Mapping Crime in the Los Angeles: A Visual Journey (2020-2024)

Team Cyan (Information and Communication Technologies)

SINGAPORE INSTITUTE OF TECHNOLOGY

Introduction

Crime in America is a significant concern, impacting the safety and well-being of residents, businesses, and tourism. There has been a sharp rise in motor vehicle thefts, which increased by 25% from 2019 to 2022[1] ,demonstrating the need for continued efforts to curb the crime rate.

Understanding and identifying areas with high crime rates can significantly enhance law enforcement training and preparation. Data consistently shows that neighborhoods such as South Los Angeles remain prevalent with violent crime[2]. Utilizing past statistical data and quantifiable information to identify hotspots allows law enforcement agencies to allocate resources more efficiently and maximize safety.

Examining crime distribution in Los Angeles, a Medium visualization focuses on the University of Southern California's University Park campus, using blue dots to represent crime incidents[3] (Figure 1). While straightforward, the plot could be refined for better clarity and impact.

Previous Visualization

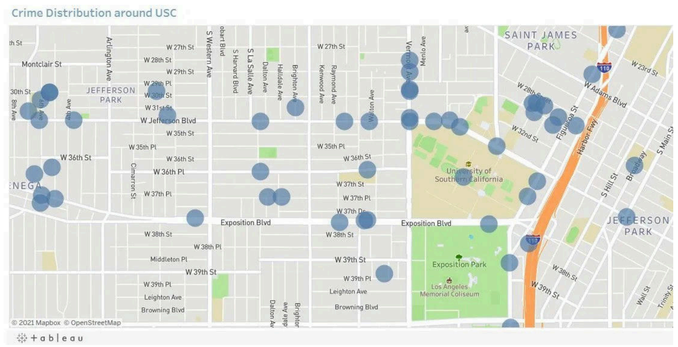

Figure 1: Crime distribution around USC, published by the Medium.

Strengths

1. Alpha was used on the circles allowing darker spots to appear if overlapped.
2. A gentle blue color was used, making it easy for users to identify crime-affected spots. The chosen color effectively contrasts with the map's background, enhancing visibility without clashing.
3. An area with good distribution was picked, as there are clusters displayed on the map.
4. As the mouse is hovered over the circles, the exact number of crimes is displayed through a tooltip (Figure 2), allowing the user to see the exact number of crimes in that area .

[1]https://www.marketwatch.com/guides/insurance-services/car-theft-statistics/
[2]https://www.latimes.com/california/story/2023-10-12/violent-crime-is-down-fear-is-up-why-is-la-perceived-as-dangerous
[3]https://towardsdatascience.com/visualizing-crime-in-los-angeles-14db37572909/

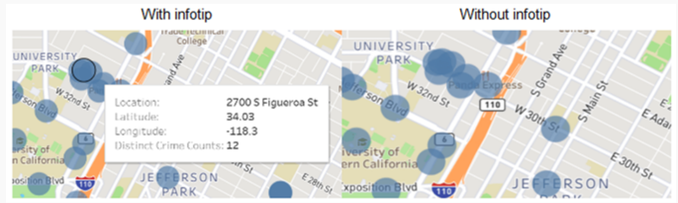

Figure 2: Crime distribution around USC, published by the Medium.

Suggested Improvements

1. **State layer view:** separated with area code, performs better visualization of the crime distribution. A localize view does not represent a crime spread well for meaningful actions.
2. **Identify type of crime clearly:** A clearer view of top crime should be labeled and display.
3. **Add missing title and guides:** Title should be used for clear description
4. **Add missing guides:** Guides should be used to show clear distinction of color shade to total crime count.
5. **Use a saturation color palette:** Shows a meaningful progression through color space. Saturation palettes shows cold to hot zone allowing human to see intensity of an area.
6. **Label locations:** Labeling popular city center allow enforcer to see crime distribution and easily identify the areas with high crime rate.
7. **Add crime types for each area:** Displaying the top 3 crimes in each area allows for better understanding of the crime distribution and provides additional information.

Implementation

Data

- The data used spans from January 1, 2020, to June 7, 2024, and is sourced from the universal crime data for Los Angeles[4]. Unlike the subset of data ending in 2021 used in the previous visualization (Figure 1), this dataset offers a more comprehensive view. Although there are datasets available for the years 2010 to 2019[5], they were not used due to differing formats.

Software

We used the Quarto publication framework and the R programming language, along with the following third-party packages:

- **dplyr** for data manipulation
- **tidyverse** for data transformation, including **ggplot2** for visualization based on the grammar of graphics
- **readxl** for data import
- **lubridate** for date and time manipulation
- **DT** for interactive data tables
- **knitr** for dynamic document generation
- **pals** for qualitative color palettes
- **RColorBrewer** for sequential color palettes

Improved Visualization

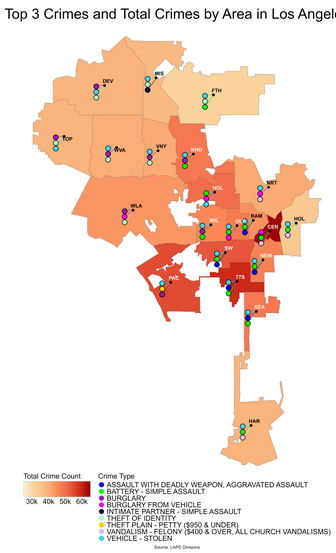

Figure 3: Top 3 crimes and total crimes by area.

Further Suggestions for Interactivity

While our visualization was designed for a poster, interactive features were not implemented. However, in an HTML document, these features can be achieved using various R packages. **ggplot2** allows for **hover, drag, zoom, and export**, which improves accessibility for people with sight disabilities by enabling zoom to increase text size. **Shiny** facilitates the **sorting of graphs** to clearly differentiate categories and provides **dynamic input**, such as displaying the distribution of only robbery crimes throughout the state. Additionally, **plotly** offers **customized tooltips** with ggplot2, expands long town names, and shows exact numbers without crowding. By **darkening borders** and adding shadows, plotly highlights areas when hovered, enhancing the overall user experience.

Conclusion

The revised crime visualization for Los Angeles (2020-2024) improves on previous versions by adding area labels, a saturation color palette, and comprehensive guides. Highlighting the top three crime types per area provides deeper insights into local patterns. These enhancements make the visualization more complex yet user-friendly, aiding law enforcement in resource allocation and strategy development, and ultimately contributing to improved community safety.

[4]https://data.lacity.org/Public-Safety/Crime-Data-from-2020-to-Present/2nrs-mtv8/data_preview
[5]https://catalog.data.gov/dataset/crime-data-from-2010-to-2019