

Predicting Insurance Company Customer Behavior

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```
library(ggplot2)
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(ggthemes)
```

```
## Warning: package 'ggthemes' was built under R version 4.0.3
```

```
library(ggcorrplot)
library(mefa4)
```

```
## Warning: package 'mefa4' was built under R version 4.0.3
```

```
## Loading required package: Matrix
```

```
## mefa4 0.3-7    2020-02-28
```

```
library(e1071)
```

```
## Warning: package 'e1071' was built under R version 4.0.3
```

```
library(faraway)
```

```
## Warning: package 'faraway' was built under R version 4.0.3
```

```
data = read.csv('C:/Users/34527/Desktop/dataset.csv')
data_raw = read.csv('C:/Users/34527/Desktop/dataset.csv')
```

- Data cleaning -

```

# Check if there is any missing data in the data set
for (i in 1:ncol(data)) {
  print(paste(colnames(data)[i], ':', sum(is.null(data[, i]))))
  print(paste(colnames(data)[i], ':', sum(data[, i] == 'NA')))
  print(paste(colnames(data)[i], ':', sum(data[, i] == 'N/A')))
  print(paste(colnames(data)[i], ':', sum(data[, i] == '')))
}

```

```

## [1] "id : 0"
## [1] "id : 0"
## [1] "id : 0"
## [1] "id : 0"
## [1] "Gender : 0"
## [1] "Gender : 0"
## [1] "Gender : 0"
## [1] "Gender : 0"
## [1] "Age : 0"
## [1] "Age : 0"
## [1] "Age : 0"
## [1] "Age : 0"
## [1] "Driving_License : 0"
## [1] "Driving_License : 0"
## [1] "Driving_License : 0"
## [1] "Driving_License : 0"
## [1] "Region_Code : 0"
## [1] "Region_Code : 0"
## [1] "Region_Code : 0"
## [1] "Region_Code : 0"
## [1] "Previously_Insured : 0"
## [1] "Previously_Insured : 0"
## [1] "Previously_Insured : 0"
## [1] "Previously_Insured : 0"
## [1] "Vehicle_Age : 0"
## [1] "Vehicle_Age : 0"
## [1] "Vehicle_Age : 0"
## [1] "Vehicle_Age : 0"
## [1] "Vehicle_Damage : 0"
## [1] "Vehicle_Damage : 0"
## [1] "Vehicle_Damage : 0"
## [1] "Vehicle_Damage : 0"
## [1] "Annual_Premium : 0"
## [1] "Annual_Premium : 0"
## [1] "Annual_Premium : 0"
## [1] "Annual_Premium : 0"
## [1] "Policy_Sales_Channel : 0"
## [1] "Policy_Sales_Channel : 0"
## [1] "Policy_Sales_Channel : 0"
## [1] "Policy_Sales_Channel : 0"
## [1] "Vintage : 0"
## [1] "Vintage : 0"
## [1] "Vintage : 0"
## [1] "Vintage : 0"
## [1] "Response : 0"

```

```
## [1] "Response : 0"
## [1] "Response : 0"
## [1] "Response : 0"
```

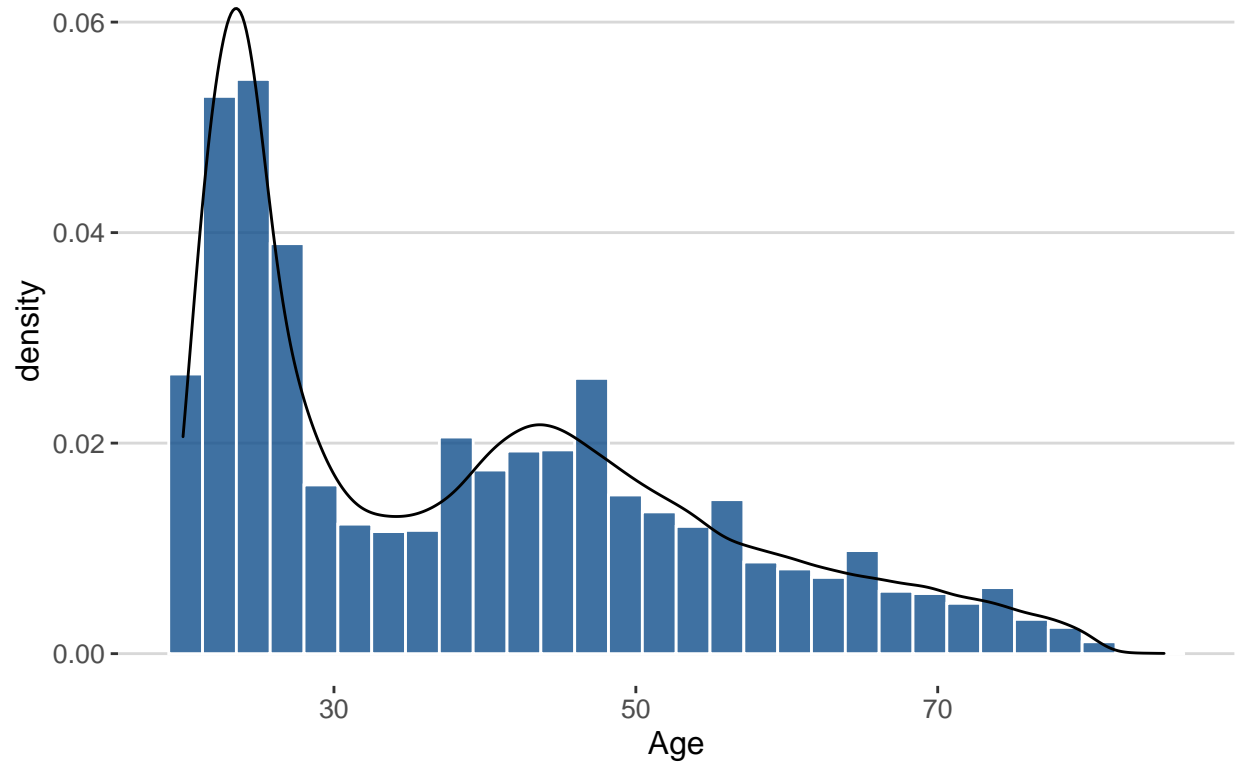
```
# Transform categorical variables to dummy variables for easier analysis and better
## model performance
data[data[, 'Vehicle_Damage'] == 'Yes', 'Vehicle_Damage'] = 1
data[data[, 'Vehicle_Damage'] == 'No', 'Vehicle_Damage'] = 0
data[data[, 'Vehicle_Age'] == '< 1 Year', 'Vehicle_Age'] = 0
data[data[, 'Vehicle_Age'] == '1-2 Year', 'Vehicle_Age'] = 1
data[data[, 'Vehicle_Age'] == '> 2 Years', 'Vehicle_Age'] = 2
data[data[, 'Gender'] == 'Female', 'Gender'] = 0
data[data[, 'Gender'] == 'Male', 'Gender'] = 1
```

```
# Manually remove the data points that is overly unrepresentative. The existence of
## these unrepresentative data points would abort the train/test split and other analysis
to_be_removed = data %>% count(Policy_Sales_Channel) %>%
  group_by(Policy_Sales_Channel) %>% filter(n < 5)
data = data[data$Policy_Sales_Channel %notin% to_be_removed$Policy_Sales_Channel, ]
data = data[, colnames(data) != 'id']
```

Exploratory Data Analysis

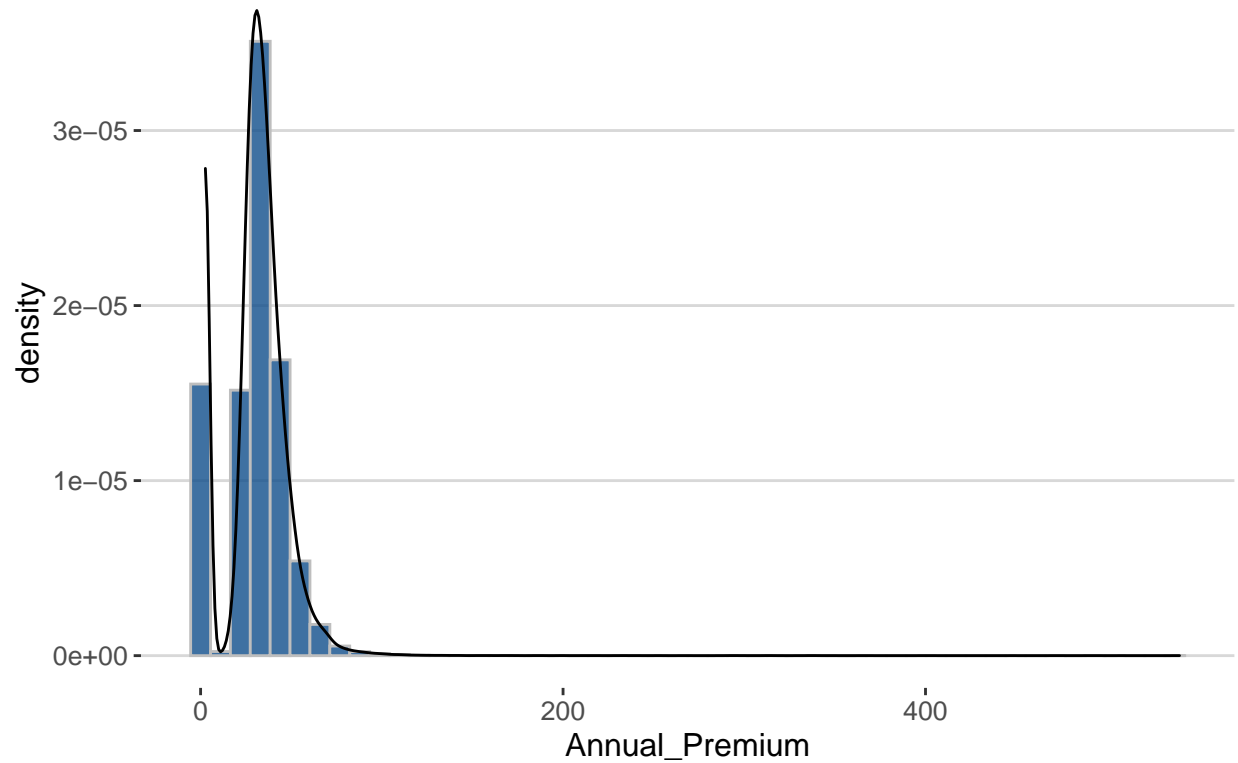
```
# A histogram showing the distribution of customer age
ggplot(data = data, aes(Age)) +
  geom_histogram(aes(y=..density..), fill="dodgerblue4", color = 'white', alpha = 0.8,
    bins = 30) +
  geom_density() +
  labs(title = 'Histogram of Age') +
  theme(plot.title = element_text(hjust = 0.5)) +
  labs(title = 'Histogram of Age') +
  theme_hc()
```

Histogram of Age

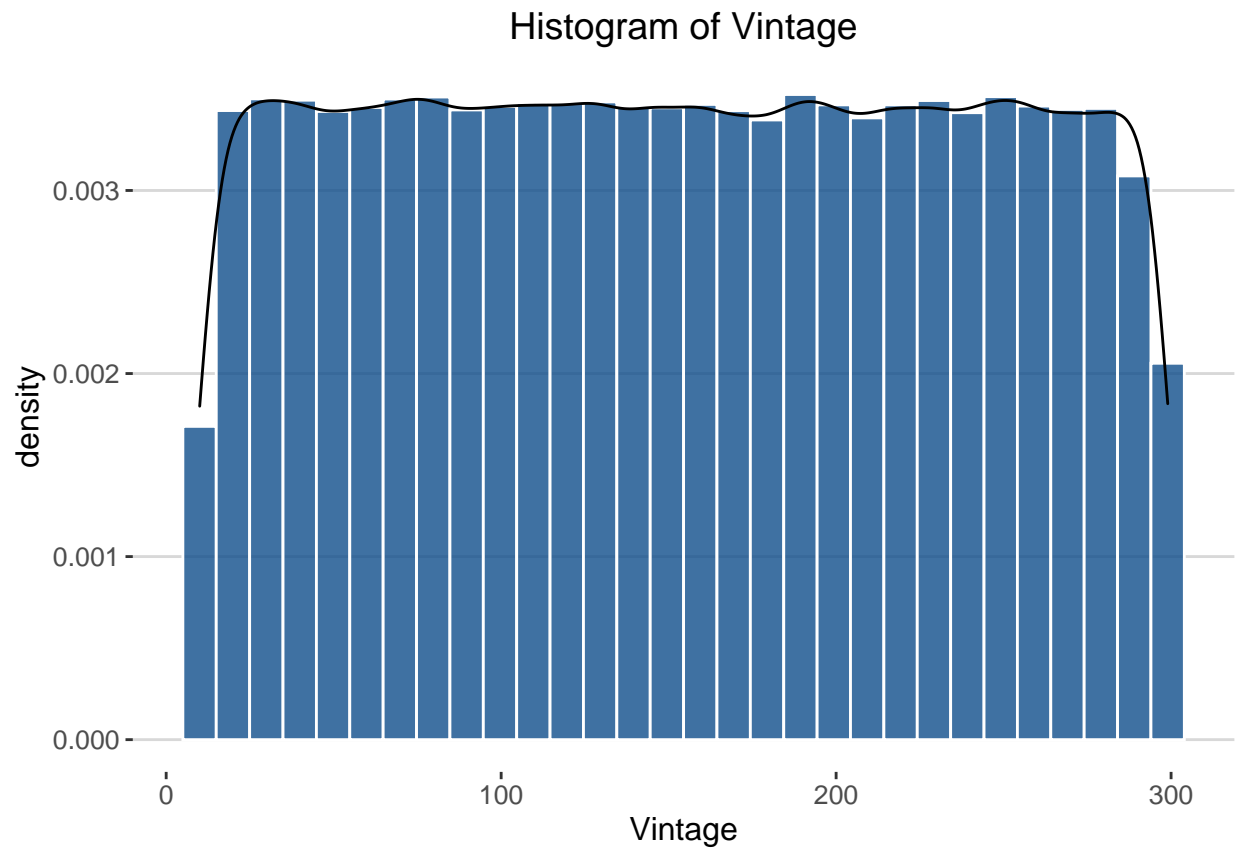


```
# A histogram showing the distribution of annual premium customers currently pay
ggplot(data = data, aes(Annual_Premium)) +
  geom_histogram(aes(y=..density..), fill="dodgerblue4", color = 'gray', alpha = 0.8,
    bins = 50) +
  geom_density(adjust = 3) +
  labs(title = 'Histogram of Annual_Premium (in thousand)') +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc() +
  scale_x_continuous(labels = function(x){x/10^3})
```

Histogram of Annual_Premium (in thousand)

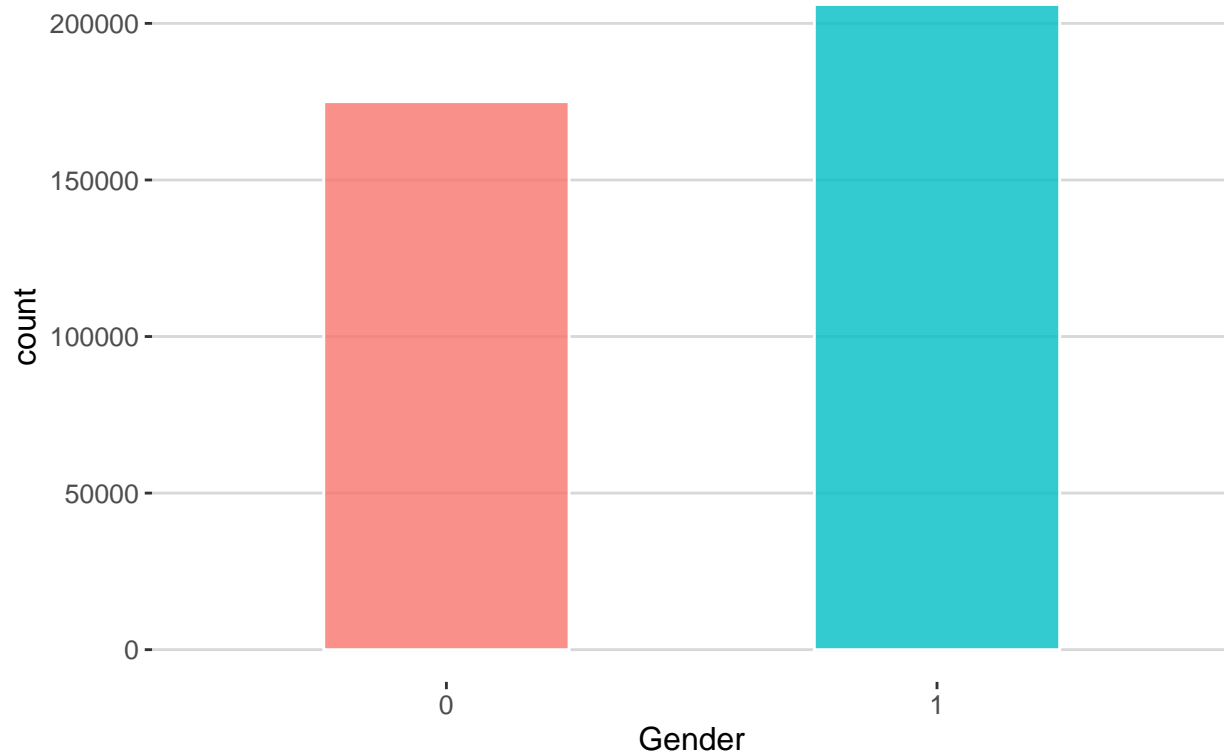


```
# A histogram showing the distribution of customer vintage (the number of days they  
## have been associated with the company)  
ggplot(data = data, aes(Vintage)) +  
  geom_histogram(aes(y=..density..), fill="dodgerblue4", color = 'white', alpha = 0.8,  
                 bins = 30) +  
  geom_density() +  
  labs(title = 'Histogram of Vintage') +  
  theme(plot.title = element_text(hjust = 0.5)) +  
  theme_hc()
```



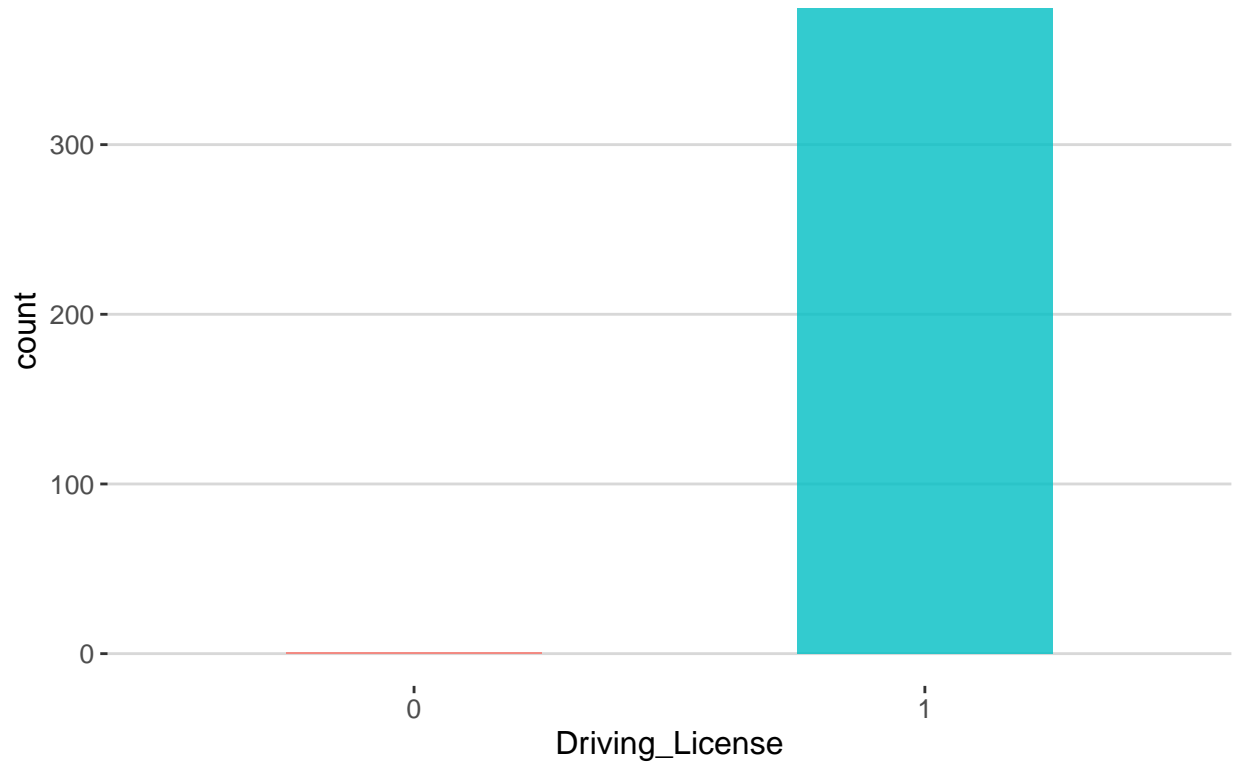
```
# A bar chart showing the number of customers in each gender group
ggplot(data = data, aes(Gender, fill = Gender)) +
  geom_bar(width = 0.5, alpha = 0.8, color = 'white', show.legend = FALSE) +
  labs(title = 'Bar chart of Gender') +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```

Bar chart of Gender

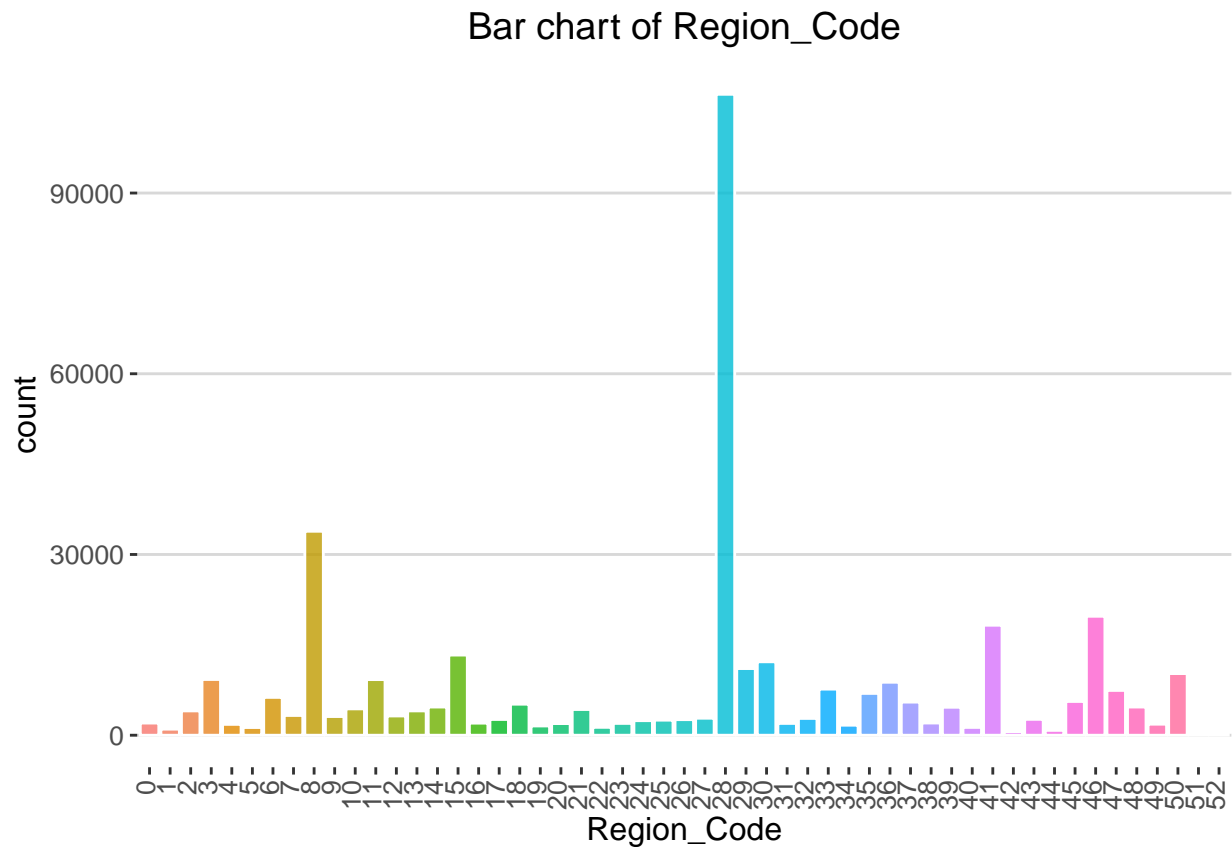


```
# A bar chart showing the number of customers with and without a driver's license
ggplot(data = data, aes(factor(Driving_License), fill = factor(Driving_License))) +
  geom_bar(width = 0.5, alpha = 0.8, show.legend = FALSE) +
  labs(title = 'Bar chart of Driving_License (in thousand)', x = 'Driving_License') +
  theme(plot.title = element_text(hjust = 0.5), legend.position = 'none') +
  scale_y_continuous(labels = function(y) {y/10^3}) +
  theme_hc()
```

Bar chart of Driving_License (in thousand)

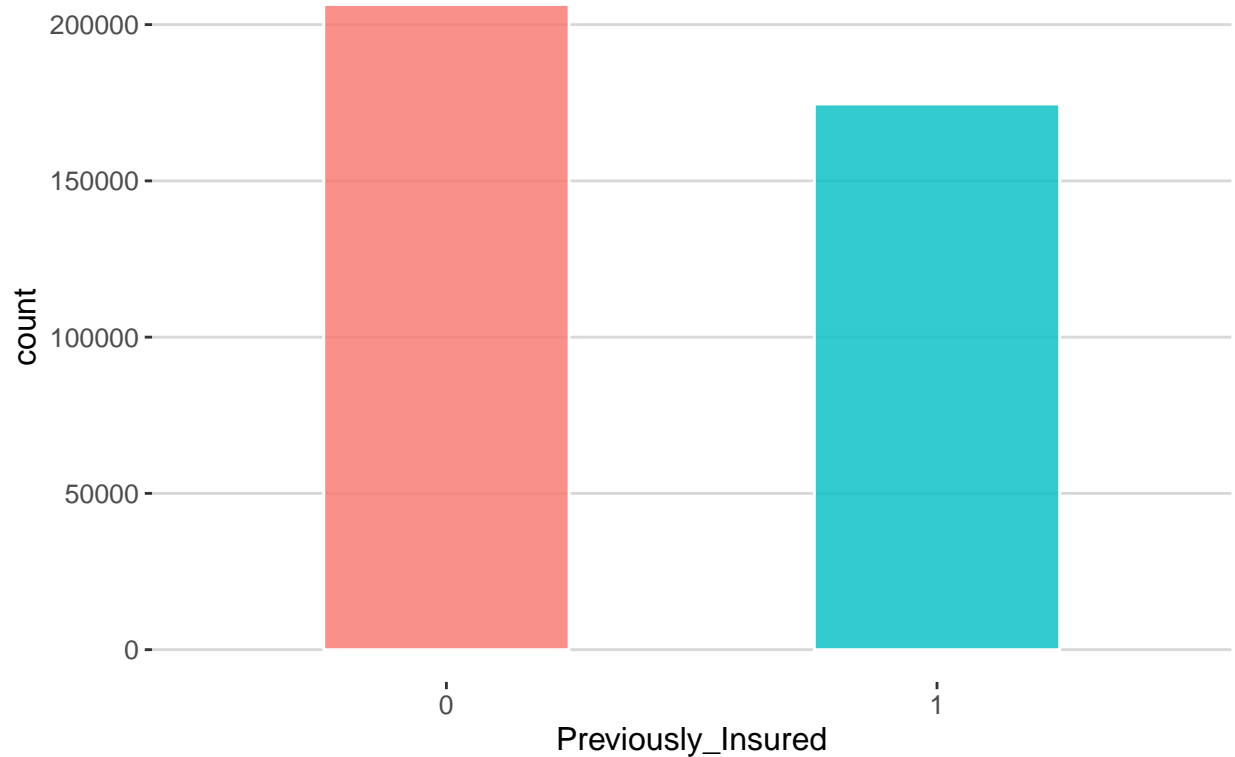


```
# A bar chart showing the number of customers within each region code
ggplot(data = data, aes(factor(Region_Code), fill = factor(Region_Code))) +
  geom_bar(alpha = 0.8, color = 'white', show.legend = FALSE) +
  labs(title = 'Bar chart of Region_Code', x = 'Region_Code') +
  theme(plot.title = element_text(hjust = 0.5),
        axis.text.x = element_text(angle = 90, hjust = 1, vjust = 0.3)) +
  theme_hc()
```

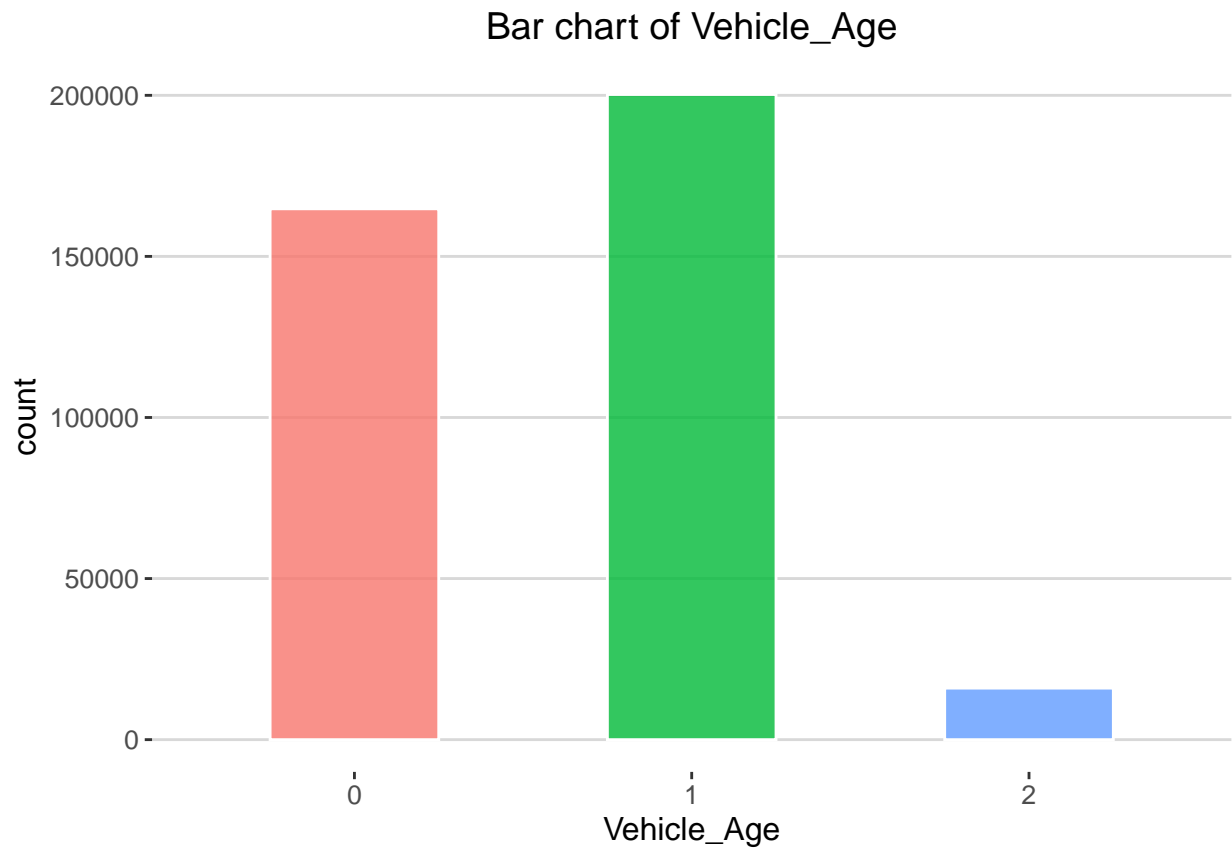



```
# A bar chart showing the number of customers who are and are not previously insured
ggplot(data = data, aes(factor(Previously_Insured), fill = factor(Previously_Insured))) +
  geom_bar(width = 0.5, alpha = 0.8, color = 'white', show.legend = FALSE) +
  labs(title = 'Bar chart of Previously_Insured', x = 'Previously_Insured') +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```

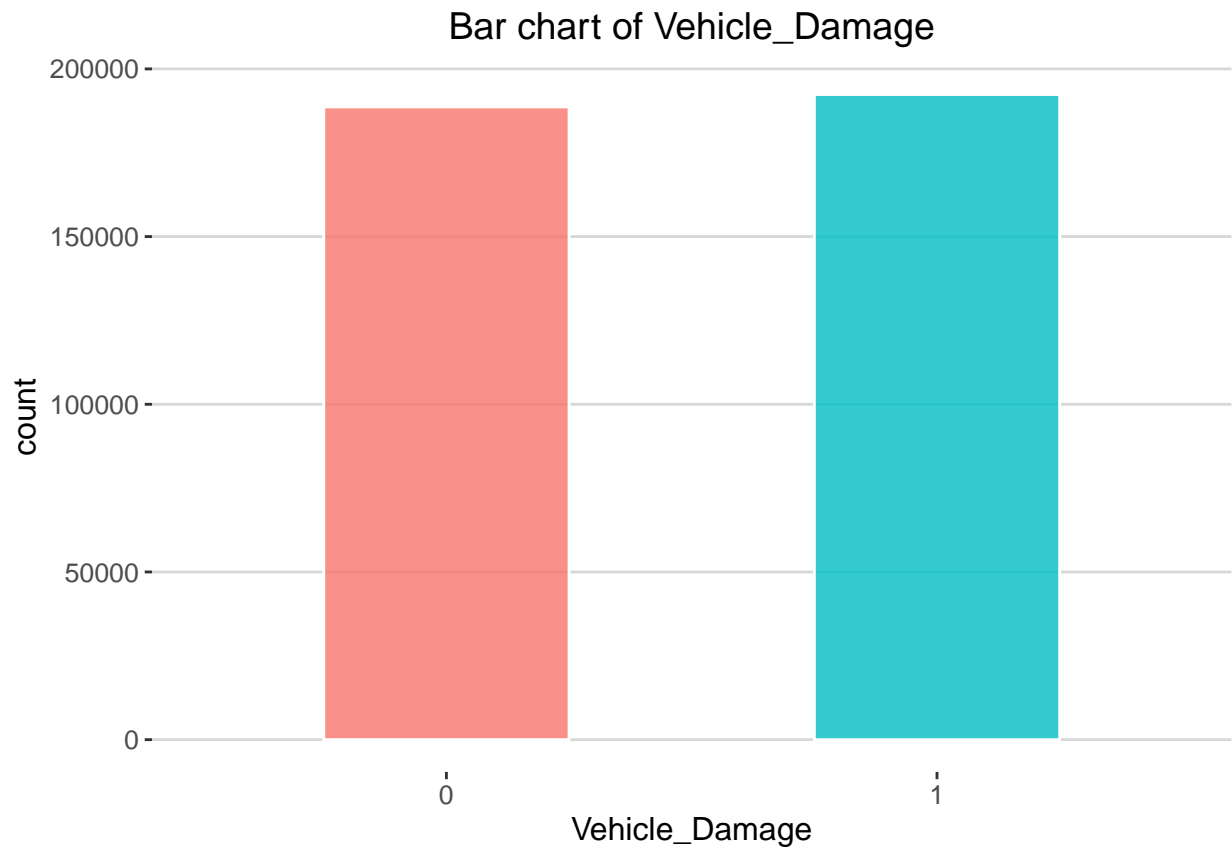
Bar chart of Previously_Insured



```
# A bar chart showing the count of customers with a vehicle that falls into each of  
## the three vehicle age groups  
ggplot(data = data, aes(factor(Vehicle_Age, ordered = TRUE, levels = c('0', '1', '2')),  
  fill = factor(Vehicle_Age))) +  
  geom_bar(width = 0.5, alpha = 0.8, color = 'white', show.legend = FALSE) +  
  labs(title = 'Bar chart of Vehicle_Age', x = 'Vehicle_Age') +  
  theme(plot.title = element_text(hjust = 0.5)) +  
  theme_hc()
```

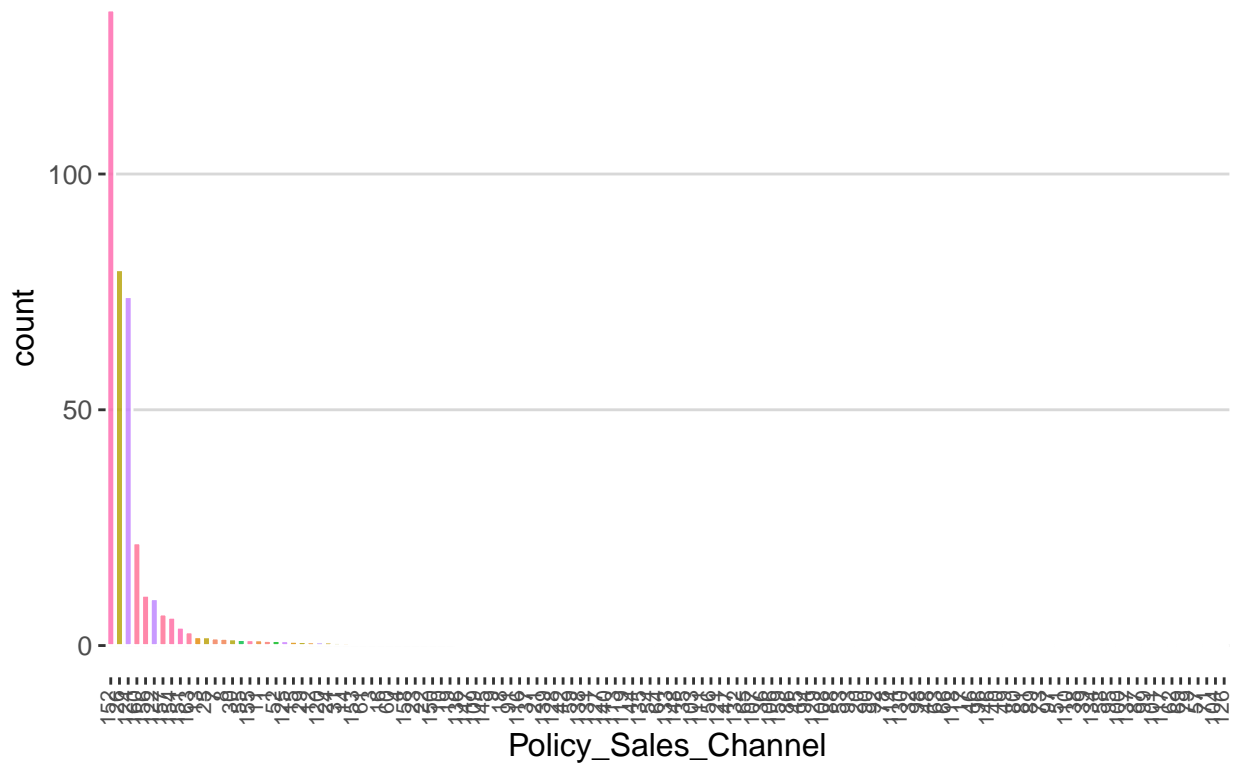


```
# A bar chart showing the number of customers with and without their vehicle been damaged  
ggplot(data = data, aes(Vehicle_Damage, fill = Vehicle_Damage)) +  
  geom_bar(width = 0.5, alpha = 0.8, color = 'white', show.legend = FALSE) +  
  labs(title = 'Bar chart of Vehicle_Damage') +  
  theme(plot.title = element_text(hjust = 0.5)) +  
  theme_hc()
```



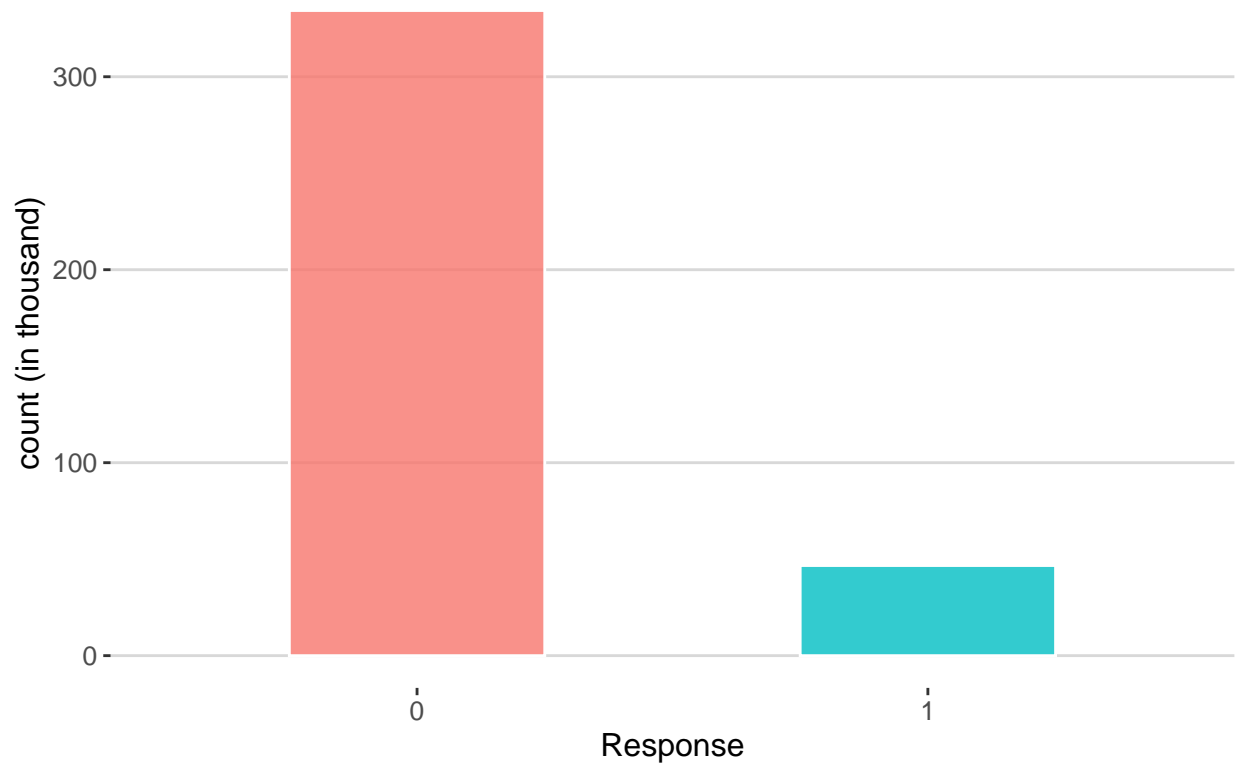
```
# A bar chart showing the number of customers within each policy sales channel
data %>% ggplot(aes(x = reorder(factor(Policy_Sales_Channel),
  Policy_Sales_Channel, function(x) -length(x)),
  fill = factor(Policy_Sales_Channel))) +
  geom_bar(alpha = 0.8, color = 'white', show.legend = FALSE) +
  labs(title = 'Bar chart of Policy_Sales_Channel (High to low in thousand)',
    x = 'Policy_Sales_Channel') +
  theme(axis.text.x = element_text(hjust = 1, angle = 90, vjust = 0.3, size = 7.5)) +
  scale_y_continuous(labels = function(y) {y/10^3}) +
  theme_hc()
```

Bar chart of Policy_Sales_Channel (High to low in thousand)

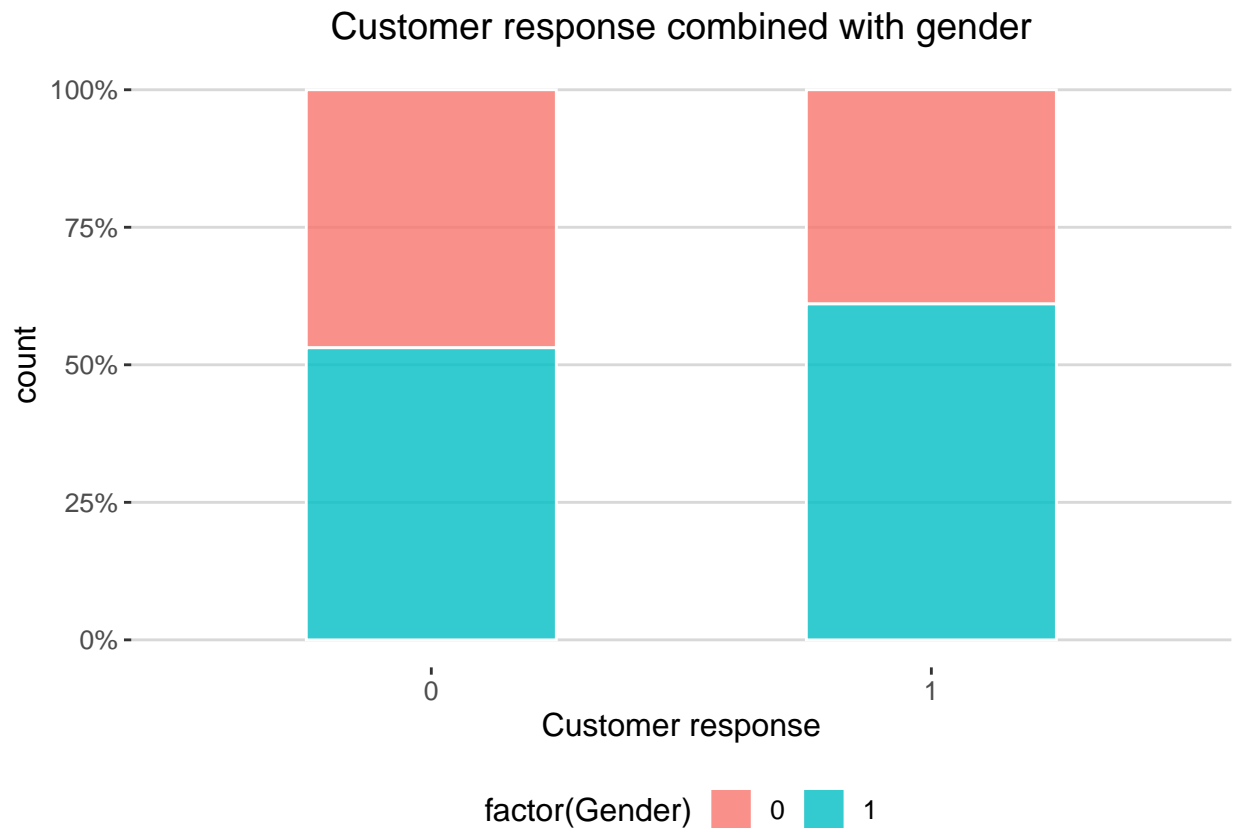


```
# A bar chart showing the count of customers' response
ggplot(data = data, aes(factor(Response), fill = factor(Response))) +
  geom_bar(stat = 'count', width = 0.5, alpha = 0.8, color = 'white', show.legend = FALSE) +
  labs(title = 'Bar chart of customer response', x = 'Response', y = 'count (in thousand)') +
  scale_y_continuous(labels = function(y) {y / 1000}) +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```

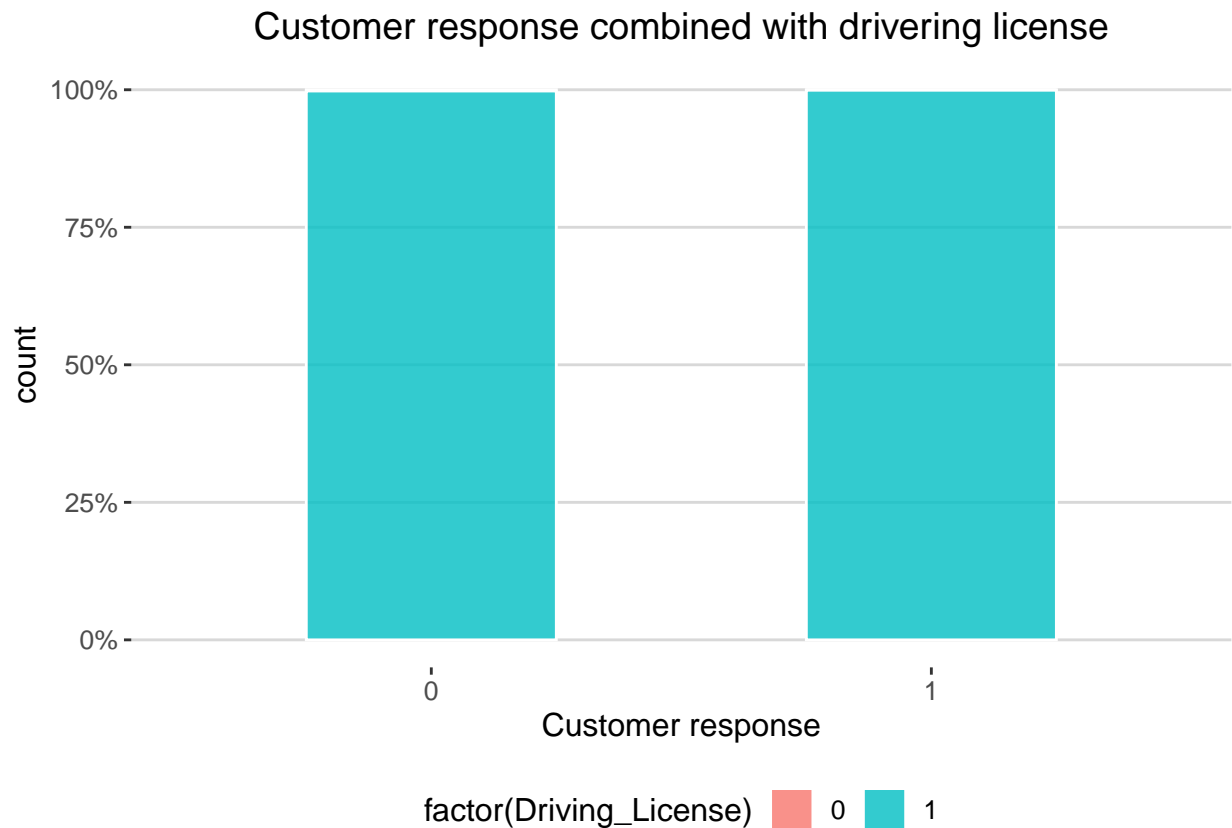
Bar chart of customer response



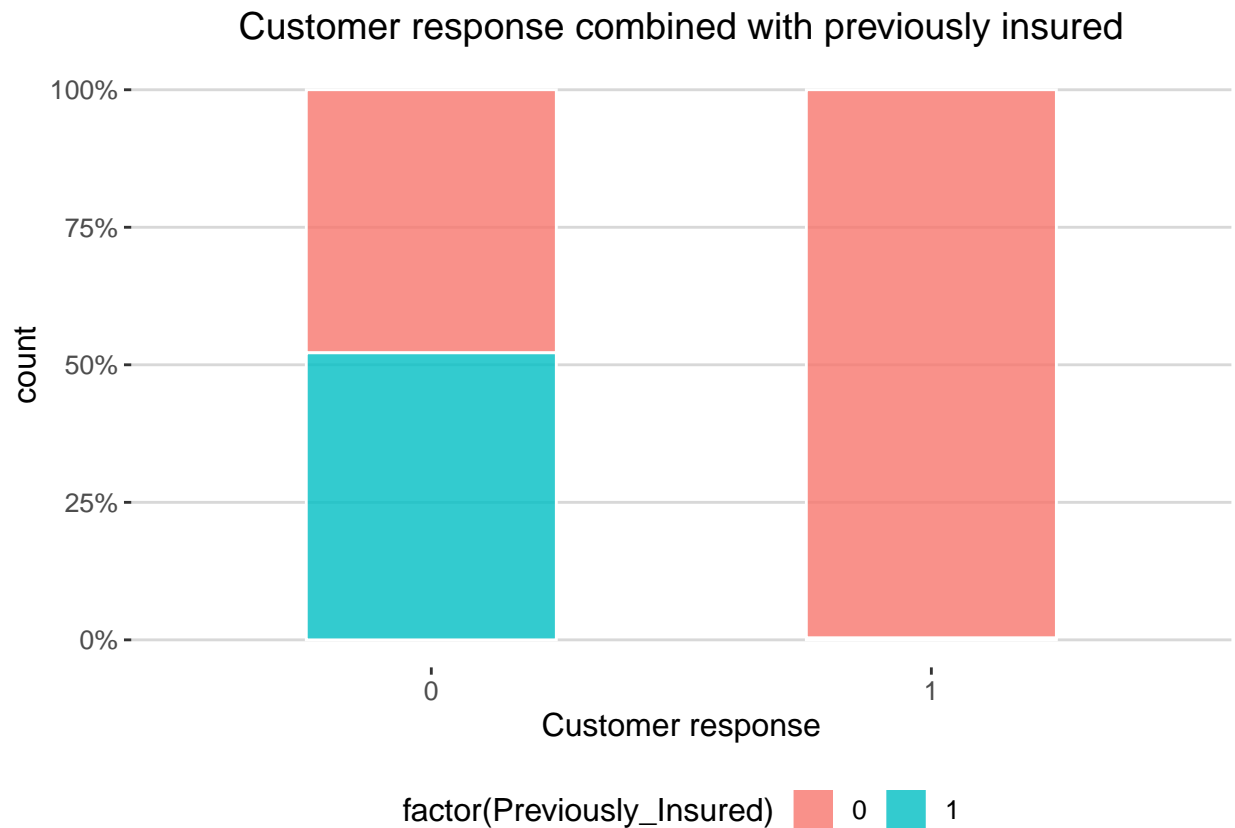
```
# A stacked bar chart showing, within each customer response group, what percentage  
## of customers is male and female  
ggplot(data, aes(factor(Response), fill = factor(Gender))) +  
  geom_bar(width = 0.5, alpha = 0.8, position = 'fill', color = 'white') +  
  scale_y_continuous(labels = scales::percent) +  
  labs(x = 'Customer response', title = 'Customer response combined with gender') +  
  theme(plot.title = element_text(hjust = 0.5)) +  
  theme_hc()
```



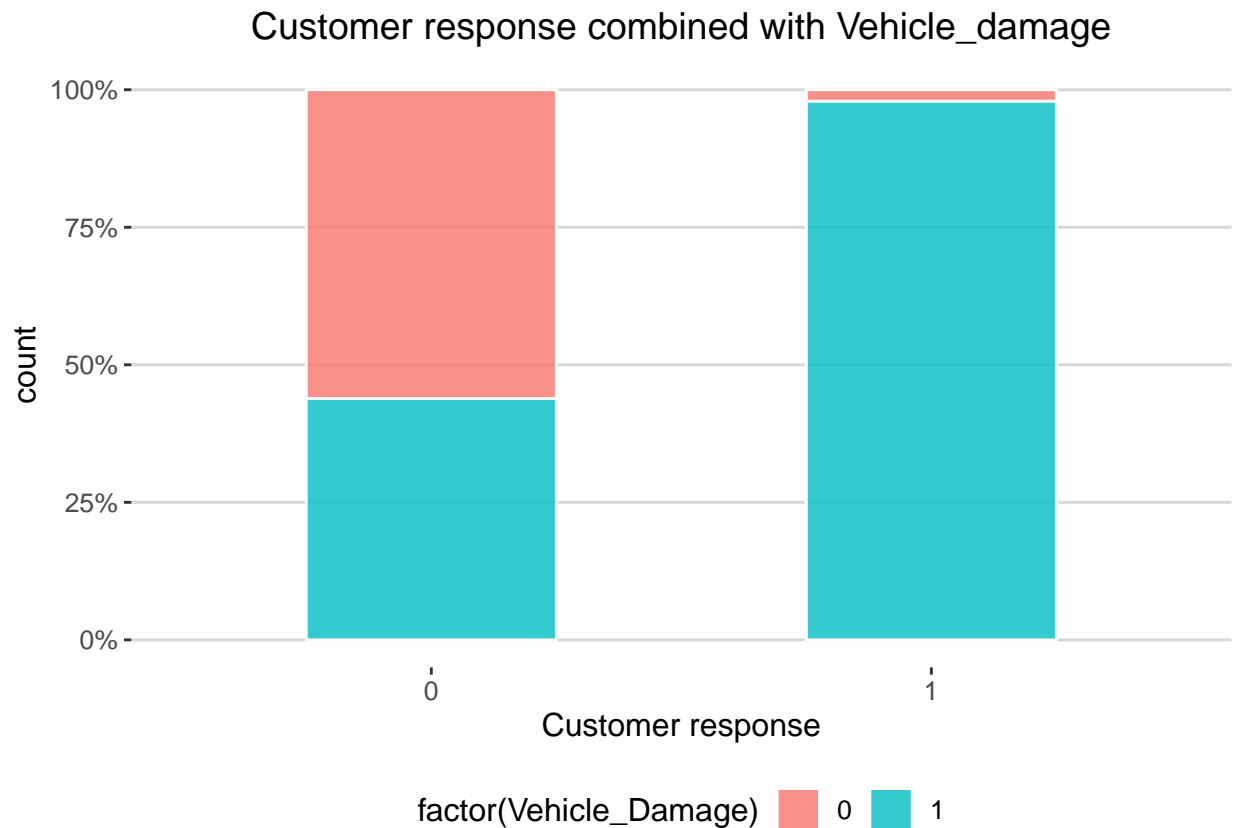
```
# A stacked bar chart showing, within each customer response group, what percentage
## of customers have or do not have a driver's license. Since most customers have a
## driver's license, the pink part is invisible
ggplot(data, aes(x = factor(Response), fill = factor(Driving_License))) +
  geom_bar(width = 0.5, alpha = 0.8, position = 'fill', color = 'white') +
  scale_y_continuous(labels = scales::percent) +
  labs(x = 'Customer response',
       title = 'Customer response combined with driving license') +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```



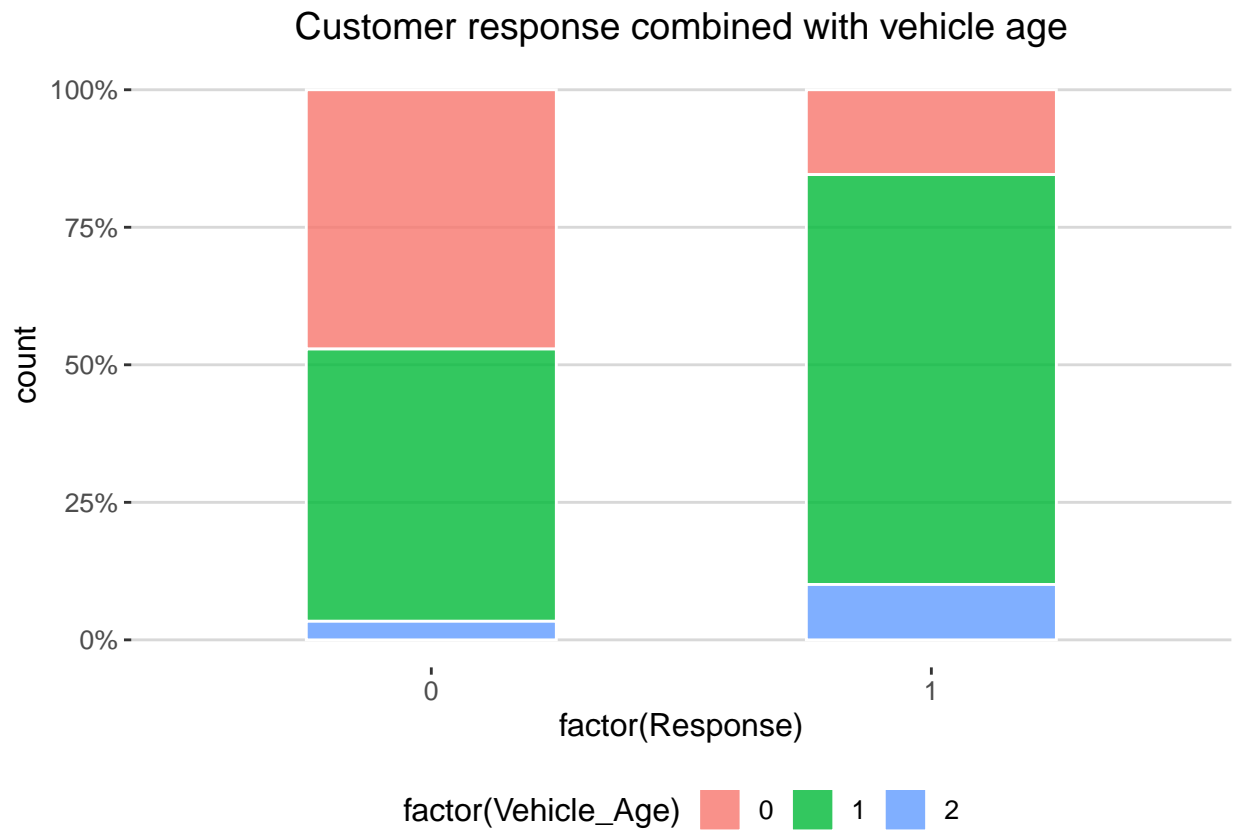
```
# A stacked bar chart showing, within each customer response group, what percentage of
## customers are previously insured
ggplot(data = data, aes(factor(Response), fill = factor(Previously_Insured))) +
  geom_bar(width = 0.5, alpha = 0.8, position = 'fill', color = 'white') +
  scale_y_continuous(labels = scales::percent) +
  labs(x='Customer response', title = 'Customer response combined with previously insured') +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```

```
# A stacked bar chart showing, within each customer response group, what percentage of
## customers have their vehicle damaged before
ggplot(data, aes(x = factor(Response), fill = factor(Vehicle_Damage))) +
  geom_bar(width = 0.5, alpha = 0.8, position = 'fill', color = 'white') +
  scale_y_continuous(labels = scales::percent) +
  labs(x = 'Customer response', title =
    'Customer response combined with Vehicle_damage') +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```



```
# A stacked bar chart showing, within each customer response group, what percentage of
## customers have a vehicle with an age below one year, from one to two years, and over
## two years respectively
ggplot(data, aes(x = factor(Response), fill = factor(Vehicle_Age))) +
  geom_bar(width = 0.5, alpha = 0.8, position = 'fill', color = 'white') +
  scale_y_continuous(labels = scales::percent) +
  labs(title = 'Customer response combined with vehicle age') +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```



```
# A density plot showing how customers' ages are distributed within each response
## group
ggplot(data, aes(x = Age, fill = factor(Response))) +
  geom_density(alpha = 0.8) +
  labs(title = 'Customer response by age') +
  scale_y_continuous(labels = scales::percent) +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```

Customer response by age



```
# A histogram showing how customers' annual premiums are distributed within each
## response group
ggplot(data, aes(x = Annual_Premium, fill = factor(Response))) +
  geom_histogram(alpha = 0.8, color = 'black') +
  geom_density() +
  labs(title = 'Customer response by annual premium paid (0 - 100K)',
       x = 'Annual_Premium (in thousand)') +
  scale_x_continuous(labels = function(x) {x / 1000}) +
  theme(plot.title = element_text(hjust = 0.5)) +
  xlim(0, 100000) +
  theme_hc()
```

```
## Scale for 'x' is already present. Adding another scale for 'x', which will
## replace the existing scale.
```

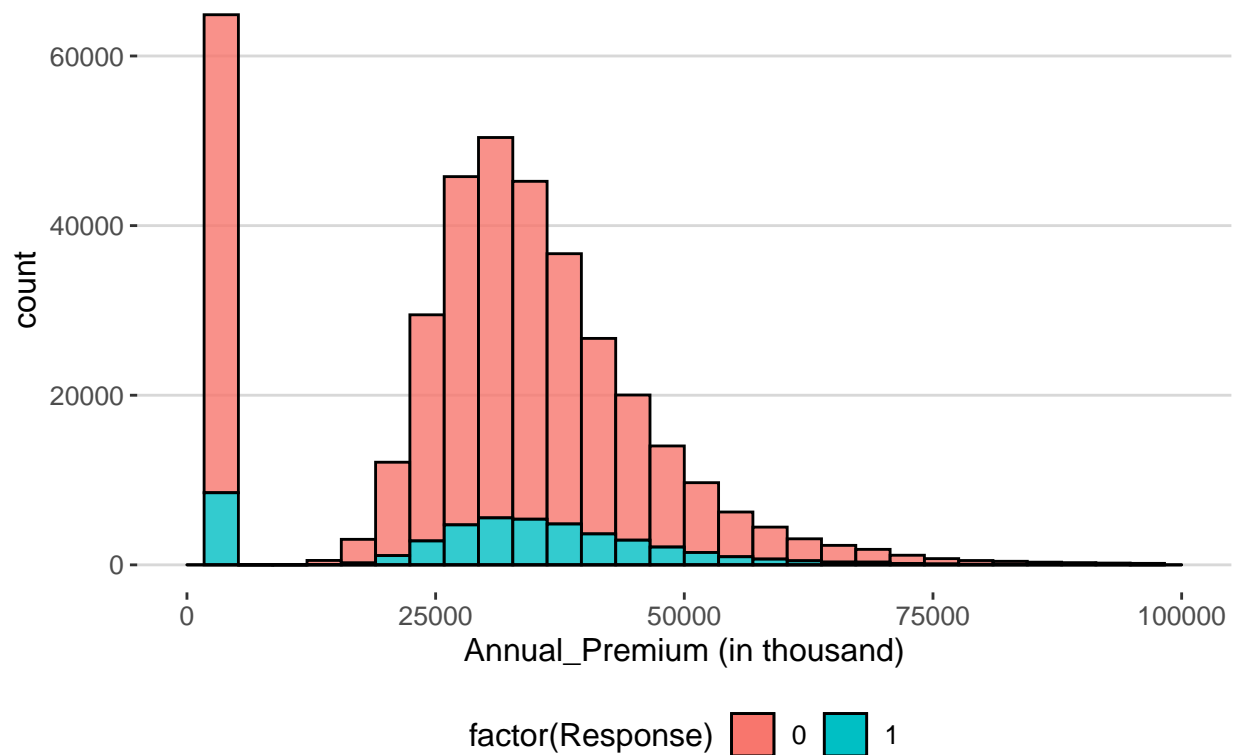
```
## 'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.
```

```
## Warning: Removed 777 rows containing non-finite values (stat_bin).
```

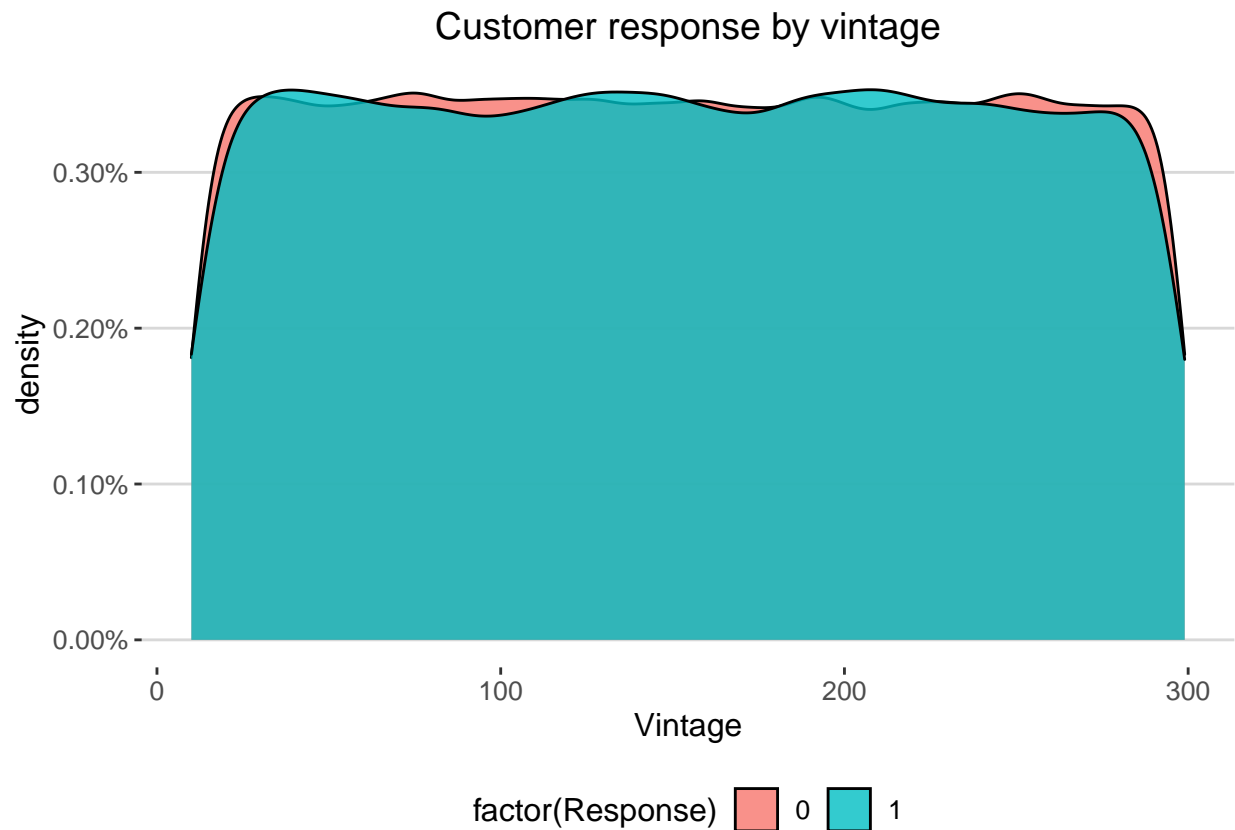
```
## Warning: Removed 777 rows containing non-finite values (stat_density).
```

```
## Warning: Removed 4 rows containing missing values (geom_bar).
```

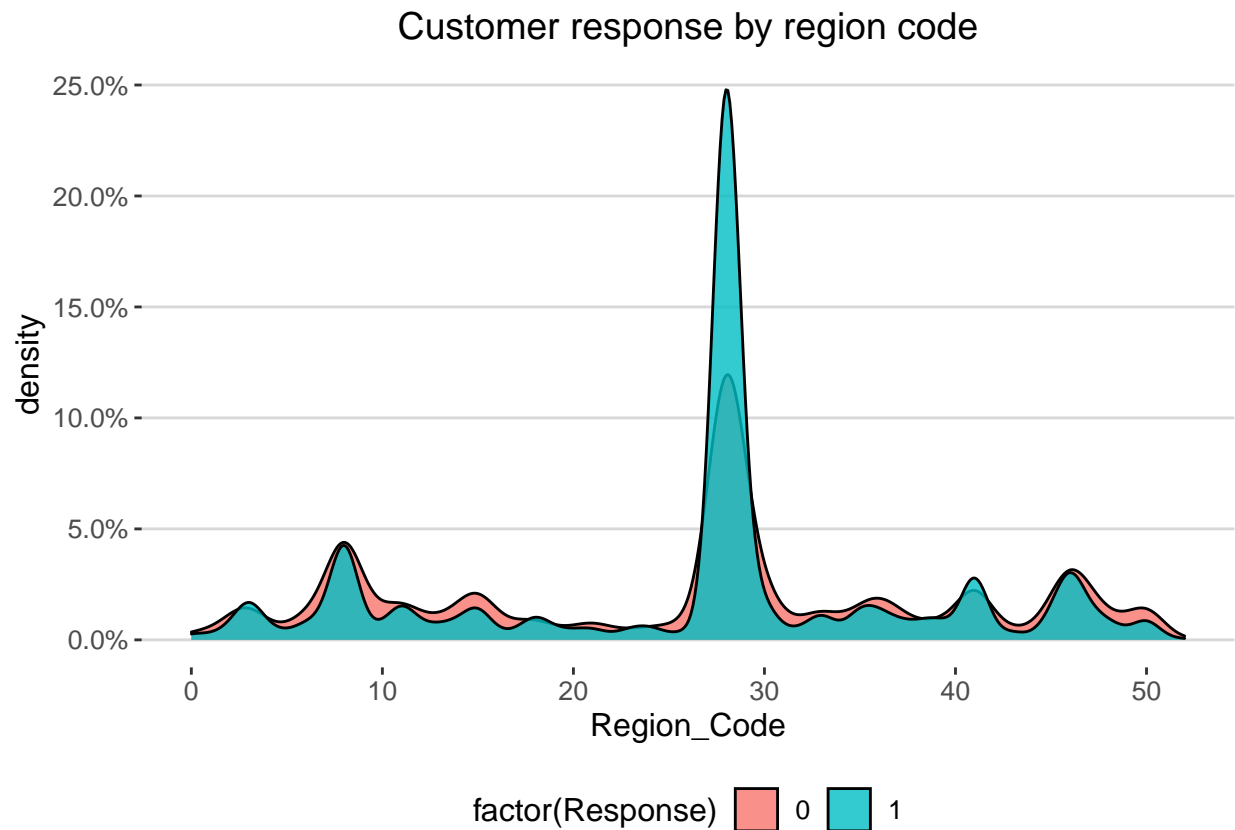
Customer response by annual premium paid (0 – 100K)



```
# A density plot showing how customers' vintages are distributed within each response
## group
ggplot(data, aes(Vintage, fill = factor(Response))) +
  geom_density(alpha = 0.8) +
  scale_y_continuous(labels = scales::percent) +
  labs(title = 'Customer response by vintage') +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```

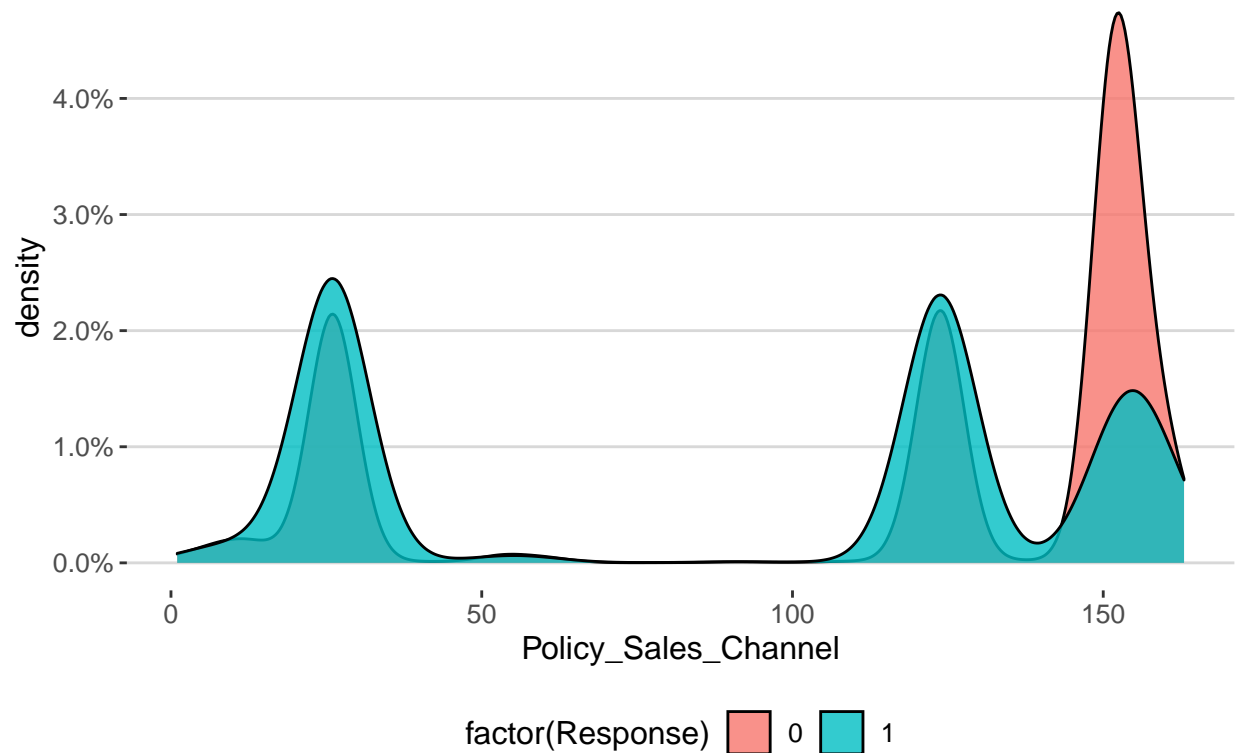


```
# A density plot showing how customers of different response group are distributed
## within the country
ggplot(data, aes(x = Region_Code, fill = factor(Response))) +
  geom_density(alpha = 0.8) +
  scale_y_continuous(labels = scales::percent) +
  labs(title = 'Customer response by region code') +
  theme(plot.title = element_text(hjust = 0.5)) +
  theme_hc()
```



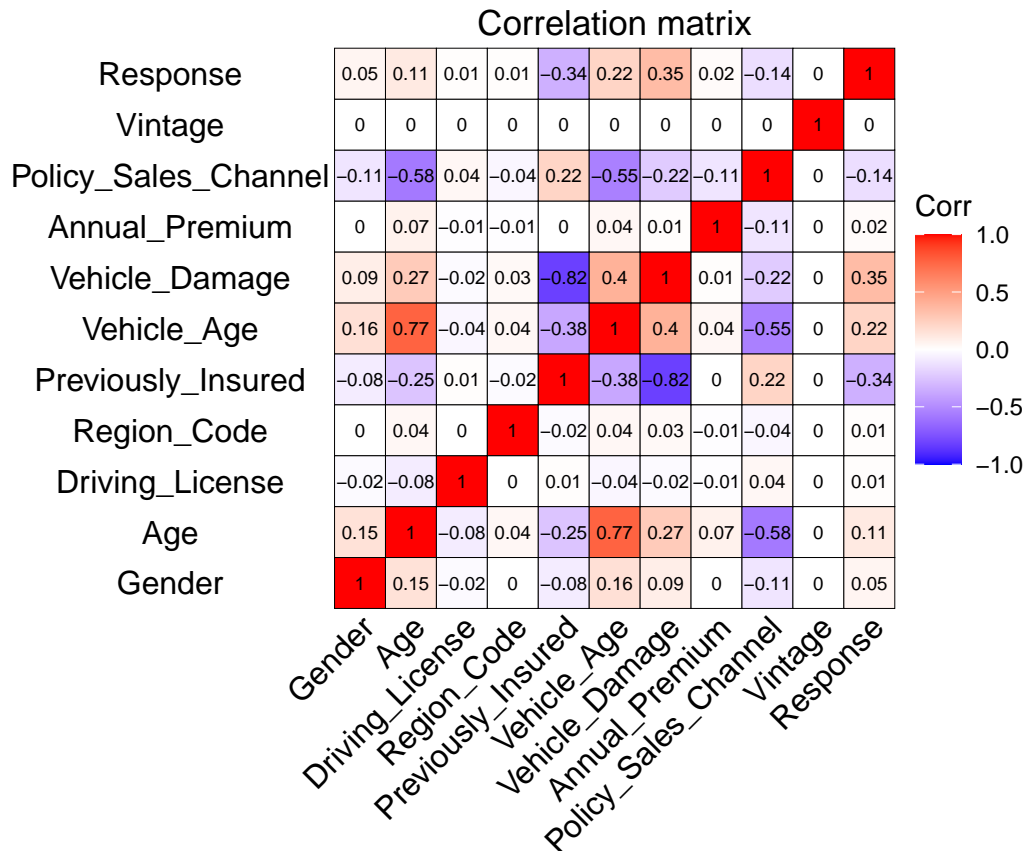
```
# A density plot showing how customers within each response group are distributed  
## among different policy sales channel  
ggplot(data, aes(x = Policy_Sales_Channel, fill = factor(Response))) +  
  geom_density(alpha = 0.8) +  
  scale_y_continuous(labels = scales::percent) +  
  labs(title = 'Customer response by policy sales channel') +  
  theme(plot.title = element_text(hjust = 0.5)) +  
  theme_hc()
```

Customer response by policy sales channel



```
# A correlation matrix showing the correlation between each pair of the variables
data_matrix = data
for (i in 1:ncol(data_matrix)) {
  data_matrix[, i] = as.numeric(data_matrix[, i])
}

ggcorrplot(cor(data_matrix), method = 'square', type = 'full', lab = TRUE,
  ggtheme = theme_void, lab_size = 2.5, outline.color = 'black',
  color = c('blue', 'white', 'red'), title = 'Correlation matrix') +
  theme(plot.title = element_text(hjust = 0.5))
```

- Logistic Regression Model -

```
# Build a logistic regression model based on previous analysis
options(max.print=1000000)
glm1 = glm(Response ~ Gender +
  Age * Vehicle_Age +
  factor(Driving_License) +
  factor(Region_Code) +
  factor(Vehicle_Damage) * factor(Previously_Insured) +
  Annual_Premium +
  factor(Policy_Sales_Channel) * Age,
  data = data,
  family = "binomial")
```

```
## Warning: glm.fit: fitted probabilities numerically 0 or 1 occurred
```

```
summary(glm1)
```

```
##
## Call:
## glm(formula = Response ~ Gender + Age * Vehicle_Age + factor(Driving_License) +
##   factor(Region_Code) + factor(Vehicle_Damage) * factor(Previously_Insured) +
##   Annual_Premium + factor(Policy_Sales_Channel) * Age, family = "binomial",
##   data = data)
##
```

```

## Deviance Residuals:
##      Min        1Q      Median        3Q        Max
## -2.9177   -0.6060   -0.0393   -0.0231    4.3458
##
## Coefficients:
##                                     Estimate Std. Error
## (Intercept)                       -5.732e+00  6.238e-01
## Gender1                            6.477e-02  1.137e-02
## Age                               5.182e-03  1.401e-02
## Vehicle_Age1                      4.044e+00  1.251e-01
## Vehicle_Age2                      4.114e+00  1.521e-01
## factor(Driving_License)1          1.129e+00  1.642e-01
## factor(Region_Code)1              2.317e-01  1.350e-01
## factor(Region_Code)2              5.768e-01  1.070e-01
## factor(Region_Code)3              9.322e-01  9.051e-02
## factor(Region_Code)4              8.792e-01  1.100e-01
## factor(Region_Code)5              7.723e-01  1.267e-01
## factor(Region_Code)6              9.327e-01  1.010e-01
## factor(Region_Code)7              7.023e-01  1.007e-01
## factor(Region_Code)8              5.882e-01  8.614e-02
## factor(Region_Code)9              4.127e-01  1.094e-01
## factor(Region_Code)10             7.024e-01  1.095e-01
## factor(Region_Code)11             1.122e+00  9.204e-02
## factor(Region_Code)12             7.491e-01  1.068e-01
## factor(Region_Code)13             7.025e-01  1.031e-01
## factor(Region_Code)14             8.107e-01  1.015e-01
## factor(Region_Code)15             5.772e-01  9.156e-02
## factor(Region_Code)16             6.055e-01  1.280e-01
## factor(Region_Code)17             4.763e-01  1.181e-01
## factor(Region_Code)18             1.022e+00  9.607e-02
## factor(Region_Code)19             7.321e-01  1.121e-01
## factor(Region_Code)20             3.424e-01  1.123e-01
## factor(Region_Code)21             8.537e-01  1.076e-01
## factor(Region_Code)22             3.529e-01  1.479e-01
## factor(Region_Code)23             8.905e-01  1.091e-01
## factor(Region_Code)24             7.841e-01  1.062e-01
## factor(Region_Code)25             2.454e-01  1.348e-01
## factor(Region_Code)26             3.158e-01  1.184e-01
## factor(Region_Code)27             6.007e-01  1.138e-01
## factor(Region_Code)28             8.243e-01  8.409e-02
## factor(Region_Code)29             1.064e+00  9.002e-02
## factor(Region_Code)30             9.258e-01  9.258e-02
## factor(Region_Code)31             3.846e-01  1.180e-01
## factor(Region_Code)32             8.275e-01  1.120e-01
## factor(Region_Code)33             7.087e-01  9.383e-02
## factor(Region_Code)34             4.183e-01  1.295e-01
## factor(Region_Code)35             1.032e+00  9.384e-02
## factor(Region_Code)36             6.624e-01  9.407e-02
## factor(Region_Code)37             6.439e-01  9.980e-02
## factor(Region_Code)38             9.213e-01  1.037e-01
## factor(Region_Code)39             6.133e-01  9.661e-02
## factor(Region_Code)40             6.206e-01  1.247e-01
## factor(Region_Code)41             1.009e+00  8.775e-02
## factor(Region_Code)42             3.331e-01  1.871e-01

```

## factor(Region_Code)43	4.414e-01	1.105e-01
## factor(Region_Code)44	1.112e-01	2.099e-01
## factor(Region_Code)45	7.820e-01	9.607e-02
## factor(Region_Code)46	7.354e-01	8.755e-02
## factor(Region_Code)47	5.296e-01	9.505e-02
## factor(Region_Code)48	2.204e-01	9.907e-02
## factor(Region_Code)49	4.494e-01	1.265e-01
## factor(Region_Code)50	3.396e-01	9.595e-02
## factor(Region_Code)51	8.009e-01	2.401e-01
## factor(Region_Code)52	6.866e-01	2.209e-01
## factor(Vehicle_Damage)1	1.925e+00	3.497e-02
## factor(Previously_Insured)1	-4.346e+00	1.230e-01
## Annual_Premium	1.383e-06	3.433e-07
## factor(Policy_Sales_Channel)3	-1.455e+00	8.034e-01
## factor(Policy_Sales_Channel)4	-3.064e+00	8.938e-01
## factor(Policy_Sales_Channel)7	-9.621e-01	7.293e-01
## factor(Policy_Sales_Channel)8	-2.519e+00	7.518e-01
## factor(Policy_Sales_Channel)9	-7.756e-01	1.621e+00
## factor(Policy_Sales_Channel)10	-1.588e+00	1.057e+00
## factor(Policy_Sales_Channel)11	-1.431e+00	8.001e-01
## factor(Policy_Sales_Channel)12	-8.476e-01	7.862e-01
## factor(Policy_Sales_Channel)13	-2.299e+00	6.847e-01
## factor(Policy_Sales_Channel)14	-1.765e+00	8.843e-01
## factor(Policy_Sales_Channel)15	-2.636e+00	8.368e-01
## factor(Policy_Sales_Channel)16	-1.465e+00	9.358e-01
## factor(Policy_Sales_Channel)17	7.760e-01	3.732e+00
## factor(Policy_Sales_Channel)18	-2.394e+00	2.173e+00
## factor(Policy_Sales_Channel)19	-1.589e+00	1.503e+00
## factor(Policy_Sales_Channel)20	1.035e+00	3.821e+00
## factor(Policy_Sales_Channel)21	-7.839e-01	1.771e+00
## factor(Policy_Sales_Channel)22	-3.147e+00	1.224e+00
## factor(Policy_Sales_Channel)23	-7.062e-01	9.009e-01
## factor(Policy_Sales_Channel)24	-1.617e+00	7.779e-01
## factor(Policy_Sales_Channel)25	-1.977e+00	6.928e-01
## factor(Policy_Sales_Channel)26	-1.692e+00	6.090e-01
## factor(Policy_Sales_Channel)29	-2.543e+00	8.128e-01
## factor(Policy_Sales_Channel)30	-1.362e+00	7.530e-01
## factor(Policy_Sales_Channel)31	-1.491e+00	7.723e-01
## factor(Policy_Sales_Channel)32	8.726e+00	8.430e+00
## factor(Policy_Sales_Channel)35	-6.027e-01	2.474e+00
## factor(Policy_Sales_Channel)36	1.051e+00	1.421e+00
## factor(Policy_Sales_Channel)37	-1.911e+00	1.430e+00
## factor(Policy_Sales_Channel)38	-2.432e+01	5.006e+03
## factor(Policy_Sales_Channel)39	4.924e-01	8.430e+00
## factor(Policy_Sales_Channel)40	2.455e+00	5.181e+00
## factor(Policy_Sales_Channel)42	-1.092e+00	1.307e+00
## factor(Policy_Sales_Channel)44	-3.259e+00	1.361e+00
## factor(Policy_Sales_Channel)45	-4.524e+00	2.414e+00
## factor(Policy_Sales_Channel)46	-2.152e+01	7.374e+03
## factor(Policy_Sales_Channel)47	-2.745e+00	2.216e+00
## factor(Policy_Sales_Channel)48	-5.886e+00	6.947e+00
## factor(Policy_Sales_Channel)49	1.858e+01	1.840e+01
## factor(Policy_Sales_Channel)51	1.393e+02	4.976e+03
## factor(Policy_Sales_Channel)52	-2.027e+00	7.772e-01

## factor(Policy_Sales_Channel)53	-4.157e+00	2.754e+00
## factor(Policy_Sales_Channel)54	-1.347e+00	1.627e+00
## factor(Policy_Sales_Channel)55	-1.528e+00	7.245e-01
## factor(Policy_Sales_Channel)56	-1.475e+00	2.002e+00
## factor(Policy_Sales_Channel)57	-1.631e+01	1.845e+01
## factor(Policy_Sales_Channel)58	-1.411e+03	1.357e+04
## factor(Policy_Sales_Channel)59	-1.595e+00	1.363e+00
## factor(Policy_Sales_Channel)60	-1.729e+00	9.809e-01
## factor(Policy_Sales_Channel)61	-7.566e-01	9.784e-01
## factor(Policy_Sales_Channel)62	1.451e+02	9.556e+03
## factor(Policy_Sales_Channel)63	9.351e+00	1.110e+01
## factor(Policy_Sales_Channel)64	-3.147e+00	3.180e+00
## factor(Policy_Sales_Channel)65	4.661e+00	5.007e+00
## factor(Policy_Sales_Channel)66	-1.823e+01	9.802e+00
## factor(Policy_Sales_Channel)69	-2.557e+01	1.383e+01
## factor(Policy_Sales_Channel)71	-1.933e+01	1.179e+04
## factor(Policy_Sales_Channel)73	6.207e+00	1.197e+01
## factor(Policy_Sales_Channel)78	-1.520e+00	2.902e+00
## factor(Policy_Sales_Channel)79	-9.784e+00	3.450e+04
## factor(Policy_Sales_Channel)80	-5.228e+00	4.615e+00
## factor(Policy_Sales_Channel)81	-4.349e-01	6.541e+00
## factor(Policy_Sales_Channel)86	1.213e+00	3.840e+00
## factor(Policy_Sales_Channel)87	-4.243e+00	4.891e+00
## factor(Policy_Sales_Channel)88	-2.185e+00	5.238e+00
## factor(Policy_Sales_Channel)89	-4.715e+00	3.617e+00
## factor(Policy_Sales_Channel)90	1.483e+00	3.676e+00
## factor(Policy_Sales_Channel)91	6.401e-02	1.505e+00
## factor(Policy_Sales_Channel)92	1.753e+00	5.701e+00
## factor(Policy_Sales_Channel)93	2.214e-01	5.486e+00
## factor(Policy_Sales_Channel)94	-5.277e-01	2.303e+00
## factor(Policy_Sales_Channel)95	-1.954e+01	5.037e+03
## factor(Policy_Sales_Channel)96	-2.000e+01	4.692e+03
## factor(Policy_Sales_Channel)97	2.128e+00	7.700e+00
## factor(Policy_Sales_Channel)98	7.027e+00	1.126e+01
## factor(Policy_Sales_Channel)99	-2.389e+01	1.224e+04
## factor(Policy_Sales_Channel)100	-1.567e+01	1.434e+01
## factor(Policy_Sales_Channel)101	2.893e+00	1.379e+01
## factor(Policy_Sales_Channel)103	-5.069e-01	2.506e+00
## factor(Policy_Sales_Channel)104	-2.179e+01	1.561e+04
## factor(Policy_Sales_Channel)106	-3.588e-01	1.899e+00
## factor(Policy_Sales_Channel)107	3.822e+00	7.746e+00
## factor(Policy_Sales_Channel)108	8.605e+00	3.229e+01
## factor(Policy_Sales_Channel)109	-2.586e+00	1.464e+00
## factor(Policy_Sales_Channel)110	5.532e+02	5.759e+03
## factor(Policy_Sales_Channel)111	3.127e+00	3.168e+00
## factor(Policy_Sales_Channel)113	-3.103e-01	2.747e+00
## factor(Policy_Sales_Channel)114	-5.025e+00	3.475e+00
## factor(Policy_Sales_Channel)116	-2.149e+00	1.853e+00
## factor(Policy_Sales_Channel)117	-1.320e+01	5.382e+03
## factor(Policy_Sales_Channel)118	-1.725e+01	4.309e+03
## factor(Policy_Sales_Channel)119	-6.826e+00	3.340e+00
## factor(Policy_Sales_Channel)120	-1.053e+00	9.085e-01
## factor(Policy_Sales_Channel)121	9.560e-01	2.010e+00
## factor(Policy_Sales_Channel)122	-1.875e+00	6.175e-01

## factor(Policy_Sales_Channel)124	-1.601e+00	6.096e-01
## factor(Policy_Sales_Channel)125	-9.511e-01	7.722e-01
## factor(Policy_Sales_Channel)126	-2.094e+01	2.515e+04
## factor(Policy_Sales_Channel)127	-1.878e-02	1.979e+00
## factor(Policy_Sales_Channel)128	2.541e+00	2.026e+00
## factor(Policy_Sales_Channel)129	-2.516e+00	2.482e+00
## factor(Policy_Sales_Channel)130	4.762e+02	2.740e+03
## factor(Policy_Sales_Channel)131	-2.376e+00	1.335e+00
## factor(Policy_Sales_Channel)132	-2.911e+00	2.476e+00
## factor(Policy_Sales_Channel)133	-5.583e+00	2.761e+00
## factor(Policy_Sales_Channel)134	-1.769e+01	5.229e+03
## factor(Policy_Sales_Channel)135	-1.863e+00	1.574e+00
## factor(Policy_Sales_Channel)136	-2.160e+00	9.753e-01
## factor(Policy_Sales_Channel)137	-3.341e+01	1.701e+04
## factor(Policy_Sales_Channel)138	-1.470e+00	1.866e+00
## factor(Policy_Sales_Channel)139	-3.506e+00	1.379e+00
## factor(Policy_Sales_Channel)140	-1.872e+00	1.929e+00
## factor(Policy_Sales_Channel)145	-2.783e+00	1.250e+00
## factor(Policy_Sales_Channel)146	-1.863e+01	3.166e+03
## factor(Policy_Sales_Channel)147	-1.230e+00	9.822e-01
## factor(Policy_Sales_Channel)148	-1.534e+00	1.866e+00
## factor(Policy_Sales_Channel)150	-1.570e+00	8.594e-01
## factor(Policy_Sales_Channel)151	-2.801e+00	7.953e-01
## factor(Policy_Sales_Channel)152	-2.074e+00	6.050e-01
## factor(Policy_Sales_Channel)153	-6.165e-01	1.157e+00
## factor(Policy_Sales_Channel)154	-2.080e+00	6.184e-01
## factor(Policy_Sales_Channel)155	-1.600e+00	6.528e-01
## factor(Policy_Sales_Channel)156	-2.516e+00	6.130e-01
## factor(Policy_Sales_Channel)157	-2.210e+00	6.165e-01
## factor(Policy_Sales_Channel)158	-2.165e+00	6.820e-01
## factor(Policy_Sales_Channel)159	1.561e+00	1.210e+01
## factor(Policy_Sales_Channel)160	-2.940e+00	6.254e-01
## factor(Policy_Sales_Channel)163	-2.159e+00	6.222e-01
## Age:Vehicle_Age1	-1.316e-01	4.233e-03
## Age:Vehicle_Age2	-1.286e-01	4.510e-03
## factor(Vehicle_Damage)1:factor(Previously_Insured)1	8.551e-01	1.642e-01
## Age:factor(Policy_Sales_Channel)3	1.004e-01	1.722e-02
## Age:factor(Policy_Sales_Channel)4	1.261e-01	1.973e-02
## Age:factor(Policy_Sales_Channel)7	8.108e-02	1.660e-02
## Age:factor(Policy_Sales_Channel)8	1.074e-01	1.688e-02
## Age:factor(Policy_Sales_Channel)9	7.551e-02	3.266e-02
## Age:factor(Policy_Sales_Channel)10	9.036e-02	2.203e-02
## Age:factor(Policy_Sales_Channel)11	7.943e-02	1.795e-02
## Age:factor(Policy_Sales_Channel)12	7.375e-02	1.776e-02
## Age:factor(Policy_Sales_Channel)13	1.023e-01	1.580e-02
## Age:factor(Policy_Sales_Channel)14	9.333e-02	1.950e-02
## Age:factor(Policy_Sales_Channel)15	1.136e-01	1.803e-02
## Age:factor(Policy_Sales_Channel)16	8.474e-02	2.040e-02
## Age:factor(Policy_Sales_Channel)17	5.672e-02	7.488e-02
## Age:factor(Policy_Sales_Channel)18	9.166e-02	4.444e-02
## Age:factor(Policy_Sales_Channel)19	8.460e-02	3.260e-02
## Age:factor(Policy_Sales_Channel)20	3.802e-02	8.182e-02
## Age:factor(Policy_Sales_Channel)21	6.805e-02	3.782e-02
## Age:factor(Policy_Sales_Channel)22	1.115e-01	2.541e-02

## Age:factor(Policy_Sales_Channel)23	7.073e-02	2.030e-02
## Age:factor(Policy_Sales_Channel)24	8.967e-02	1.750e-02
## Age:factor(Policy_Sales_Channel)25	1.054e-01	1.583e-02
## Age:factor(Policy_Sales_Channel)26	9.890e-02	1.463e-02
## Age:factor(Policy_Sales_Channel)29	1.087e-01	1.836e-02
## Age:factor(Policy_Sales_Channel)30	8.594e-02	1.677e-02
## Age:factor(Policy_Sales_Channel)31	9.513e-02	1.790e-02
## Age:factor(Policy_Sales_Channel)32	-1.332e-01	1.876e-01
## Age:factor(Policy_Sales_Channel)35	6.768e-02	5.095e-02
## Age:factor(Policy_Sales_Channel)36	3.921e-02	3.498e-02
## Age:factor(Policy_Sales_Channel)37	8.900e-02	2.843e-02
## Age:factor(Policy_Sales_Channel)38	2.609e-01	9.754e+01
## Age:factor(Policy_Sales_Channel)39	2.961e-02	1.692e-01
## Age:factor(Policy_Sales_Channel)40	-1.939e-02	1.302e-01
## Age:factor(Policy_Sales_Channel)42	8.462e-02	2.722e-02
## Age:factor(Policy_Sales_Channel)44	1.296e-01	2.786e-02
## Age:factor(Policy_Sales_Channel)45	1.425e-01	5.034e-02
## Age:factor(Policy_Sales_Channel)46	1.855e-01	1.492e+02
## Age:factor(Policy_Sales_Channel)47	1.084e-01	4.592e-02
## Age:factor(Policy_Sales_Channel)48	1.516e-01	1.258e-01
## Age:factor(Policy_Sales_Channel)49	-3.265e-01	4.011e-01
## Age:factor(Policy_Sales_Channel)51	-3.504e+00	1.276e+02
## Age:factor(Policy_Sales_Channel)52	9.349e-02	1.750e-02
## Age:factor(Policy_Sales_Channel)53	1.448e-01	5.565e-02
## Age:factor(Policy_Sales_Channel)54	7.952e-02	3.390e-02
## Age:factor(Policy_Sales_Channel)55	8.719e-02	1.656e-02
## Age:factor(Policy_Sales_Channel)56	8.966e-02	4.142e-02
## Age:factor(Policy_Sales_Channel)57	4.368e-01	4.338e-01
## Age:factor(Policy_Sales_Channel)58	2.131e+01	2.043e+02
## Age:factor(Policy_Sales_Channel)59	9.219e-02	2.766e-02
## Age:factor(Policy_Sales_Channel)60	8.668e-02	2.167e-02
## Age:factor(Policy_Sales_Channel)61	6.256e-02	2.190e-02
## Age:factor(Policy_Sales_Channel)62	-3.012e+00	1.975e+02
## Age:factor(Policy_Sales_Channel)63	-1.126e-01	2.153e-01
## Age:factor(Policy_Sales_Channel)64	1.093e-01	6.602e-02
## Age:factor(Policy_Sales_Channel)65	-4.936e-02	1.077e-01
## Age:factor(Policy_Sales_Channel)66	3.844e-01	1.724e-01
## Age:factor(Policy_Sales_Channel)69	5.026e-01	2.123e-01
## Age:factor(Policy_Sales_Channel)71	1.410e-01	2.695e+02
## Age:factor(Policy_Sales_Channel)73	-1.191e-01	2.943e-01
## Age:factor(Policy_Sales_Channel)78	9.510e-02	5.700e-02
## Age:factor(Policy_Sales_Channel)79	-8.848e-02	7.572e+02
## Age:factor(Policy_Sales_Channel)80	1.759e-01	8.891e-02
## Age:factor(Policy_Sales_Channel)81	9.530e-02	1.201e-01
## Age:factor(Policy_Sales_Channel)86	3.295e-02	8.595e-02
## Age:factor(Policy_Sales_Channel)87	1.602e-01	1.066e-01
## Age:factor(Policy_Sales_Channel)88	7.292e-02	1.100e-01
## Age:factor(Policy_Sales_Channel)89	1.484e-01	6.182e-02
## Age:factor(Policy_Sales_Channel)90	4.177e-02	7.782e-02
## Age:factor(Policy_Sales_Channel)91	6.224e-02	3.216e-02
## Age:factor(Policy_Sales_Channel)92	2.412e-02	1.248e-01
## Age:factor(Policy_Sales_Channel)93	4.186e-02	1.155e-01
## Age:factor(Policy_Sales_Channel)94	7.792e-02	4.548e-02
## Age:factor(Policy_Sales_Channel)95	1.461e-01	8.507e+01

## Age:factor(Policy_Sales_Channel)96	1.557e-01	9.023e+01
## Age:factor(Policy_Sales_Channel)97	2.275e-02	1.500e-01
## Age:factor(Policy_Sales_Channel)98	-1.079e-01	2.512e-01
## Age:factor(Policy_Sales_Channel)99	2.405e-01	2.299e+02
## Age:factor(Policy_Sales_Channel)100	3.562e-01	2.549e-01
## Age:factor(Policy_Sales_Channel)101	7.427e-03	2.965e-01
## Age:factor(Policy_Sales_Channel)103	7.077e-02	5.203e-02
## Age:factor(Policy_Sales_Channel)104	1.954e-01	3.285e+02
## Age:factor(Policy_Sales_Channel)106	7.701e-02	3.948e-02
## Age:factor(Policy_Sales_Channel)107	-1.000e-01	2.730e-01
## Age:factor(Policy_Sales_Channel)108	-1.833e-01	8.469e-01
## Age:factor(Policy_Sales_Channel)109	1.025e-01	3.210e-02
## Age:factor(Policy_Sales_Channel)110	-1.422e+01	1.491e+02
## Age:factor(Policy_Sales_Channel)111	-2.515e-02	7.526e-02
## Age:factor(Policy_Sales_Channel)113	5.751e-02	6.029e-02
## Age:factor(Policy_Sales_Channel)114	1.513e-01	6.691e-02
## Age:factor(Policy_Sales_Channel)116	9.761e-02	3.495e-02
## Age:factor(Policy_Sales_Channel)117	1.208e-01	1.057e+02
## Age:factor(Policy_Sales_Channel)118	1.020e-01	7.224e+01
## Age:factor(Policy_Sales_Channel)119	1.765e-01	5.389e-02
## Age:factor(Policy_Sales_Channel)120	7.762e-02	1.989e-02
## Age:factor(Policy_Sales_Channel)121	2.759e-02	6.235e-02
## Age:factor(Policy_Sales_Channel)122	9.676e-02	1.477e-02
## Age:factor(Policy_Sales_Channel)124	9.217e-02	1.465e-02
## Age:factor(Policy_Sales_Channel)125	7.128e-02	1.770e-02
## Age:factor(Policy_Sales_Channel)126	1.848e-01	4.882e+02
## Age:factor(Policy_Sales_Channel)127	4.374e-02	4.328e-02
## Age:factor(Policy_Sales_Channel)128	-7.802e-03	4.693e-02
## Age:factor(Policy_Sales_Channel)129	9.019e-02	5.405e-02
## Age:factor(Policy_Sales_Channel)130	-1.605e+01	9.303e+01
## Age:factor(Policy_Sales_Channel)131	9.611e-02	2.900e-02
## Age:factor(Policy_Sales_Channel)132	1.034e-01	4.801e-02
## Age:factor(Policy_Sales_Channel)133	1.531e-01	4.881e-02
## Age:factor(Policy_Sales_Channel)134	1.158e-01	8.334e+01
## Age:factor(Policy_Sales_Channel)135	8.542e-02	3.317e-02
## Age:factor(Policy_Sales_Channel)136	1.082e-01	2.187e-02
## Age:factor(Policy_Sales_Channel)137	4.520e-01	3.472e+02
## Age:factor(Policy_Sales_Channel)138	8.012e-02	4.122e-02
## Age:factor(Policy_Sales_Channel)139	1.171e-01	2.788e-02
## Age:factor(Policy_Sales_Channel)140	7.997e-02	4.240e-02
## Age:factor(Policy_Sales_Channel)145	1.176e-01	2.506e-02
## Age:factor(Policy_Sales_Channel)146	1.329e-01	5.806e+01
## Age:factor(Policy_Sales_Channel)147	8.417e-02	2.156e-02
## Age:factor(Policy_Sales_Channel)148	8.890e-02	3.738e-02
## Age:factor(Policy_Sales_Channel)150	9.380e-02	1.979e-02
## Age:factor(Policy_Sales_Channel)151	1.008e-01	2.472e-02
## Age:factor(Policy_Sales_Channel)152	7.842e-02	1.458e-02
## Age:factor(Policy_Sales_Channel)153	3.728e-02	3.995e-02
## Age:factor(Policy_Sales_Channel)154	1.040e-01	1.487e-02
## Age:factor(Policy_Sales_Channel)155	1.018e-01	1.559e-02
## Age:factor(Policy_Sales_Channel)156	1.106e-01	1.474e-02
## Age:factor(Policy_Sales_Channel)157	1.087e-01	1.480e-02
## Age:factor(Policy_Sales_Channel)158	1.086e-01	1.611e-02
## Age:factor(Policy_Sales_Channel)159	-1.154e-01	5.730e-01

## Age:factor(Policy_Sales_Channel)160	8.542e-02	1.598e-02	
## Age:factor(Policy_Sales_Channel)163	1.136e-01	1.497e-02	
##	z value	Pr(> z)	
## (Intercept)	-9.189	< 2e-16	***
## Gender1	5.696	1.22e-08	***
## Age	0.370	0.711443	
## Vehicle_Age1	32.315	< 2e-16	***
## Vehicle_Age2	27.053	< 2e-16	***
## factor(Driving_License)1	6.874	6.23e-12	***
## factor(Region_Code)1	1.716	0.086210	.
## factor(Region_Code)2	5.391	7.01e-08	***
## factor(Region_Code)3	10.298	< 2e-16	***
## factor(Region_Code)4	7.991	1.34e-15	***
## factor(Region_Code)5	6.097	1.08e-09	***
## factor(Region_Code)6	9.231	< 2e-16	***
## factor(Region_Code)7	6.973	3.09e-12	***
## factor(Region_Code)8	6.828	8.59e-12	***
## factor(Region_Code)9	3.772	0.000162	***
## factor(Region_Code)10	6.413	1.43e-10	***
## factor(Region_Code)11	12.191	< 2e-16	***
## factor(Region_Code)12	7.014	2.32e-12	***
## factor(Region_Code)13	6.813	9.56e-12	***
## factor(Region_Code)14	7.991	1.34e-15	***
## factor(Region_Code)15	6.304	2.90e-10	***
## factor(Region_Code)16	4.731	2.24e-06	***
## factor(Region_Code)17	4.032	5.54e-05	***
## factor(Region_Code)18	10.634	< 2e-16	***
## factor(Region_Code)19	6.529	6.60e-11	***
## factor(Region_Code)20	3.050	0.002291	**
## factor(Region_Code)21	7.935	2.11e-15	***
## factor(Region_Code)22	2.386	0.017012	*
## factor(Region_Code)23	8.165	3.22e-16	***
## factor(Region_Code)24	7.386	1.51e-13	***
## factor(Region_Code)25	1.820	0.068815	.
## factor(Region_Code)26	2.667	0.007653	**
## factor(Region_Code)27	5.279	1.30e-07	***
## factor(Region_Code)28	9.802	< 2e-16	***
## factor(Region_Code)29	11.821	< 2e-16	***
## factor(Region_Code)30	10.000	< 2e-16	***
## factor(Region_Code)31	3.259	0.001120	**
## factor(Region_Code)32	7.388	1.49e-13	***
## factor(Region_Code)33	7.553	4.26e-14	***
## factor(Region_Code)34	3.229	0.001240	**
## factor(Region_Code)35	10.998	< 2e-16	***
## factor(Region_Code)36	7.042	1.90e-12	***
## factor(Region_Code)37	6.452	1.11e-10	***
## factor(Region_Code)38	8.881	< 2e-16	***
## factor(Region_Code)39	6.348	2.18e-10	***
## factor(Region_Code)40	4.975	6.52e-07	***
## factor(Region_Code)41	11.501	< 2e-16	***
## factor(Region_Code)42	1.780	0.075003	.
## factor(Region_Code)43	3.995	6.47e-05	***
## factor(Region_Code)44	0.530	0.596335	
## factor(Region_Code)45	8.140	3.96e-16	***

## factor(Region_Code)46	8.399	< 2e-16	***
## factor(Region_Code)47	5.572	2.52e-08	***
## factor(Region_Code)48	2.225	0.026064	*
## factor(Region_Code)49	3.552	0.000383	***
## factor(Region_Code)50	3.540	0.000401	***
## factor(Region_Code)51	3.336	0.000850	***
## factor(Region_Code)52	3.108	0.001882	**
## factor(Vehicle_Damage)1	55.045	< 2e-16	***
## factor(Previously_Insured)1	-35.320	< 2e-16	***
## Annual_Premium	4.027	5.64e-05	***
## factor(Policy_Sales_Channel)3	-1.811	0.070131	.
## factor(Policy_Sales_Channel)4	-3.428	0.000608	***
## factor(Policy_Sales_Channel)7	-1.319	0.187051	
## factor(Policy_Sales_Channel)8	-3.351	0.000805	***
## factor(Policy_Sales_Channel)9	-0.478	0.632301	
## factor(Policy_Sales_Channel)10	-1.502	0.133028	
## factor(Policy_Sales_Channel)11	-1.788	0.073731	.
## factor(Policy_Sales_Channel)12	-1.078	0.280991	
## factor(Policy_Sales_Channel)13	-3.358	0.000786	***
## factor(Policy_Sales_Channel)14	-1.996	0.045954	*
## factor(Policy_Sales_Channel)15	-3.150	0.001631	**
## factor(Policy_Sales_Channel)16	-1.565	0.117572	
## factor(Policy_Sales_Channel)17	0.208	0.835290	
## factor(Policy_Sales_Channel)18	-1.102	0.270548	
## factor(Policy_Sales_Channel)19	-1.058	0.290185	
## factor(Policy_Sales_Channel)20	0.271	0.786388	
## factor(Policy_Sales_Channel)21	-0.443	0.658094	
## factor(Policy_Sales_Channel)22	-2.572	0.010120	*
## factor(Policy_Sales_Channel)23	-0.784	0.433112	
## factor(Policy_Sales_Channel)24	-2.079	0.037659	*
## factor(Policy_Sales_Channel)25	-2.854	0.004320	**
## factor(Policy_Sales_Channel)26	-2.778	0.005477	**
## factor(Policy_Sales_Channel)29	-3.128	0.001757	**
## factor(Policy_Sales_Channel)30	-1.809	0.070422	.
## factor(Policy_Sales_Channel)31	-1.930	0.053560	.
## factor(Policy_Sales_Channel)32	1.035	0.300597	
## factor(Policy_Sales_Channel)35	-0.244	0.807498	
## factor(Policy_Sales_Channel)36	0.740	0.459465	
## factor(Policy_Sales_Channel)37	-1.336	0.181455	
## factor(Policy_Sales_Channel)38	-0.005	0.996124	
## factor(Policy_Sales_Channel)39	0.058	0.953425	
## factor(Policy_Sales_Channel)40	0.474	0.635553	
## factor(Policy_Sales_Channel)42	-0.835	0.403589	
## factor(Policy_Sales_Channel)44	-2.395	0.016635	*
## factor(Policy_Sales_Channel)45	-1.874	0.060936	.
## factor(Policy_Sales_Channel)46	-0.003	0.997672	
## factor(Policy_Sales_Channel)47	-1.239	0.215471	
## factor(Policy_Sales_Channel)48	-0.847	0.396814	
## factor(Policy_Sales_Channel)49	1.010	0.312438	
## factor(Policy_Sales_Channel)51	0.028	0.977667	
## factor(Policy_Sales_Channel)52	-2.608	0.009099	**
## factor(Policy_Sales_Channel)53	-1.510	0.131162	
## factor(Policy_Sales_Channel)54	-0.828	0.407581	
## factor(Policy_Sales_Channel)55	-2.109	0.034906	*

## factor(Policy_Sales_Channel)56	-0.737 0.461381
## factor(Policy_Sales_Channel)57	-0.884 0.376732
## factor(Policy_Sales_Channel)58	-0.104 0.917207
## factor(Policy_Sales_Channel)59	-1.171 0.241791
## factor(Policy_Sales_Channel)60	-1.763 0.077882 .
## factor(Policy_Sales_Channel)61	-0.773 0.439332
## factor(Policy_Sales_Channel)62	0.015 0.987887
## factor(Policy_Sales_Channel)63	0.843 0.399374
## factor(Policy_Sales_Channel)64	-0.990 0.322418
## factor(Policy_Sales_Channel)65	0.931 0.351900
## factor(Policy_Sales_Channel)66	-1.860 0.062870 .
## factor(Policy_Sales_Channel)69	-1.849 0.064486 .
## factor(Policy_Sales_Channel)71	-0.002 0.998691
## factor(Policy_Sales_Channel)73	0.518 0.604222
## factor(Policy_Sales_Channel)78	-0.524 0.600318
## factor(Policy_Sales_Channel)79	0.000 0.999774
## factor(Policy_Sales_Channel)80	-1.133 0.257232
## factor(Policy_Sales_Channel)81	-0.066 0.946984
## factor(Policy_Sales_Channel)86	0.316 0.752141
## factor(Policy_Sales_Channel)87	-0.868 0.385665
## factor(Policy_Sales_Channel)88	-0.417 0.676600
## factor(Policy_Sales_Channel)89	-1.304 0.192391
## factor(Policy_Sales_Channel)90	0.403 0.686586
## factor(Policy_Sales_Channel)91	0.043 0.966070
## factor(Policy_Sales_Channel)92	0.307 0.758484
## factor(Policy_Sales_Channel)93	0.040 0.967806
## factor(Policy_Sales_Channel)94	-0.229 0.818807
## factor(Policy_Sales_Channel)95	-0.004 0.996904
## factor(Policy_Sales_Channel)96	-0.004 0.996598
## factor(Policy_Sales_Channel)97	0.276 0.782236
## factor(Policy_Sales_Channel)98	0.624 0.532559
## factor(Policy_Sales_Channel)99	-0.002 0.998443
## factor(Policy_Sales_Channel)100	-1.093 0.274273
## factor(Policy_Sales_Channel)101	0.210 0.833910
## factor(Policy_Sales_Channel)103	-0.202 0.839739
## factor(Policy_Sales_Channel)104	-0.001 0.998886
## factor(Policy_Sales_Channel)106	-0.189 0.850113
## factor(Policy_Sales_Channel)107	0.493 0.621709
## factor(Policy_Sales_Channel)108	0.266 0.789873
## factor(Policy_Sales_Channel)109	-1.767 0.077303 .
## factor(Policy_Sales_Channel)110	0.096 0.923470
## factor(Policy_Sales_Channel)111	0.987 0.323726
## factor(Policy_Sales_Channel)113	-0.113 0.910059
## factor(Policy_Sales_Channel)114	-1.446 0.148134
## factor(Policy_Sales_Channel)116	-1.160 0.246054
## factor(Policy_Sales_Channel)117	-0.002 0.998043
## factor(Policy_Sales_Channel)118	-0.004 0.996806
## factor(Policy_Sales_Channel)119	-2.043 0.041018 *
## factor(Policy_Sales_Channel)120	-1.160 0.246187
## factor(Policy_Sales_Channel)121	0.476 0.634405
## factor(Policy_Sales_Channel)122	-3.037 0.002393 **
## factor(Policy_Sales_Channel)124	-2.626 0.008636 **
## factor(Policy_Sales_Channel)125	-1.232 0.218069
## factor(Policy_Sales_Channel)126	-0.001 0.999336

## factor(Policy_Sales_Channel)127	-0.009	0.992428	
## factor(Policy_Sales_Channel)128	1.254	0.209708	
## factor(Policy_Sales_Channel)129	-1.014	0.310747	
## factor(Policy_Sales_Channel)130	0.174	0.862020	
## factor(Policy_Sales_Channel)131	-1.781	0.074993	.
## factor(Policy_Sales_Channel)132	-1.176	0.239772	
## factor(Policy_Sales_Channel)133	-2.022	0.043142	*
## factor(Policy_Sales_Channel)134	-0.003	0.997301	
## factor(Policy_Sales_Channel)135	-1.184	0.236502	
## factor(Policy_Sales_Channel)136	-2.215	0.026769	*
## factor(Policy_Sales_Channel)137	-0.002	0.998433	
## factor(Policy_Sales_Channel)138	-0.787	0.431011	
## factor(Policy_Sales_Channel)139	-2.543	0.010997	*
## factor(Policy_Sales_Channel)140	-0.970	0.331892	
## factor(Policy_Sales_Channel)145	-2.227	0.025963	*
## factor(Policy_Sales_Channel)146	-0.006	0.995303	
## factor(Policy_Sales_Channel)147	-1.252	0.210431	
## factor(Policy_Sales_Channel)148	-0.822	0.410859	
## factor(Policy_Sales_Channel)150	-1.826	0.067815	.
## factor(Policy_Sales_Channel)151	-3.522	0.000428	***
## factor(Policy_Sales_Channel)152	-3.428	0.000607	***
## factor(Policy_Sales_Channel)153	-0.533	0.594049	
## factor(Policy_Sales_Channel)154	-3.364	0.000769	***
## factor(Policy_Sales_Channel)155	-2.450	0.014277	*
## factor(Policy_Sales_Channel)156	-4.104	4.06e-05	***
## factor(Policy_Sales_Channel)157	-3.586	0.000336	***
## factor(Policy_Sales_Channel)158	-3.175	0.001497	**
## factor(Policy_Sales_Channel)159	0.129	0.897321	
## factor(Policy_Sales_Channel)160	-4.700	2.60e-06	***
## factor(Policy_Sales_Channel)163	-3.471	0.000519	***
## Age:Vehicle_Age1	-31.092	< 2e-16	***
## Age:Vehicle_Age2	-28.511	< 2e-16	***
## factor(Vehicle_Damage)1:factor(Previously_Insured)1	5.208	1.91e-07	***
## Age:factor(Policy_Sales_Channel)3	5.832	5.47e-09	***
## Age:factor(Policy_Sales_Channel)4	6.388	1.68e-10	***
## Age:factor(Policy_Sales_Channel)7	4.883	1.04e-06	***
## Age:factor(Policy_Sales_Channel)8	6.364	1.97e-10	***
## Age:factor(Policy_Sales_Channel)9	2.312	0.020762	*
## Age:factor(Policy_Sales_Channel)10	4.102	4.09e-05	***
## Age:factor(Policy_Sales_Channel)11	4.425	9.65e-06	***
## Age:factor(Policy_Sales_Channel)12	4.153	3.28e-05	***
## Age:factor(Policy_Sales_Channel)13	6.473	9.63e-11	***
## Age:factor(Policy_Sales_Channel)14	4.786	1.70e-06	***
## Age:factor(Policy_Sales_Channel)15	6.302	2.95e-10	***
## Age:factor(Policy_Sales_Channel)16	4.155	3.25e-05	***
## Age:factor(Policy_Sales_Channel)17	0.758	0.448729	
## Age:factor(Policy_Sales_Channel)18	2.063	0.039153	*
## Age:factor(Policy_Sales_Channel)19	2.595	0.009468	**
## Age:factor(Policy_Sales_Channel)20	0.465	0.642185	
## Age:factor(Policy_Sales_Channel)21	1.799	0.071995	.
## Age:factor(Policy_Sales_Channel)22	4.387	1.15e-05	***
## Age:factor(Policy_Sales_Channel)23	3.485	0.000493	***
## Age:factor(Policy_Sales_Channel)24	5.125	2.97e-07	***
## Age:factor(Policy_Sales_Channel)25	6.658	2.78e-11	***

## Age:factor(Policy_Sales_Channel)26	6.759	1.39e-11	***
## Age:factor(Policy_Sales_Channel)29	5.918	3.26e-09	***
## Age:factor(Policy_Sales_Channel)30	5.126	2.96e-07	***
## Age:factor(Policy_Sales_Channel)31	5.314	1.08e-07	***
## Age:factor(Policy_Sales_Channel)32	-0.710	0.477587	
## Age:factor(Policy_Sales_Channel)35	1.328	0.184078	
## Age:factor(Policy_Sales_Channel)36	1.121	0.262310	
## Age:factor(Policy_Sales_Channel)37	3.130	0.001746	**
## Age:factor(Policy_Sales_Channel)38	0.003	0.997866	
## Age:factor(Policy_Sales_Channel)39	0.175	0.861126	
## Age:factor(Policy_Sales_Channel)40	-0.149	0.881599	
## Age:factor(Policy_Sales_Channel)42	3.109	0.001876	**
## Age:factor(Policy_Sales_Channel)44	4.654	3.26e-06	***
## Age:factor(Policy_Sales_Channel)45	2.831	0.004638	**
## Age:factor(Policy_Sales_Channel)46	0.001	0.999007	
## Age:factor(Policy_Sales_Channel)47	2.360	0.018263	*
## Age:factor(Policy_Sales_Channel)48	1.205	0.228117	
## Age:factor(Policy_Sales_Channel)49	-0.814	0.415586	
## Age:factor(Policy_Sales_Channel)51	-0.027	0.978089	
## Age:factor(Policy_Sales_Channel)52	5.343	9.13e-08	***
## Age:factor(Policy_Sales_Channel)53	2.601	0.009286	**
## Age:factor(Policy_Sales_Channel)54	2.345	0.019013	*
## Age:factor(Policy_Sales_Channel)55	5.265	1.40e-07	***
## Age:factor(Policy_Sales_Channel)56	2.164	0.030431	*
## Age:factor(Policy_Sales_Channel)57	1.007	0.313894	
## Age:factor(Policy_Sales_Channel)58	0.104	0.916919	
## Age:factor(Policy_Sales_Channel)59	3.332	0.000861	***
## Age:factor(Policy_Sales_Channel)60	4.001	6.31e-05	***
## Age:factor(Policy_Sales_Channel)61	2.856	0.004285	**
## Age:factor(Policy_Sales_Channel)62	-0.015	0.987833	
## Age:factor(Policy_Sales_Channel)63	-0.523	0.601113	
## Age:factor(Policy_Sales_Channel)64	1.655	0.097916	.
## Age:factor(Policy_Sales_Channel)65	-0.458	0.646877	
## Age:factor(Policy_Sales_Channel)66	2.230	0.025747	*
## Age:factor(Policy_Sales_Channel)69	2.367	0.017928	*
## Age:factor(Policy_Sales_Channel)71	0.001	0.999583	
## Age:factor(Policy_Sales_Channel)73	-0.405	0.685777	
## Age:factor(Policy_Sales_Channel)78	1.668	0.095239	.
## Age:factor(Policy_Sales_Channel)79	0.000	0.999907	
## Age:factor(Policy_Sales_Channel)80	1.979	0.047850	*
## Age:factor(Policy_Sales_Channel)81	0.793	0.427519	
## Age:factor(Policy_Sales_Channel)86	0.383	0.701430	
## Age:factor(Policy_Sales_Channel)87	1.502	0.132985	
## Age:factor(Policy_Sales_Channel)88	0.663	0.507362	
## Age:factor(Policy_Sales_Channel)89	2.400	0.016373	*
## Age:factor(Policy_Sales_Channel)90	0.537	0.591461	
## Age:factor(Policy_Sales_Channel)91	1.935	0.052961	.
## Age:factor(Policy_Sales_Channel)92	0.193	0.846692	
## Age:factor(Policy_Sales_Channel)93	0.362	0.717129	
## Age:factor(Policy_Sales_Channel)94	1.713	0.086680	.
## Age:factor(Policy_Sales_Channel)95	0.002	0.998630	
## Age:factor(Policy_Sales_Channel)96	0.002	0.998623	
## Age:factor(Policy_Sales_Channel)97	0.152	0.879433	
## Age:factor(Policy_Sales_Channel)98	-0.429	0.667634	

## Age:factor(Policy_Sales_Channel)99	0.001	0.999165	
## Age:factor(Policy_Sales_Channel)100	1.397	0.162419	
## Age:factor(Policy_Sales_Channel)101	0.025	0.980020	
## Age:factor(Policy_Sales_Channel)103	1.360	0.173787	
## Age:factor(Policy_Sales_Channel)104	0.001	0.999525	
## Age:factor(Policy_Sales_Channel)106	1.951	0.051083	.
## Age:factor(Policy_Sales_Channel)107	-0.366	0.714136	
## Age:factor(Policy_Sales_Channel)108	-0.216	0.828646	
## Age:factor(Policy_Sales_Channel)109	3.194	0.001403	**
## Age:factor(Policy_Sales_Channel)110	-0.095	0.924025	
## Age:factor(Policy_Sales_Channel)111	-0.334	0.738245	
## Age:factor(Policy_Sales_Channel)113	0.954	0.340122	
## Age:factor(Policy_Sales_Channel)114	2.262	0.023723	*
## Age:factor(Policy_Sales_Channel)116	2.793	0.005229	**
## Age:factor(Policy_Sales_Channel)117	0.001	0.999088	
## Age:factor(Policy_Sales_Channel)118	0.001	0.998873	
## Age:factor(Policy_Sales_Channel)119	3.275	0.001058	**
## Age:factor(Policy_Sales_Channel)120	3.901	9.56e-05	***
## Age:factor(Policy_Sales_Channel)121	0.443	0.658095	
## Age:factor(Policy_Sales_Channel)122	6.550	5.77e-11	***
## Age:factor(Policy_Sales_Channel)124	6.291	3.16e-10	***
## Age:factor(Policy_Sales_Channel)125	4.027	5.66e-05	***
## Age:factor(Policy_Sales_Channel)126	0.000	0.999698	
## Age:factor(Policy_Sales_Channel)127	1.011	0.312165	
## Age:factor(Policy_Sales_Channel)128	-0.166	0.867956	
## Age:factor(Policy_Sales_Channel)129	1.669	0.095193	.
## Age:factor(Policy_Sales_Channel)130	-0.172	0.863068	
## Age:factor(Policy_Sales_Channel)131	3.314	0.000919	***
## Age:factor(Policy_Sales_Channel)132	2.153	0.031323	*
## Age:factor(Policy_Sales_Channel)133	3.137	0.001706	**
## Age:factor(Policy_Sales_Channel)134	0.001	0.998891	
## Age:factor(Policy_Sales_Channel)135	2.576	0.010008	*
## Age:factor(Policy_Sales_Channel)136	4.948	7.51e-07	***
## Age:factor(Policy_Sales_Channel)137	0.001	0.998961	
## Age:factor(Policy_Sales_Channel)138	1.944	0.051943	.
## Age:factor(Policy_Sales_Channel)139	4.198	2.69e-05	***
## Age:factor(Policy_Sales_Channel)140	1.886	0.059272	.
## Age:factor(Policy_Sales_Channel)145	4.691	2.72e-06	***
## Age:factor(Policy_Sales_Channel)146	0.002	0.998174	
## Age:factor(Policy_Sales_Channel)147	3.904	9.46e-05	***
## Age:factor(Policy_Sales_Channel)148	2.378	0.017397	*
## Age:factor(Policy_Sales_Channel)150	4.739	2.14e-06	***
## Age:factor(Policy_Sales_Channel)151	4.077	4.56e-05	***
## Age:factor(Policy_Sales_Channel)152	5.380	7.44e-08	***
## Age:factor(Policy_Sales_Channel)153	0.933	0.350807	
## Age:factor(Policy_Sales_Channel)154	6.995	2.64e-12	***
## Age:factor(Policy_Sales_Channel)155	6.530	6.58e-11	***
## Age:factor(Policy_Sales_Channel)156	7.500	6.38e-14	***
## Age:factor(Policy_Sales_Channel)157	7.346	2.05e-13	***
## Age:factor(Policy_Sales_Channel)158	6.741	1.57e-11	***
## Age:factor(Policy_Sales_Channel)159	-0.201	0.840416	
## Age:factor(Policy_Sales_Channel)160	5.346	9.02e-08	***
## Age:factor(Policy_Sales_Channel)163	7.589	3.23e-14	***
## ---			

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##    Null deviance: 283505  on 381040  degrees of freedom
## Residual deviance: 202880  on 380721  degrees of freedom
## AIC: 203520
##
## Number of Fisher Scoring iterations: 16
```

```
vif(glm1)
```

```
##
##                Gender1
##                1.223525e+01
##                Age
##                1.799034e+04
##                Vehicle_Age1
##                1.488024e+03
##                Vehicle_Age2
##                3.544852e+02
## factor(Driving_License)1
##                2.181143e+01
## factor(Region_Code)1
##                1.832870e+01
## factor(Region_Code)2
##                4.571786e+01
## factor(Region_Code)3
##                7.395276e+01
## factor(Region_Code)4
##                2.169960e+01
## factor(Region_Code)5
##                2.045655e+01
## factor(Region_Code)6
##                6.305389e+01
## factor(Region_Code)7
##                3.297066e+01
## factor(Region_Code)8
##                2.289465e+02
## factor(Region_Code)9
##                3.683441e+01
## factor(Region_Code)10
##                5.186870e+01
## factor(Region_Code)11
##                7.630662e+01
## factor(Region_Code)12
##                3.617332e+01
## factor(Region_Code)13
##                4.246071e+01
## factor(Region_Code)14
##                4.755154e+01
## factor(Region_Code)15
##                1.076591e+02
## factor(Region_Code)16
##                3.270265e+01
```

```

##          factor(Region_Code)17
##          3.624598e+01
##          factor(Region_Code)18
##          4.690926e+01
##          factor(Region_Code)19
##          1.921871e+01
##          factor(Region_Code)20
##          2.427190e+01
##          factor(Region_Code)21
##          4.883383e+01
##          factor(Region_Code)22
##          2.852939e+01
##          factor(Region_Code)23
##          2.318138e+01
##          factor(Region_Code)24
##          2.704507e+01
##          factor(Region_Code)25
##          4.520721e+01
##          factor(Region_Code)26
##          3.601637e+01
##          factor(Region_Code)27
##          3.629172e+01
##          factor(Region_Code)28
##          5.422808e+02
##          factor(Region_Code)29
##          8.705900e+01
##          factor(Region_Code)30
##          1.011485e+02
##          factor(Region_Code)31
##          2.714974e+01
##          factor(Region_Code)32
##          3.470396e+01
##          factor(Region_Code)33
##          6.603005e+01
##          factor(Region_Code)34
##          2.779195e+01
##          factor(Region_Code)35
##          6.000591e+01
##          factor(Region_Code)36
##          7.603703e+01
##          factor(Region_Code)37
##          5.399351e+01
##          factor(Region_Code)38
##          2.168764e+01
##          factor(Region_Code)39
##          4.281054e+01
##          factor(Region_Code)40
##          2.008201e+01
##          factor(Region_Code)41
##          1.338740e+02
##          factor(Region_Code)42
##          2.065513e+01
##          factor(Region_Code)43
##          3.198550e+01

```

```

##          factor(Region_Code)44
##          3.547163e+01
##          factor(Region_Code)45
##          5.095253e+01
##          factor(Region_Code)46
##          1.435426e+02
##          factor(Region_Code)47
##          6.586579e+01
##          factor(Region_Code)48
##          4.535701e+01
##          factor(Region_Code)49
##          2.918748e+01
##          factor(Region_Code)50
##          9.167681e+01
##          factor(Region_Code)51
##          1.054172e+01
##          factor(Region_Code)52
##          1.301831e+01
##          factor(Vehicle_Damage)1
##          1.164716e+02
##          factor(Previously_Insured)1
##          1.432258e+03
##          Annual_Premium
##          1.330849e+01
##          factor(Policy_Sales_Channel)3
##          3.371228e+02
##          factor(Policy_Sales_Channel)4
##          4.061115e+02
##          factor(Policy_Sales_Channel)7
##          8.462730e+02
##          factor(Policy_Sales_Channel)8
##          8.527863e+02
##          factor(Policy_Sales_Channel)9
##          4.438089e+02
##          factor(Policy_Sales_Channel)10
##          2.948411e+02
##          factor(Policy_Sales_Channel)11
##          7.677039e+02
##          factor(Policy_Sales_Channel)12
##          4.830212e+02
##          factor(Policy_Sales_Channel)13
##          8.700898e+02
##          factor(Policy_Sales_Channel)14
##          4.856208e+02
##          factor(Policy_Sales_Channel)15
##          6.204316e+02
##          factor(Policy_Sales_Channel)16
##          4.573404e+02
##          factor(Policy_Sales_Channel)17
##          2.228594e+02
##          factor(Policy_Sales_Channel)18
##          7.879215e+02
##          factor(Policy_Sales_Channel)19
##          5.008917e+02

```



```

##          factor(Policy_Sales_Channel)20
##          3.940704e+02
##          factor(Policy_Sales_Channel)21
##          4.641702e+02
##          factor(Policy_Sales_Channel)22
##          4.967703e+02
##          factor(Policy_Sales_Channel)23
##          3.421569e+02
##          factor(Policy_Sales_Channel)24
##          4.530014e+02
##          factor(Policy_Sales_Channel)25
##          8.827071e+02
##          factor(Policy_Sales_Channel)26
##          2.337729e+04
##          factor(Policy_Sales_Channel)29
##          5.557260e+02
##          factor(Policy_Sales_Channel)30
##          7.966093e+02
##          factor(Policy_Sales_Channel)31
##          3.757629e+02
##          factor(Policy_Sales_Channel)32
##          1.492152e+03
##          factor(Policy_Sales_Channel)35
##          4.587784e+02
##          factor(Policy_Sales_Channel)36
##          1.049862e+02
##          factor(Policy_Sales_Channel)37
##          3.106972e+02
##          factor(Policy_Sales_Channel)38
##          2.505826e+08
##          factor(Policy_Sales_Channel)39
##          7.106624e+02
##          factor(Policy_Sales_Channel)40
##          4.025689e+02
##          factor(Policy_Sales_Channel)42
##          2.255261e+02
##          factor(Policy_Sales_Channel)44
##          1.870020e+02
##          factor(Policy_Sales_Channel)45
##          2.738820e+02
##          factor(Policy_Sales_Channel)46
##          8.700932e+08
##          factor(Policy_Sales_Channel)47
##          3.093844e+02
##          factor(Policy_Sales_Channel)48
##          9.650566e+02
##          factor(Policy_Sales_Channel)49
##          4.737585e+03
##          factor(Policy_Sales_Channel)51
##          2.970590e+08
##          factor(Policy_Sales_Channel)52
##          6.354737e+02
##          factor(Policy_Sales_Channel)53
##          2.427014e+02

```

```

##          factor(Policy_Sales_Channel)54
##                2.645798e+02
##          factor(Policy_Sales_Channel)55
##                6.612887e+02
##          factor(Policy_Sales_Channel)56
##                2.604453e+02
##          factor(Policy_Sales_Channel)57
##                1.701481e+03
##          factor(Policy_Sales_Channel)58
##                1.657149e+09
##          factor(Policy_Sales_Channel)59
##                2.356870e+02
##          factor(Policy_Sales_Channel)60
##                4.967264e+02
##          factor(Policy_Sales_Channel)61
##                5.533811e+02
##          factor(Policy_Sales_Channel)62
##                5.479276e+08
##          factor(Policy_Sales_Channel)63
##                2.339008e+03
##          factor(Policy_Sales_Channel)64
##                8.997572e+02
##          factor(Policy_Sales_Channel)65
##                1.478785e+03
##          factor(Policy_Sales_Channel)66
##                1.729177e+03
##          factor(Policy_Sales_Channel)69
##                1.147293e+03
##          factor(Policy_Sales_Channel)71
##                6.944758e+08
##          factor(Policy_Sales_Channel)73
##                1.863870e+03
##          factor(Policy_Sales_Channel)78
##                1.936738e+02
##          factor(Policy_Sales_Channel)79
##                7.141652e+09
##          factor(Policy_Sales_Channel)80
##                2.981161e+02
##          factor(Policy_Sales_Channel)81
##                5.988945e+02
##          factor(Policy_Sales_Channel)86
##                7.078607e+02
##          factor(Policy_Sales_Channel)87
##                1.674653e+02
##          factor(Policy_Sales_Channel)88
##                9.326636e+02
##          factor(Policy_Sales_Channel)89
##                1.831236e+02
##          factor(Policy_Sales_Channel)90
##                3.512412e+02
##          factor(Policy_Sales_Channel)91
##                3.576254e+02
##          factor(Policy_Sales_Channel)92
##                7.798973e+02

```

```

##          factor(Policy_Sales_Channel)93
##          8.425535e+02
##          factor(Policy_Sales_Channel)94
##          2.440277e+02
##          factor(Policy_Sales_Channel)95
##          2.283252e+08
##          factor(Policy_Sales_Channel)96
##          3.522135e+08
##          factor(Policy_Sales_Channel)97
##          7.706633e+02
##          factor(Policy_Sales_Channel)98
##          2.662228e+03
##          factor(Policy_Sales_Channel)99
##          1.048296e+09
##          factor(Policy_Sales_Channel)100
##          1.644410e+03
##          factor(Policy_Sales_Channel)101
##          1.332023e+03
##          factor(Policy_Sales_Channel)103
##          4.522477e+02
##          factor(Policy_Sales_Channel)104
##          1.218912e+09
##          factor(Policy_Sales_Channel)106
##          1.874244e+02
##          factor(Policy_Sales_Channel)107
##          3.239818e+03
##          factor(Policy_Sales_Channel)108
##          3.962020e+04
##          factor(Policy_Sales_Channel)109
##          3.747641e+02
##          factor(Policy_Sales_Channel)110
##          3.648176e+08
##          factor(Policy_Sales_Channel)111
##          6.825133e+02
##          factor(Policy_Sales_Channel)113
##          7.843151e+02
##          factor(Policy_Sales_Channel)114
##          2.776771e+02
##          factor(Policy_Sales_Channel)116
##          5.284391e+02
##          factor(Policy_Sales_Channel)117
##          2.027249e+08
##          factor(Policy_Sales_Channel)118
##          3.342606e+08
##          factor(Policy_Sales_Channel)119
##          1.149002e+03
##          factor(Policy_Sales_Channel)120
##          6.333608e+02
##          factor(Policy_Sales_Channel)121
##          2.586024e+02
##          factor(Policy_Sales_Channel)122
##          3.688028e+03
##          factor(Policy_Sales_Channel)124
##          2.215589e+04

```

```

##          factor(Policy_Sales_Channel)125
##          6.101120e+02
##          factor(Policy_Sales_Channel)126
##          3.163166e+09
##          factor(Policy_Sales_Channel)127
##          4.308332e+02
##          factor(Policy_Sales_Channel)128
##          5.621298e+02
##          factor(Policy_Sales_Channel)129
##          2.709902e+02
##          factor(Policy_Sales_Channel)130
##          1.651629e+08
##          factor(Policy_Sales_Channel)131
##          2.154194e+02
##          factor(Policy_Sales_Channel)132
##          3.800906e+02
##          factor(Policy_Sales_Channel)133
##          6.477369e+02
##          factor(Policy_Sales_Channel)134
##          2.734678e+08
##          factor(Policy_Sales_Channel)135
##          2.501023e+02
##          factor(Policy_Sales_Channel)136
##          1.758875e+02
##          factor(Policy_Sales_Channel)137
##          2.314818e+09
##          factor(Policy_Sales_Channel)138
##          4.317061e+02
##          factor(Policy_Sales_Channel)139
##          2.718228e+02
##          factor(Policy_Sales_Channel)140
##          3.980425e+02
##          factor(Policy_Sales_Channel)145
##          2.717381e+02
##          factor(Policy_Sales_Channel)146
##          1.603296e+08
##          factor(Policy_Sales_Channel)147
##          1.774170e+02
##          factor(Policy_Sales_Channel)148
##          2.680250e+02
##          factor(Policy_Sales_Channel)150
##          2.302705e+02
##          factor(Policy_Sales_Channel)151
##          2.432488e+03
##          factor(Policy_Sales_Channel)152
##          3.188475e+04
##          factor(Policy_Sales_Channel)153
##          8.109696e+02
##          factor(Policy_Sales_Channel)154
##          2.255594e+03
##          factor(Policy_Sales_Channel)155
##          5.241651e+02
##          factor(Policy_Sales_Channel)156
##          3.893560e+03

```

```

##          factor(Policy_Sales_Channel)157
##          2.495808e+03
##          factor(Policy_Sales_Channel)158
##          2.285398e+02
##          factor(Policy_Sales_Channel)159
##          7.462909e+03
##          factor(Policy_Sales_Channel)160
##          8.032124e+03
##          factor(Policy_Sales_Channel)163
##          1.111365e+03
##          Age:Vehicle_Age1
##          4.632545e+03
##          Age:Vehicle_Age2
##          9.897935e+02
## factor(Vehicle_Damage)1:factor(Previously_Insured)1
##          2.604750e+02
##          Age:factor(Policy_Sales_Channel)3
##          5.381738e+02
##          Age:factor(Policy_Sales_Channel)4
##          4.829641e+02
##          Age:factor(Policy_Sales_Channel)7
##          1.375906e+03
##          Age:factor(Policy_Sales_Channel)8
##          1.304154e+03
##          Age:factor(Policy_Sales_Channel)9
##          5.805723e+02
##          Age:factor(Policy_Sales_Channel)10
##          3.974522e+02
##          Age:factor(Policy_Sales_Channel)11
##          1.186824e+03
##          Age:factor(Policy_Sales_Channel)12
##          7.421868e+02
##          Age:factor(Policy_Sales_Channel)13
##          1.418542e+03
##          Age:factor(Policy_Sales_Channel)14
##          7.119524e+02
##          Age:factor(Policy_Sales_Channel)15
##          9.164681e+02
##          Age:factor(Policy_Sales_Channel)16
##          6.758581e+02
##          Age:factor(Policy_Sales_Channel)17
##          3.065831e+02
##          Age:factor(Policy_Sales_Channel)18
##          9.674505e+02
##          Age:factor(Policy_Sales_Channel)19
##          6.396507e+02
##          Age:factor(Policy_Sales_Channel)20
##          4.992353e+02
##          Age:factor(Policy_Sales_Channel)21
##          6.470348e+02
##          Age:factor(Policy_Sales_Channel)22
##          6.317572e+02
##          Age:factor(Policy_Sales_Channel)23
##          5.196453e+02

```

```

##      Age:factor(Policy_Sales_Channel)24
##      6.749333e+02
##      Age:factor(Policy_Sales_Channel)25
##      1.443707e+03
##      Age:factor(Policy_Sales_Channel)26
##      3.747630e+04
##      Age:factor(Policy_Sales_Channel)29
##      7.230274e+02
##      Age:factor(Policy_Sales_Channel)30
##      1.319192e+03
##      Age:factor(Policy_Sales_Channel)31
##      4.604320e+02
##      Age:factor(Policy_Sales_Channel)32
##      1.750977e+03
##      Age:factor(Policy_Sales_Channel)35
##      5.196347e+02
##      Age:factor(Policy_Sales_Channel)36
##      1.268521e+02
##      Age:factor(Policy_Sales_Channel)37
##      3.979038e+02
##      Age:factor(Policy_Sales_Channel)38
##      2.700574e+08
##      Age:factor(Policy_Sales_Channel)39
##      8.403098e+02
##      Age:factor(Policy_Sales_Channel)40
##      6.810357e+02
##      Age:factor(Policy_Sales_Channel)42
##      2.709672e+02
##      Age:factor(Policy_Sales_Channel)44
##      2.092213e+02
##      Age:factor(Policy_Sales_Channel)45
##      2.787179e+02
##      Age:factor(Policy_Sales_Channel)46
##      8.801130e+08
##      Age:factor(Policy_Sales_Channel)47
##      3.285497e+02
##      Age:factor(Policy_Sales_Channel)48
##      8.733647e+02
##      Age:factor(Policy_Sales_Channel)49
##      6.828626e+03
##      Age:factor(Policy_Sales_Channel)51
##      4.584455e+08
##      Age:factor(Policy_Sales_Channel)52
##      9.367958e+02
##      Age:factor(Policy_Sales_Channel)53
##      2.539844e+02
##      Age:factor(Policy_Sales_Channel)54
##      3.319017e+02
##      Age:factor(Policy_Sales_Channel)55
##      1.022549e+03
##      Age:factor(Policy_Sales_Channel)56
##      2.969183e+02
##      Age:factor(Policy_Sales_Channel)57
##      1.545143e+03

```

```

##      Age:factor(Policy_Sales_Channel)58
##      1.118663e+09
##      Age:factor(Policy_Sales_Channel)59
##      2.856802e+02
##      Age:factor(Policy_Sales_Channel)60
##      6.406205e+02
##      Age:factor(Policy_Sales_Channel)61
##      7.714935e+02
##      Age:factor(Policy_Sales_Channel)62
##      6.677760e+08
##      Age:factor(Policy_Sales_Channel)63
##      2.863346e+03
##      Age:factor(Policy_Sales_Channel)64
##      1.053899e+03
##      Age:factor(Policy_Sales_Channel)65
##      2.089392e+03
##      Age:factor(Policy_Sales_Channel)66
##      1.629364e+03
##      Age:factor(Policy_Sales_Channel)69
##      9.077973e+02
##      Age:factor(Policy_Sales_Channel)71
##      6.791398e+08
##      Age:factor(Policy_Sales_Channel)73
##      2.524181e+03
##      Age:factor(Policy_Sales_Channel)78
##      2.156634e+02
##      Age:factor(Policy_Sales_Channel)79
##      7.148059e+09
##      Age:factor(Policy_Sales_Channel)80
##      3.155213e+02
##      Age:factor(Policy_Sales_Channel)81
##      6.008010e+02
##      Age:factor(Policy_Sales_Channel)86
##      9.571500e+02
##      Age:factor(Policy_Sales_Channel)87
##      1.569690e+02
##      Age:factor(Policy_Sales_Channel)88
##      1.035663e+03
##      Age:factor(Policy_Sales_Channel)89
##      1.648298e+02
##      Age:factor(Policy_Sales_Channel)90
##      3.662362e+02
##      Age:factor(Policy_Sales_Channel)91
##      4.213302e+02
##      Age:factor(Policy_Sales_Channel)92
##      9.746495e+02
##      Age:factor(Policy_Sales_Channel)93
##      1.026333e+03
##      Age:factor(Policy_Sales_Channel)94
##      2.901158e+02
##      Age:factor(Policy_Sales_Channel)95
##      2.231061e+08
##      Age:factor(Policy_Sales_Channel)96
##      3.517803e+08

```

```

##      Age:factor(Policy_Sales_Channel)97
##      8.931560e+02
##      Age:factor(Policy_Sales_Channel)98
##      4.342004e+03
##      Age:factor(Policy_Sales_Channel)99
##      1.064909e+09
##      Age:factor(Policy_Sales_Channel)100
##      1.399963e+03
##      Age:factor(Policy_Sales_Channel)101
##      1.186896e+03
##      Age:factor(Policy_Sales_Channel)103
##      5.102796e+02
##      Age:factor(Policy_Sales_Channel)104
##      1.231929e+09
##      Age:factor(Policy_Sales_Channel)106
##      2.193315e+02
##      Age:factor(Policy_Sales_Channel)107
##      4.548200e+03
##      Age:factor(Policy_Sales_Channel)108
##      4.143266e+04
##      Age:factor(Policy_Sales_Channel)109
##      4.241395e+02
##      Age:factor(Policy_Sales_Channel)110
##      7.103391e+08
##      Age:factor(Policy_Sales_Channel)111
##      1.009678e+03
##      Age:factor(Policy_Sales_Channel)113
##      1.019060e+03
##      Age:factor(Policy_Sales_Channel)114
##      2.800596e+02
##      Age:factor(Policy_Sales_Channel)116
##      6.063661e+02
##      Age:factor(Policy_Sales_Channel)117
##      2.023732e+08
##      Age:factor(Policy_Sales_Channel)118
##      3.404413e+08
##      Age:factor(Policy_Sales_Channel)119
##      1.013034e+03
##      Age:factor(Policy_Sales_Channel)120
##      9.403091e+02
##      Age:factor(Policy_Sales_Channel)121
##      3.771965e+02
##      Age:factor(Policy_Sales_Channel)122
##      6.121319e+03
##      Age:factor(Policy_Sales_Channel)124
##      3.051943e+04
##      Age:factor(Policy_Sales_Channel)125
##      8.884937e+02
##      Age:factor(Policy_Sales_Channel)126
##      3.337197e+09
##      Age:factor(Policy_Sales_Channel)127
##      6.416594e+02
##      Age:factor(Policy_Sales_Channel)128
##      8.936861e+02

```



```

##      Age:factor(Policy_Sales_Channel)129
##      3.847670e+02
##      Age:factor(Policy_Sales_Channel)130
##      4.872618e+08
##      Age:factor(Policy_Sales_Channel)131
##      2.529287e+02
##      Age:factor(Policy_Sales_Channel)132
##      4.475106e+02
##      Age:factor(Policy_Sales_Channel)133
##      6.390552e+02
##      Age:factor(Policy_Sales_Channel)134
##      2.784863e+08
##      Age:factor(Policy_Sales_Channel)135
##      3.184000e+02
##      Age:factor(Policy_Sales_Channel)136
##      2.172984e+02
##      Age:factor(Policy_Sales_Channel)137
##      2.395344e+09
##      Age:factor(Policy_Sales_Channel)138
##      5.729340e+02
##      Age:factor(Policy_Sales_Channel)139
##      3.077070e+02
##      Age:factor(Policy_Sales_Channel)140
##      4.631920e+02
##      Age:factor(Policy_Sales_Channel)145
##      3.437802e+02
##      Age:factor(Policy_Sales_Channel)146
##      1.601018e+08
##      Age:factor(Policy_Sales_Channel)147
##      2.518236e+02
##      Age:factor(Policy_Sales_Channel)148
##      3.166066e+02
##      Age:factor(Policy_Sales_Channel)150
##      2.689366e+02
##      Age:factor(Policy_Sales_Channel)151
##      1.587166e+03
##      Age:factor(Policy_Sales_Channel)152
##      1.381454e+04
##      Age:factor(Policy_Sales_Channel)153
##      7.578021e+02
##      Age:factor(Policy_Sales_Channel)154
##      2.326469e+03
##      Age:factor(Policy_Sales_Channel)155
##      5.927227e+02
##      Age:factor(Policy_Sales_Channel)156
##      3.806514e+03
##      Age:factor(Policy_Sales_Channel)157
##      2.764620e+03
##      Age:factor(Policy_Sales_Channel)158
##      2.658786e+02
##      Age:factor(Policy_Sales_Channel)159
##      8.225907e+03
##      Age:factor(Policy_Sales_Channel)160
##      3.112261e+03

```

```
##                Age:factor(Policy_Sales_Channel)163
##                9.979255e+02
```

Train Test Split

```
# Randomly assign 80% of data to the training set and train the logistic regression
## model using data. Then, test the model using the 20% data left to check the
## prediction accuracy. I performed this process five times using different random
## number seed and got the mean of the five accuracy numbers. I considered this
## average number as the final prediction accuracy of the model
set.seed(123)
indices1 = sample(nrow(data), 0.8 * nrow(data))
train_set1 = data[indices1, ]
test_set1 = data[-indices1, ]

glm_train1 = glm(Response ~ Gender + factor(Driving_License) + factor(Region_Code) +
                  factor(Previously_Insured) * factor(Vehicle_Damage) + Vehicle_Age * Age +
                  Annual_Premium + factor(Policy_Sales_Channel),
                  data = train_set1, family = binomial(link = 'logit'))

res1 = data.frame(predict(glm_train1, newdata = test_set1))
t_res1 = c()
for (i in 1:nrow(res1)) {
  if (res1[i,] < 0.5) {
    t_res1 = c(t_res1, 0)
  }
  else {
    t_res1 = c(t_res1, 1)
  }
}
accuracy1 = sum(data.frame(t_res1) == test_set1[, 'Response']) / nrow(test_set1)
accuracy1
```

```
## [1] 0.8764582
```

```
set.seed(124)
indices2 = sample(nrow(data), 0.8 * nrow(data))
train_set2 = data[indices2,]
test_set2 = data[-indices2,]

glm_train2 = glm(Response ~ Gender + factor(Driving_License) + factor(Region_Code) +
                  factor(Previously_Insured) * factor(Vehicle_Damage) + Vehicle_Age * Age +
                  Annual_Premium + factor(Policy_Sales_Channel), data = train_set2,
                  family = binomial(link = 'logit'))

res2 = data.frame(predict(glm_train2, newdata = test_set2))
t_res2 = c()
for (i in 1:nrow(res2)) {
  if (res2[i,] < 0.5) {
    t_res2 = c(t_res2, 0)
  }
  else {
    t_res2 = c(t_res2, 1)
  }
}
```

```

    }
  }
  accuracy2 = sum(data.frame(t_res2) == test_set2[, 'Response']) / nrow(test_set2)
  accuracy2

```

```
## [1] 0.8759989
```

```

set.seed(125)
indices3 = sample(nrow(data), 0.8 * nrow(data))
train_set3=data[indices3,]
test_set3=data[-indices3,]

glm_train3 = glm(Response ~ Gender + factor(Driving_License) + factor(Region_Code) +
  factor(Previously_Insured) * factor(Vehicle_Damage) + Vehicle_Age * Age +
  Annual_Premium + factor(Policy_Sales_Channel), data = train_set3,
  family = binomial(link = 'logit'))

res3 = data.frame(predict(glm_train3, newdata = test_set3))
t_res3 = c()
for (i in 1: nrow(res3)) {
  if (res3[i,] < 0.5) {
    t_res3 = c(t_res3, 0)
  }
  else {
    t_res3 = c(t_res3, 1)
  }
}
accuracy3 = sum(data.frame(t_res3) == test_set3[, 11]) / 76222
accuracy3

```

```
## [1] 0.877004
```

```

set.seed(126)
indices4 = sample(nrow(data), 0.8 * nrow(data))
train_set4=data[indices4,]
test_set4=data[-indices4,]

glm_train4 = glm(Response ~ Gender + factor(Driving_License) + factor(Region_Code) +
  factor(Previously_Insured) * factor(Vehicle_Damage) + Vehicle_Age * Age +
  Annual_Premium + factor(Policy_Sales_Channel), data = train_set4,
  family = binomial(link = 'logit'))

res4 = data.frame(predict(glm_train4, newdata = test_set4))
t_res4 = c()
for (i in 1: nrow(res4)) {
  if (res4[i,] < 0.5) {
    t_res4 = c(t_res4, 0)
  }
  else {
    t_res4 = c(t_res4, 1)
  }
}

```

```
accuracy4 = sum(data.frame(t_res4) == test_set4[, 11]) / 76222
accuracy4
```

```
## [1] 0.8769778
```

```
set.seed(127)
indices5 = sample(nrow(data), 0.8 * nrow(data))
train_set5=data[indices5,]
test_set5=data[-indices5,]

glm_train5 = glm(Response ~ Gender + factor(Driving_License) + factor(Region_Code) +
  factor(Previously_Insured) * factor(Vehicle_Damage) + Vehicle_Age * Age +
  Annual_Premium + factor(Policy_Sales_Channel), data = train_set5,
  family = binomial(link = 'logit'))

res5 = data.frame(predict(glm_train5, newdata = test_set5))
t_res5 = c()
for (i in 1: nrow(res5)) {
  if (res5[i,] < 0.5) {
    t_res5 = c(t_res5, 0)
  }
  else {
    t_res5 = c(t_res5, 1)
  }
}
accuracy5 = sum(data.frame(t_res5) == test_set5[, 11]) / 76222
accuracy5
```

```
## [1] 0.8780929
```

```
mean(accuracy1, accuracy2, accuracy3, accuracy4, accuracy5)
```

```
## [1] 0.8764582
```