**Crime in Los Angeles – Project 2 Data Visualization Dashboard**

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1. **Introduction**

This report describes the creation of a dashboard that interactively visualizes data on crimes that happened in Los Angeles between 2010 and 2019. This project was part of the course “Data Visualization” as part of the master’s degree “Data Science and Advanced Analytics” at NOVA IMS in Lisbon in 2021.

1. **Dataset Description**

The main dataset in use in this project contains information on crimes that occurred in Los Angeles between 2010 and 2019. This dataset can be found on Kaggle.com at [1], where a CSV file with 2.12 million records is available for download.

The dataset contains 28 columns that contain information like dates, locations, crime descriptions and information about the crime victims, such as ethnicity, age and gender. The features used for the analysis and visualizations of this projects are: ‘DATE OCC’ (date of crime’s occurrence), ‘AREA NAME’ (the name of the area where it occurred), ‘Crm Cd Desc’ (a description of the occurred crime), ‘Vict Descent’ (the ethnicity of the victim), ‘LAT’, and ‘LON’ (the geographical location of the occurred crime).

Apart from this dataset, the authors also resorted to the Los Angeles Police Department’s website [2] in order to retrieve each area’s population and the square miles area of each area. Since for three areas of Los Angeles (‘Olympic’, ‘West LA’, and ‘Topanga’) this information was not available, the median of the respective variable was used for these three areas.

[Philipp please complete this last paragraph with the cases in which the median was used. Also, the next one should concern the ethnicities data that you used.]

1. **Visualizations and Interaction**
2. Inspiration

The content of the crime dataset used served as the source of inspiration for the visualizations created for this project.

1. KPIs / Big Numbers

In terms of visualizations, the first thing the reader will see are 3/4 numbers that will provide a very high-level perspective of data. Big numbers are a very common practice in dashboards and are used to give the viewer some context before diving into deeper analysis. The information is this visualization will tell where in Los Angeles is there a higher and lower crime incidence and compare the numbers of reported crimes between the selected year and the year before, so that the reader can have an idea of how things evolved.

1. Map of Los Angeles Crime in Selected Year - Choropleth / Map

This graphic displays a spatial heat map, using Los Angeles area, in order to show which areas had more crime incidence. The values in each area can be compared by means of a colour scale/intensity. This is a very handy graphic since it very concretely shows general areas of higher incidence, always considering a specific year selection.

1. Top 10 Most Common Crime Types – Bar Chart

An also very common practice in dashboards, since there is limited space, is to present top analysis using the most significant categories. In this case, from 142 described crime types, the most frequent 10 are show, for a given year. Furthermore, the user is given the possibility of passing the mouse over the bars to find the exact values of occurrences.

1. Line Chart

For the line chart, we decided to include also the top 10 crimes committed, where the user can visually observe the behaviour of crimes throughout the selected year in the specified neighbourhood. Since displaying 10 lines, corresponding to the 10 categories, would be imperceptible and hard to visualize, by default the plot only shows the 5 most frequent crimes, while the others only contain the legend. This way the user can select or deselect crimes according to his intentions, without being overwhelmed with a chaotic chart at a first glance.

1. Average Number of Reported Crimes per inhabitants per year for the respective area of Los Angeles - Bar Chart

This bar chart combines information on the population, the square miles area and the yearly average crime count of each area in one plot. The user is able to select an area of Los Angeles in the selector above, which results in the respective data to be visualized in the left bar of the two-bar plot. The right bar with the label “Total Los Angeles” serves as an object of comparison to give the user an insight on the magnitude of the crime rate in the respective area compared to Los Angeles as a whole. A two-bar plot was chosen for this visualization, because it is the most effective way to provide the described comparison to the viewer.

1. Victim’s Ethnicities Distribution for the respective area of Los Angeles - Donut Plot

This donut plot visualizes the ethnicity distribution of the crime victims of the area that is selected by the user using the same selector as above. For a better visual result only victim’s ethnicities that make up at least 1% of the occurred crimes are displayed as a separate category. The others are aggregated in the category “Other”. A donut plot was chosen, because it is able to transport the same amount of information as a pie chart, whilst using significantly less ink due to its whole in the middle. The colours representing each category were chosen in the way they are displayed in order to ensure optimal visual separability of the different classes and that don’t lead the reader to guess any type of order in the categories.

1. **Technical aspects**

Similarly to what was taught in the practical classes, the plots were created using the python library ‘Plotly’, which enable the creation of dynamic dashboards for an enriched visualization of data. Even though Dash, the platform thought on classes, is a compatible solution to create dashboards using the Plotly plots, for familiarity and simplicity reasons, we decided to use Streamlit [2]. Streamlit, like Dash, is a library for building data dashboard web apps that even though is more recent, it has been gaining a lot of popularity for its rapid prototyping capabilities. Lastly, on the implementation and deployment part, we hosted our web application using Heroku [3].

Regarding the dashboard content, our application offers some features to facilitate its visualization, which we will go briefly through.

All the content is dynamically displayed accordingly to the year selected in the draggable bar (2010-2019), presented in the top part of the web page. Below, are 3 indicators that present the best and worst neighbourhoods in terms of crimes and also shows the total number of crimes for the selected year as well as a comparison with the previous year, except for 2010 (that is the first year of the analysed timeframe).

Further down, we display a map with a heatmap for the crimes occurred in Los Angeles. Here, the user can observe what are the most dangerous areas, interacting with the plot by zooming in for a more precise analyses of certain regions.

Next, for this second part of our web page, there is a new level of granularity by enabling the user to filter by neighbourhoods. In the dropdown menu, there are 21 neighbourhoods of LA, where the upcoming plots will display info based on the select option. The default value is the area of Newton.

Filtering through neighbourhood is important because it gives the operator the opportunity to explore deeper each of the areas analysed previously in the map. Here, there is information about the demographics (population percentage of the whole area of LA) and criminality of the selected area and year.

The GitHub repo linked to Heroku for the deployment of the web app can be found [here](https://github.com/ph1001/Data_Visualisation_Project_Group_I/tree/main/Dashboard).

1. **Discussion**

With the elaboration of this project, we were able to not only produce meaningful plots in order to display the desirable information but also to interact and grasp other concepts related with the composition of a dashboard and subsequent deployment to a web application.

For this second project, the challenges faced in the first project were faced again, more specifically, the processing of the data to match our needs and expectations as well as finding suitable plots for the right visualizations and interactions. Regarding the dashboard and the deployment, the documentation provided by the official websites is very complete and precise, with the most challenging part being the execution of call-backs by the filters and the optimization of the web app for faster loading times.

With the accomplishment of this project, we were able to produce a web page that could provide relevant insights for the city of Los Angeles, for instance, this could help users decide on were to look for their next apartment based on areas that are prominently placed above the other in terms of safety**.**

1. **References**

[1] <https://www.kaggle.com/chaitanyakck/crime-data-from-2020-to-present/version/5?select=Crime_Data_from_2010_to_2019.csv>

[2]<https://streamlit.io/>

[3]<https://devcenter.heroku.com/>