Bharatiya Vidya Bhavan's

SARDAR PATEL INSTITUTE OF TECHNOLOGY

Advanced Data Visualization

Experiment no. 5

Submitted To

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Submitted By

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Batch: BE Comps (Batch B)

1. Aim:

Create basic charts using R programming language on dataset Crime or Police / Law and Order
● Basic - Bar chart, Pie chart, Histogram, Time line chart, Scatter plot, Bubble plot
● Write observations from each chart

2. Procedure Description:

Step-1: Dataset:

You can view the dataset from this link.

Step-2: Description:

This dataset contains housing data from California and includes features such as the median house value, median income, housing median age, total rooms, total bedrooms, and population. It's suitable for analyzing housing prices and identifying factors that affect real estate values.

Step-3: MetaData:

- **Longitude**: The longitude coordinate for the location of the house.
- **Latitude**: The latitude coordinate for the location of the house.
- **Housing Median Age**: The median age of the houses in the block.
- **Total Rooms**: The total number of rooms in the house.
- **Total Bedrooms**: The total number of bedrooms in the house.
- **Population**: The population of the block.
- **Households**: The number of households in the block.
- **Median Income**: The median income of the block's residents (scaled to tens of thousands).
- **Median House Value**: The median house value for the block (target variable, the house price to predict).

Step-4: Data Visualization Analysis:

Attached below

```
!sudo apt-get install r-base
```

```
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
r-base is already the newest version (4.4.1-1.2204.0).
0 upgraded, 0 newly installed, 0 to remove and 49 not upgraded.
```

```
%load_ext rpy2.ipython
```

```
The rpy2.ipython extension is already loaded. To reload it, use:
  %reload_ext rpy2.ipython
```

```
# Install the necessary R packages
%%R
install.packages("ggplot2")
install.packages("dplyr")
install.packages("viridis")
install.packages("wordcloud")
install.packages("plotly")
```

```
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WARNING:rpy2.rinterface_lib.callbacks:R[write to console]:

WARNING:rpy2.rinterface_lib.callbacks:R[write to console]:
WARNING:rpy2.rinterface_lib.callbacks:R[write to console]: The downloaded source packages are in
        '/tmp/RtmpxlOSkx/downloaded_packages'
WARNING:rpy2.rinterface_lib.callbacks:R[write to console]:
WARNING:rpy2.rinterface_lib.callbacks:R[write to console]:
```

```
%%R
# Load the libraries
library(ggplot2)
library(dplyr)
library(viridis)
library(wordcloud)
library(plotly)
```

```
%%R
# Load the uploaded dataset in R
housing_data <- read.csv("/content/housing.csv")
head(housing_data)
```

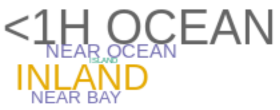
```
  longitude latitude housing_median_age total_rooms total_bedrooms population
1   -122.23    37.88                 41         880            129        322
2   -122.22    37.86                 21        7099           1106       2401
3   -122.24    37.85                 52        1467            190        496
4   -122.25    37.85                 52        1274            235        558
5   -122.25    37.85                 52        1627            280        565
6   -122.25    37.85                 52         919            213        413
  households median_income median_house_value ocean_proximity
1        126        8.3252             452600        NEAR BAY
2       1138        8.3014             358500        NEAR BAY
3        177        7.2574             352100        NEAR BAY
4        219        5.6431             341300        NEAR BAY
5        259        3.8462             342200        NEAR BAY
6        193        4.0368             269700        NEAR BAY
```

```
%%R
print(colnames(housing_data))
```

```
 [1] "longitude"          "latitude"           "housing_median_age"
 [4] "total_rooms"        "total_bedrooms"     "population"
 [7] "households"         "median_income"      "median_house_value"
[10] "ocean_proximity"
```

Word Cloud

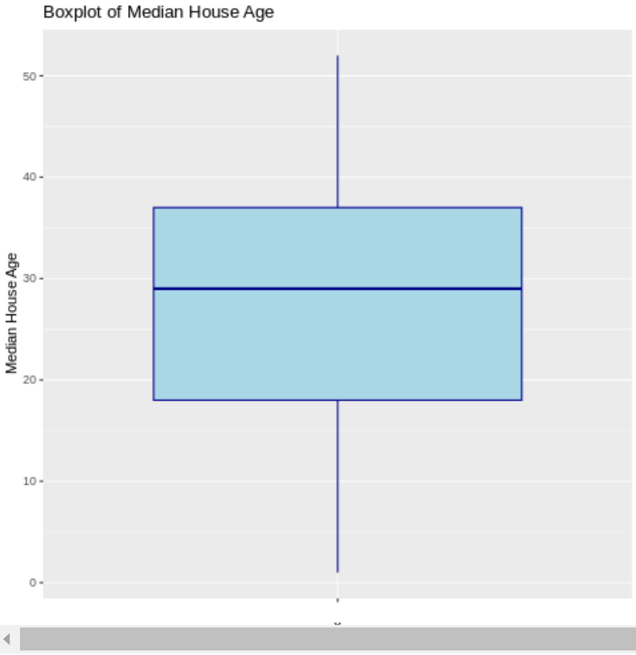
```
%%R
# Assuming 'ocean_proximity' is a column in your 'housing_data'
word_freq <- table(housing_data$ocean_proximity)

# Create word cloud
wordcloud(words = names(word_freq), freq = word_freq, min.freq = 1, scale=c(3,0.5), colors=brewer.pal(8, "Dark2"))
```



Provides a visual frequency of categorical data like city names or neighborhoods, showing which locations have more data entries.

Box and Whisker Plot

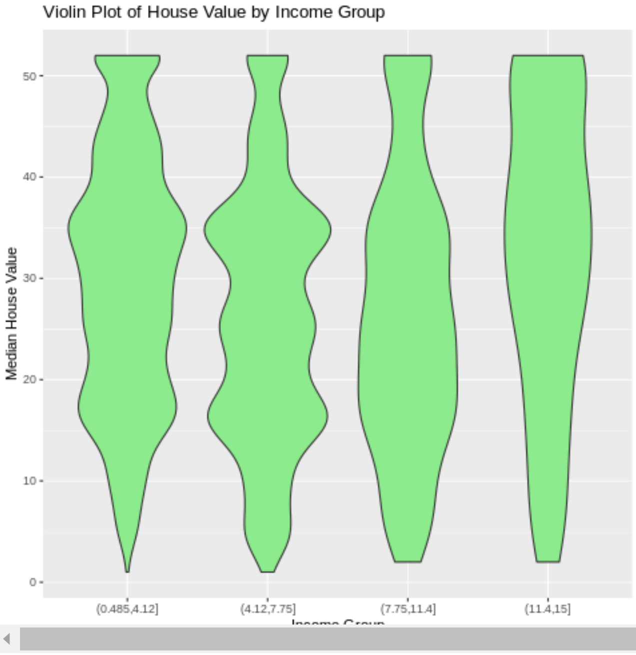
```
%%R
ggplot(housing_data, aes(x = "", y = housing_median_age)) +
  geom_boxplot(fill = "lightblue", color = "darkblue") +
  ylab("Median House Age") +
  ggtitle("Boxplot of Median House Age")
```



Can reveal the spread of house prices, detect outliers, and give insights into the central tendency of house values.

Violin Plot

```
%%R
housing_data$median_income <- cut(housing_data$median_income, breaks = 4)

# Violin plot
ggplot(housing_data, aes(x = median_income, y = housing_median_age)) +
  geom_violin(fill = "lightgreen") +
  ylab("Median House Value") +
  xlab("Income Group") +
  ggtitle("Violin Plot of House Value by Income Group")
```

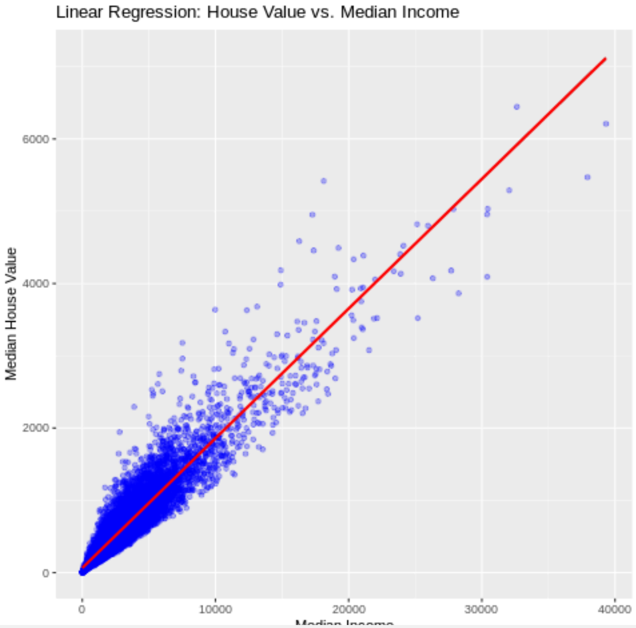


Shows the distribution and density of house values across different income groups, highlighting income groups with higher variance in house prices.

Linear Regression Plot

```
%%R
# Linear regression between Median Income and House Value
ggplot(housing_data, aes(x = total_rooms, y = total_bedrooms)) +
  geom_point(color = "blue", alpha = 0.3) +
  geom_smooth(method = "lm", color = "red") +
  ggtitle("Linear Regression: House Value vs. Median Income") +
  xlab("Median Income") +
  ylab("Median House Value")
```

```
`geom_smooth()` using formula = 'y ~ x'
```

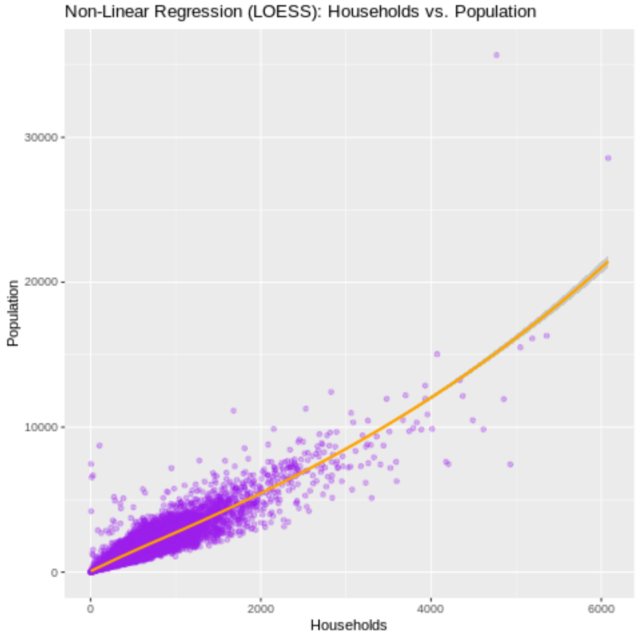


A linear regression line provides insight into the direct relationship between median income and house prices, showing a positive trend where higher income leads to higher house prices.

Non-Linear Regression Plot

```
%%R
# Non-linear regression using LOESS
ggplot(housing_data, aes(x = households, y = population)) +
  geom_point(color = "purple", alpha = 0.3) +
  geom_smooth(method = "loess", color = "orange") +
  ggtitle("Non-Linear Regression (LOESS): Households vs. Population") +
  xlab("Households") +
  ylab("Population")
```

```
`geom_smooth()` using formula = 'y ~ x'
```



LOESS smoothing can uncover more nuanced relationships between income and house prices, showing local trends that a linear model might miss.

3D Scatter Plot

```
%%R


# 3D scatter plot
plot_ly(housing_data, x = ~longitude, y = ~latitude, z = ~housing_median_age,
        type = 'scatter3d', mode = 'markers',
        marker = list(size = 3, color = ~housing_median_age, colorscale = 'Viridis'))
```

Explores how location (longitude and latitude) influences house values, helping visualize geographical pricing trends.

Jitter Plot

```
%%R
ggplot(housing_data, aes(x = median_income, y = housing_median_age)) +
  geom_jitter(color = "blue", alpha = 0.5, width = 0.3, height = 0.3) +
  ggtitle("Jitter Plot: House Value vs. Median Income") +
  xlab("Median Income") +
  ylab("Median House Value")
```

Jitter Plot: House Value vs. Median Income