is also able to select a local authority without any stars and see what the likelihood of it receiving stars and how many there could be. They can also filter the map by multiple options in order to see what they need to. Here is the final look of the project.

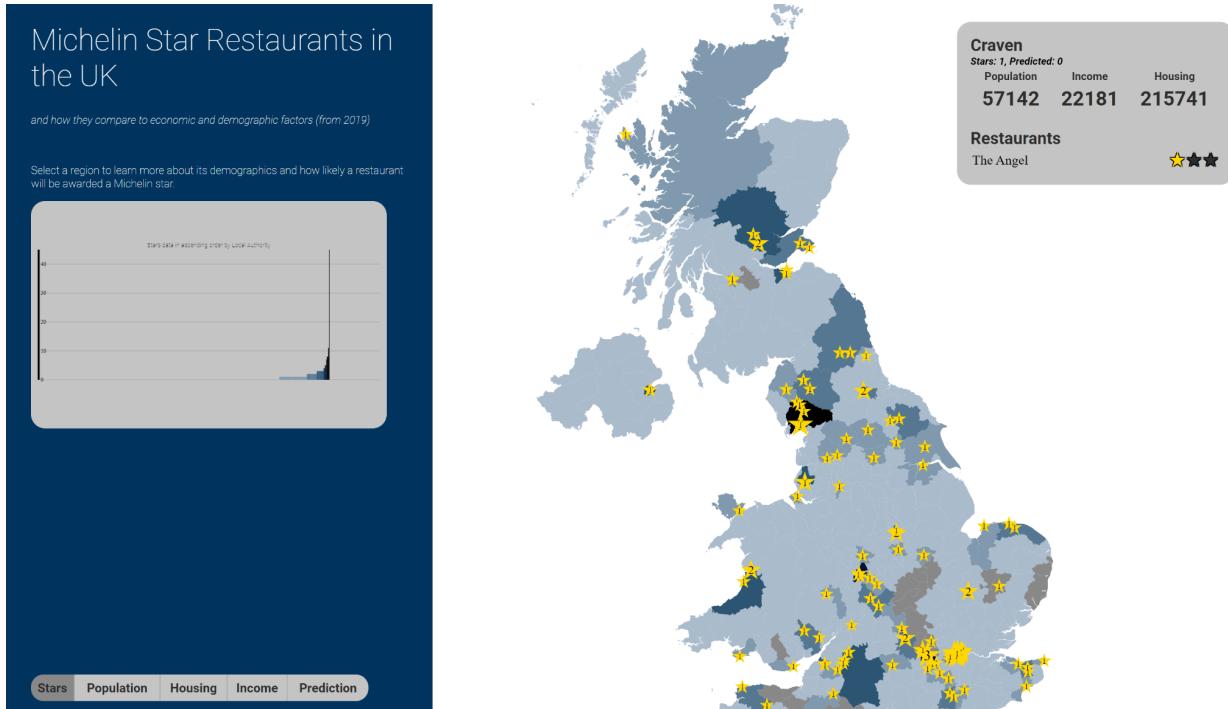


Figure 26. Final project dashboard.

It is easy to use as a user can scroll around the whole country, as well as zoom into specific areas to get a better look at them. Using this dashboard, an eager restaurant owner can get some more information about which area may be best to open a new restaurant in as compared to that local authority's demographics.

References

- [1] Z. Feng, H. Li, W. Zeng, S.-H. Yang, and H. Qu. Topology density map for urban data visualization and analysis. *IEEE Transactions on Visualization and Computer Graphics*, 27(2):828–838, 2021.
- [2] S. Few and P. Edge. Introduction to geographical data visualization. *Visual Business Intelligence Newsletter*, 2, 2009.
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- [4] R. E. Roth. Interactive maps: What we know and what we need to know. *Journal of Spatial Information Science*, (6):59–115, 2013.

[5] C. Turkay, A. Slingsby, H. Hauser, J. Wood, and J. Dykes. Attribute signatures: Dynamic visual summaries for analyzing multivariate geographical data. *IEEE Transactions on Visualization*