

Business Performance Analysis

Load necessary libraries

```
library(tidyverse)

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

## Warning: package 'tidyr' was built under R version 4.3.1

## Warning: package 'purrr' was built under R version 4.3.1

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

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

## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## * dplyr     1.1.2     * readr     2.1.4
## * forcats   1.0.0     * stringr   1.5.0
## * ggplot2   3.4.4     * tibble    3.2.1
## * lubridate 1.9.3     * tidyr    1.3.0
## * purrr    1.0.2
## -- Conflicts ----- tidyverse_conflicts() --
## * dplyr::filter() masks stats::filter()
## * dplyr::lag()   masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become error
```

```
library(dplyr)
library(ggplot2)
library (scales)

##
## Attaching package: 'scales'
##
## The following object is masked from 'package:purrr':
##
##     discard
##
## The following object is masked from 'package:readr':
##
##     col_factor
```

Load and inspect the data

```
ev_data <- read.csv("C:/Users/swani/Downloads/ev_33.csv")
head(ev_data)

##   commissions marketing purchase product period promotions buyer campaign
## 1     83.10    239.47 28592.64  sedan    12      yes single  twitter
## 2     82.64        NA      NA    suv    12       no single  twitter
## 3     78.33    256.33 27975.11    suv     7      yes single  twitter
## 4     82.58    227.33 27809.05  sedan    12       no single  twitter
## 5     76.30    253.98        NA          8      yes single  twitter
## 6     66.46    244.69 27392.90    suv    12       no single  twitter
##   rep_id
## 1     48
## 2     45
## 3     57
## 4      9
## 5     87
## 6    100
```

```
rep_data <- read.csv("C:/Users/swani/Downloads/rep_33.csv")
head(rep_data)
```

```
##   rep_id jobtype qualification gender experience training
## 1     1 full time           msc male       33     yes
## 2     2 part time           msc male       11      no
## 3     3 full time           msc male       21      no
## 4     4 full time           msc male       36      no
## 5     5 part time           msc male       23     yes
## 6     6 part time           msc male       16     yes
```

Data Preposition

```
# Find sum of rows with null values in EV Data
rows_with_null_ev <- sum(!complete.cases(ev_data))

# Find sum of rows with null values in Rep Data
rows_with_null_rep <- sum(!complete.cases(rep_data))

# Display results
cat("Number of rows with null values in EV Data:", rows_with_null_ev, "\n")
```

```
## Number of rows with null values in EV Data: 5
```

```
cat("Number of rows with null values in Rep Data:", rows_with_null_rep, "\n")
```

```
## Number of rows with null values in Rep Data: 1
```

```

# Delete rows with null values in EV Data
ev_data<- na.omit(ev_data)

# Delete rows with null values in Rep Data
rep_data <- na.omit(rep_data)

# Find sum of rows with null values in EV Data
rows_with_null_ev_clean <- sum(!complete.cases(ev_data))

# Find sum of rows with null values in Rep Data
rows_with_null_rep_clean <- sum(!complete.cases(rep_data))

# Display results
cat("Number of rows with null values in EV Data:", rows_with_null_ev_clean, "\n")

## Number of rows with null values in EV Data: 0

cat("Number of rows with null values in Rep Data:", rows_with_null_rep_clean, "\n")

## Number of rows with null values in Rep Data: 0

# Check for missing values
summary(ev_data)

```

```

##   commissions      marketing      purchase      product
## Min.    : 39.21    Min.    :208.6    Min.    :26367    Length:49343
## 1st Qu.: 73.19    1st Qu.:243.2    1st Qu.:27726    Class  :character
## Median  : 79.96    Median  :250.0    Median  :28001    Mode   :character
## Mean    : 80.00    Mean    :250.0    Mean    :28000
## 3rd Qu.: 86.87    3rd Qu.:256.8    3rd Qu.:28272
## Max.    :117.37    Max.    :293.6    Max.    :29900
##   period        promotions       buyer        campaign
## Min.    : 0.000    Length:49343    Length:49343    Length:49343
## 1st Qu.: 5.000    Class  :character  Class  :character  Class  :character
## Median  : 9.000    Mode   :character  Mode   :character  Mode   :character
## Mean    : 8.191
## 3rd Qu.:12.000
## Max.    :12.000
##   rep_id
## Min.    : 1.0
## 1st Qu.: 25.0
## Median  : 51.0
## Mean    : 50.8
## 3rd Qu.: 76.0
## Max.    :100.0

```

```

summary(rep_data)

```

```

##   rep_id      jobtype      qualification      gender
## Min.    : 1.00    Length:99    Length:99    Length:99

```

```

## 1st Qu.: 25.50   Class :character   Class :character   Class :character
## Median : 50.00   Mode  :character   Mode  :character   Mode  :character
## Mean   : 50.38
## 3rd Qu.: 75.50
## Max.   :100.00
##   experience      training
## Min.   : 1.00  Length:99
## 1st Qu.: 9.00  Class :character
## Median :18.00  Mode  :character
## Mean   :18.75
## 3rd Qu.:28.50
## Max.   :40.00

# Merge datasets
merged_data <- merge(ev_data, rep_data, by = "rep_id")

head(merged_data)

##   rep_id commissions marketing purchase product period promotions buyer
## 1     1        89.69    243.48 29096.81   stale     12       no single
## 2     1        71.55    258.96 27932.44     suv      9       no single
## 3     1        84.51    236.65 28113.08     suv      9      yes single
## 4     1        94.81    258.79 28050.03     suv      3       no single
## 5     1        69.26    252.66 26970.66     suv     10     cramp   mess
## 6     1        66.58    251.89 27636.56     suv      0     cramp   mess
##   campaign jobtype qualification gender experience training
## 1 instagram full time           msc male       33   yes
## 2 tiktok   full time           msc male       33   yes
## 3 fbook    full time           msc male       33   yes
## 4 instagram full time           msc male       33   yes
## 5 fbook    full time           msc male       33   yes
## 6 fbook    full time           msc male       33   yes

dim(merged_data)

## [1] 48815   14

# Delete rows with null values in EV Data
merged_data<- na.omit(merged_data)
sum(is.na(merged_data))

## [1] 0

```

Exploratory Data Analysis

```

# Explore structure and summary statistics
str(merged_data)

```

```

## 'data.frame': 48815 obs. of 14 variables:

```

```

## $ rep_id      : int  1 1 1 1 1 1 1 1 1 1 ...
## $ commissions : num  89.7 71.5 84.5 94.8 69.3 ...
## $ marketing   : num  243 259 237 259 253 ...
## $ purchase    : num  29097 27932 28113 28050 26971 ...
## $ product     : chr  "stale" "suv" "suv" "suv" ...
## $ period      : int  12 9 9 3 10 0 12 12 8 8 ...
## $ promotions   : chr  "no" "no" "yes" "no" ...
## $ buyer       : chr  "single" "single" "single" "single" ...
## $ campaign    : chr  "instagram" "tiktok" "fbook" "instagram" ...
## $ jobtype     : chr  "full time" "full time" "full time" "full time" ...
## $ qualification: chr  "msc" "msc" "msc" "msc" ...
## $ gender      : chr  "male" "male" "male" "male" ...
## $ experience  : int  33 33 33 33 33 33 33 33 33 ...
## $ training    : chr  "yes" "yes" "yes" "yes" ...

```

```
summary(merged_data)
```

```

##      rep_id      commissions      marketing      purchase
## Min.   : 1.00   Min.   :39.21   Min.   :208.6   Min.   :26367
## 1st Qu.: 25.00  1st Qu.:73.19   1st Qu.:243.2   1st Qu.:27726
## Median : 51.00  Median :79.96   Median :250.0   Median :28001
## Mean   : 50.68  Mean   :80.00   Mean   :250.0   Mean   :28000
## 3rd Qu.: 76.00  3rd Qu.:86.86   3rd Qu.:256.8   3rd Qu.:28272
## Max.   :100.00  Max.   :117.37  Max.   :293.6   Max.   :29900
##      product      period      promotions      buyer
## Length:48815   Min.   : 0.000  Length:48815   Length:48815
## Class :character 1st Qu.: 5.000  Class :character  Class :character
## Mode  :character Median : 9.000  Mode  :character  Mode  :character
##                   Mean   : 8.193
##                   3rd Qu.:12.000
##                   Max.   :12.000
##      campaign      jobtype      qualification      gender
## Length:48815   Length:48815   Length:48815   Length:48815
## Class :character Class :character Class :character  Class :character
## Mode  :character Mode  :character Mode  :character  Mode  :character
## 
## 
## 
##      experience      training
## Min.   : 1.0   Length:48815
## 1st Qu.: 9.0   Class :character
## Median :19.0   Mode  :character
## Mean   :18.9
## 3rd Qu.:29.0
## Max.   :40.0

```

```

# Descriptive statistics
merged_data %>%
  group_by(period) %>%
  summarise(avg_purchase = mean(purchase) )

```

```

## # A tibble: 13 x 2
##   period avg_purchase

```

```

##      <int>     <dbl>
## 1       0    27832.
## 2       1    27855.
## 3       2    27869.
## 4       3    27867.
## 5       4    27882.
## 6       5    27895.
## 7       6    27913.
## 8       7    27937.
## 9       8    27946.
## 10     9    27950.
## 11    10    27984.
## 12    11    27996.
## 13    12    28128.

# Convert 'period' to a factor
merged_data$period <- as.factor(merged_data$period)

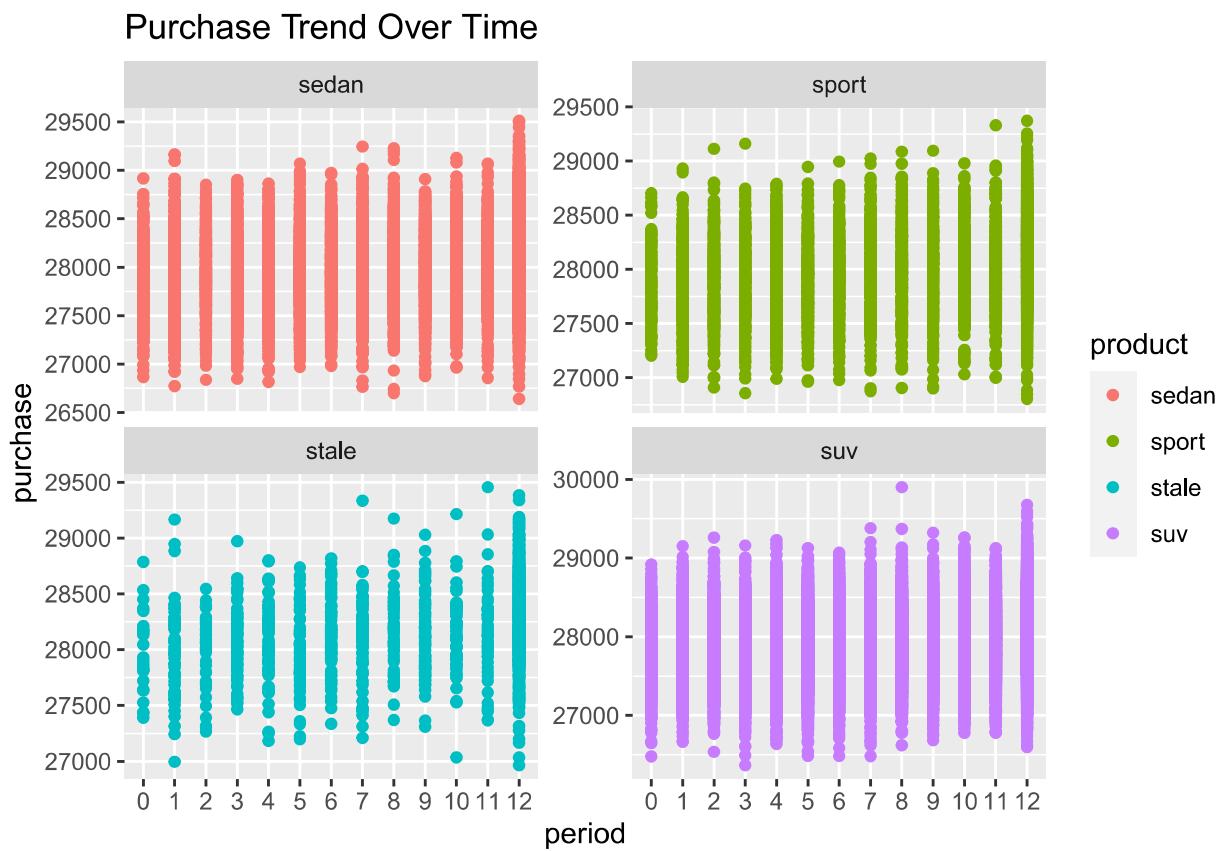
```

Sales Trend Over Time

```

ggplot(merged_data, aes(x = period, y = purchase, color = product)) +
  geom_point() +
  facet_wrap(~product, scales = "free_y") +
  labs(title = "Purchase Trend Over Time")

```



```

## Seasonal Trend Over Time

avg_sale_data <- merged_data %>%
  group_by(period, product) %>%
  summarise(avg_sale = mean(purchase, na.rm = TRUE))

## `summarise()` has grouped output by 'period'. You can override using the
## `.groups` argument.

avg_sale_data

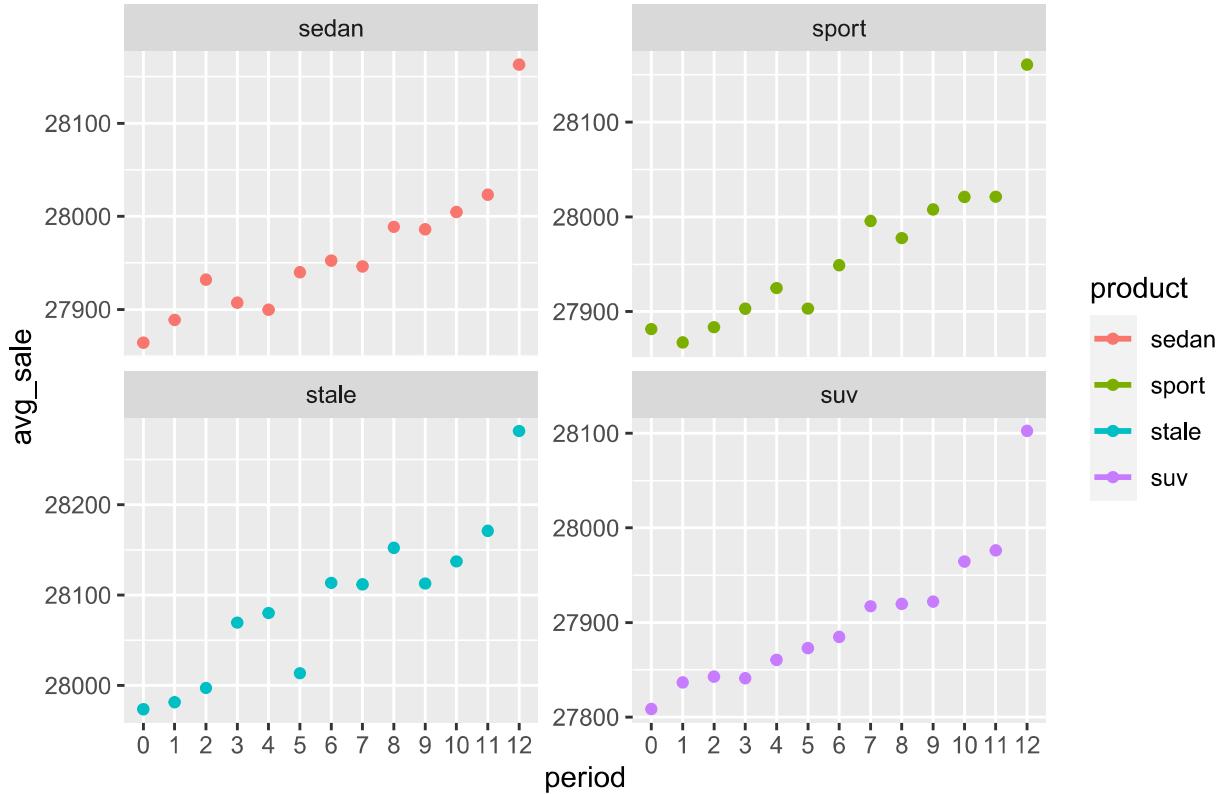
## # A tibble: 52 x 3
## # Groups:   period [13]
##   period product avg_sale
##   <fct>   <chr>     <dbl>
## 1 0       sedan     27864.
## 2 0       sport     27881.
## 3 0       stale     27974.
## 4 0       suv       27808.
## 5 1       sedan     27889.
## 6 1       sport     27867.
## 7 1       stale     27982.
## 8 1       suv       27837.
## 9 2       sedan     27932.
## 10 2      sport     27884.
## # i 42 more rows

# Data visualization examples with facets based on average sale
ggplot(avg_sale_data, aes(x = period, y = avg_sale, color = product)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE) +
  facet_wrap(~product, scales = "free_y") +
  labs(title = "Average Purchase Trend Over Time by Product")

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

```

Average Purchase Trend Over Time by Product

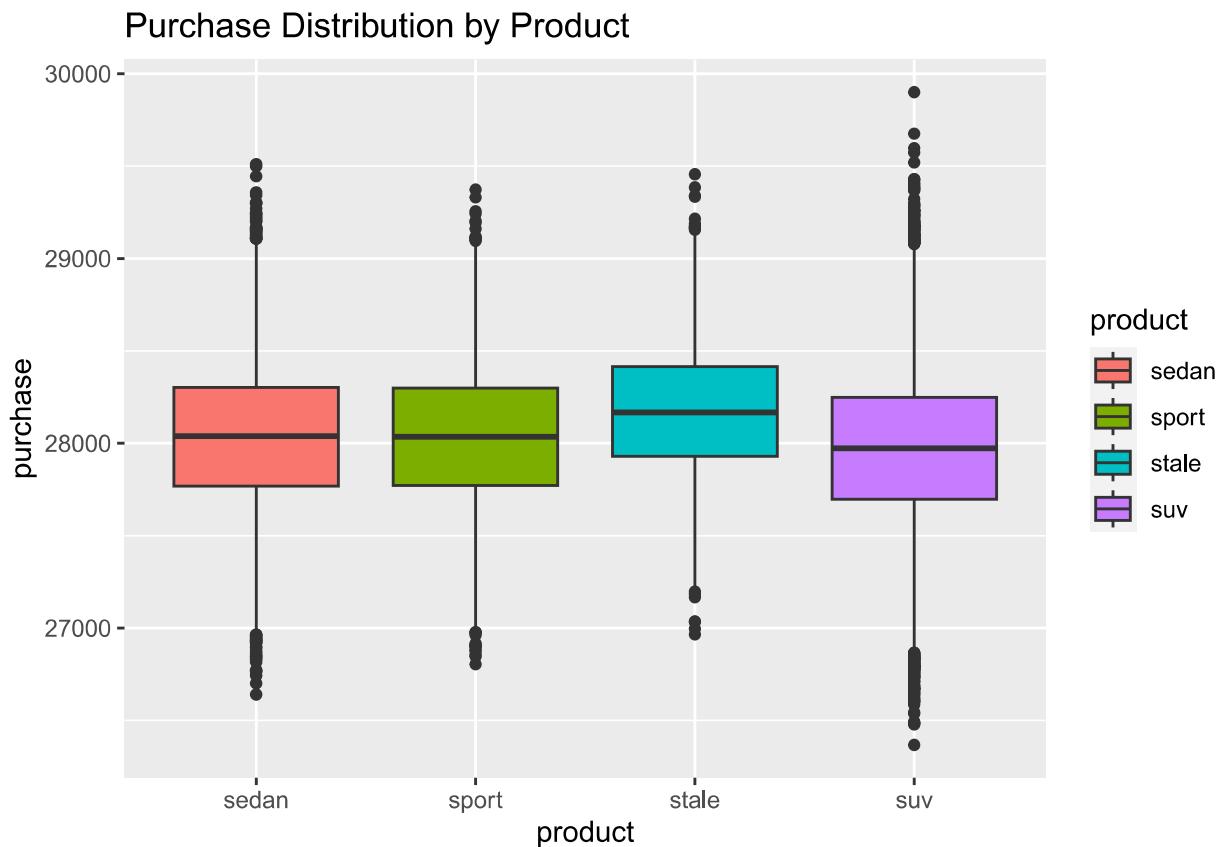


```
cleaned_data <- merged_data %>%
  filter(!is.na(purchase)) %>%
  mutate(total_spend = commissions + marketing)
head(cleaned_data)
```

```
##   rep_id commissions marketing purchase product period promotions buyer
## 1     1        89.69    243.48 29096.81   stale    12       no single
## 2     1        71.55    258.96 27932.44     suv     9       no single
## 3     1        84.51    236.65 28113.08     suv     9      yes single
## 4     1        94.81    258.79 28050.03     suv     3       no single
## 5     1        69.26    252.66 26970.66     suv    10     cramp mess
## 6     1        66.58    251.89 27636.56     suv     0     cramp mess
##   campaign jobtype qualification gender experience training total_spend
## 1 instagram   full time           msc   male        33     yes   333.17
## 2 tiktok     full time           msc   male        33     yes   330.51
## 3 fbook      full time           msc   male        33     yes   321.16
## 4 instagram   full time           msc   male        33     yes   353.60
## 5 fbook      full time           msc   male        33     yes   321.92
## 6 fbook      full time           msc   male        33     yes   318.47
```

Purchase Distribution

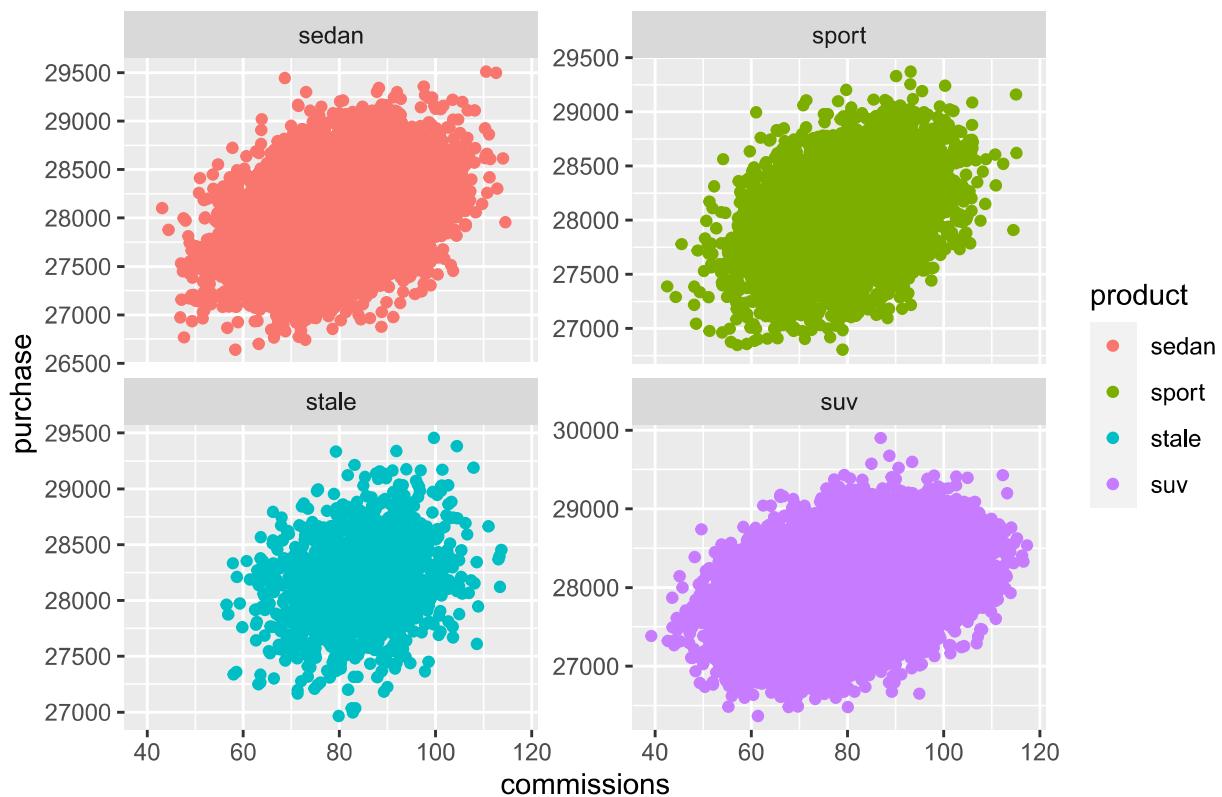
```
ggplot(merged_data, aes(x = product, y = purchase, fill = product)) +
  geom_boxplot() +
  labs(title = "Purchase Distribution by Product")
```



Commission vs. Purchase

```
ggplot(merged_data, aes(x = commissions, y = purchase, color = product)) +
  geom_point() +
  facet_wrap(~product, scales = "free_y") +
  labs(title = "Purchase vs. Commission")
```

Purchase vs. Commission

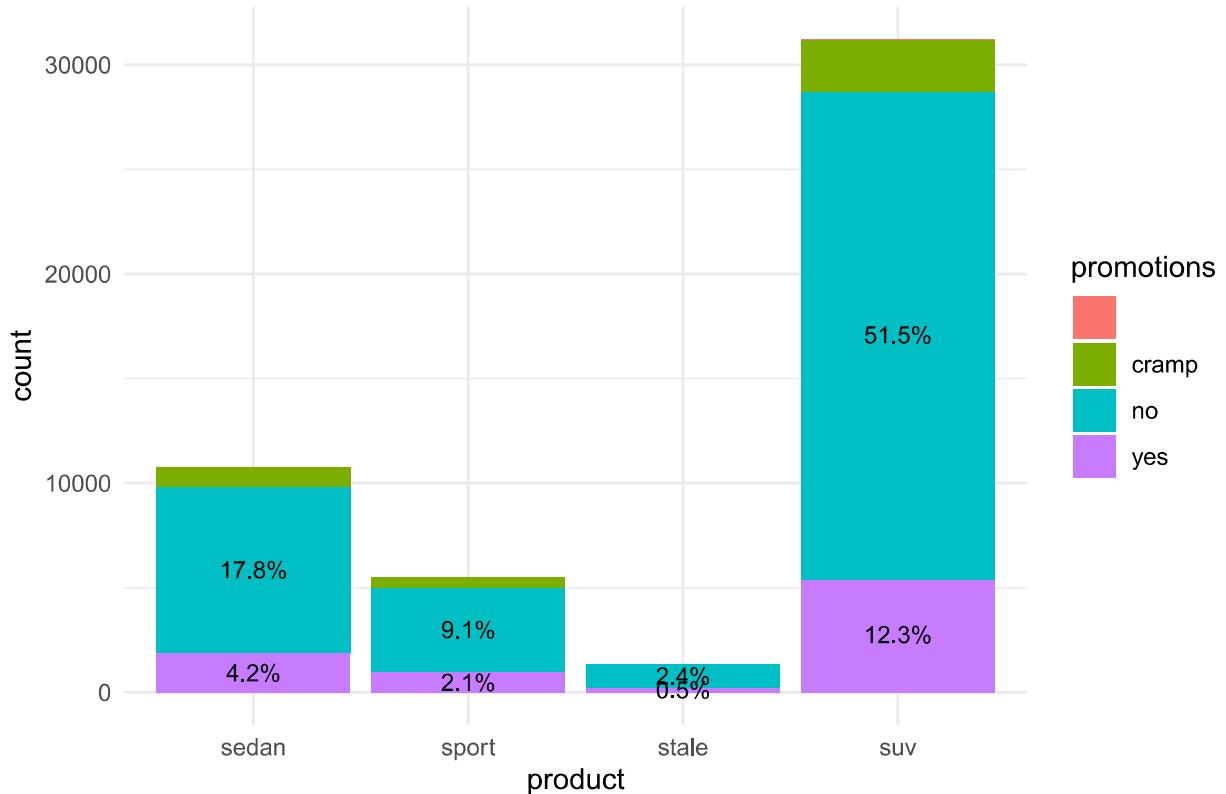


Promotions Analysis

```
# Data visualization with labeled percentage for "yes" and "no" and increased size
ggplot(merged_data, aes(x = product, fill = promotions)) +
  geom_bar() +
  geom_text(data = subset(merged_data, promotions %in% c("yes", "no")),
            stat = "count",
            aes(label = paste0(round(..count..) / sum(..count..) * 100, 1), "%"),
            position = position_stack(vjust = 0.5),
            size = 3) + # Adjust size as needed
  labs(title = "Purchase with Promotions Over Time by Product") +
  theme_minimal() # You can change the theme as needed
```

```
## Warning: The dot-dot notation ('..count..') was deprecated in ggplot2 3.4.0.
## i Please use 'after_stat(count)' instead.
## This warning is displayed once every 8 hours.
## Call 'lifecycle::last_lifecycle_warnings()' to see where this warning was
## generated.
```

Purchase with Promotions Over Time by Product



```
# Save the plot with increased size (adjust width and height as needed)
ggsave("output_plot.png", width = 10, height = 6)
```

Sales Rep Training Status

```
rep_data <- rep_data %>%
  mutate(training = ifelse(training == 'nyes', 'yes', training))

ggplot(rep_data, aes(x = training)) +
  geom_bar(fill = "skyblue", alpha = 0.7) +
  labs(title = "Distribution of Rep Training", x = "Training Status", y = "Count") +
  theme_minimal() +
  geom_text(stat = "count", aes(label = after_stat(count)), vjust = -0.5)
```

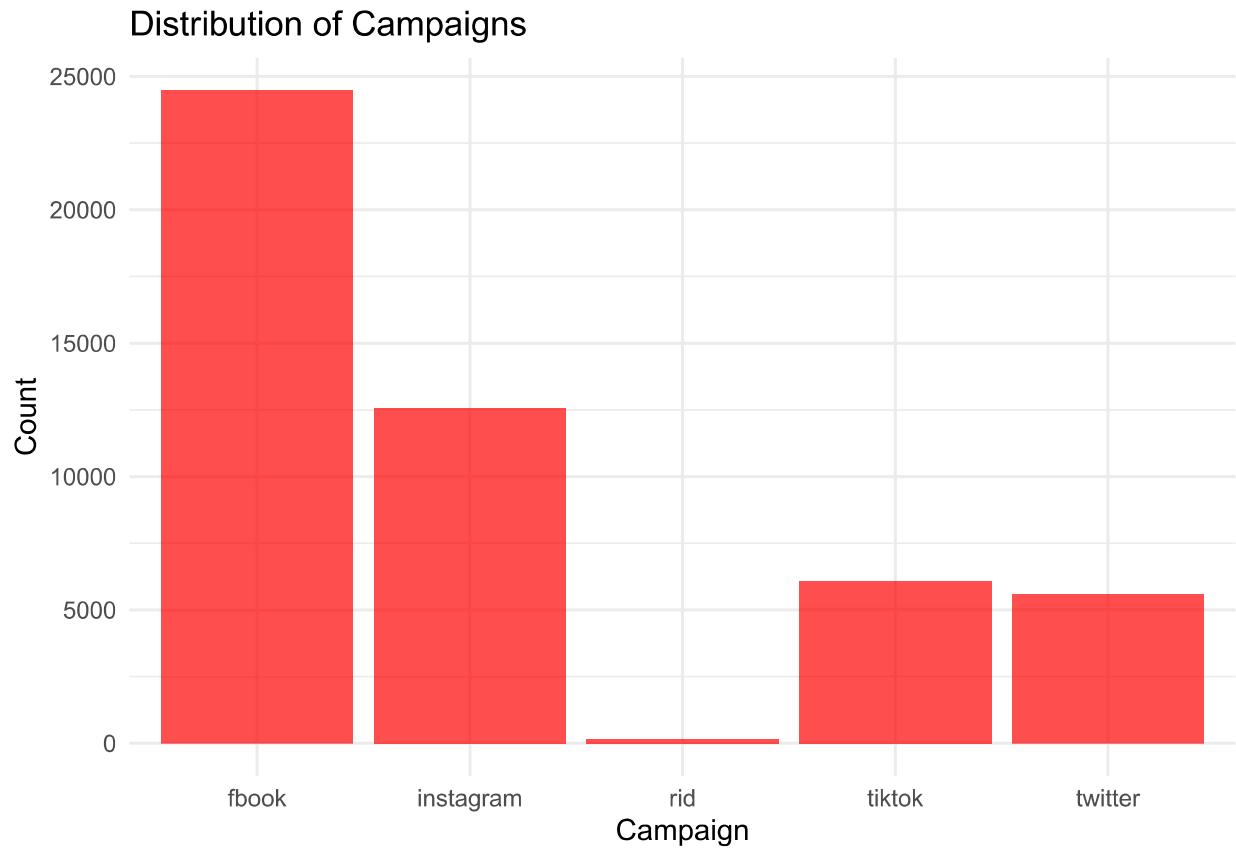
Distribution of Rep Training



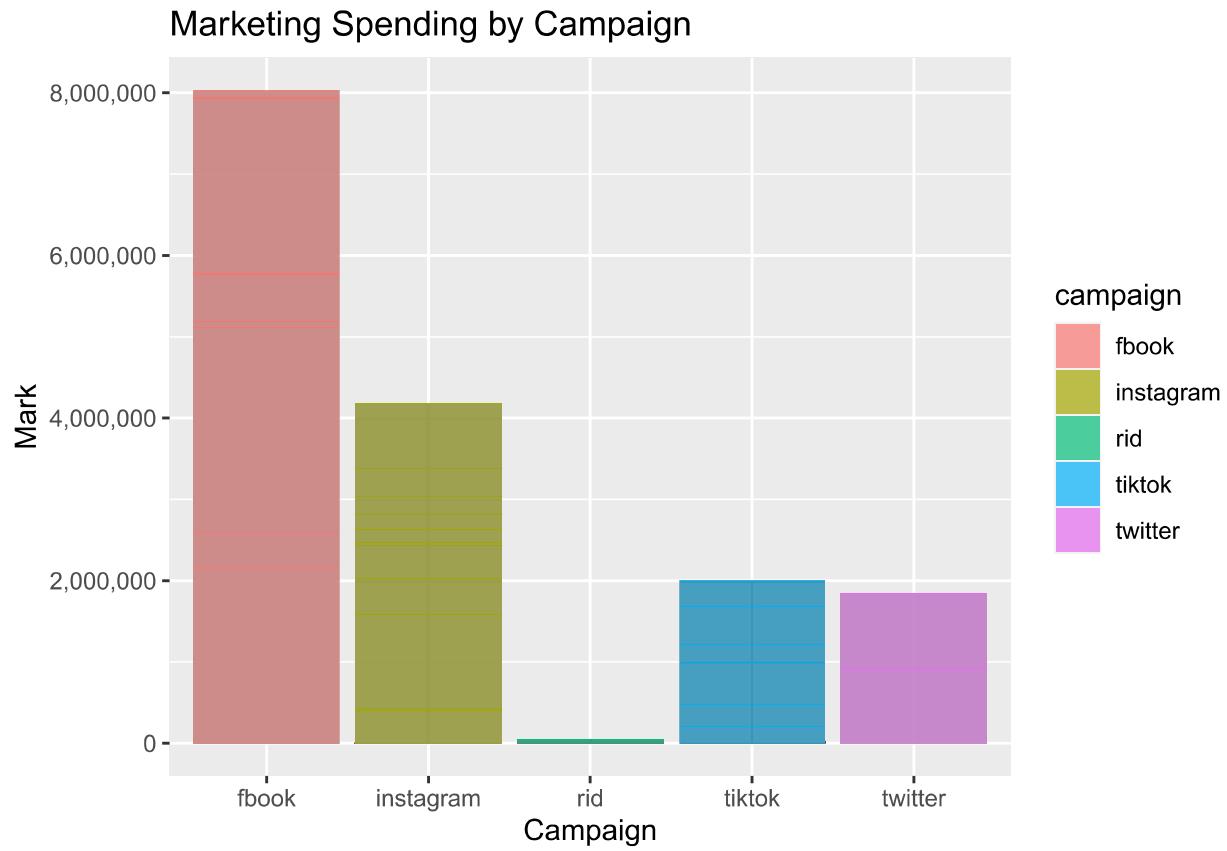
Campaign Analysis

```
library(scales)

ggplot(merged_data, aes(x = campaign)) +
  geom_bar(fill = "red", alpha = 0.7) +
  labs(title = "Distribution of Campaigns", x = "Campaign", y = "Count") +
  theme_minimal()
```



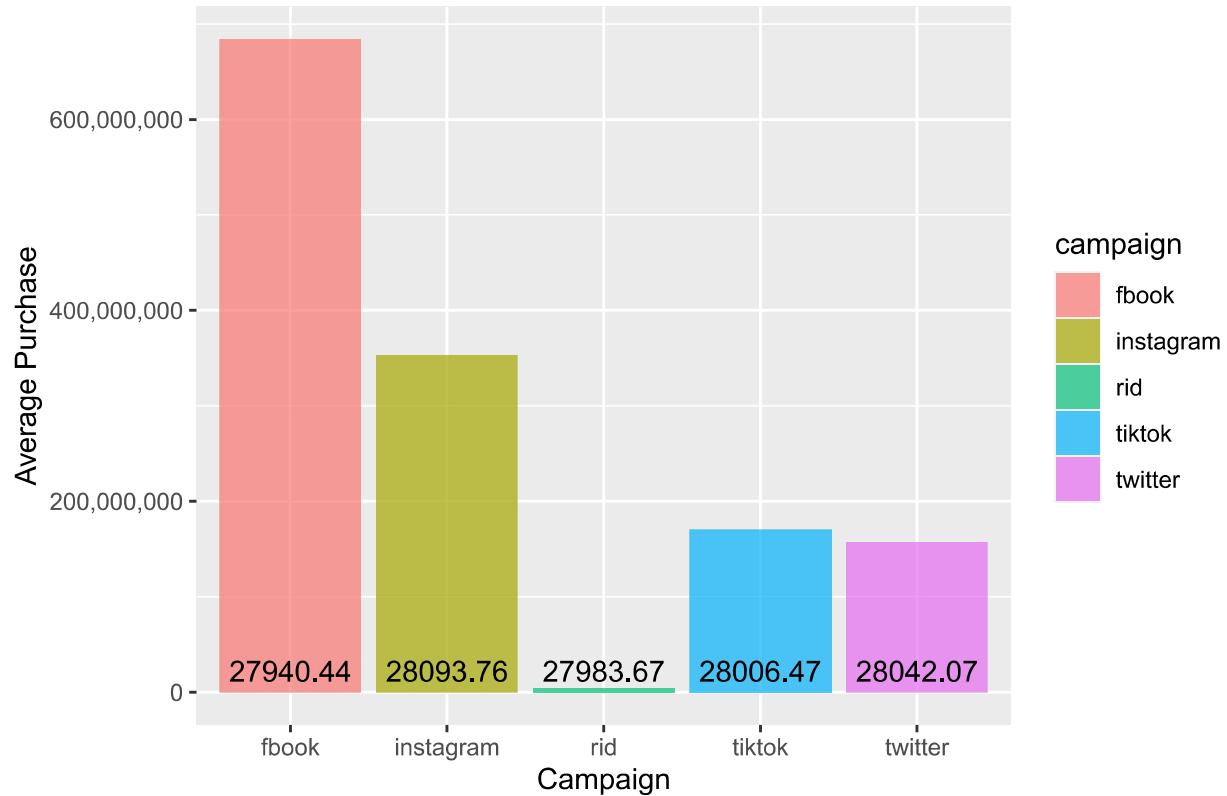
```
ggplot(cleaned_data, aes(x = campaign, y = total_spend, fill = campaign)) +  
  geom_bar(stat = "identity", alpha = 0.7) +  
  labs(title = "Marketing Spending by Campaign", x = "Campaign", y = "Mark") +  
  scale_y_continuous(labels = scales::comma_format()) # This line ensures regular y-axis labels
```



```
ggplot(merged_data, aes(x = campaign, y = purchase, fill = campaign)) +
  geom_bar(stat = "summary", fun = "sum", position = "dodge", alpha = 0.7) +
  geom_text(stat = "summary", aes(label = round(..y.., 2)), position = position_dodge(width = 0.9), vjust = 0) +
  labs(title = "Average Purchase by Campaign", x = "Campaign", y = "Average Purchase") +
  scale_y_continuous(labels = scales::comma_format())

## No summary function supplied, defaulting to 'mean_se()'
```

Average Purchase by Campaign



```
theme_minimal()
```

```
## List of 97
## $ line                         :List of 6
##   ..$ colour        : chr "black"
##   ..$ linewidth     : num 0.5
##   ..$ linetype      : num 1
##   ..$ lineend       : chr "butt"
##   ..$ arrow         : logi FALSE
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_line" "element"
## $ rect                          :List of 5
##   ..$ fill           : chr "white"
##   ..$ colour         : chr "black"
##   ..$ linewidth     : num 0.5
##   ..$ linetype       : num 1
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_rect" "element"
## $ text                           :List of 11
##   ..$ family         : chr ""
##   ..$ face           : chr "plain"
##   ..$ colour         : chr "black"
##   ..$ size           : num 11
##   ..$ hjust          : num 0.5
##   ..$ vjust          : num 0.5
```

```

## ..$ angle      : num 0
## ..$ lineheight : num 0.9
## ..$ margin     : 'margin' num [1:4] 0points 0points 0points 0points
## ... - attr(*, "unit")= int 8
## ..$ debug      : logi FALSE
## ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ title        : NULL
## $ aspect.ratio : NULL
## $ axis.title   : NULL
## $ axis.title.x :List of 11
## ..$ family     : NULL
## ..$ face       : NULL
## ..$ colour     : NULL
## ..$ size       : NULL
## ..$ hjust      : NULL
## ..$ vjust      : num 1
## ..$ angle      : NULL
## ..$ lineheight : NULL
## ..$ margin     : 'margin' num [1:4] 2.75points 0points 0points 0points
## ... - attr(*, "unit")= int 8
## ..$ debug      : NULL
## ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.title.x.top :List of 11
## ..$ family     : NULL
## ..$ face       : NULL
## ..$ colour     : NULL
## ..$ size       : NULL
## ..$ hjust      : NULL
## ..$ vjust      : num 0
## ..$ angle      : NULL
## ..$ lineheight : NULL
## ..$ margin     : 'margin' num [1:4] 0points 0points 2.75points 0points
## ... - attr(*, "unit")= int 8
## ..$ debug      : NULL
## ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.title.x.bottom : NULL
## $ axis.title.y   :List of 11
## ..$ family     : NULL
## ..$ face       : NULL
## ..$ colour     : NULL
## ..$ size       : NULL
## ..$ hjust      : NULL
## ..$ vjust      : num 1
## ..$ angle      : num 90
## ..$ lineheight : NULL
## ..$ margin     : 'margin' num [1:4] 0points 2.75points 0points 0points
## ... - attr(*, "unit")= int 8
## ..$ debug      : NULL
## ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.title.y.left : NULL

```

```

## $ axis.title.y.right      :List of 11
## ..$ family      : NULL
## ..$ face        : NULL
## ..$ colour      : NULL
## ..$ size         : NULL
## ..$ hjust        : NULL
## ..$ vjust        : num 0
## ..$ angle        : num -90
## ..$ lineheight   : NULL
## ..$ margin       : 'margin' num [1:4] 0points 0points 0points 2.75points
## ...- attr(*, "unit")= int 8
## ..$ debug        : NULL
## ..$ inherit.blank: logi TRUE
## ...- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text      :List of 11
## ..$ family      : NULL
## ..$ face        : NULL
## ..$ colour      : chr "grey30"
## ..$ size         : 'rel' num 0.8
## ..$ hjust        : NULL
## ..$ vjust        : NULL
## ..$ angle        : NULL
## ..$ lineheight   : NULL
## ..$ margin       : NULL
## ..$ debug        : NULL
## ..$ inherit.blank: logi TRUE
## ...- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text.x     :List of 11
## ..$ family      : NULL
## ..$ face        : NULL
## ..$ colour      : NULL
## ..$ size         : NULL
## ..$ hjust        : NULL
## ..$ vjust        : num 1
## ..$ angle        : NULL
## ..$ lineheight   : NULL
## ..$ margin       : 'margin' num [1:4] 2.2points 0points 0points 0points
## ...- attr(*, "unit")= int 8
## ..$ debug        : NULL
## ..$ inherit.blank: logi TRUE
## ...- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text.x.top :List of 11
## ..$ family      : NULL
## ..$ face        : NULL
## ..$ colour      : NULL
## ..$ size         : NULL
## ..$ hjust        : NULL
## ..$ vjust        : num 0
## ..$ angle        : NULL
## ..$ lineheight   : NULL
## ..$ margin       : 'margin' num [1:4] 0points 0points 2.2points 0points
## ...- attr(*, "unit")= int 8
## ..$ debug        : NULL
## ..$ inherit.blank: logi TRUE

```

```

## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text.x.bottom      : NULL
## $ axis.text.y      :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : NULL
##   ..$ size        : NULL
##   ..$ hjust       : num 1
##   ..$ vjust       : NULL
##   ..$ angle       : NULL
##   ..$ lineheight  : NULL
##   ..$ margin      : 'margin' num [1:4] 0points 2.2points 0points 0points
## ... .- attr(*, "unit")= int 8
##   ..$ debug       : NULL
##   ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.text.y.left      : NULL
## $ axis.text.y.right     :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : NULL
##   ..$ size        : NULL
##   ..$ hjust       : num 0
##   ..$ vjust       : NULL
##   ..$ angle       : NULL
##   ..$ lineheight  : NULL
##   ..$ margin      : 'margin' num [1:4] 0points 0points 0points 2.2points
## ... .- attr(*, "unit")= int 8
##   ..$ debug       : NULL
##   ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ axis.ticks      : list()
## ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ axis.ticks.x      : NULL
## $ axis.ticks.x.top    : NULL
## $ axis.ticks.x.bottom  : NULL
## $ axis.ticks.y      : NULL
## $ axis.ticks.y.left   : NULL
## $ axis.ticks.y.right  : NULL
## $ axis.ticks.length   : 'simpleUnit' num 2.75points
## ... .- attr(*, "unit")= int 8
##   $ axis.ticks.length.x   : NULL
##   $ axis.ticks.length.x.top : NULL
##   $ axis.ticks.length.x.bottom: NULL
##   $ axis.ticks.length.y   : NULL
##   $ axis.ticks.length.y.left : NULL
##   $ axis.ticks.length.y.right: NULL
## $ axis.line      : list()
## ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ axis.line.x      : NULL
## $ axis.line.x.top    : NULL
## $ axis.line.x.bottom  : NULL
## $ axis.line.y      : NULL
## $ axis.line.y.left   : NULL

```

```

## $ axis.line.y.right      : NULL
## $ legend.background      : list()
## ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ legend.margin          : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
## ..- attr(*, "unit")= int 8
## $ legend.spacing         : 'simpleUnit' num 11points
## ..- attr(*, "unit")= int 8
## $ legend.spacing.x       : NULL
## $ legend.spacing.y       : NULL
## $ legend.key             : list()
## ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ legend.key.size        : 'simpleUnit' num 1.2lines
## ..- attr(*, "unit")= int 3
## $ legend.key.height      : NULL
## $ legend.key.width       : NULL
## $ legend.text            :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : NULL
##   ..$ size         : 'rel' num 0.8
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin        : NULL
##   ..$ debug         : NULL
##   ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ legend.text.align      : NULL
## $ legend.title           :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : NULL
##   ..$ size         : NULL
##   ..$ hjust        : num 0
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin        : NULL
##   ..$ debug         : NULL
##   ..$ inherit.blank: logi TRUE
## ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ legend.title.align     : NULL
## $ legend.position        : chr "right"
## $ legend.direction       : NULL
## $ legend.justification   : chr "center"
## $ legend.box              : NULL
## $ legend.box.just        : NULL
## $ legend.box.margin       : 'margin' num [1:4] 0cm 0cm 0cm 0cm
## ..- attr(*, "unit")= int 1
## $ legend.box.background   : list()
## ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ legend.box.spacing      : 'simpleUnit' num 11points
## ..- attr(*, "unit")= int 8

```

```

## $ panel.background      : list()
## ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ panel.border          : list()
## ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ panel.spacing         : 'simpleUnit' num 5.5points
## ..- attr(*, "unit")= int 8
## $ panel.spacing.x       : NULL
## $ panel.spacing.y       : NULL
## $ panel.grid            :List of 6
##   ..$ colour        : chr "grey92"
##   ..$ linewidth     : NULL
##   ..$ linetype      : NULL
##   ..$ lineend       : NULL
##   ..$ arrow         : logi FALSE
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_line" "element"
## $ panel.grid.major       : NULL
## $ panel.grid.minor      :List of 6
##   ..$ colour        : NULL
##   ..$ linewidth     : 'rel' num 0.5
##   ..$ linetype      : NULL
##   ..$ lineend       : NULL
##   ..$ arrow         : logi FALSE
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_line" "element"
## $ panel.grid.major.x    : NULL
## $ panel.grid.major.y    : NULL
## $ panel.grid.minor.x   : NULL
## $ panel.grid.minor.y   : NULL
## $ panel.ontop          : logi FALSE
## $ plot.background       : list()
## ..- attr(*, "class")= chr [1:2] "element_blank" "element"
## $ plot.title           :List of 11
##   ..$ family        : NULL
##   ..$ face          : NULL
##   ..$ colour        : NULL
##   ..$ size          : 'rel' num 1.2
##   ..$ hjust         : num 0
##   ..$ vjust         : num 1
##   ..$ angle         : NULL
##   ..$ lineheight    : NULL
##   ..$ margin         : 'margin' num [1:4] 0points 0points 5.5points 0points
##   ..- .- attr(*, "unit")= int 8
##   ..$ debug         : NULL
##   ..$ inherit.blank: logi TRUE
##   ..- attr(*, "class")= chr [1:2] "element_text" "element"
## $ plot.title.position   : chr "panel"
## $ plot.subtitle        :List of 11
##   ..$ family        : NULL
##   ..$ face          : NULL
##   ..$ colour        : NULL
##   ..$ size          : NULL
##   ..$ hjust         : num 0
##   ..$ vjust         : num 1

```

```

## ..$ angle      : NULL
## ..$ lineheight : NULL
## ..$ margin     : 'margin' num [1:4] 0points 0points 5.5points 0points
## ... - attr(*, "unit")= int 8
## ..$ debug      : NULL
## ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ plot.caption           :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : NULL
##   ..$ size         : 'rel' num 0.8
##   ..$ hjust        : num 1
##   ..$ vjust        : num 1
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 5.5points 0points 0points 0points
## ... - attr(*, "unit")= int 8
## ..$ debug        : NULL
## ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ plot.caption.position    : chr "panel"
## $ plot.tag               :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : NULL
##   ..$ size         : 'rel' num 1.2
##   ..$ hjust        : num 0.5
##   ..$ vjust        : num 0.5
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : NULL
##   ..$ debug        : NULL
##   ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ plot.tag.position       : chr "topleft"
## $ plot.margin             : 'margin' num [1:4] 5.5points 5.5points 5.5points 5.5points
## ... - attr(*, "unit")= int 8
## $ strip.background        : list()
## ... - attr(*, "class")= chr [1:2] "element_blank" "element"
## $ strip.background.x      : NULL
## $ strip.background.y      : NULL
## $ strip.clip              : chr "inherit"
## $ strip.placement        : chr "inside"
## $ strip.text               :List of 11
##   ..$ family      : NULL
##   ..$ face        : NULL
##   ..$ colour      : chr "grey10"
##   ..$ size         : 'rel' num 0.8
##   ..$ hjust        : NULL
##   ..$ vjust        : NULL
##   ..$ angle        : NULL
##   ..$ lineheight   : NULL
##   ..$ margin       : 'margin' num [1:4] 4.4points 4.4points 4.4points 4.4points

```

```

## ... - attr(*, "unit")= int 8
## ..$ debug      : NULL
## ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ strip.text.x           : NULL
## $ strip.text.x.bottom    : NULL
## $ strip.text.x.top       : NULL
## $ strip.text.y           :List of 11
##   ..$ family     : NULL
##   ..$ face       : NULL
##   ..$ colour     : NULL
##   ..$ size       : NULL
##   ..$ hjust      : NULL
##   ..$ vjust      : NULL
##   ..$ angle      : num -90
##   ..$ lineheight : NULL
##   ..$ margin     : NULL
##   ..$ debug      : NULL
##   ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ strip.text.y.left      :List of 11
##   ..$ family     : NULL
##   ..$ face       : NULL
##   ..$ colour     : NULL
##   ..$ size       : NULL
##   ..$ hjust      : NULL
##   ..$ vjust      : NULL
##   ..$ angle      : num 90
##   ..$ lineheight : NULL
##   ..$ margin     : NULL
##   ..$ debug      : NULL
##   ..$ inherit.blank: logi TRUE
## ... - attr(*, "class")= chr [1:2] "element_text" "element"
## $ strip.text.y.right     : NULL
## $ strip.switch.pad.grid  : 'simpleUnit' num 2.75points
## ... - attr(*, "unit")= int 8
## $ strip.switch.pad.wrap   : 'simpleUnit' num 2.75points
## ... - attr(*, "unit")= int 8
## - attr(*, "class")= chr [1:2] "theme" "gg"
## - attr(*, "complete")= logi TRUE
## - attr(*, "validate")= logi TRUE

```

Buyer Analysis

```

pie_data <- merged_data %>%
  group_by(buyer) %>%
  summarise(total_purchase = sum(purchase))

# Calculate percentage
pie_data$percentage <- (pie_data$total_purchase / sum(pie_data$total_purchase)) * 100

# Create a pie chart with labels

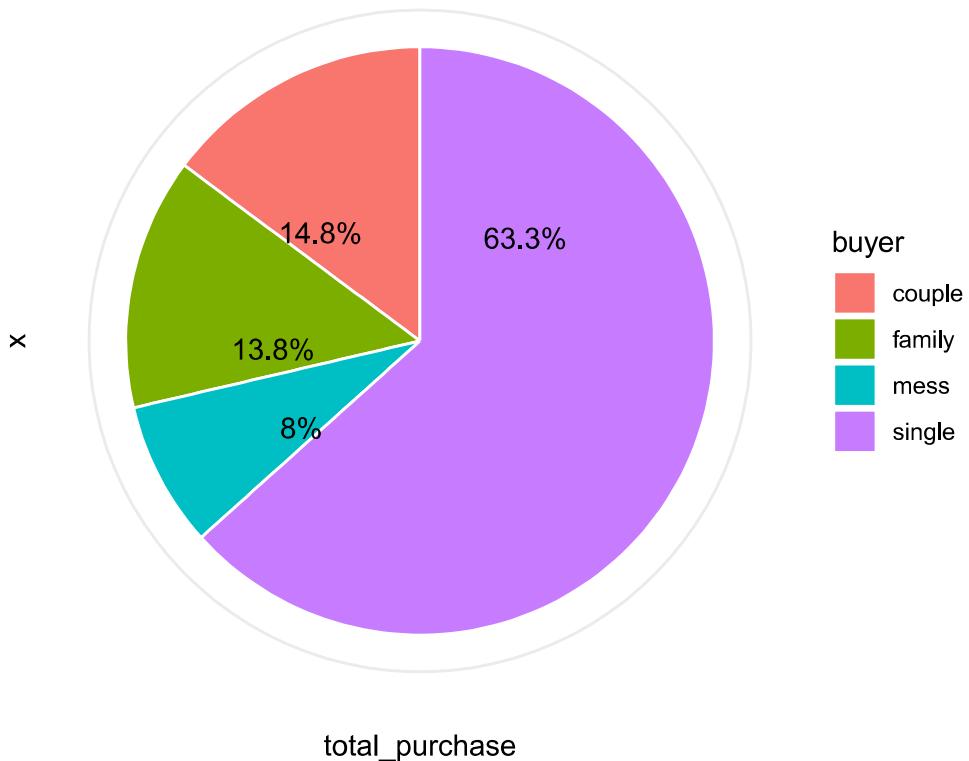
```

```

ggplot(pie_data, aes(x = "", y = total_purchase, fill = buyer, label = paste0(round(percentage, 1), "%"))
  geom_bar(stat = "identity", width = 1, color = "white") +
  coord_polar("y") +
  labs(title = "Distribution of Total Purchase by Buyer Status") +
  scale_y_discrete(labels = comma) +
  theme_minimal() +
  geom_text(position = position_stack(vjust = 0.2))

```

Distribution of Total Purchase by Buyer Status



Profit Analysis

```

profit_data <- merged_data %>%
  group_by(product) %>%
  summarise(total_profit = sum(purchase - marketing - commissions))

ggplot(profit_data, aes(x = product, y = total_profit, fill = product)) +
  geom_bar(stat = "identity", alpha = 0.7) +
  labs(title = "Total Profit by Product", x = "Product", y = "Total Profit") +
  scale_y_continuous(labels = scales::comma_format())

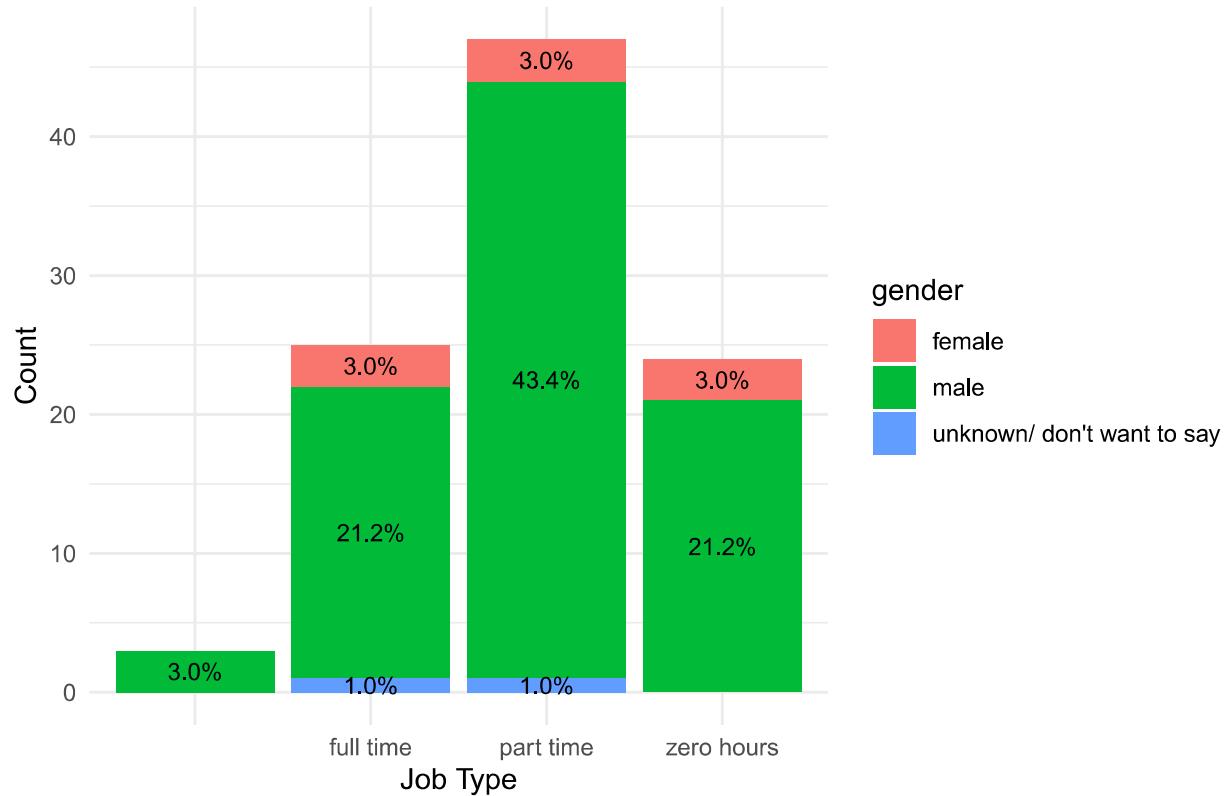
```



```
' ## Representative Analysis
```

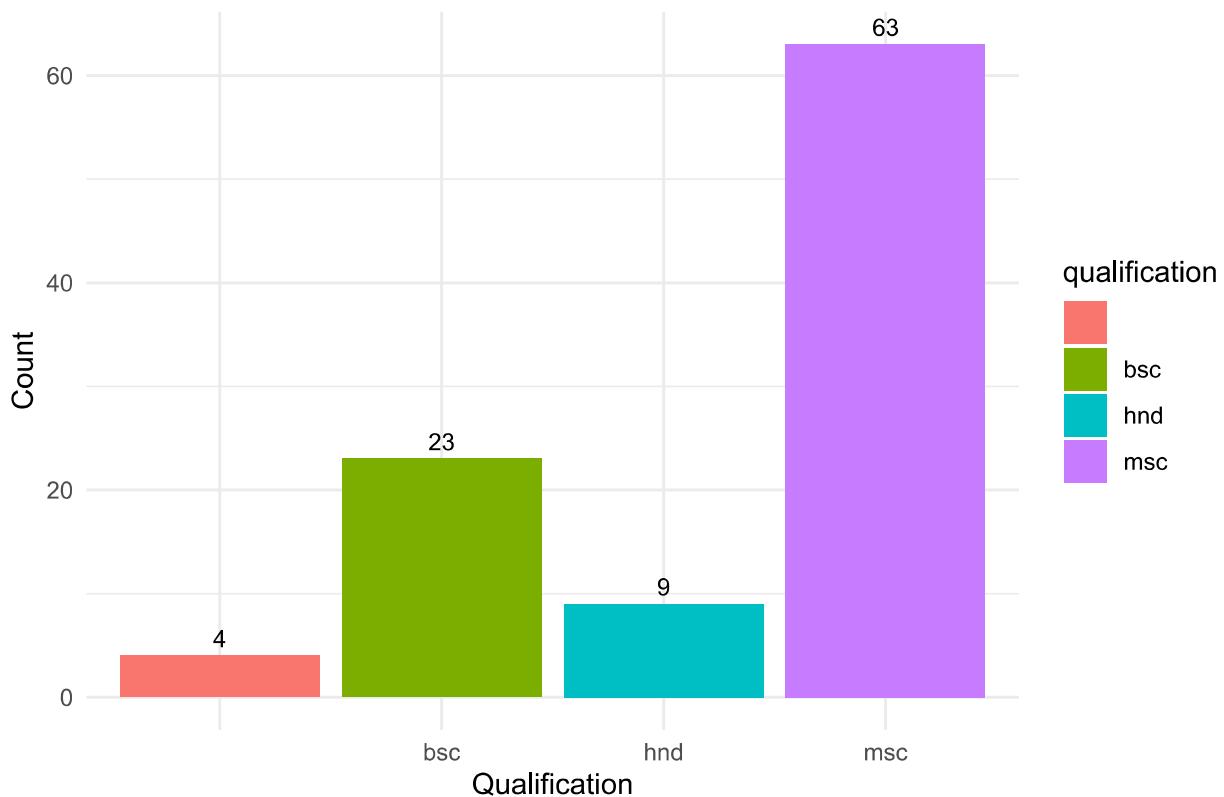
```
ggplot(rep_data, aes(x = jobtype, fill = gender)) +
  geom_bar() +
  geom_text(
    stat = "count",
    aes(label = percent(..count.. / sum(..count..))),
    position = position_stack(vjust = 0.5),
    size = 3
  ) +
  labs(title = "Distribution of Representatives by Job Type and Gender", x = "Job Type", y = "Count")
  theme_minimal()
```

Distribution of Representatives by Job Type and Gender



```
ggplot(rep_data, aes(x = qualification, fill = qualification)) +
  geom_bar() +
  geom_text(stat = "count", aes(label = ..count..), vjust = -0.5, size = 3) +
  labs(title = "Distribution of Reps based on Qualification",
       x = "Qualification",
       y = "Count") +
  theme_minimal()
```

Distribution of Reps based on Qualification



```
# Hypothesis Testing for H1
cor_test_result_marketing <- cor.test(as.numeric(merged_data$marketing), as.numeric(merged_data$purchase))
print(cor_test_result_marketing)
```

```
##
## Pearson's product-moment correlation
##
## data: as.numeric(merged_data$marketing) and as.numeric(merged_data$purchase)
## t = 68.764, df = 48813, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  0.2890671 0.3052424
## sample estimates:
##        cor
## 0.2971761
```

```
# Hypothesis Testing for H2
cor_test_result_commission <- cor.test(as.numeric(merged_data$commissions), as.numeric(merged_data$purc
print(cor_test_result_commission)

##
## Pearson's product-moment correlation
##
## data: as.numeric(merged_data$commissions) and as.numeric(merged_data$purchase)
## t = 84.766, df = 48813, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## 0.3504484 0.3659141
## sample estimates:
## cor
## 0.3582058
```