Assignment 2 - Data Analysis using R Programming

Group 5

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1. Data Loading

```
# Load the dataset
df <- read.csv("employee_salary_dataset.csv")
```

2. Structure and Overview

Print the structure of your dataset

```
str(df)
```

```
## 'data.frame':    50 obs. of  9 variables:
##  $ EmployeeID      : int  1 2 3 4 5 6 7 8 9 10 ...
##  $ Name            : chr  "Employee_1" "Employee_2" "Employee_3" "Employee_4" ...
##  $ Department      : chr  "Marketing" "Operations" "IT" "Operations" ...
##  $ Experience_Years: int  15 7 12 8 15 3 14 17 4 18 ...
##  $ Education_Level : chr  "Master" "Bachelor" "High School" "PhD" ...
##  $ Age             : int  53 25 51 44 36 50 57 34 53 28 ...
##  $ Gender          : chr  "Female" "Female" "Female" "Male" ...
##  $ City            : chr  "Delhi" "Bangalore" "Hyderabad" "Delhi" ...
##  $ Monthly_Salary  : int  111416 95271 69064 95091 132450 65818 70525 44830 42429 31893 ...
```

List the variables in your dataset

```
names(df)
```

```
## [1] "EmployeeID"       "Name"             "Department"       "Experience_Years"
## [5] "Education_Level"  "Age"              "Gender"           "City"
## [9] "Monthly_Salary"
```

Print the top 15 rows of your dataset

```
head(df, 15)
```

```
##    EmployeeID        Name Department Experience_Years Education_Level Age
## 1           1  Employee_1  Marketing               15          Master  53
## 2           2  Employee_2 Operations                7        Bachelor  25
## 3           3  Employee_3         IT               12     High School  51
## 4           4  Employee_4 Operations                8             PhD  44
## 5           5  Employee_5 Operations               15          Master  36
## 6           6  Employee_6    Finance                3     High School  50
## 7           7  Employee_7         IT               14             PhD  57
## 8           8  Employee_8         IT               17             PhD  34
## 9           9  Employee_9         IT                4        Bachelor  53
## 10         10 Employee_10 Operations               18     High School  28
## 11         11 Employee_11  Marketing                8             PhD  43
## 12         12 Employee_12         IT                4          Master  49
## 13         13 Employee_13 Operations                2          Master  23
## 14         14 Employee_14    Finance                6        Bachelor  27
## 15         15 Employee_15  Marketing               10             PhD  49
##    Gender      City Monthly_Salary
## 1  Female     Delhi         111416
## 2  Female Bangalore          95271
## 3  Female Hyderabad          69064
## 4    Male     Delhi          95091
## 5  Female     Delhi         132450
## 6    Male    Mumbai          65818
## 7    Male    Mumbai          70525
## 8  Female Bangalore          44830
## 9    Male Hyderabad          42429
## 10   Male    Mumbai          31893
## 11   Male     Delhi         141381
## 12 Female Hyderabad         104909
## 13 Female Hyderabad          72333
## 14   Male     Delhi          28436
## 15 Female    Mumbai          99290
```

3. User Defined Function

Write a user defined function using any of the variables from the data set.

```r
# Function to categorize experience level
categorize_experience <- function(years) {
  if (years < 5) {
    return("Junior")
  } else if (years >= 5 & years <= 10) {
    return("Mid-Level")
  } else {
    return("Senior")
  }
}

# Apply the function to the first few rows to demonstrate
sapply(head(df$Experience_Years), categorize_experience)
```

```
## [1] "Senior"    "Mid-Level" "Senior"    "Mid-Level" "Senior"    "Junior"
```

4. Data Manipulation and Filtering

Use data manipulation techniques and filter rows based on any logical criteria

```
# Filter employees with more than 10 years of experience and are from IT department
filtered_df <- df %>%
  filter(Experience_Years > 10 & Department == "IT")

head(filtered_df)
```

```
##   EmployeeID        Name Department Experience_Years Education_Level Age Gender
## 1          3  Employee_3         IT               12     High School  51 Female
## 2          7  Employee_7         IT               14             PhD  57   Male
## 3          8  Employee_8         IT               17             PhD  34 Female
## 4         26 Employee_26         IT               14          Master  24   Male
## 5         31 Employee_31         IT               15        Bachelor  54 Female
## 6         35 Employee_35         IT               13          Master  53   Male
##        City Monthly_Salary
## 1 Hyderabad          69064
## 2    Mumbai          70525
## 3 Bangalore          44830
## 4 Hyderabad          30600
## 5 Hyderabad          70714
## 6 Bangalore         130983
```

5. Reshaping and Joining

Identify the dependent & independent variables and use reshaping techniques and create a new data frame by joining those variables from your dataset.

```
# Dependent variable: Monthly_Salary
# Independent variables: Experience_Years, Age

# Create two separate dataframes to demonstrate joining
df_salary <- df %>% select(EmployeeID, Monthly_Salary)
df_details <- df %>% select(EmployeeID, Experience_Years, Age)

# Join them back together
joined_df <- left_join(df_details, df_salary, by = "EmployeeID")

head(joined_df)
```

```
##   EmployeeID Experience_Years Age Monthly_Salary
## 1          1               15  53         111416
## 2          2                7  25          95271
## 3          3               12  51          69064
## 4          4                8  44          95091
## 5          5               15  36         132450
## 6          6                3  50          65818
```

6. Data Cleaning

Remove missing values in your dataset.

```
# Check for missing values
sum(is.na(df))
```

```
## [1] 0
```

```
# Remove missing values (if any)
df_clean <- na.omit(df)
```

Identify and remove duplicated data in your dataset

```
# Check for duplicates
sum(duplicated(df_clean))
```

```
## [1] 0
```

```
# Remove duplicates
df_clean <- df_clean %>% distinct()
```

7. Reordering and Renaming

Reorder multiple rows in descending order

```
# Reorder by Monthly_Salary in descending order
df_sorted <- df_clean %>% arrange(desc(Monthly_Salary))
head(df_sorted)
```

```
##   EmployeeID        Name Department Experience_Years Education_Level Age Gender
## 1         38 Employee_38 Operations                9          Master  23   Male
## 2         11 Employee_11  Marketing                8             PhD  43   Male
## 3         34 Employee_34         HR               15        Bachelor  53 Female
## 4         25 Employee_25         HR                8     High School  34 Female
## 5          5  Employee_5 Operations               15          Master  36 Female
## 6         35 Employee_35         IT               13          Master  53   Male
##        City Monthly_Salary
## 1    Mumbai         149123
## 2     Delhi         141381
## 3     Delhi         134616
## 4 Bangalore         132455
## 5     Delhi         132450
## 6 Bangalore         130983
```

Rename some of the column names in your dataset

```r
# Rename 'Monthly_Salary' to 'Salary' and 'Experience_Years' to 'Experience'
df_renamed <- df_sorted %>%
  rename(Salary = Monthly_Salary,
         Experience = Experience_Years)

names(df_renamed)
```

```
## [1] "EmployeeID"      "Name"            "Department"      "Experience"
## [5] "Education_Level" "Age"             "Gender"          "City"
## [9] "Salary"
```

8. New Variables

Add new variables in your data frame by using a mathematical function

```r
# Add a new variable 'Annual_Salary' (Monthly_Salary * 12)
df_final <- df_renamed %>%
  mutate(Annual_Salary = Salary * 12)

head(df_final)
```

```
##   EmployeeID        Name Department Experience Education_Level Age Gender
## 1         38 Employee_38 Operations          9          Master  23   Male
## 2         11 Employee_11  Marketing          8             PhD  43   Male
## 3         34 Employee_34         HR         15        Bachelor  53 Female
## 4         25 Employee_25         HR          8     High School  34 Female
## 5          5  Employee_5 Operations         15          Master  36 Female
## 6         35 Employee_35         IT         13          Master  53   Male
##        City Salary Annual_Salary
## 1    Mumbai 149123       1789476
## 2     Delhi 141381       1696572
## 3     Delhi 134616       1615392
## 4 Bangalore 132455       1589460
## 5     Delhi 132450       1589400
## 6 Bangalore 130983       1571796
```

9. Training Set

Create a training set using random number generator engine.

```r
set.seed(123) # Set seed for reproducibility
sample_index <- sample(1:nrow(df_final), 0.7 * nrow(df_final))
training_set <- df_final[sample_index, ]
testing_set <- df_final[-sample_index, ]

dim(training_set)
```

```
## [1] 35 10
```

10. Summary Statistics

Print the summary statistics of your dataset

```
summary(df_final)
```

```
##    EmployeeID        Name            Department          Experience
##  Min.   : 1.00   Length:50          Length:50          Min.   : 1.00
##  1st Qu.:13.25   Class :character   Class :character   1st Qu.: 5.25
##  Median :25.50   Mode  :character   Mode  :character   Median :10.00
##  Mean   :25.50                                         Mean   : 9.90
##  3rd Qu.:37.75                                         3rd Qu.:14.75
##  Max.   :50.00                                         Max.   :19.00
##  Education_Level          Age           Gender             City
##  Length:50          Min.   :22.00   Length:50          Length:50
##  Class :character   1st Qu.:28.25   Class :character   Class :character
##  Mode  :character   Median :43.50   Mode  :character   Mode  :character
##                     Mean   :39.76
##                     3rd Qu.:49.00
##                     Max.   :57.00
##      Salary       Annual_Salary
##  Min.   : 28420   Min.   : 341040
##  1st Qu.: 59424   1st Qu.: 713088
##  Median : 73890   Median : 886686
##  Mean   : 82289   Mean   : 987466
##  3rd Qu.:107219   3rd Qu.:1286628
##  Max.   :149123   Max.   :1789476
```

Use any of the numerical variables from the dataset and perform the following statistical functions

```
# Using 'Salary' variable
salary_mean <- mean(df_final$Salary)
salary_median <- median(df_final$Salary)
salary_range <- range(df_final$Salary)

# Calculate Mode
get_mode <- function(v) {
   uniqv <- unique(v)
   uniqv[which.max(tabulate(match(v, uniqv)))]
}
salary_mode <- get_mode(df_final$Salary)

cat("Mean Salary:", salary_mean, "\n")
```

```
## Mean Salary: 82288.8
```

```
cat("Median Salary:", salary_median, "\n")
```

```
## Median Salary: 73890.5
```

```r
cat("Mode Salary:", salary_mode, "\n")
```

```
## Mode Salary: 149123
```

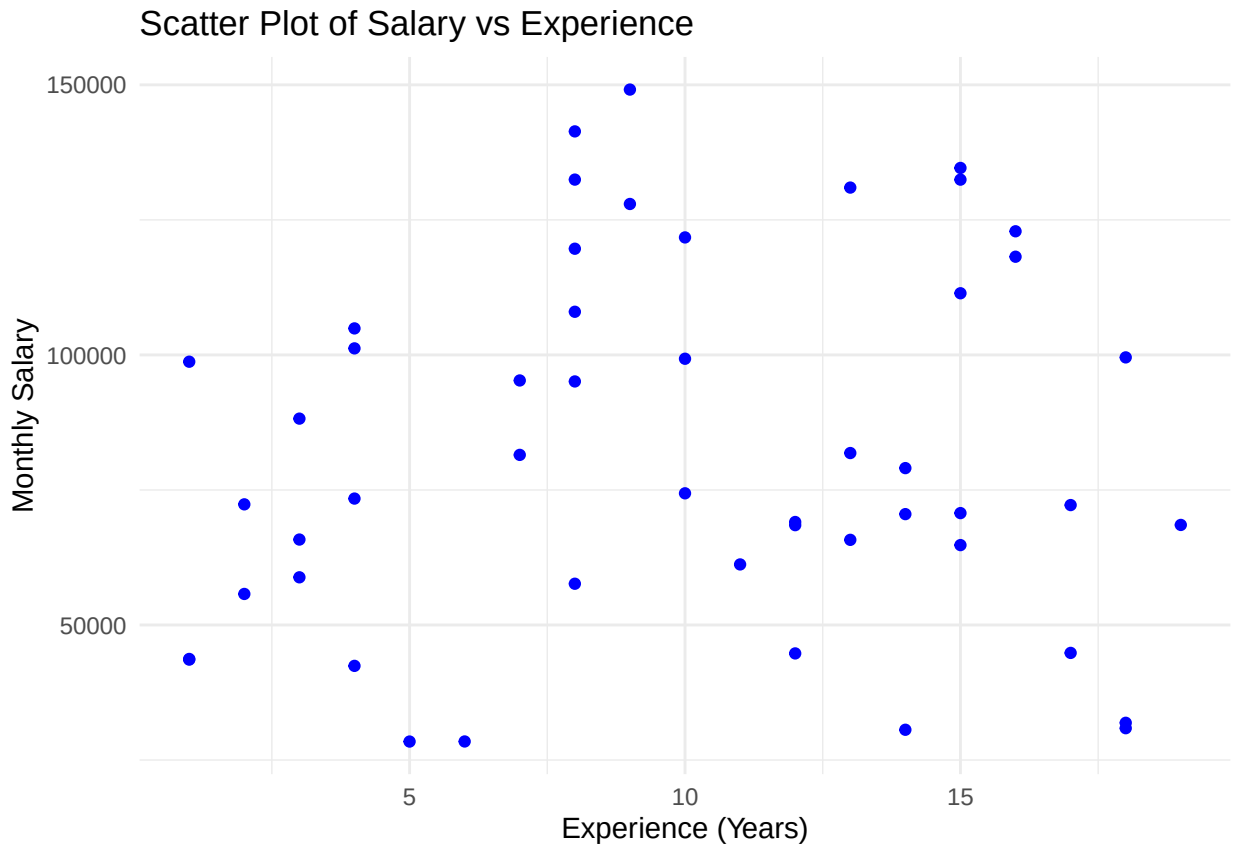
```r
cat("Range Salary:", salary_range, "\n")
```

```
## Range Salary: 28420 149123
```

11. Visualization

Plot a scatter plot for any 2 variables in your dataset

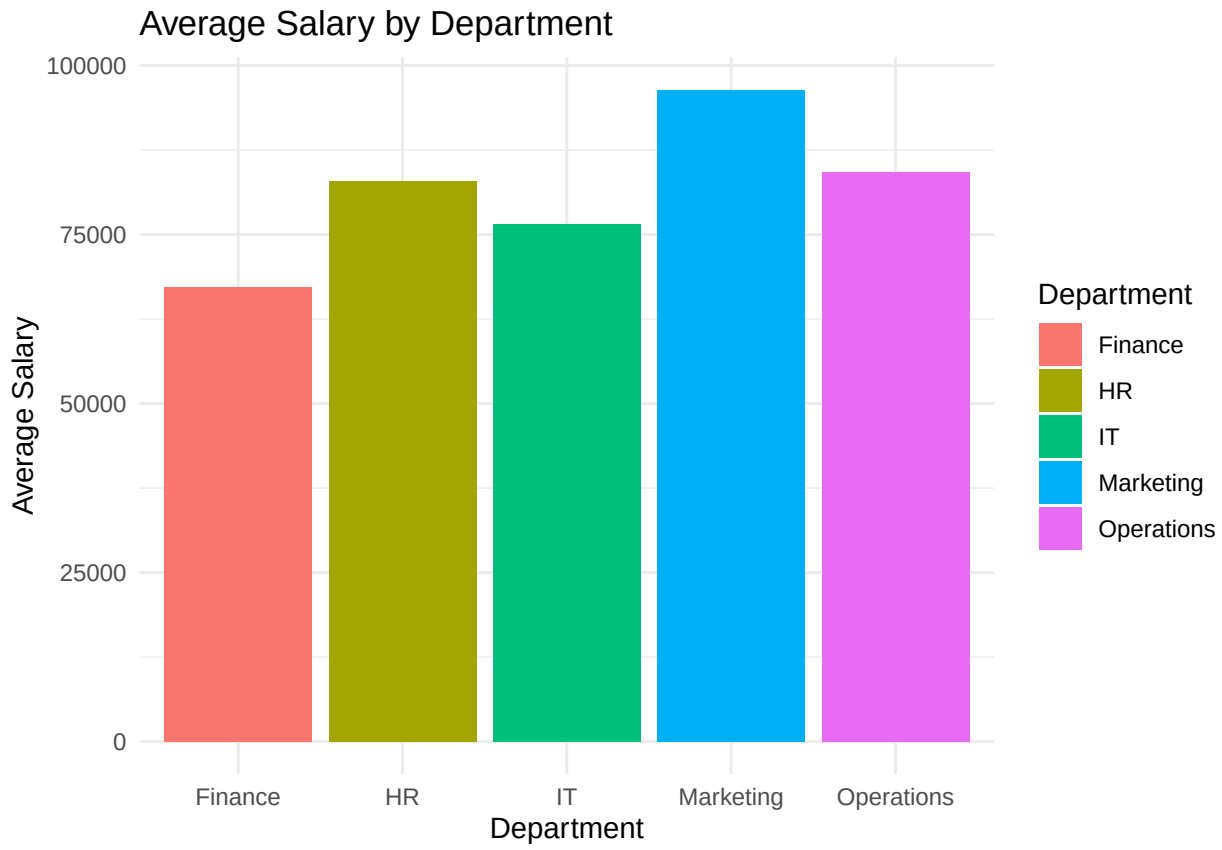
```r
ggplot(df_final, aes(x = Experience, y = Salary)) +
  geom_point(color = "blue") +
  labs(title = "Scatter Plot of Salary vs Experience",
       x = "Experience (Years)",
       y = "Monthly Salary") +
  theme_minimal()
```



Plot a bar plot for any 2 variables in your dataset

```r
# Average salary by Department
avg_salary_dept <- df_final %>%
  group_by(Department) %>%
  summarise(Avg_Salary = mean(Salary))

ggplot(avg_salary_dept, aes(x = Department, y = Avg_Salary, fill = Department)) +
  geom_bar(stat = "identity") +
  labs(title = "Average Salary by Department",
       x = "Department",
       y = "Average Salary") +
  theme_minimal()
```



12. Correlation

Find the correlation between any 2 variables by applying Pearson correlation

```r
correlation <- cor(df_final$Experience, df_final$Salary, method = "pearson")
cat("Pearson correlation between Experience and Salary:", correlation, "\n")
```

```
## Pearson correlation between Experience and Salary: 0.07422086
```