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Course	Advanced Data Visualization

Experiment 5

Aim	Create advanced charts using R programming language on the dataset - Housing data 1. Advanced - Word chart, Box and whisker plot, Violin plot, Regression plot (linear and nonlinear), 3D chart, Jitter 2. Write observations from each chart

Dataset Description:

This dataset contains real estate property listings with key features such as price, area, number of bedrooms, bathrooms, and stories. It also includes several binary and categorical variables that represent property amenities like access to a main road, presence of a guestroom, basement, hot water heating, air conditioning, parking, and preferred area. Additionally, the dataset captures the furnishing status of the property, with values such as furnished, semi-furnished, and unfurnished. This information provides a comprehensive view of each property's attributes for potential buyers.

Metadata:

Variable	Description	Data Type
price	Property price in currency units	Integer
area	Total area of the property in square feet	Integer
bedrooms	Number of bedrooms in the property	Integer
bathrooms	Number of bathrooms in the property	Integer
stories	Number of stories the property has	Integer
mainroad	Whether the property has access to a main road	Categorical
guestroom	Whether the property has a guestroom	Categorical
basement	Whether the property has a basement	Categorical
hotwaterheating	Whether the property has hot water heating	Categorical
airconditioning	Whether the property has air conditioning	Categorical
parking	Number of parking spaces available	Integer

Variable	Description	Data Type
prefarea	Whether the property is in a preferred area	Categorical
furnishingstatus	The furnishing status of the property	Categorical

1. Importing Libraries and Dataset

In [32]:
```
library(ggplot2)
library(dplyr)
library(lintr)
library(lubridate)
library(wordcloud)
library(RColorBrewer)
library(plotly)
library(tm)
library(quanteda)
library(scatterplot3d)
```

2. Data Preprocessing

In [22]:
```
data <- read.csv("../Datasets/Housing.csv")
head(data)
```

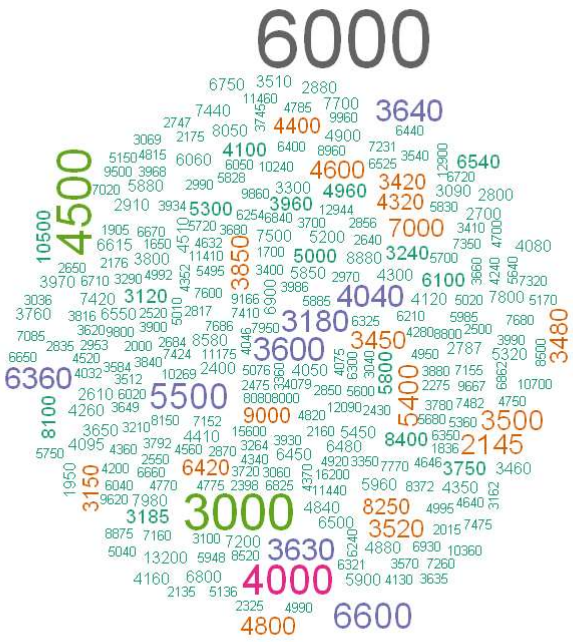
A data.frame: 6 × 13

	price	area	bedrooms	bathrooms	stories	mainroad	guestroom	basement	hotwa
	<int>	<int>	<int>	<int>	<int>	<chr>	<chr>	<chr>	
1	13300000	7420	4	2	3	yes	no	no	
2	12250000	8960	4	4	4	yes	no	no	
3	12250000	9960	3	2	2	yes	no	yes	
4	12215000	7500	4	2	2	yes	no	yes	
5	11410000	7420	4	1	2	yes	yes	yes	
6	10850000	7500	3	3	1	yes	no	yes	

3. Advanced Plots

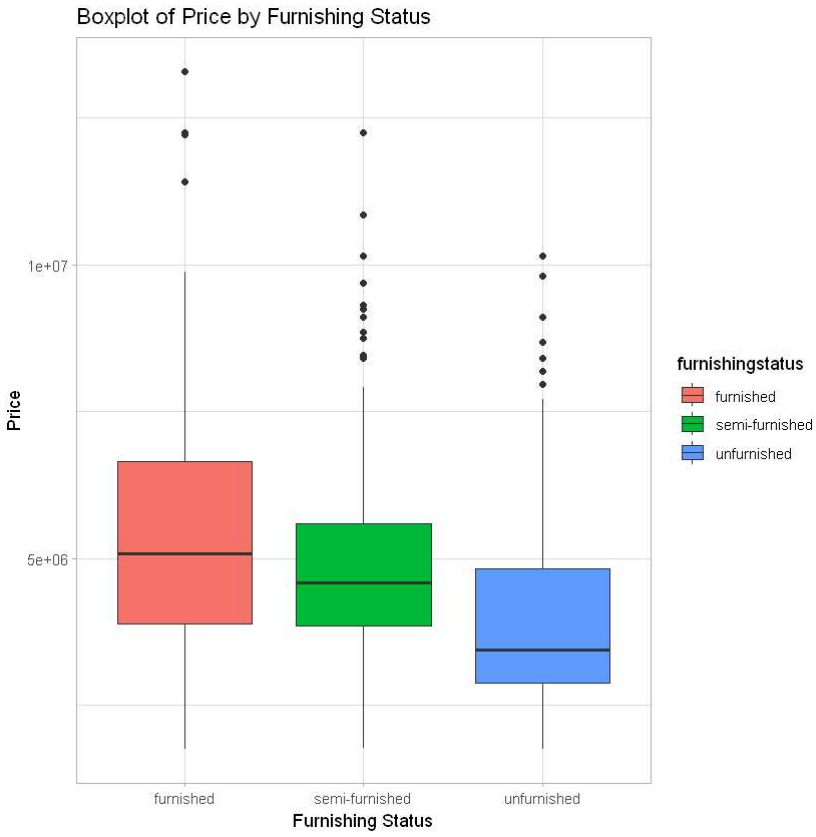
3.1 Word Cloud

In [23]:
```
# Convert the 'area' column to a character vector
real_estate_data <- data
real_estate_data$area <- as.character(real_estate_data$area)

# Create a corpus from the 'area' column
area_corpus <- corpus(real_estate_data$area)
dfm_area <- dfm(tokens(area_corpus))
word_freqs_area <- topfeatures(dfm_area, n = nrow(dfm_area))

# Create the word cloud
wordcloud(names(word_freqs_area), freq = word_freqs_area, min.freq = 1, colors = br
```



3.2 Box and Whisker Plot

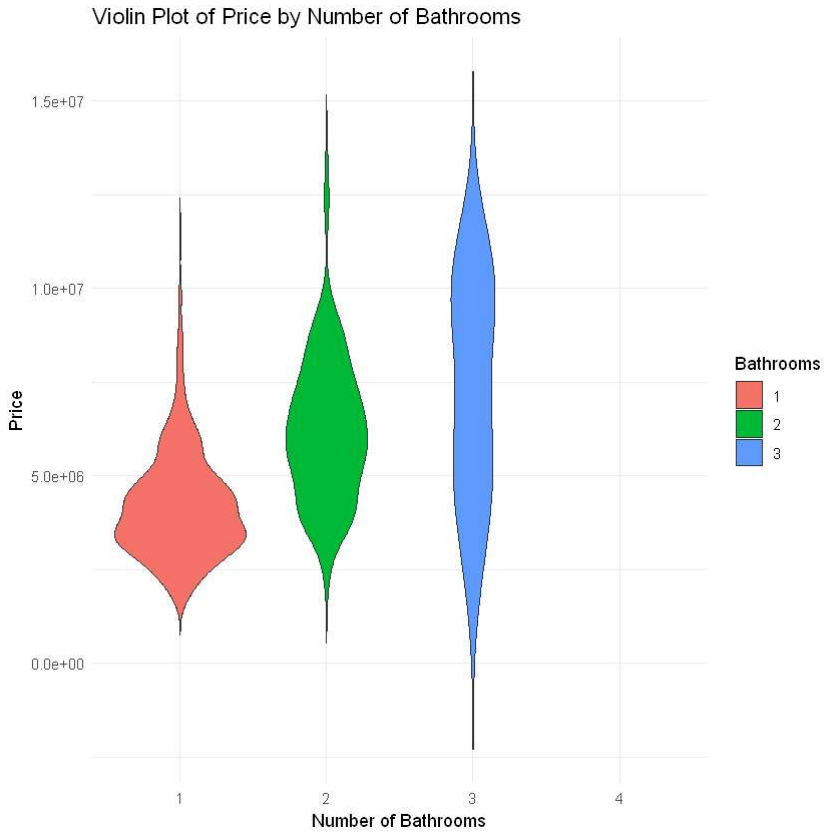
In [24]:
```
ggplot(data, aes(x = furnishingstatus, y = price, fill = furnishingstatus)) +
    geom_boxplot() +
    labs(
        title = "Boxplot of Price by Furnishing Status",
        x = "Furnishing Status",
        y = "Price"
    ) +
    theme_light()
```



3.3 Violin Plot

In [25]:
```
# Create the violin plot: Price by Number of Bathrooms
ggplot(data, aes(x = factor(bathrooms), y = price, fill = factor(bathrooms))) +
    geom_violin(trim = FALSE) +
    labs(
        title = "Violin Plot of Price by Number of Bathrooms",
        x = "Number of Bathrooms",
        y = "Price",
        fill = "Bathrooms"
    ) +
    theme_minimal()
```

```
Warning message:
"Groups with fewer than two datapoints have been dropped.
i Set `drop = FALSE` to consider such groups for position adjustment purposes."
```



3.4 Linear Regression Plot

In [29]:
```
linear_model <- lm(price ~ area + bedrooms + bathrooms + stories + parking, data =
summary(linear_model)

# Plot the regression
ggplot(data, aes(x = area, y = price)) +
    geom_point() +
    geom_smooth(method = "lm", col = "blue") +
    labs(
        title = "Linear Regression of Price on Area",
        x = "Area",
        y = "Price"
    ) +
    theme_light()
```

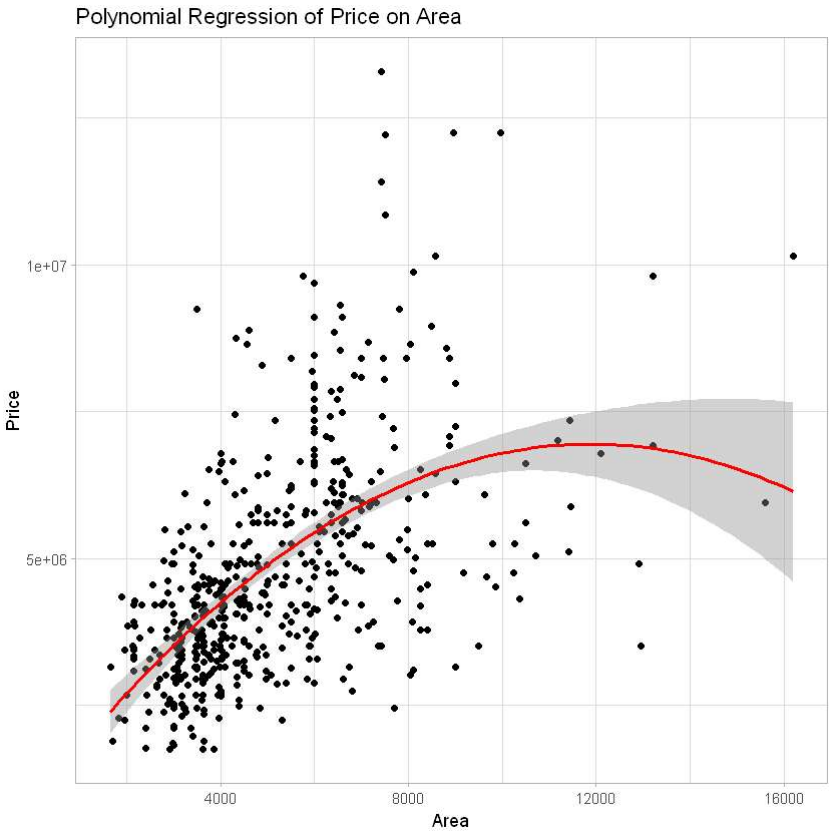
```
Call:
lm(formula = price ~ area + bedrooms + bathrooms + stories +
    parking, data = data)

Residuals:
     Min       1Q   Median       3Q      Max
-3396744  -731825   -64056   601486  5651126

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -145734.5   246634.5  -0.591   0.5548
area            331.1       26.6  12.448  < 2e-16 ***
bedrooms     167809.8    82932.7   2.023   0.0435 *
bathrooms   1133740.2   118828.3   9.541  < 2e-16 ***
stories      547939.8    68894.5   7.953 1.07e-14 ***
parking      377596.3    66804.1   5.652 2.57e-08 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1244000 on 539 degrees of freedom
Multiple R-squared:  0.5616,    Adjusted R-squared:  0.5575
F-statistic: 138.1 on 5 and 539 DF,  p-value: < 2.2e-16
`geom_smooth()` using formula = 'y ~ x'
```

3.5 Nonlinear Regression Plot

In [30]:
```
poly_model <- lm(price ~ poly(area, 2) + bedrooms + bathrooms + stories + parking,
summary(poly_model)

# Plot the polynomial regression
```

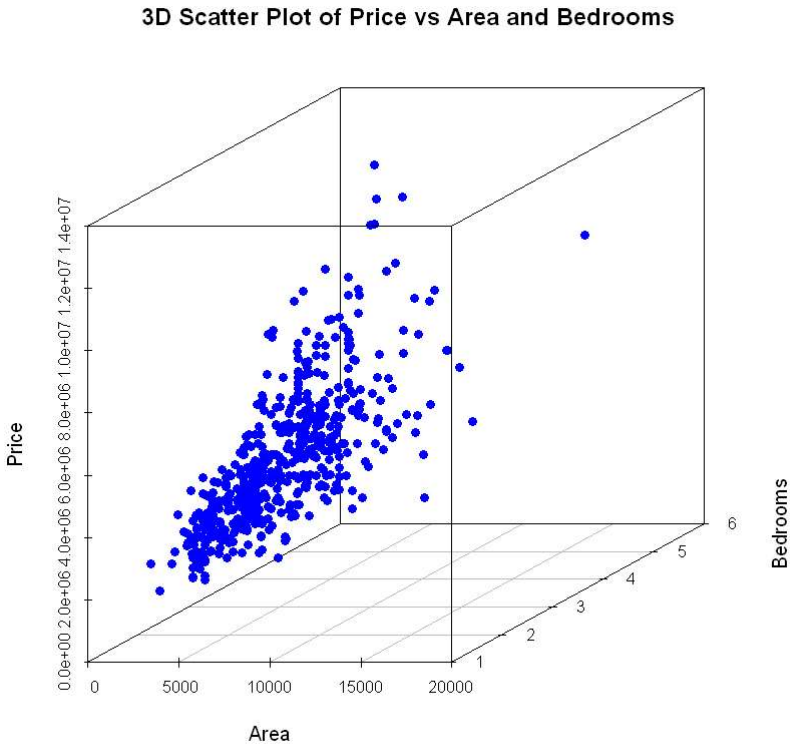
```
ggplot(data, aes(x = area, y = price)) +
    geom_point() +
    geom_smooth(method = "lm", formula = y ~ poly(x, 2), col = "red") +
    labs(
        title = "Polynomial Regression of Price on Area",
        x = "Area",
        y = "Price"
    ) +
    theme_light()
```

```
Call:
lm(formula = price ~ poly(area, 2) + bedrooms + bathrooms + stories +
    parking, data = data)

Residuals:
     Min       1Q   Median       3Q      Max
-3324926  -752806   -51912   603035  5552968

Coefficients:
               Estimate Std. Error t value Pr(>|t|)
(Intercept)     1620839     231351   7.006 7.36e-12 ***
poly(area, 2)1 17026113    1328575  12.815  < 2e-16 ***
poly(area, 2)2 -5116230    1246132  -4.106 4.66e-05 ***
bedrooms         182055      81813   2.225   0.0265 *
bathrooms       1119057     117173   9.550  < 2e-16 ***
stories          512514      68449   7.488 2.89e-13 ***
parking          347982      66237   5.254 2.15e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1226000 on 538 degrees of freedom
Multiple R-squared:  0.5749,    Adjusted R-squared:  0.5702
F-statistic: 121.3 on 6 and 538 DF,  p-value: < 2.2e-16
```



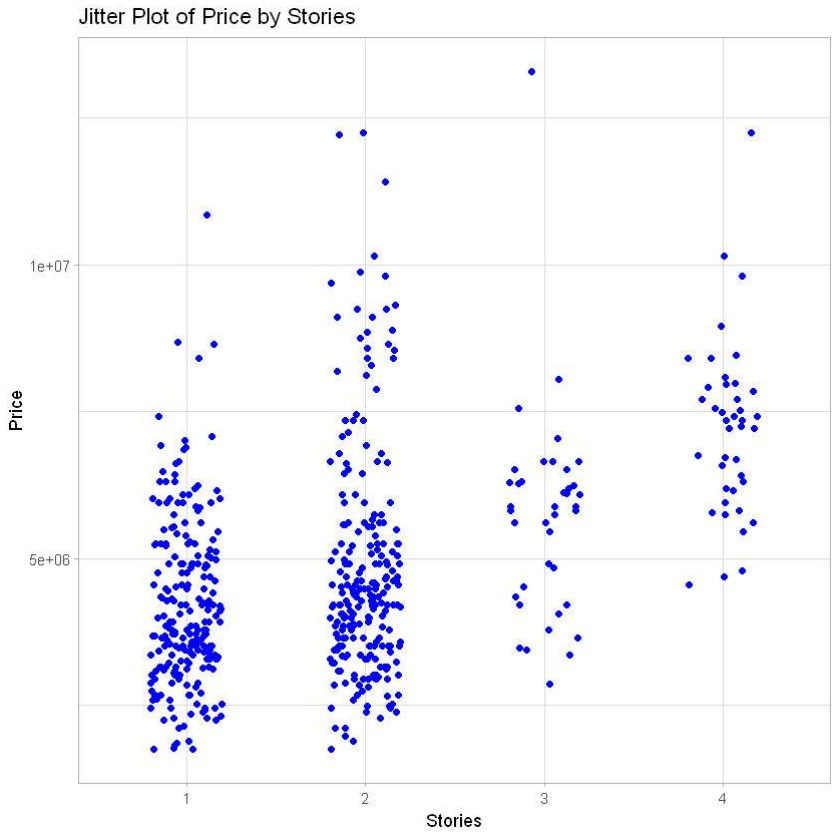
3.6 3D Scatter Plot

In [35]:
```
# Create the 3D scatter plot with price, area, and bedrooms
scatter_3d <- scatterplot3d(data$area, data$bedrooms, data$price,
    pch = 16, # Use solid circles for points
    color = "blue", # Set point color to blue
    xlab = "Area", # Label for x-axis
    ylab = "Bedrooms", # Label for y-axis
    zlab = "Price", # Label for z-axis
    main = "3D Scatter Plot of Price vs Area and Bedrooms"
)
```



3.7 Jitter Plot

In [41]:
```
# Create the jitter plot for price by stories
ggplot(data, aes(x = as.factor(stories), y = price)) +
    geom_jitter(color = "blue", width = 0.2, height = 0) + # Jitter to avoid overla
    labs(
        title = "Jitter Plot of Price by Stories",
        x = "Stories",
        y = "Price"
    ) +
    theme_light()
```


Jitter Plot of Price by Stories
Price
1e+07
5e+06
1
2
3
4
Stories

Conclusion

In this experiment, we learned how to create advanced charts using the R programming language on the dataset - Housing data. We created word clouds, box and whisker plots, violin plots, linear and nonlinear regression plots, 3D scatter plots, and jitter plots. We also wrote observations from each chart. These advanced charts provide a comprehensive view of the dataset and help in understanding the relationships between different variables.