

# *New York City Arrest Dynamics: A Comprehensive Visual Analysis of Trends and Demographic Patterns*

Gangurde, Priyadarshani  
Computer and Information Science.  
Fordham University  
New York City, United States  
prg@fordham.edu

Samanta, Ujjwal  
Computer and Information Science  
Fordham University  
New York City, United States  
usamanta@fordham.edu

## **Abstract:**

The endeavor of this project is to conduct a detailed, visually engaging exploration of arrest patterns in New York City's various boroughs, meticulously chronicling the nuances over a span of years. Leveraging the advanced visual analytics proficiencies of Tableau, the initiative is geared towards elucidating the multifaceted nature of arrest data, scrutinizing aspects such as demographic particulars, racial background distribution, age group statistics, and the specific categories of offenses committed. The aspiration is to synthesize an articulate, interactive visual narrative that not only delineates the intricate tapestry of arrests but also serves as a pivotal resource for stakeholders. This illustrative representation aims to augment comprehension of the intricate interplay between law enforcement activities and the community dynamics, thereby bolstering strategic decision-making in the realm of public safety and policy planning.

## **Introduction:**

Embarking on this venture involves the meticulous construction of an expansive dashboard that serves as a tableau, capturing the intricate patterns and trends in arrest data. The visual compilation will not simply reflect quantities but will weave a comprehensive story across temporal and demographic spectra. Prospective visualizations are slated to encompass an array of facets such as cumulative arrests mapped by borough, granular weekly arrest counts retrospectively analyzed over several years, and patterns of arrests categorized by the nature of offenses. A key component of this analysis is delving into demographic strata, dissecting the data through the lenses of age brackets and racial demographics, with an intent to unearth potential patterns indicative of deeper socio-economic and policy-driven forces at play.

In essence, this project is investigative and exploratory, eschewing preconceived notions or hypotheses. This stance facilitates an unfettered analytical journey through the extensive troves of arrest records, where emergent correlations, trends, and insights are detected through a natural, data-led investigative process. Such an exploratory paradigm is fundamental to maintaining an objective stance, enabling the resultant visualizations to effectively communicate the intrinsic stories woven within the data. Our commitment is to an investigative process that is as revelatory as it is impartial, ensuring that the derived insights are reflective of the reality on the ground and can serve as a cornerstone for informed policy deliberation and enactment.

## **Background:**

New York City is one of the most densely populated urban centers in the United States, and its unique demographic, economic, and social landscape makes it a focal point for crime analysis and policy planning. Arrest patterns in the city reflect a diverse array of factors, including socio-economic disparities, neighborhood demographics, and variations in policing strategies across boroughs. With five distinct boroughs—Brooklyn, Manhattan, the Bronx, Queens, and Staten Island—the city displays a rich diversity in population density, income levels, and cultural backgrounds. This complexity necessitates a nuanced understanding of crime data to better tailor public safety measures and resource allocation.

Prior research has demonstrated the significance of factors such as unemployment rates, neighborhood conditions, and youth involvement in shaping crime dynamics. Moreover, historical shifts in law enforcement policies,

particularly those tied to drug-related offenses, have had a lasting impact on arrest rates across different communities. Understanding these broader trends offers a foundational perspective for interpreting the arrest data and exploring potential disparities in criminal activities among various groups.

### **Dataset:**

To fuel this analytical engine, we will harness the publicly accessible arrest records made available by the NYPD. This dataset presents itself as a raw, unrefined ore that requires a thorough process of data cleansing and transformation to render it suitable for consumption by Tableau's sophisticated analytical suite. We anticipate that the data preparation phase will be both rigorous and challenging, encompassing a suite of operations including, but not restricted to, the stratification of offenses, systematic filtering to distill relevance, and encoding to facilitate seamless integration and interpretation within our analytical framework.

Dataset 1 Link- [https://data.cityofnewyork.us/Public-Safety/NYPD-Arrests-Data-Historic-/8h9b-rp9u/about\\_data](https://data.cityofnewyork.us/Public-Safety/NYPD-Arrests-Data-Historic-/8h9b-rp9u/about_data)

Dataset 2 Link- <https://data.cityofnewyork.us/Public-Safety/Crime-Map-/5jvd-shfj>

### **Tools and Technology:**

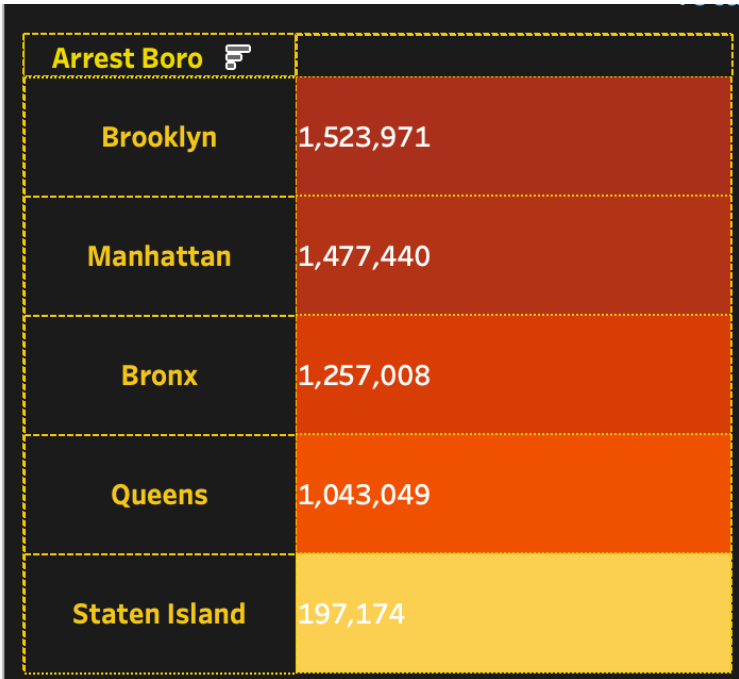
At the forefront of our visualization toolkit stands Tableau, esteemed for its interactive prowess, user-friendly interface, and exceptional capacity for rendering complex data into coherent and intuitive visual formats. As the project evolves and the demand for more intricate data manipulation arises, we are prepared to supplement our toolkit with Python and its ecosystem of data manipulation libraries, notably Pandas for data structuring and NumPy for numerical computation. The integration of these tools aims to facilitate a seamless pipeline from raw data to polished, interactive visualizations.

### **Related Work:**

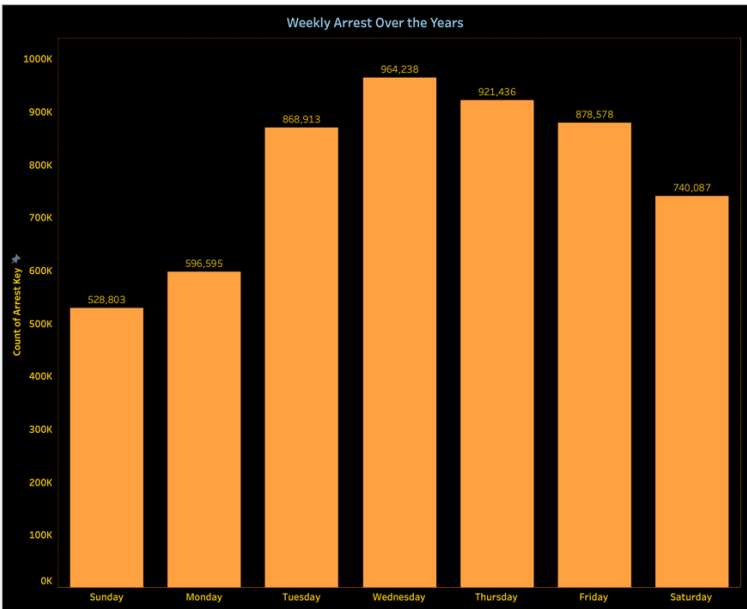
Previous studies have explored New York City's crime data from various angles. For instance, the Brennan Center for Justice has analyzed the impact of shifting policing strategies on crime trends, finding that changes in stop-and-frisk policies directly influenced certain categories of arrests. Furthermore, researchers have scrutinized the relationship between neighborhood gentrification and evolving arrest patterns, revealing that areas experiencing rapid economic growth often see shifts in both the volume and types of crimes.

Other notable work includes the annual NYPD crime statistics reports, which provide a comprehensive overview of the year-on-year crime rates and offer insights into the prevalence of specific offenses. Additionally, sociologists and criminologists have investigated the intersection of race, poverty, and arrests, offering valuable context for the disproportionate representation of certain racial groups in New York City's criminal justice system. This body of research underscores the importance of thorough, data-driven analysis in shaping policies that aim to address systemic disparities and enhance public safety.

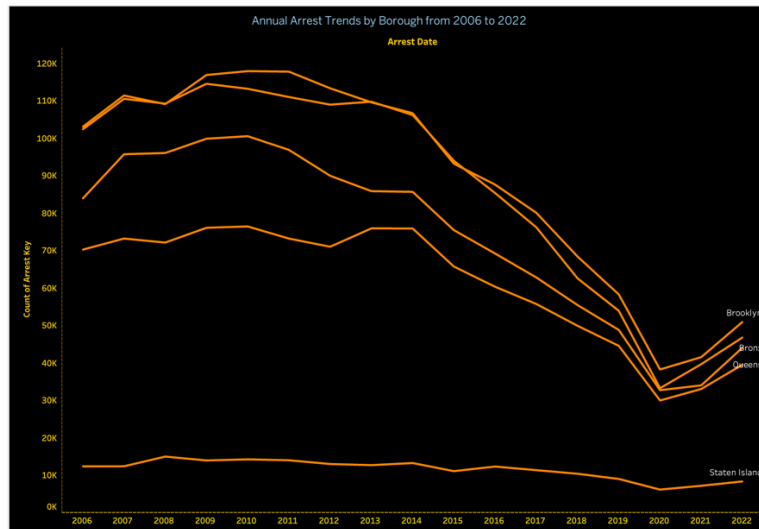
Data Visualizations:



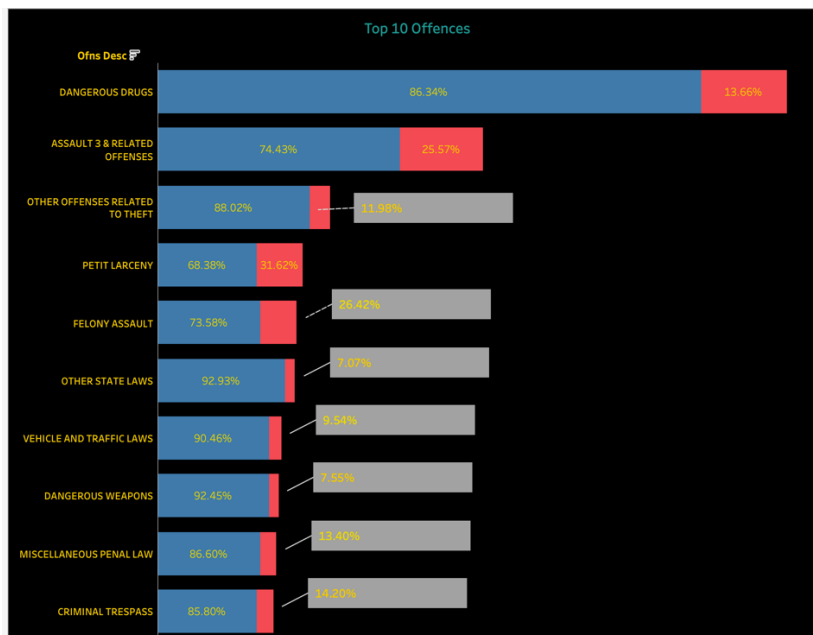
This **table**, "**Total Number of Arrest in each Borough**," serves as a stark visual representation of the distribution of arrests across the boroughs of New York City. Using a gradient color scale where darker shades indicate higher numbers, the map clearly shows Brooklyn with the highest count at 1,523,971, represented by the deepest shade of red. Manhattan follows closely, with 1,477,440 arrests, and the Bronx is shown with 1,257,008, both in varying intensities of red-orange, signaling moderately high arrest volumes. Queens, depicted in a lighter orange, shows a substantial drop to 1,043,049 arrests. Staten Island has the fewest arrests, with 197,174, indicated by a pale yellow. This visual arrangement quickly communicates the relative scale of arrests in each borough and prompts an immediate inquiry into the factors that might contribute to such disparities, from demographic and socioeconomic conditions to policing policies and crime rates.



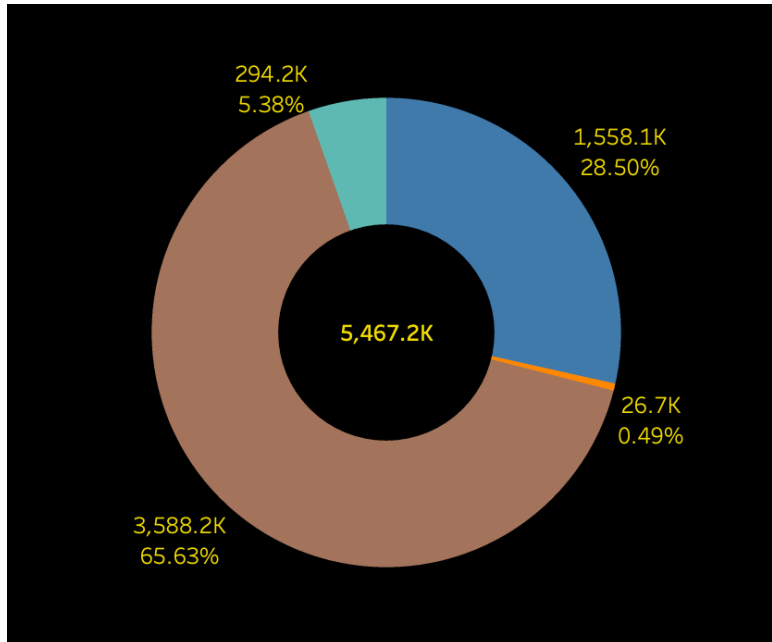
The **bar chart** titled "**Weekly Arrest Over the Years**" illustrates the aggregate number of arrests for each day of the week, combining data over a span of years. The vertical axis measures the count of arrests, while the horizontal axis represents days of the week. Notably, the highest number of arrests occurs on Friday, with over 960,000 cases, suggesting increased police activity or incidence at the end of the workweek. Thursday and Wednesday follow, each with over 900,000 arrests, indicating a midweek surge in arrest numbers. In contrast, Sunday sees the fewest arrests, with just over 500,000 occurrences, which could reflect lower levels of police interaction or a drop in offenses reported on that day. This distribution pattern could guide law enforcement strategies and public safety initiatives, highlighting days where resources might need to be allocated differently.



The **line graph**, titled "**Annual Arrest Trends by Borough from 2006 to 2022**," displays the yearly arrest counts for each of New York City's five boroughs. The distinct colored lines for each borough reveal trends over time. We observe a similar pattern across all boroughs, where arrest counts peak around the years 2010-2011 and show a notable decline around 2020. This synchronized dip may reflect broader societal and policy changes impacting arrest rates. The sharp decrease across all lines around 2020 is particularly striking and could correlate with the onset of the COVID-19 pandemic and subsequent changes in law enforcement practices or crime rates. Brooklyn consistently has the highest number of arrests, while Staten Island has the fewest. The graph illustrates how arrest trends are not static and are subject to fluctuations over time, which may warrant further investigation into the causative factors behind these shifts.



The bar graph titled "Offence Analysis" illustrates the distribution of arrests by gender for various offense categories. Each horizontal bar represents a type of offense, segmented into proportions that correspond to the gender of the perpetrators (female in red and male in blue). The offenses range from "Dangerous Drugs" to "Criminal Trespass." Key observations include a notably higher proportion of males being arrested across all categories, with the category "Other Offenses Related to Theft" having the largest percentage of females at approximately 12%. In contrast, offenses like "Dangerous Weapons" and "Other State Laws" have a higher male arrest dominance, exceeding 90%.



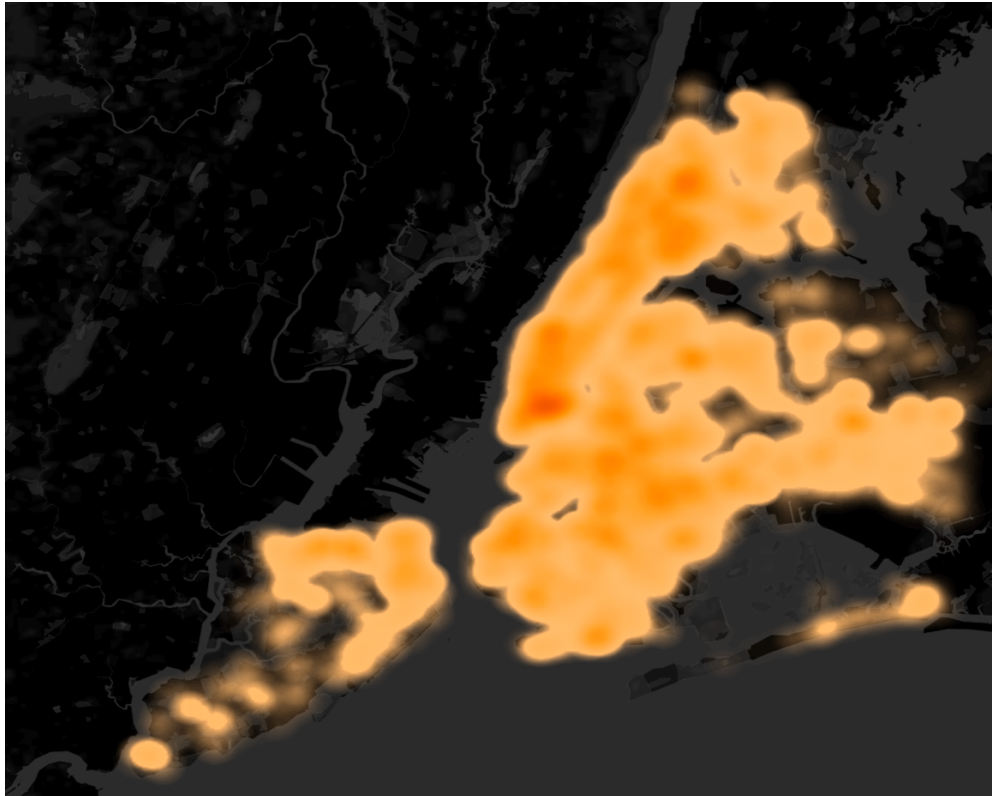
The **donut chart** titled "**Offence Analysis**" categorizes offenses into four legal classifications: Felony, Misdemeanor, Violation, and Infractions. The chart visually quantifies the proportion of each category within the total number of offenses. Misdemeanors constitute the majority with 65.63%, followed by Felonies at 28.50%, indicating a higher occurrence of lesser offenses over more serious crimes. Violations and Infractions account for a smaller fraction of the offenses at 5.38% and 0.49% respectively. This distribution provides a high-level overview of the nature of offenses processed by law enforcement, suggesting where resources may be most intensively required and informing policy on crime prevention and prosecution.

Borough-Wise Breakdown of Offense Counts										
Arrest Boro	ASSAULT & RELATED OFFEN.	CRIMINAL TRESPASS	DANGEROUS DRUGS	DANGEROUS WEAPONS	FELONY ASSAULT	MISCELLANEOUS PENAL LAW	OTHER OFFENSES RELATED TO THE..	OTHER STATE LAWS	PETIT LARCENY	VEHICLE AND TRAFFIC LAWS
Bronx	152,358	72,127	320,470	58,318	62,894	29,696	76,472	20,316	50,240	48,611
Brooklyn	165,389	41,700	334,028	63,018	77,396	74,812	78,289	85,417	54,819	50,016
Manhattan	108,134	59,444	262,563	40,336	45,876	38,773	115,858	89,319	94,210	56,405
Queens	124,172	26,637	149,220	43,137	49,953	55,086	32,333	46,021	44,843	51,211
Staten Island	23,096	3,974	43,555	7,972	8,588	10,411	1,238	1,138	11,096	11,108

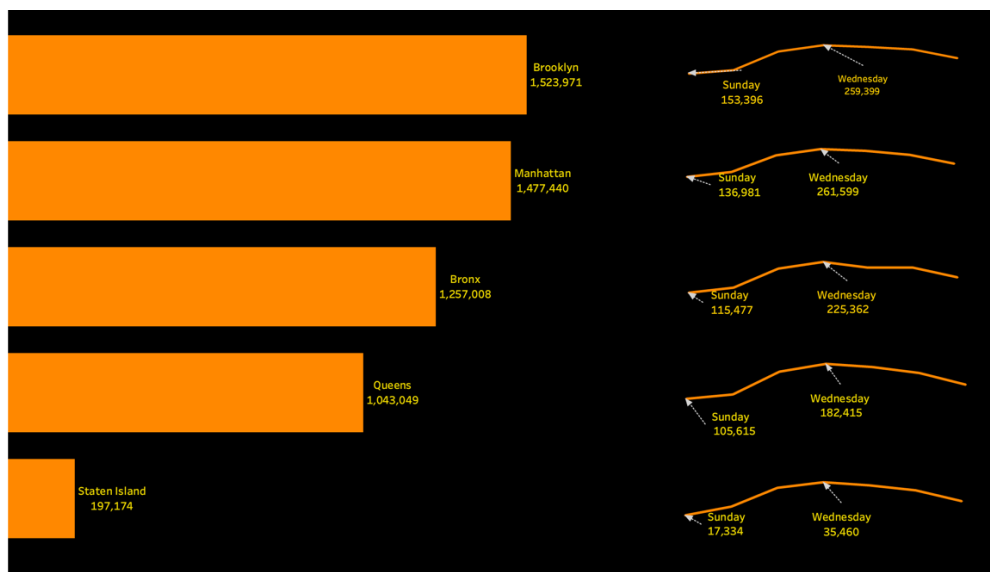
The **stacked bar** chart titled "**Borough-Wise Breakdown of Offense Counts**" compares the prevalence of different types of offenses across New York City's boroughs. Each bar represents a borough, segmented into color-coded categories that correspond to specific offense types.

Major points from this visualization include:

- Brooklyn and the Bronx report higher counts for most types of offenses, with Brooklyn showing notably high instances of "Dangerous Drugs" and "Felony Assault" offenses.
- Manhattan, while having lower numbers overall compared to Brooklyn and the Bronx, still shows significant counts in "Other Offenses Related to Theft" and "Petit Larceny."
- Queens displays a relatively balanced distribution among offense types, with "Dangerous Drugs" being a major category.
- Staten Island has substantially fewer offenses in all categories, consistent with its smaller population.

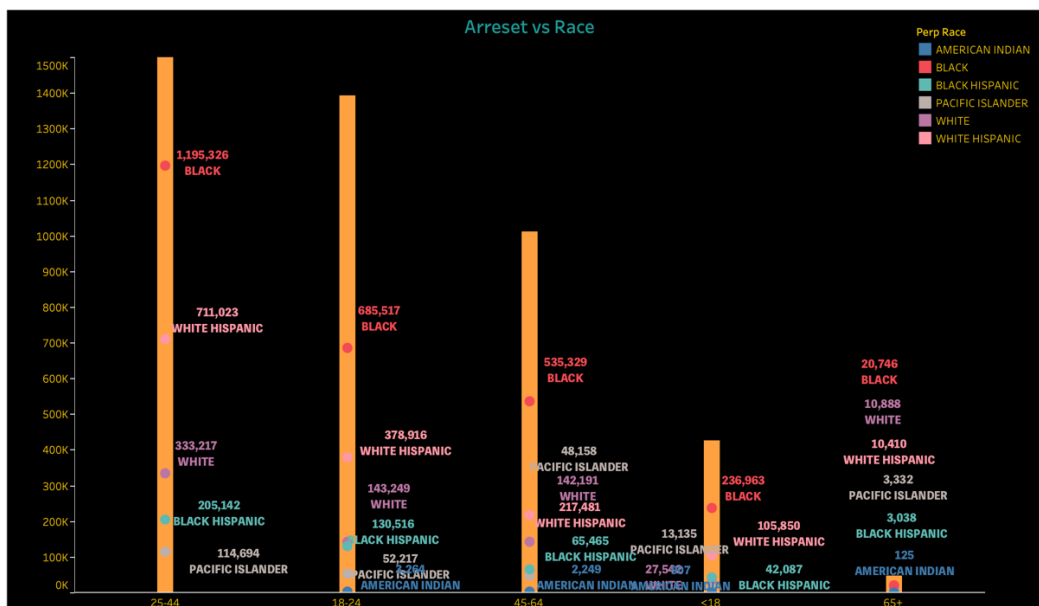


The **map** provided, represents the geographic distribution of crime concentrations in New York City. The darker spots denote areas with a higher frequency of reported crimes, while the lighter areas indicate fewer incidents. The most intense areas of criminal activity are highlighted in deep red, offering a clear visualization of crime hotspots within the city. This geographical analysis can be vital for pinpointing where to increase police presence or community resources and can also help to identify patterns related to urban planning, such as the correlation between crime rates and factors like population density, neighborhood composition, and socio-economic conditions.



The visualization comprises a **bar chart** and accompanying **line graph** for each borough in New York City, delineating the highest and lowest arrest counts based on the days of the week. The bar chart displays the total arrests for each borough, with Brooklyn registering the most arrests, followed by Manhattan, the Bronx, Queens, and Staten Island with the least.

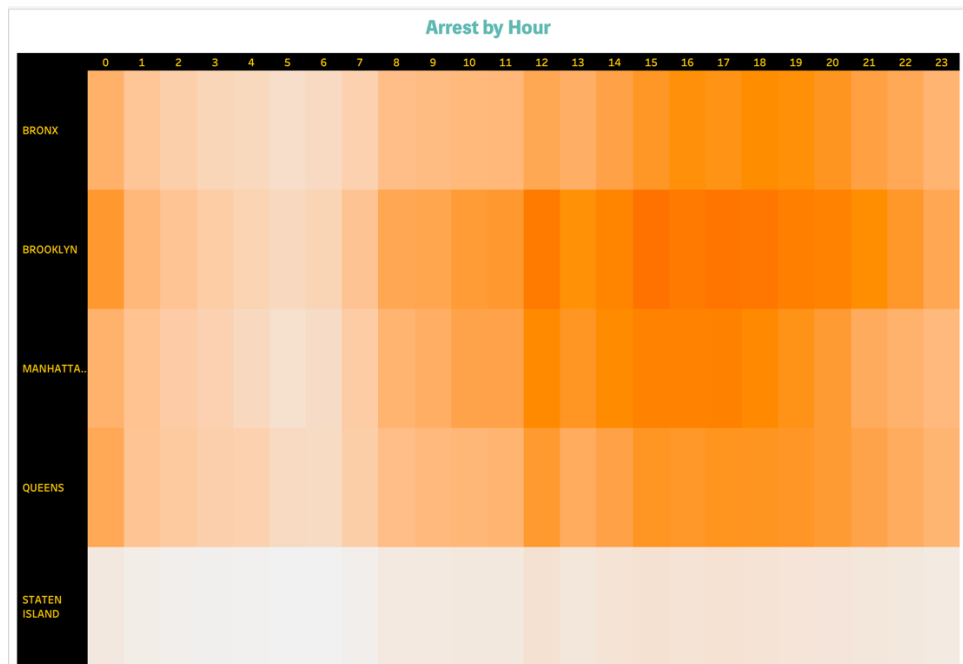
For each borough, the line graph highlights the days with the peak and nadir of arrest activity within a typical week. The trend across the boroughs indicates that Sunday consistently has the lowest number of arrests, whereas Wednesday typically has the highest. This pattern is uniformly observed in all boroughs, albeit with varying absolute numbers of arrests. This set of visuals offers a clear depiction of arrest patterns, both in terms of total numbers across the boroughs and the weekly arrest cycle within each borough.



The **bar chart**, titled "Age Groups Vs Race" appears to represent arrest counts categorized by race/ethnicity across different age groups. Each bar is segmented by color to indicate various racial and ethnic groups, with specific counts for each category labeled on the chart.

- The age group 25-44 has the highest number of arrests across all racial and ethnic groups, with Black individuals having the largest count within this group.
- The age group 18-24 also shows a high number of arrests, particularly among Black and White Hispanic individuals.
- In contrast, the 45-64 and 65+ age groups have markedly fewer arrests, although Black individuals still constitute the highest numbers within these age brackets.
- The <18 age group has the lowest overall arrest counts.





The **heat map** titled "**Arrest by Hour**" illustrates the number of arrests made in New York City throughout the different hours of the day. The horizontal axis represents the hours in a 24-hour format, while the vertical axis quantifies the number of arrests.

- A significant dip in arrests occurs in the early morning hours, reaching the lowest point around 5 AM.
- Arrest numbers begin to rise steadily from the morning, peaking in the late evening hours between 6 PM and 9 PM, suggesting that most arrests occur during these times.
- After the evening peak, there is a decline in arrest numbers, but they remain relatively high until around midnight, after which they start to fall again.

This temporal distribution indicates that arrests are less frequent in the early hours of the morning and more frequent in the evenings, providing insights into when crimes are more likely to be reported or occur, which could inform patrol scheduling and resource allocation for law enforcement agencies.



The **heat map** titled "Arrest by Month" portrays the monthly distribution of arrests throughout a given year. The horizontal axis represents months, and the vertical axis shows the count of arrests. The data points indicate that March experienced the highest number of arrests, significantly exceeding the median level represented by the shaded area. A notable decrease is observed in April, followed by a resurgence in May. The trend appears relatively stable from May through September, with a mild dip below the median in July. Arrest numbers drop in the fall months, reaching the lowest point in December.

This seasonal trend may be influenced by a variety of factors including weather, holiday periods, and police enforcement cycles. The pronounced drop in December might reflect a decrease in criminal activities during the holiday season or possibly a strategic reduction in arrests due to resource reallocation.

## Conclusion:

The analysis of New York City's arrest patterns reveals several notable trends across boroughs, demographics, and offense categories. Brooklyn consistently has the highest arrest count, while Staten Island reports the fewest. Weekly trends show that arrests peak on Fridays, and seasonally, there's a significant drop in December. Males are disproportionately arrested across all offense categories, particularly for "Dangerous Weapons." Arrests are most prevalent among individuals aged 25-44, especially Black individuals, and the decline around 2020 reflects societal changes due to COVID-19. These insights emphasize the need for data-driven policing and public safety strategies that account for geographic, demographic, and socio-economic factors influencing crime patterns. Further research could deepen our understanding of these correlations and inform more effective crime prevention policies.