Assignment-3

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```
library(scales)
library(tidyr)
library(dplyr)

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

library(ggplot2)

## Warning: package 'ggplot2' was built under R version 4.3.3

# Import the dataset
# 21BDS0064
df= read.csv('C:\\Users\\91984\\OneDrive\\Desktop\\VIT\\Sem7\\Exploratory
Data Analysis Lab\\Student_bucketing.csv')
head(df)

##   Student_id Age     Grade Employed marks
## 1          1  19 1st Class      yes    29
## 2          2  20 2nd Class       no    41
## 3          3  18 1st Class       no    57
## 4          4  21 2nd Class       no    29
## 5          5  19 1st Class       no    57
## 6          6  20 2nd Class      yes    53

# PART 1.
# Transformation functions

# Finding outliers
# 21BDS0064
outliers <- boxplot.stats(df$Age)$out
print(outliers)

## [1] 88 62 56
```

```r
median_df <- median(df$Age[!df$Age %in% outliers], na.rm = TRUE)
mean_df <- mean(df$marks[!df$marks %in% outliers], na.rm = TRUE)

# Imputing outliers (e.g., replacing with median)
# 21BDS0064
df$Age[df$Age %in% outliers] <- median_df

# Finding variables with missing values
# 21BDS0064
missing_data <- sapply(df, function(x) sum(is.na(x)))
print(missing_data)
```

```
## Student_id        Age      Grade   Employed      marks
##          0         17          0          0         23
```

```r
# Imputing missing values (e.g., using mean, median)
# 21BDS0064
df$Age[is.na(df$Age)] <- median_df
df$marks[is.na(df$marks)] <- mean_df

# Checking for missing data again, it should print out 0
# 21BDS0064
missing_data <- sapply(df, function(x) sum(is.na(x)))
print(missing_data)
```

```
## Student_id        Age      Grade   Employed      marks
##          0          0          0          0          0
```

```r
# Verifying the absence of outliers
# 21BDS0064
outliers <- boxplot.stats(df$Age)$out
print(outliers)
```

```
## numeric(0)
```

```r
# Summary of the imputed variable
# 21BDS0064
summary(df$Age)
```

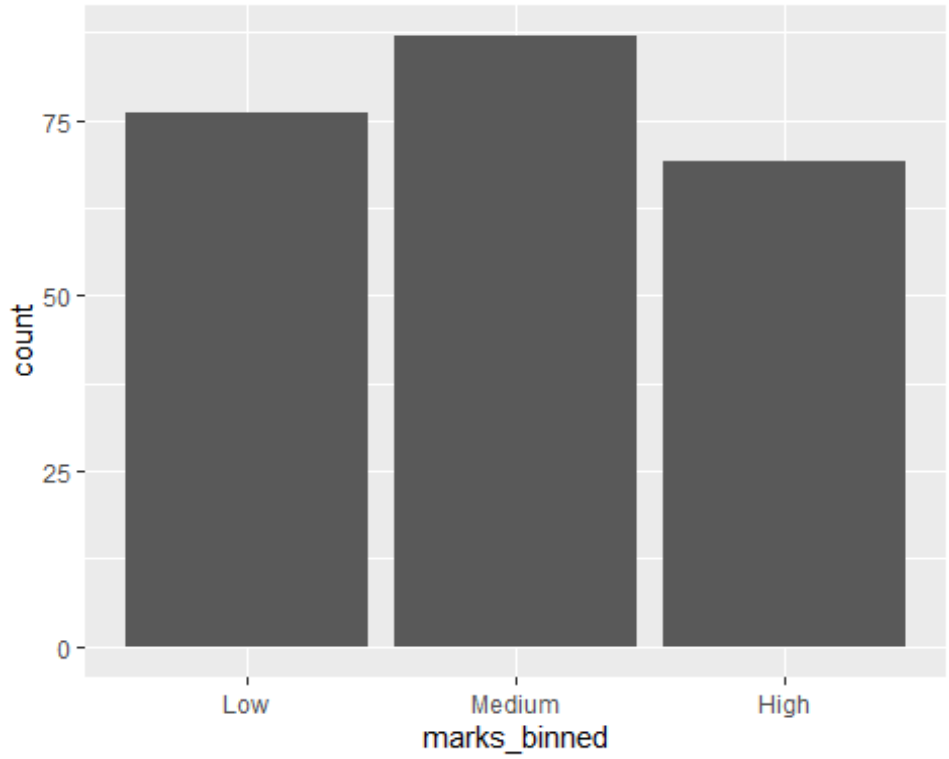
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    18.0    19.0    20.0    19.9    21.0    22.0
```

```r
# Binning marks into categories of low medium and high
# 21BDS0064
df$marks_binned <- cut(df$marks, breaks = 3, labels = c("Low", "Medium",
"High"))

# Summary of the binning result
# 21BDS0064
summary(df$marks_binned)
```

```
##    Low Medium   High
##     76     87     69

# Plotting binned data
# 21BDS0064
ggplot(df, aes(x = marks_binned)) + geom_bar()
```




```
# PART 2.
# Functions on the dataset

#1. Arrange the dataframe in a particular order
# 21BDS0064
age_df <- arrange(df, Age)
print(head(age_df))
```

```
##   Student_id Age     Grade Employed marks marks_binned
## 1          3  18 1st Class       no    57       Medium
## 2         18  18 3rd Class       no    27          Low
## 3         32  18 1st Class       no    88         High
## 4         47  18 3rd Class       no    72       Medium
## 5         61  18 1st Class       no    93         High
## 6         76  18 3rd Class       no    67       Medium
```

```
#2. Select only the age column of the dataframe
# 21BDS0064
age_selected <- select(df, -Age)
print(head(age_selected))
```

```
##   Student_id     Grade Employed marks marks_binned
## 1          1 1st Class      yes    29          Low
## 2          2 2nd Class       no    41          Low
## 3          3 1st Class       no    57       Medium
## 4          4 2nd Class       no    29          Low
## 5          5 1st Class       no    57       Medium
## 6          6 2nd Class      yes    53       Medium
```

```r
#3. Filter rows where Sepal.Length is greater than 5
# 21BDS0064
filtered_df <- df[df$marks > 80, ]
print(head(filtered_df))
```

```
##    Student_id Age     Grade Employed marks marks_binned
## 9           9  22 3rd Class      yes    97         High
## 11         11  20 3rd Class      yes    83         High
## 16         16  19 2nd Class       no    98         High
## 19         19  21 2nd Class      yes    82         High
## 24         24  22 3rd Class       no    94         High
## 25         25  21 1st Class       no    84         High
```

```r
#4. Gather example
# 21BDS0064
marks_long <- gather(df, key = "marks", value = "Age", marks, Age)
print(head(marks_long))
```

```
##   Student_id     Grade Employed marks_binned marks Age
## 1          1 1st Class      yes          Low marks  29
## 2          2 2nd Class       no          Low marks  41
## 3          3 1st Class       no       Medium marks  57
## 4          4 2nd Class       no          Low marks  29
## 5          5 1st Class       no       Medium marks  57
## 6          6 2nd Class      yes       Medium marks  53
```

```r
#5. Group by Grade and summarize
# 21BDS0064
df_grouped <- df %>%
  group_by(Grade) %>%
  summarize(average_marks = mean(marks, na.rm = TRUE))
print(head(df_grouped))
```

```
## # A tibble: 3 × 2
##   Grade     average_marks
##   <chr>             <dbl>
## 1 1st Class          57.8
## 2 2nd Class          59.0
## 3 3rd Class          59.6
```

```r
# PART 3.
# Normalization examples
```

```r
#1. Normalize data between 0 and 1
# 21BDS0064
df_normalized_0_1 <- as.data.frame(lapply(iris[, sapply(iris, is.numeric)],
rescale))
print(head(df_normalized_0_1))
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1   0.22222222   0.6250000   0.06779661  0.04166667
## 2   0.16666667   0.4166667   0.06779661  0.04166667
## 3   0.11111111   0.5000000   0.05084746  0.04166667
## 4   0.08333333   0.4583333   0.08474576  0.04166667
## 5   0.19444444   0.6666667   0.06779661  0.04166667
## 6   0.30555556   0.7916667   0.11864407  0.12500000
```

```r
#2. Normalize data between -1 and 1
# 21BDS0064
normalize_neg1_1 <- function(x) {
  return((2 * (x - min(x)) / (max(x) - min(x))) - 1)
}

df_normalized_neg1_1 <- as.data.frame(lapply(iris[, sapply(iris,
is.numeric)], normalize_neg1_1))
print(head(df_normalized_neg1_1))
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1   -0.5555556  0.25000000   -0.8644068  -0.9166667
## 2   -0.6666667 -0.16666667   -0.8644068  -0.9166667
## 3   -0.7777778  0.00000000   -0.8983051  -0.9166667
## 4   -0.8333333 -0.08333333   -0.8305085  -0.9166667
## 5   -0.6111111  0.33333333   -0.8644068  -0.9166667
## 6   -0.3888889  0.58333333   -0.7627119  -0.7500000
```

```r
#3. Z-score normalization
# 21BDS0064
z_score_normalize <- function(x) {
  return((x - mean(x)) / sd(x))
}

df_normalized_z_score <- as.data.frame(lapply(iris[, sapply(iris,
is.numeric)], z_score_normalize))
print(head(df_normalized_z_score))
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1   -0.8976739  1.01560199    -1.335752   -1.311052
## 2   -1.1392005 -0.13153881    -1.335752   -1.311052
## 3   -1.3807271  0.32731751    -1.392399   -1.311052
## 4   -1.5014904  0.09788935    -1.279104   -1.311052
## 5   -1.0184372  1.24503015    -1.335752   -1.311052
## 6   -0.5353840  1.93331463    -1.165809   -1.048667
```

```r
# Find range across all numeric columns in the dataframe
# 21BDS0064
numeric_columns <- sapply(df, is.numeric)
range_df <- max(df[, numeric_columns], na.rm=TRUE) - min(df[,
numeric_columns], na.rm=TRUE)
print(range_df)
```

```
## [1] 231
```