The Airbnb Market in NYC: A Brief Exploratory Data Analysis using R

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```
library(ggridges)
library(tidyverse)
library(ggplot2)
library(dplyr)
```

```
nycbnb = nycbnb |>
    select(
      id,
      price,
      neighborhood,
      borough,
      accommodates,
      bathrooms,
      bedrooms,
      beds,
      review_scores_rating,
      number_of_reviews,
      listing_url )
```

Initial Exploration

Q; How many rows does the dataset have?

A: The dataset has 37765 rows.

Q: What does each row in the dataset represent?

A: Each row represents an Airbnb listing. Each column represents an aspect of the listing, such as number of bedrooms, neighborhood location, price of rental, or listing url.

Data Preparation

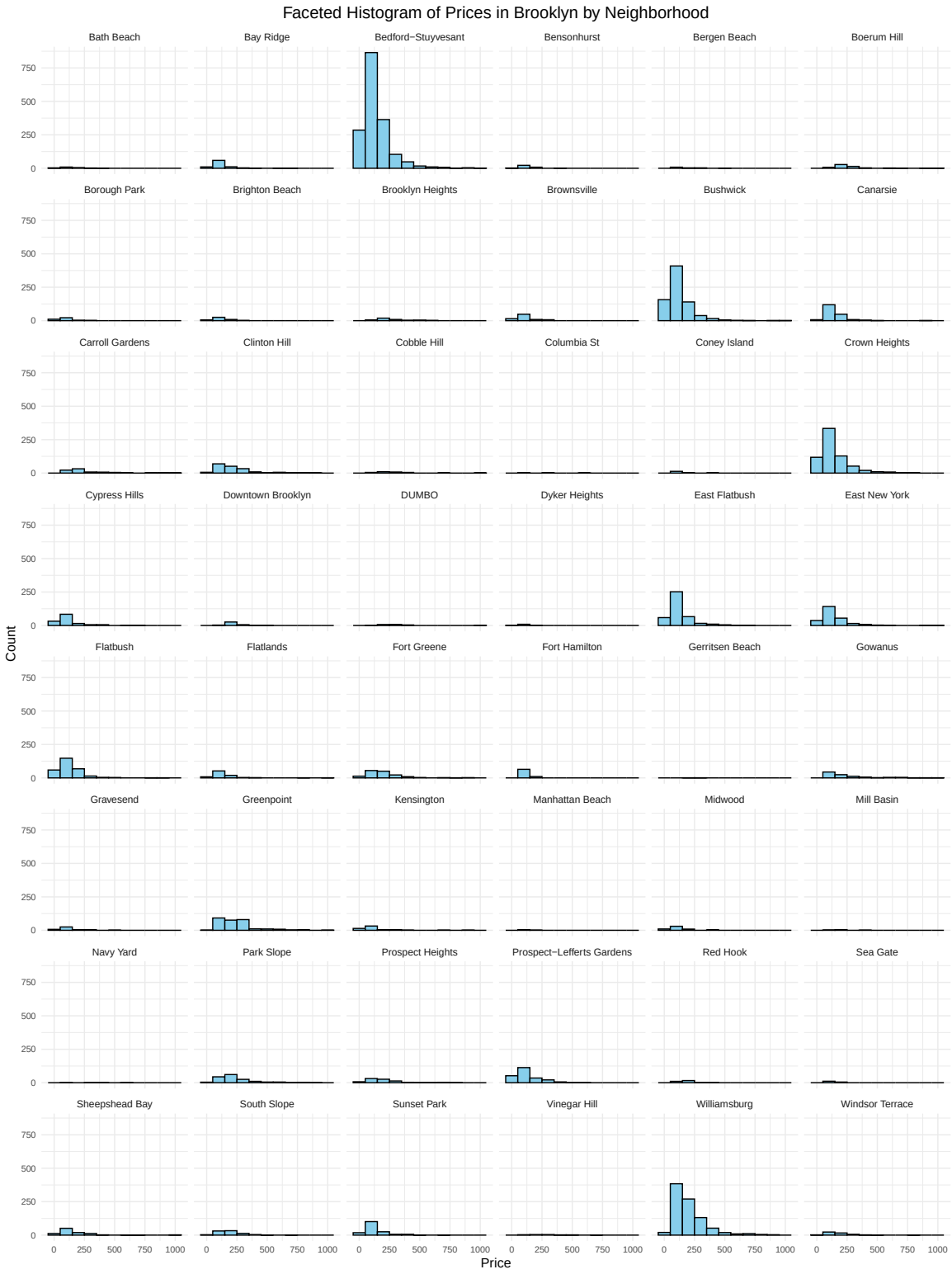
```
# Filter data for Brooklyn
brooklyn_data <- nycbnb[nycbnb$borough == "Brooklyn", ]
# Remove null values
clean_data <- brooklyn_data[is.finite(brooklyn_data$price), ]
```

Data Visualization

We'll create a faceted histogram of this cleaned Brooklyn Airbnb data. We have 48 neighborhoods to display, so a layout of 6 columns and 8 rows will allow us to see all of the facets/neighborhoods at once, while being able to scan for trends in pricing.

```
ggplot(clean_data, aes(x = price)) +
  geom_histogram(binwidth = 100, fill = "skyblue", color = "black") +
  facet_wrap(~ neighborhood, ncol = 6) +
  labs(title = "Faceted Histogram of Prices in Brooklyn by Neighborhood",
       x = "Price",
       y = "Count") +
  theme_minimal() +
  theme(
    axis.text.x = element_text(size =8),
    axis.text.y = element_text(size = 8),
    axis.title.x = element_text(size = 12),
    axis.title.y = element_text(size = 12),
    plot.title = element_text(size = 15, hjust=0.5)

  )
```


Faceted Histogram of Prices in Brooklyn by Neighborhood
Bath Beach
Bay Ridge
Bedford−Stuyvesant
Bensonhurst
Bergen Beach
Boerum Hill
Borough Park
Brighton Beach
Brooklyn Heights
Brownsville
Bushwick
Canarsie
Carroll Gardens
Clinton Hill
Cobble Hill
Columbia St
Coney Island
Crown Heights
Cypress Hills
Downtown Brooklyn
DUMBO
Dyker Heights
East Flatbush
East New York
Flatbush
Flatlands
Fort Greene
Fort Hamilton
Gerritsen Beach
Gowanus
Gravesend
Greenpoint
Kensington
Manhattan Beach
Midwood
Mill Basin
Navy Yard
Park Slope
Prospect Heights
Prospect−Lefferts Gardens
Red Hook
Sea Gate
Sheepshead Bay
South Slope
Sunset Park
Vinegar Hill
Williamsburg
Windsor Terrace
Count
0
250
500
750
Price
0
250
500
750
1000

Data Visualization Improvements

The spatial layout has room for improvement. Bed-Stuy shows an outlier of maximum price in its histogram chart, which skews data visualization and leads to scale distortion. A future idea is to normalize the data or transform to account for the outlier, so that we can see more of the data for each neighborhood, instead of the scale distortion creating a "vertically squished" effect.

Further Data Exploration

Identity the neighborhoods city-wide with the top five median listing prices that have a minimum of 50 listings.

```
top_5_neighborhoods <- clean_data %>%
  group_by(neighborhood) %>%
  filter(n() >= 50) %>%
  summarize(median_price = median(price, na.rm = TRUE)) %>%
  arrange(desc(median_price)) %>%
  slice_head(n = 5) %>%
  pull(neighborhood)

top_5_neighborhoods
```

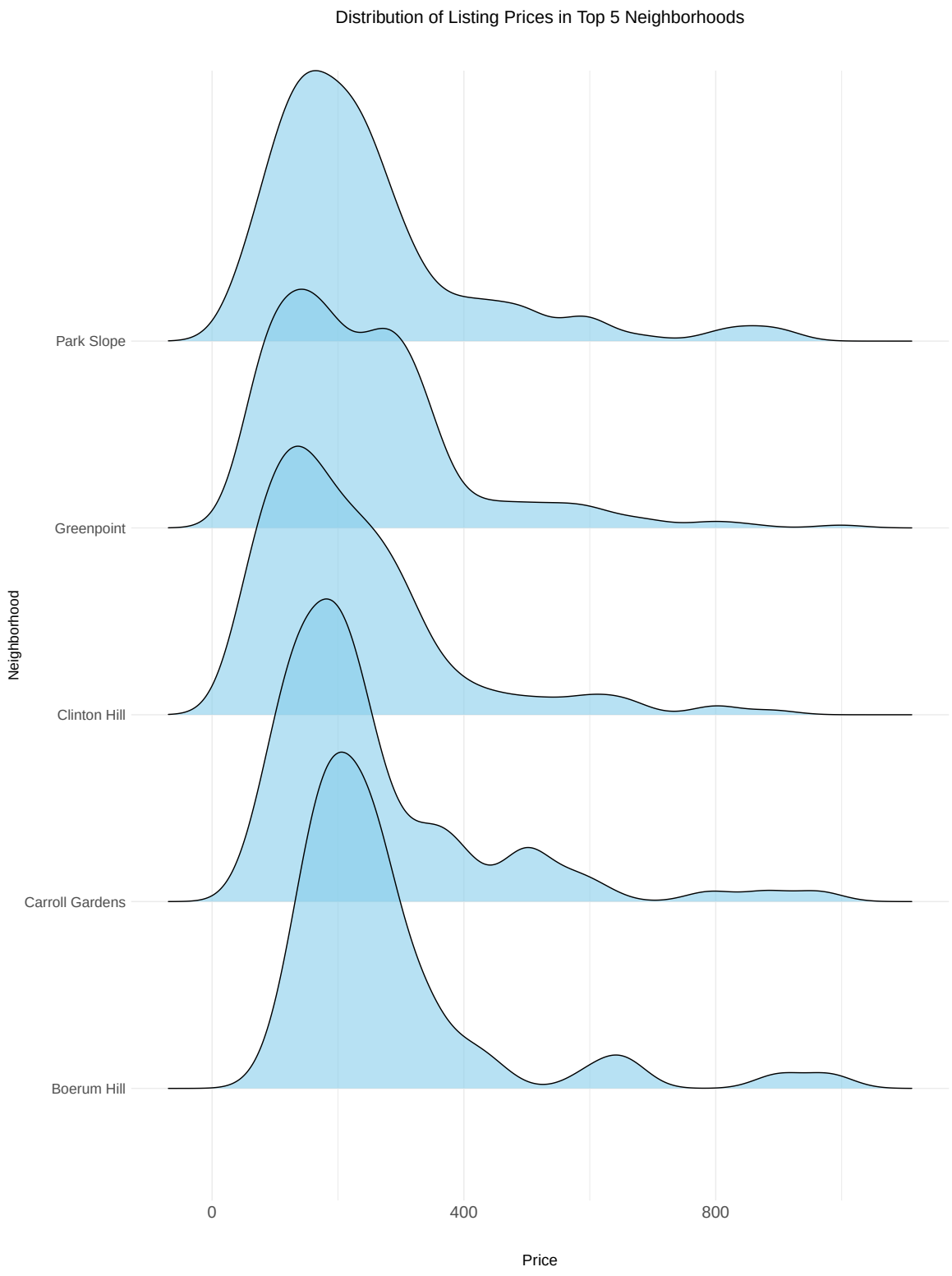
```
[1] "Boerum Hill"     "Greenpoint"      "Park Slope"      "Carroll Gardens"
[5] "Clinton Hill"
```

Filter the data for these five neighborhoods and make ridge plots of the distributions of listing prices in these five neighborhoods

```
filtered_data <- clean_data %>%
  filter(neighborhood %in% top_5_neighborhoods)
```

```
#|mmessage: false
ggplot(filtered_data, aes(x = price, y = neighborhood)) +
  geom_density_ridges(fill = "skyblue", color = "black", alpha = 0.6) +
  labs(title = "Distribution of Listing Prices in Top 5 Neighborhoods",
       x = "Price",
       y = "Neighborhood") +
  theme_minimal()  +
  theme(
    axis.text.x = element_text(size =15),
    axis.text.y = element_text(size = 13),
    axis.title.x = element_text(size = 14, margin=(margin(t=30))),
```

```
    axis.title.y = element_text(size = 13),
    plot.title = element_text(size = 16, hjust=0.5, margin=(margin(b=40)))
  )
```


Distribution of Listing Prices in Top 5 Neighborhoods
Park Slope
Greenpoint
Clinton Hill
Carroll Gardens
Boerum Hill
Neighborhood
0
400
800
Price

Calculate the minimum, mean, median, standard deviation, IQR, and maximum listing price in each of these neighborhoods.

```
summary_stats <- filtered_data %>%
  group_by(neighborhood) %>%
  summarize(
    min_price = min(price, na.rm = TRUE),
    mean_price = mean(price, na.rm = TRUE),
    median_price = median(price, na.rm = TRUE),
    sd_price = sd(price, na.rm = TRUE),
    iqr_price = IQR(price, na.rm = TRUE),
    max_price = max(price, na.rm = TRUE)
  )

summary_stats
```

```
# A tibble: 5 x 7
  neighborhood    min_price mean_price median_price sd_price iqr_price max_price
  <chr>               <dbl>      <dbl>        <dbl>    <dbl>     <dbl>     <dbl>
1 Boerum Hill            99       279.          231     173.      115         980
2 Carroll Gardens        75       261.          200     177.      163         963
3 Clinton Hill           48       222.          185     151.      154         890
4 Greenpoint             46       240.          209     151.      170.        998
5 Park Slope             44       244.          201     169.      146.        900
```

Data Analysis

Boerum Hill and Carroll Gardens show the highest mean price and lowest minimum price of Airbnb rentals. These are more upscale neighborhoods, and that is reflected in these summary statistics. Rentals generally start at higher prices in Boerum Hill, as seen in the ridge distribution chart.

Clinton Hill, Greenpoint, and Park Slope share the lowest minimum prices of Airbnb rentals. Park Slope seems to have a greater amount of highly priced rentals than the other 2 neighborhoods, judging by the distribution charts. The maximum price, however is highest in Greenpoint, showing the upscale atmosphere of the neighborhood. Park Slope and Clinton Hill, perhaps, have various areas of the neighborhood, some that may be considered lower in market value. Clinton Hill has the lowest median price and mean price of the 5 neighborhoods, which isn't surprising to me as a New Yorker. I think this speaks to the rapid gentrification of Clinton Hill over the past decade, and the fact that some areas are still considered "shady". However, noise complaints may be a potential factor to consider, among other factors. Park Slope is considered a wealthy area, but some areas are super wealthy, while others may have

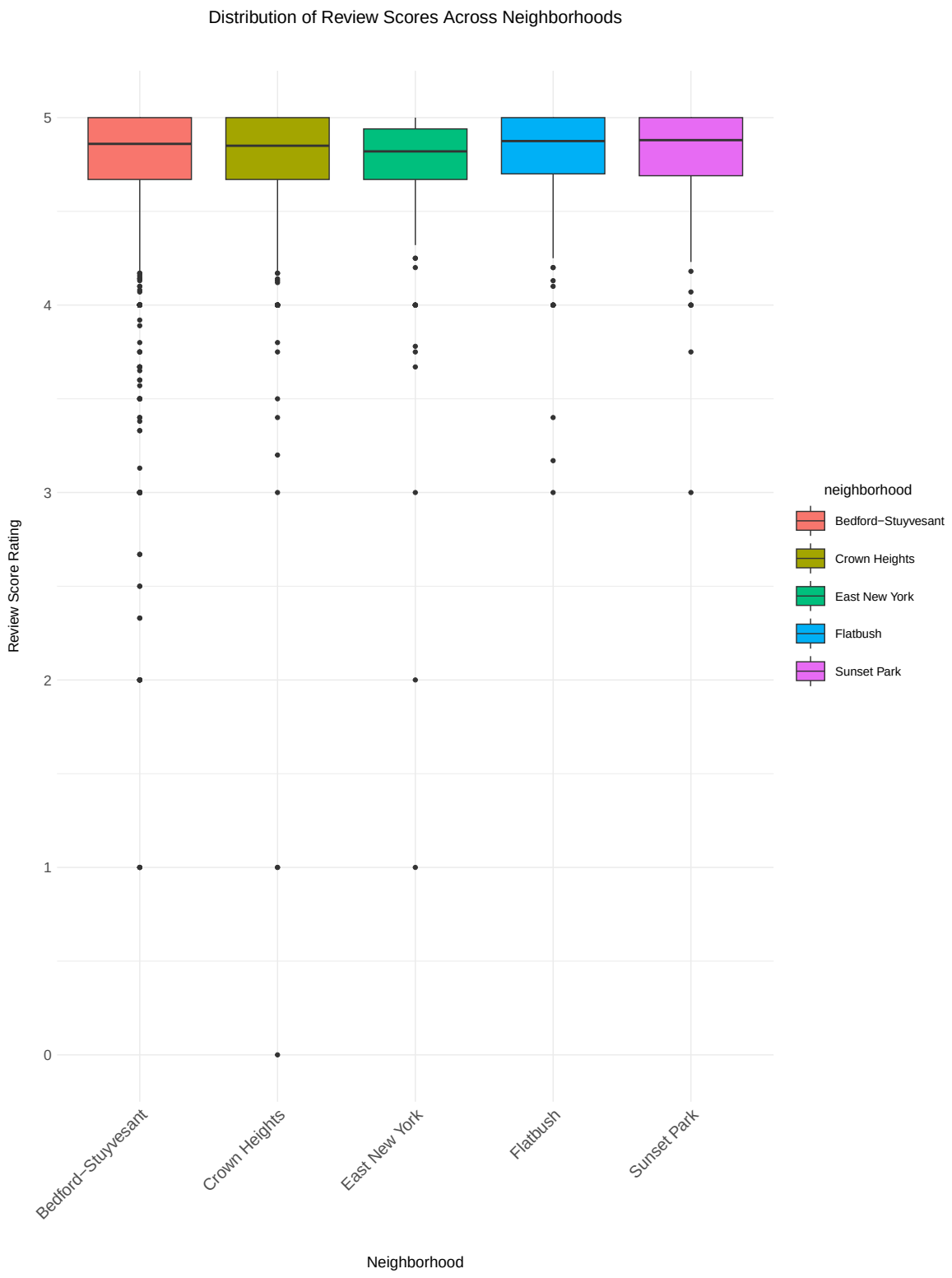
predominantly middle-class residents. A comparison of resident income/wealth data with these Airbnb rental datasets could provide additional insights.

Create a visualization that will help you compare the distribution of review scores (`review_scores_rating`) across neighborhoods.

```
neighborhoods_of_interest <- c("Bedford-Stuyvesant",
                               "East New York", "Crown Heights",
                               "Flatbush", "Sunset Park")

filtered_data <- nycbnb %>%
  filter(!is.na(review_scores_rating)) %>%
  filter(neighborhood %in% neighborhoods_of_interest)
```

```
ggplot(filtered_data, aes(x = neighborhood,
                          y = review_scores_rating,
                          fill = neighborhood)) +
  geom_boxplot() +
  labs(title = "Distribution of Review Scores Across Neighborhoods",
       x = "Neighborhood",
       y = "Review Score Rating") +
  theme_minimal() +
  theme(
      legend.title = element_text(size = 13, hjust=0.5),
    legend.text = element_text(size = 11),
    legend.key.size = unit(1.2, "cm"),
    axis.text.x = element_text(size =15, angle = 45, hjust = 1),
    axis.text.y = element_text(size = 13),
    axis.title.x = element_text(size = 14, margin=(margin(t=30))),
    axis.title.y = element_text(size = 13, margin=(margin(r=20))),
    plot.title = element_text(size = 16, hjust=0.5, margin=(margin(b=40)))
  )
```


Distribution of Review Scores Across Neighborhoods
Review Score Rating
5
4
3
2
1
0
Bedford−Stuyvesant
Crown Heights
East New York
Flatbush
Sunset Park
Neighborhood
neighborhood
Bedford−Stuyvesant
Crown Heights
East New York
Flatbush
Sunset Park

It seems like Bed-Stuy has the lowest overall range of reviews, which may be due to the rapid recent gentrification— with too many resulting factors and social dynamic to explain briefly, that cause dissatisfaction for renters. I'm surprised East New York's ratings are so high because it's known as one of New York's dangerous neighborhoods. It's interesting to think about local New Yorkers' perceptions of neighborhoods—those of us who have seen the rapid change and gentrification of neighborhoods, versus those who are merely visiting from elsewhere, only seeing the neighborhood through these outside eyes or through their romanticizing of NYC.