Human Resource Analytics

Loading The required packages

```
library(ggplot2)
library(dplyr)
library(tidyr)

#Loading the Dataset

hrm<-read.csv('HR_comma_sep.csv')

#Structure of the Dataset
str(hrm)
```

```
## 'data.frame':    14999 obs. of  10 variables:
##  $ satisfaction_level   : num  0.38 0.8 0.11 0.72 0.37 0.41 0.1 0.92 0.89
0.42 ...
##  $ last_evaluation      : num  0.53 0.86 0.88 0.87 0.52 0.5 0.77 0.85 1
0.53 ...
##  $ number_project       : int  2 5 7 5 2 2 6 5 5 2 ...
##  $ average_montly_hours : int  157 262 272 223 159 153 247 259 224 142 ...
##  $ time_spend_company   : int  3 6 4 5 3 3 4 5 5 3 ...
##  $ Work_accident        : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ left                 : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ promotion_last_5years: int  0 0 0 0 0 0 0 0 0 0 ...
##  $ sales                : Factor w/ 10 levels "accounting","hr",..: 8 8 8
8 8 8 8 8 8 8 ...
##  $ salary               : Factor w/ 3 levels "high","low","medium": 2 3 3
2 2 2 2 2 2 2 ...
```

```
attach(hrm)

#converting left variable to factor variable
hrm$left<-ifelse(left==1,'True','False')

hrm$left<-factor(hrm$left,levels=c("True","False"))
table(hrm$left)
```

```
##
##  True False
##  3571 11428
```

```
#Summary Statistics of the dataset
summary(hrm)
```

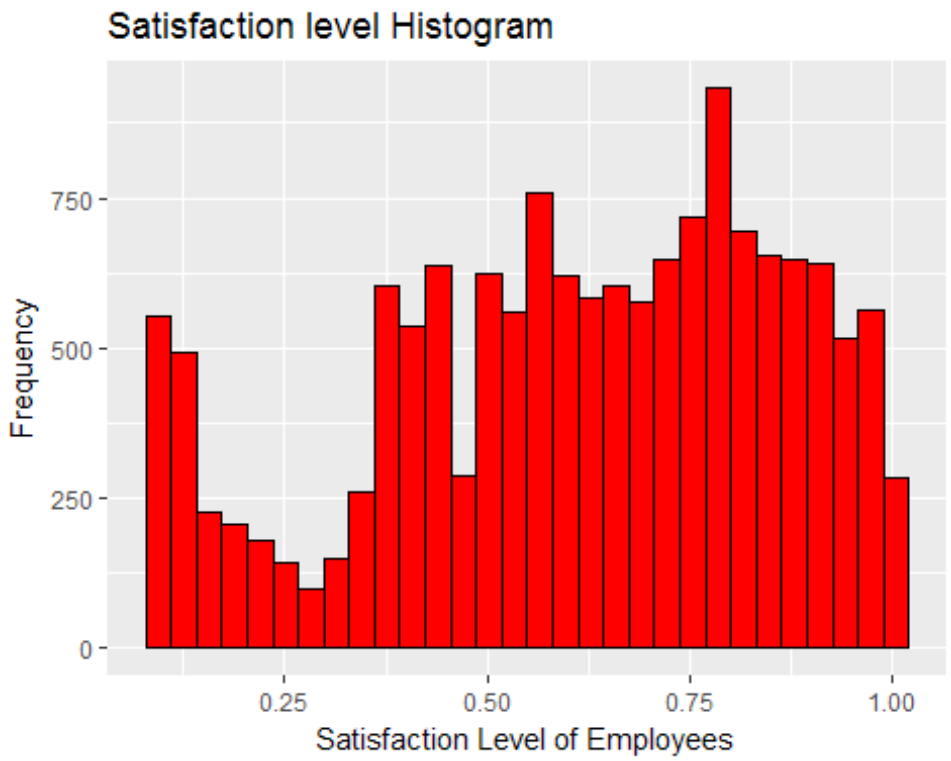
```
##  satisfaction_level last_evaluation  number_project  average_montly_hours
##  Min.   :0.0900     Min.   :0.3600   Min.   :2.000   Min.   : 96.0
##  1st Qu.:0.4400     1st Qu.:0.5600   1st Qu.:3.000   1st Qu.:156.0
##  Median :0.6400     Median :0.7200   Median :4.000   Median :200.0
##  Mean   :0.6128     Mean   :0.7161   Mean   :3.803   Mean   :201.1
##  3rd Qu.:0.8200     3rd Qu.:0.8700   3rd Qu.:5.000   3rd Qu.:245.0
##  Max.   :1.0000     Max.   :1.0000   Max.   :7.000   Max.   :310.0
##
##  time_spend_company Work_accident       left       promotion_last_5years
##  Min.   : 2.000     Min.   :0.0000   True : 3571   Min.   :0.00000
##  1st Qu.: 3.000     1st Qu.:0.0000   False:11428   1st Qu.:0.00000
##  Median : 3.000     Median :0.0000                 Median :0.00000
##  Mean   : 3.498     Mean   :0.1446                 Mean   :0.02127
##  3rd Qu.: 4.000     3rd Qu.:0.0000                 3rd Qu.:0.00000
##  Max.   :10.000     Max.   :1.0000                 Max.   :1.00000
##
##          sales         salary
##  sales      :4140   high  :1237
##  technical  :2720   low   :7316
##  support    :2229   medium:6446
##  IT         :1227
##  product_mng: 902
##  marketing  : 858
##  (Other)    :2923
```

Satisfaction level statistics splitted by salary ranges

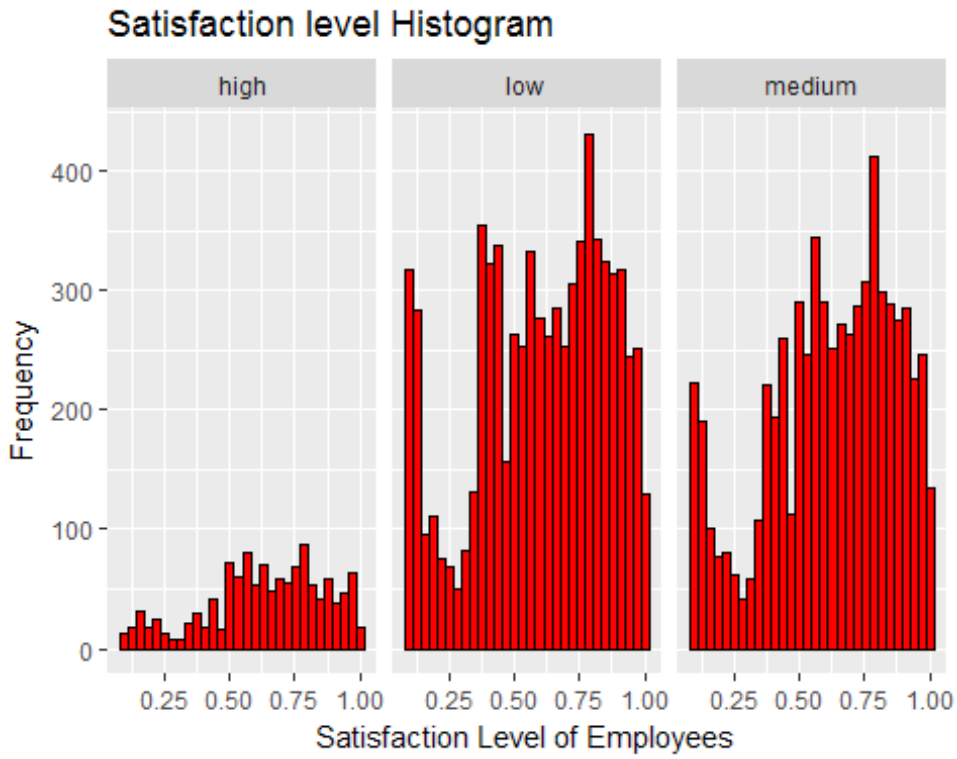
```
by(hrm$satisfaction_level,hrm$salary,summary)
```

```
## hrm$salary: high
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.5000  0.6600  0.6375  0.8100  1.0000
## ------------------------------------------------------------
## hrm$salary: low
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.4200  0.6300  0.6008  0.8100  1.0000
## ------------------------------------------------------------
## hrm$salary: medium
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.4500  0.6600  0.6218  0.8200  1.0000
```

```
#Histogram

p1<-ggplot(aes(x=satisfaction_level),data=hrm) +
  geom_histogram(color="black",fill="red",bins = 30) +
  labs(title="Satisfaction level Histogram",x='Satisfaction Level of
Employees', y="Frequency")

p1
```




```
#Satisfaction level histogram facetted by sallary classes

p2 =  p1  + facet_wrap(~salary)
p2
```

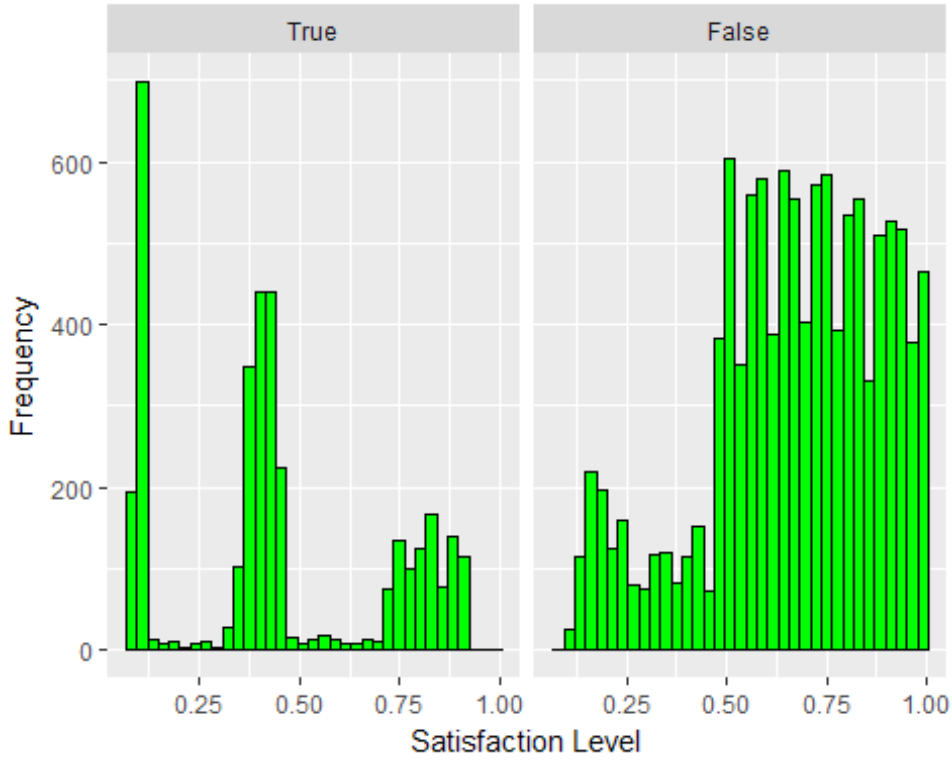


The disrtibution of satisfaction level for each class of Salary Ranges is almost same.
The High salary employees have a little bit higher mean satisfaction level.
Employees with High salary are less in number.

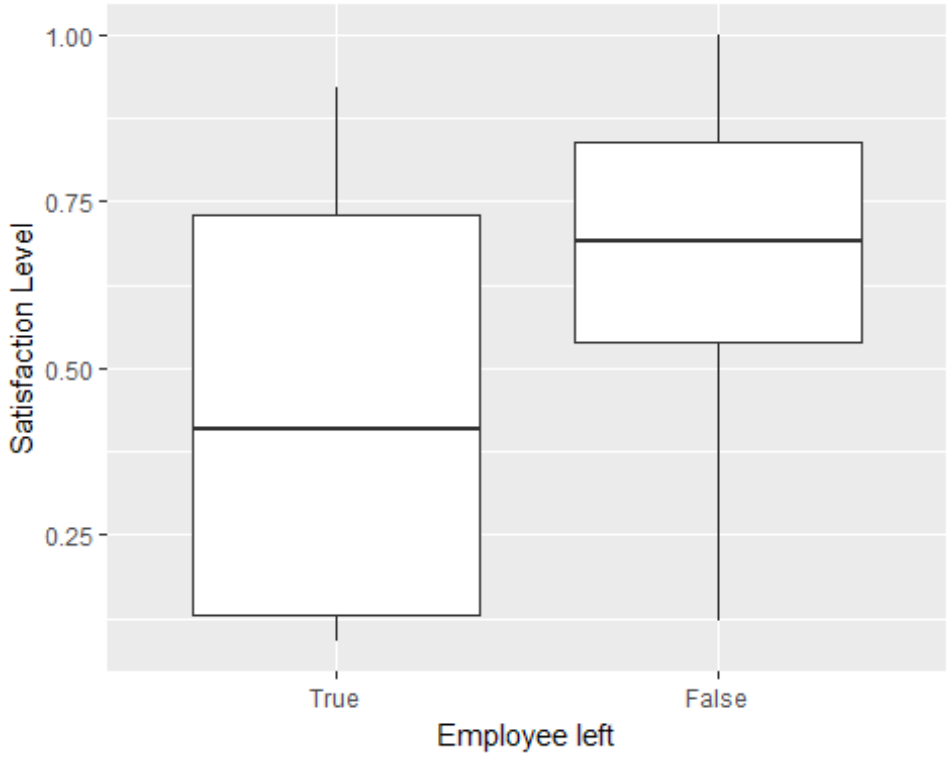
```
by(satisfaction_level,left,summary)
```

```
## left: 0
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1200  0.5400  0.6900  0.6668  0.8400  1.0000
## ------------------------------------------------------------
## left: 1
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.1300  0.4100  0.4401  0.7300  0.9200
```

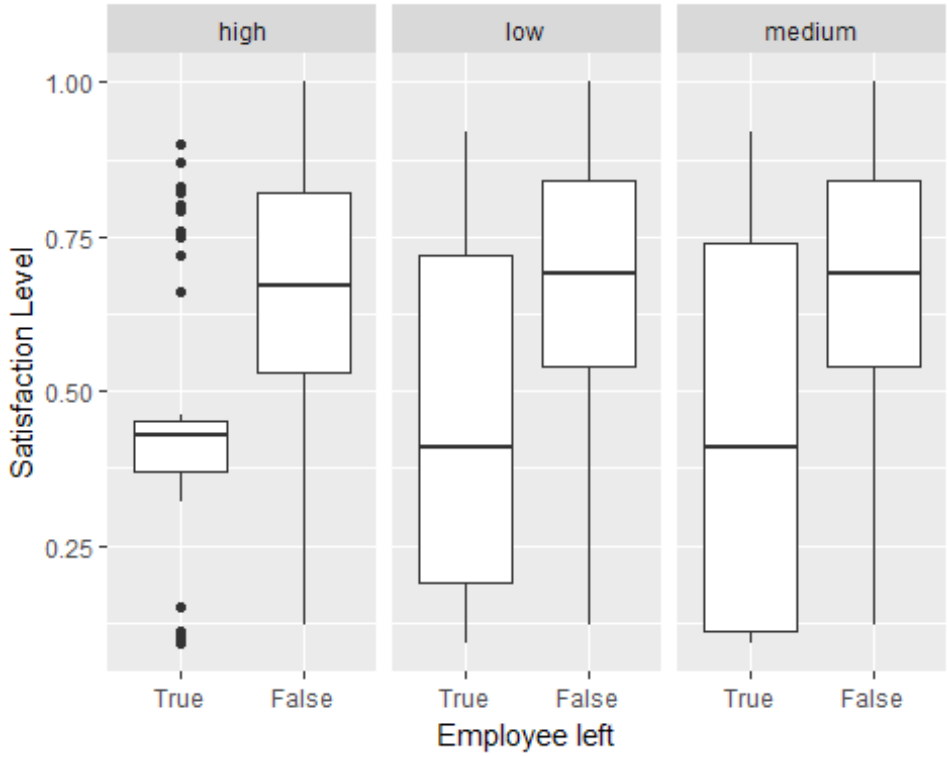
```
#As peedicted the satifaction level of employees who left was lower

#Sstisfaction level vs left
ggplot(aes(x = satisfaction_level),data=hrm) +
  geom_histogram(color='black',fill='green',bins=35) +
  xlab('Satisfaction Level') +
  ylab("Frequency")  +
  facet_wrap(~left)
```




```
#Boxplot for Satisfaction level vs left
ggplot(aes(x = left,y=satisfaction_level),data= hrm) +
  geom_boxplot() +
  ylab('Satisfaction Level') +
  xlab("Employee left") +
  labs(fill="Salary Classes")
```




```r
#Boxplot for Satisfaction level vs left facetted by Salary Ranges
ggplot(aes(x = left,y=satisfaction_level),data= hrm) +
  geom_boxplot() +
  ylab('Satisfaction Level') +
  xlab("Employee left") +
  facet_wrap(~salary)
```




```
table(hrm$left , salary)
```

```
##        salary
##         high  low medium
##   True    82 2172   1317
##   False 1155 5144   5129
```

```
#Testing for the dependence between left and salary Ranges
#Both are categorial variables so we use Chisq Test statistic
chisq.test(left,salary)
```

```
##
##  Pearson's Chi-squared test
##
## data:  left and salary
## X-squared = 381.23, df = 2, p-value < 2.2e-16
```

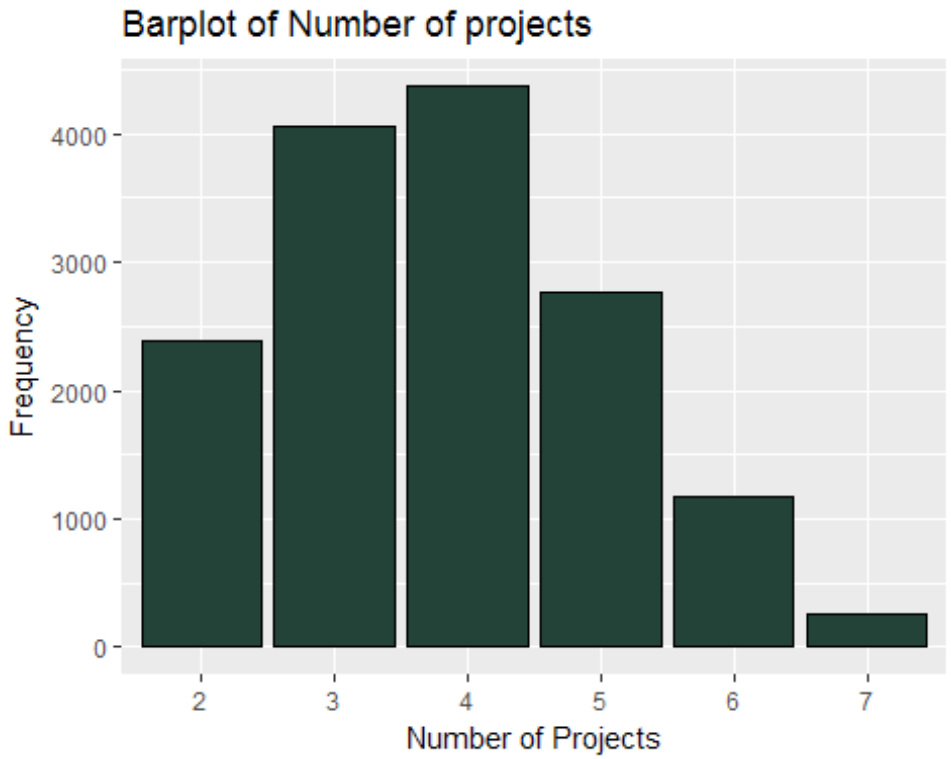
X-squared value is high and p-value is less i.e results are significant.Both variables are related

---

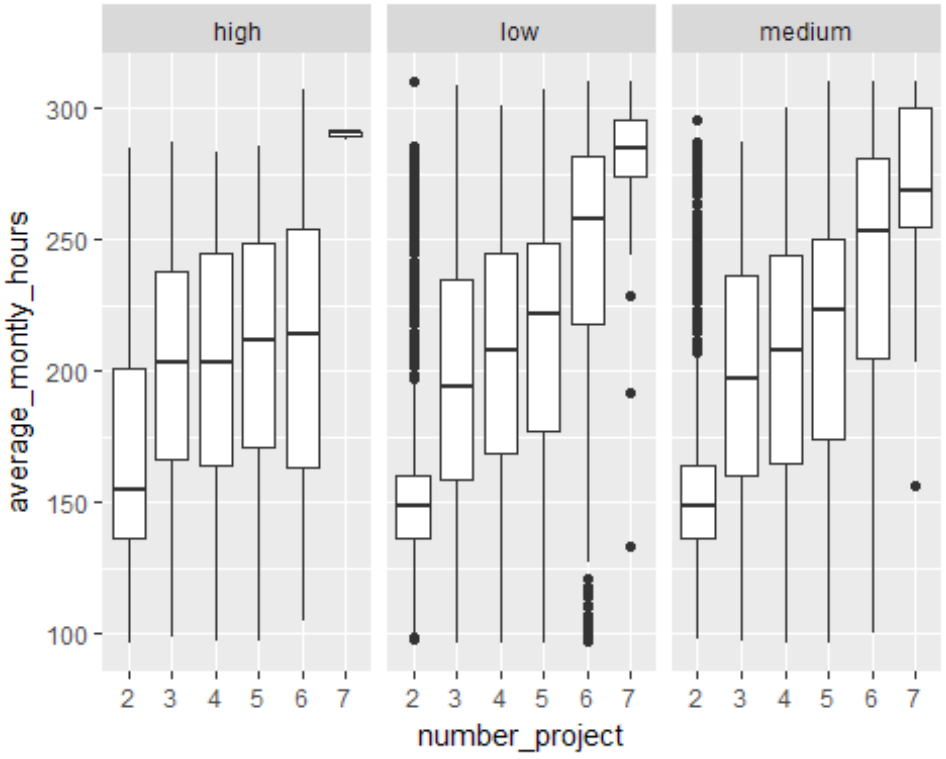
Analysis on number of Projects

```
hrm$number_project<-factor(hrm$number_project)

ggplot(aes(x=number_project),data = hrm) +
  geom_bar(color='black',fill='#234338') +
```

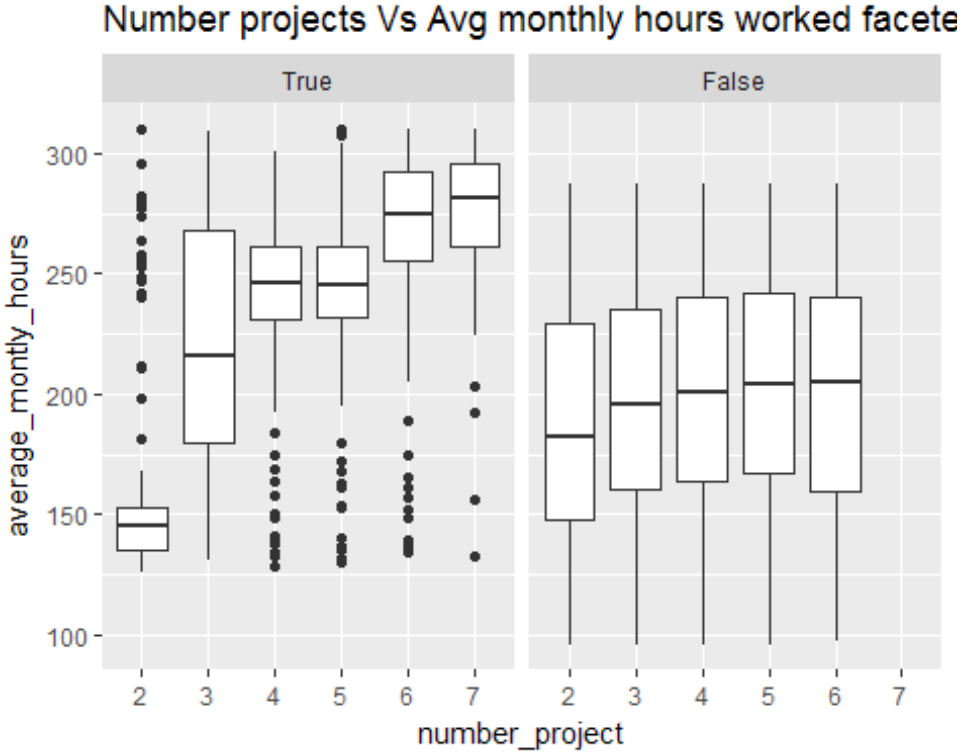
```
  xlab("Number of Projects") +
  ylab("Frequency") +
  labs(title="Barplot of Number of projects")
```



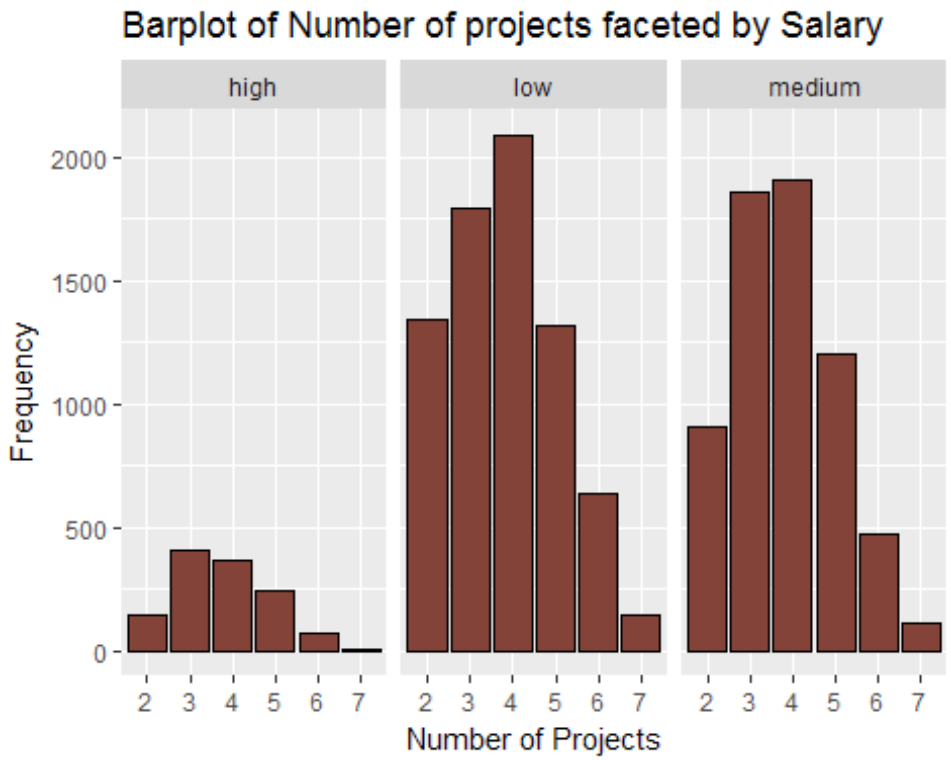

```
#boxplot of number of projects vs  Average monthly hours at workplace of
employees
p3=ggplot(aes(x=number_project, y = average_montly_hours),data=hrm)+
  geom_boxplot()

p4=p3+facet_wrap(~salary)
p4
```



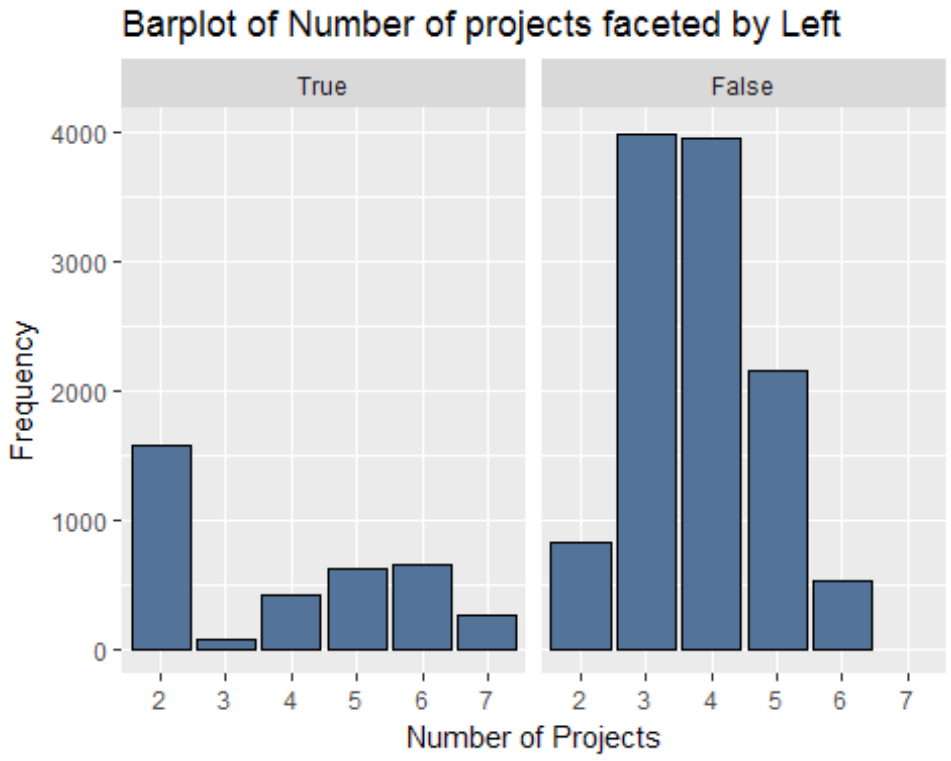

```
p5=p3+facet_wrap(~left) + labs(title="Number projects Vs Avg monthly hours
worked faceted by Left")
p5
```



```r
#facetted by salary
ggplot(aes(x=number_project),data = hrm) +
  geom_bar(color='black',fill='#834338') +
  xlab("Number of Projects") +
  ylab("Frequency") +
  labs(title="Barplot of Number of projects faceted by Salary") +
  facet_wrap(~salary)
```

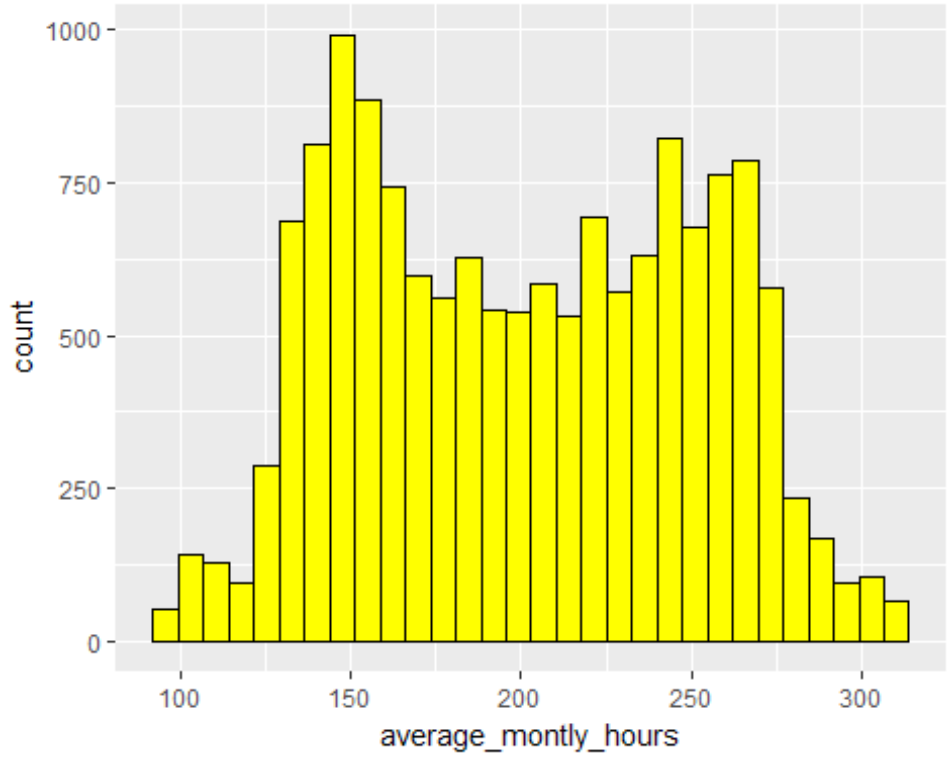



```r
#faceted by If a employee left or not
ggplot(aes(x=number_project),data = hrm) +
  geom_bar(color='black',fill='#547398') +
  xlab("Number of Projects") +
  ylab("Frequency") +
  labs(title="Barplot of Number of projects faceted by Left")+
  facet_wrap(~left)
```

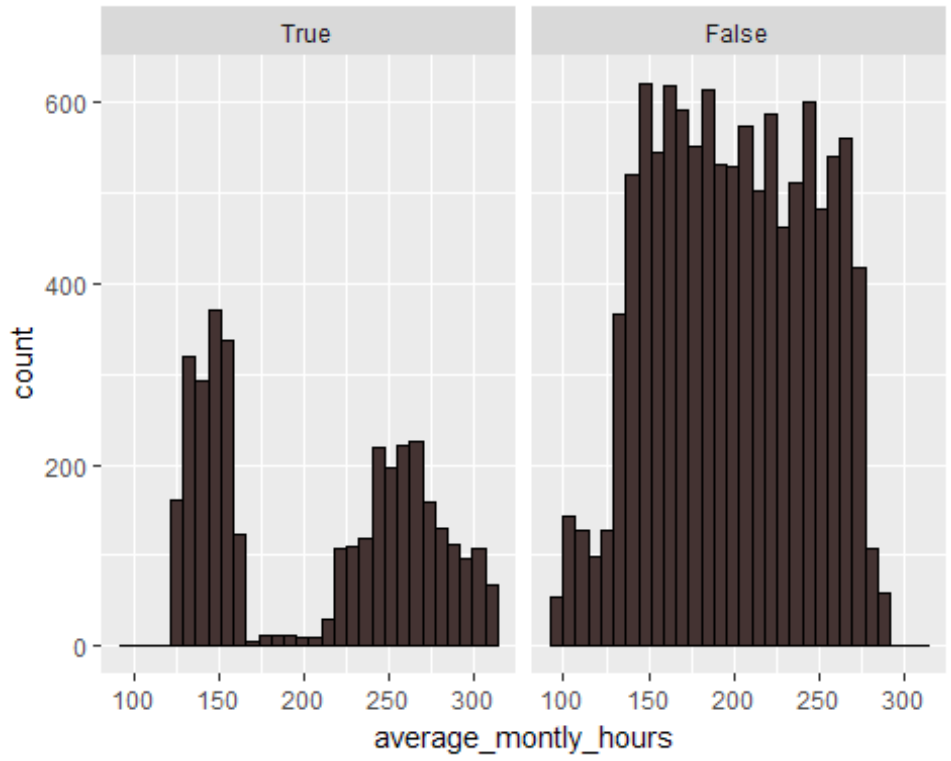


Analysis on Average Number of Hours a Employee works

```
#Analysis of average monthly hours
summary(average_montly_hours)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    96.0   156.0   200.0   201.1   245.0   310.0

#Somewhat Normally distributed

ggplot(aes(x= average_montly_hours),data = hrm)+
  geom_histogram(color='black',fill="yellow",bins = 30)
```




```
cor.test(satisfaction_level,average_montly_hours)

##
##  Pearson's product-moment correlation
##
## data:  satisfaction_level and average_montly_hours
## t = -2.4556, df = 14997, p-value = 0.01408
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.036040356 -0.004045605
## sample estimates:
##         cor
## -0.02004811

#No relation between both the variables -  as r is eqv to 0

ggplot(aes(x = average_montly_hours),data =hrm ) +
  geom_histogram(color='black',fill='#443332',bins = 30) +
  facet_wrap(~left)
```




```
by(average_montly_hours , hrm$left ,summary)

## hrm$left: True
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   126.0   146.0   224.0   207.4   262.0   310.0
## ------------------------------------------------------------
## hrm$left: False
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    96.0   162.0   198.0   199.1   238.0   287.0

ggplot(aes(y = average_montly_hours, x = hrm$left),data=hrm)+
  geom_boxplot() +
  xlab("Employee left or not") +
  ylab("Average Montly hours worked")
```

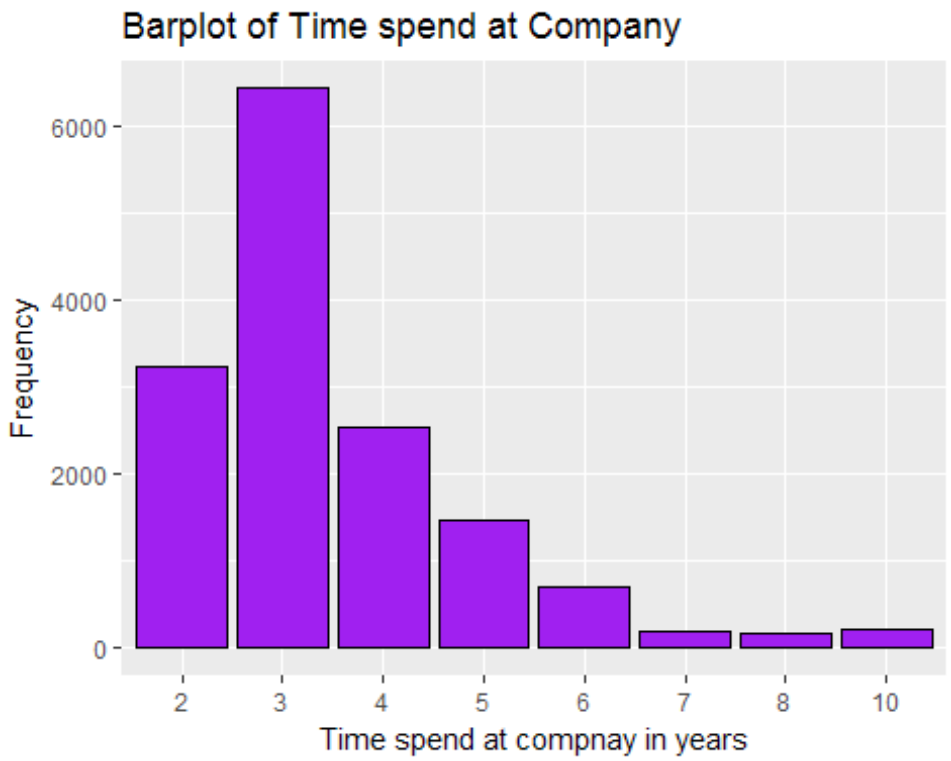
A thing to notice is that employee who left the company worked more hours than those who did not leave, hence it might be possible that they left bacause they were over pressurized by their peers or bosses or over worked or stressed with lots of work

Anslysis for variable Time spend at company

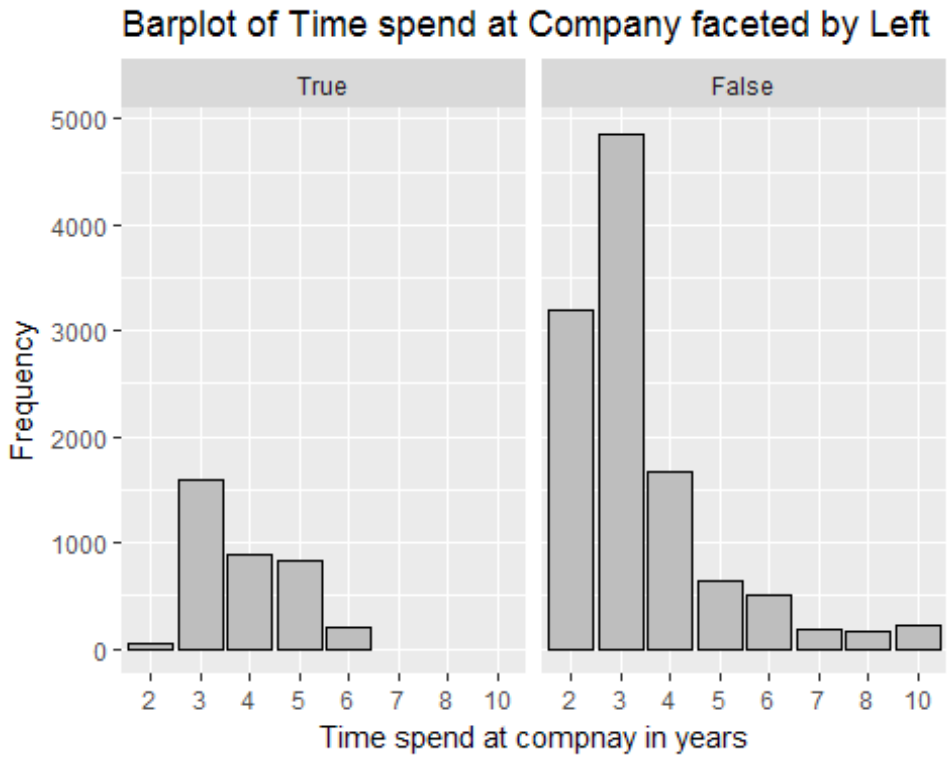
```
table(hrm$time_spend_company)
```

```
##
##    2    3    4    5    6    7    8   10
## 3244 6443 2557 1473  718  188  162  214
```

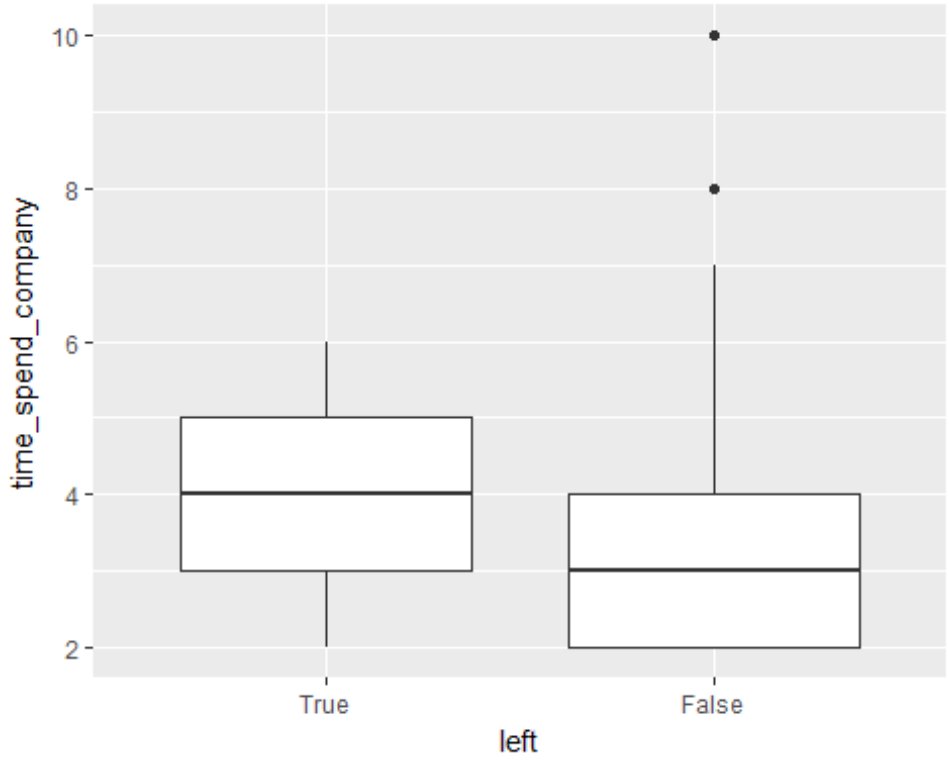
```
ggplot(aes(x = factor(time_spend_company)),data = hrm) +
  geom_bar(fill = 'purple',color='black') +
  xlab("Time spend at compnay in years") +
  ylab("Frequency")+
  labs(title = "Barplot of Time spend at Company")
```




```r
#Time spend at company vs Left or not

ggplot(aes(x = factor(time_spend_company)),data = hrm) +
  geom_bar(fill = 'grey',color='black') +
  xlab("Time spend at compnay in years") +
  ylab("Frequency")+
  labs(title = "Barplot of Time spend at Company faceted by Left")  +
  facet_wrap(~left)
```




```
by(time_spend_company , left , summary)

## left: 0
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2.00    2.00    3.00    3.38    4.00   10.00
## ------------------------------------------------------------
## left: 1
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.877   5.000   6.000

ggplot(aes(x = left , y = time_spend_company),data = hrm)+
  geom_boxplot()
```



Time Spend at company vs Satisfaaction level

```
by(satisfaction_level,factor(time_spend_company),summary)
```

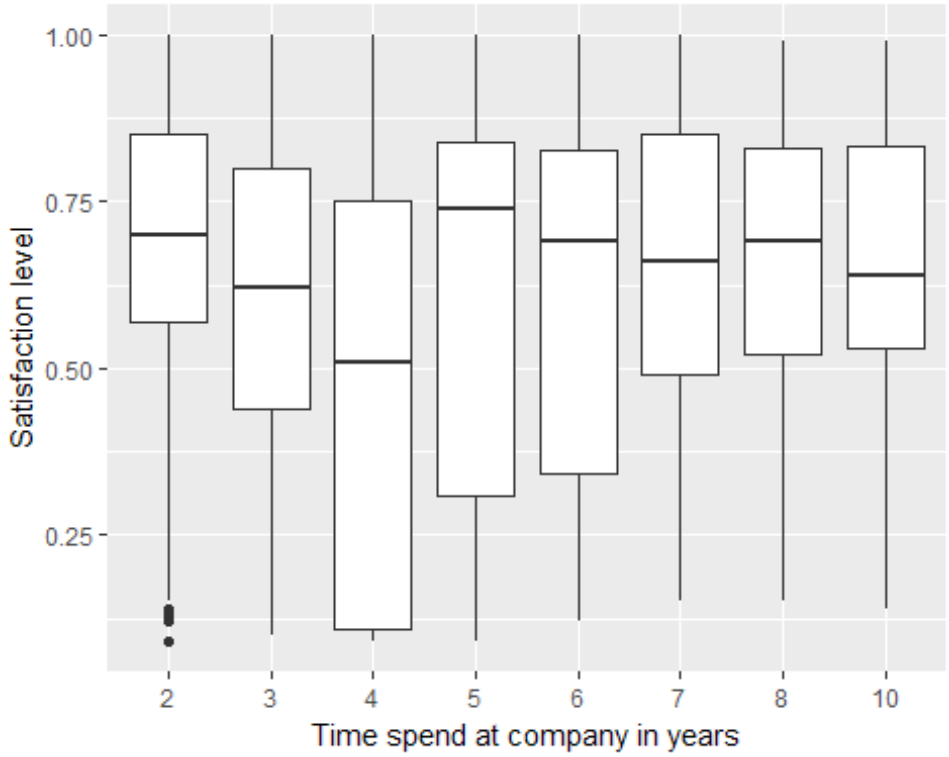
```
## factor(time_spend_company): 2
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.5700  0.7000  0.6971  0.8500  1.0000
## ------------------------------------------------------------
## factor(time_spend_company): 3
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1000  0.4400  0.6200  0.6263  0.8000  1.0000
## ------------------------------------------------------------
## factor(time_spend_company): 4
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.1100  0.5100  0.4675  0.7500  1.0000
## ------------------------------------------------------------
## factor(time_spend_company): 5
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.3100  0.7400  0.6103  0.8400  1.0000
## ------------------------------------------------------------
## factor(time_spend_company): 6
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1200  0.3425  0.6900  0.6034  0.8275  1.0000
## ------------------------------------------------------------
## factor(time_spend_company): 7
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.150   0.490   0.660   0.636   0.850   1.000
```

```
## ------------------------------------------------------------
## factor(time_spend_company): 8
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1500  0.5200  0.6900  0.6651  0.8300  0.9900
## ------------------------------------------------------------
## factor(time_spend_company): 10
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.1400  0.5300  0.6400  0.6553  0.8325  0.9900
```

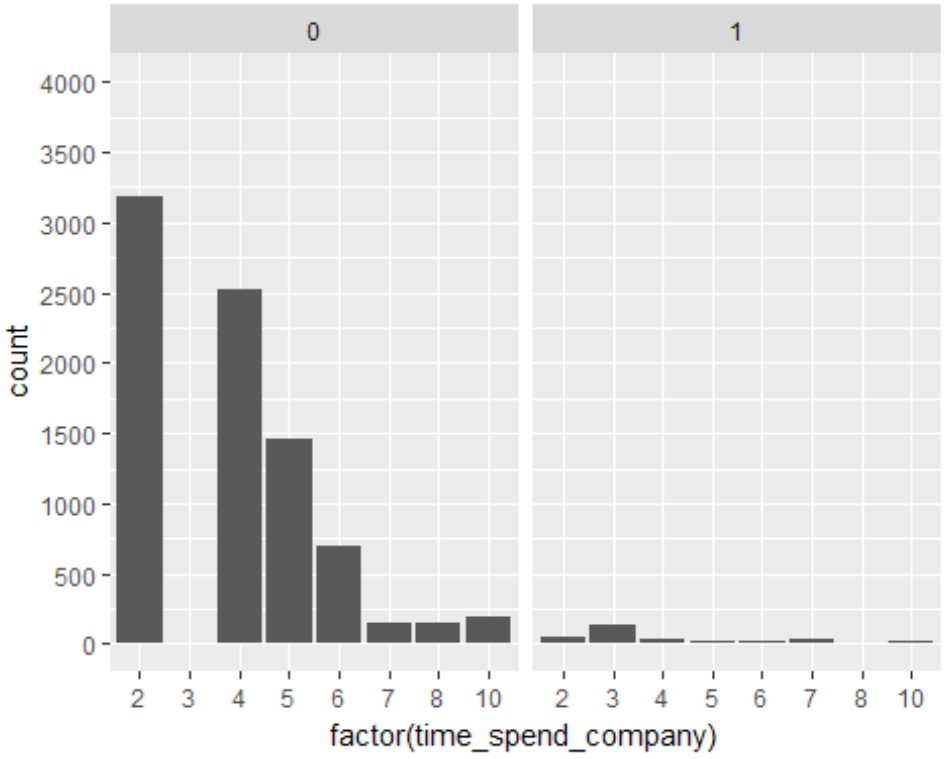
```
cor.test(satisfaction_level,time_spend_company)
```

```
##
##  Pearson's product-moment correlation
##
## data:  satisfaction_level and time_spend_company
## t = -12.416, df = 14997, p-value < 2.2e-16
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
##  -0.11668153 -0.08499948
## sample estimates:
##        cor
## -0.1008661
```

```
#both have a negetive correlation

#plots vs Time spend and Satisfaction level
ggplot(aes(x=factor(time_spend_company),y=satisfaction_level),data=hrm)+
  geom_boxplot() +
  xlab("Time spend at company in years")+
  ylab("Satisfaction level")
```




```
#Time spend at compnay vs Promotion in last 5 years

table(Promotion=promotion_last_5years,Time_Spend=factor(time_spend_company))

##           Time_Spend
## Promotion    2    3    4    5    6    7    8   10
##         0 3190 6309 2522 1456  701  152  152  198
##         1   54  134   35   17   17   36   10   16

#Employees who have had promotion are very less


ggplot(aes(x = factor(time_spend_company)),data = hrm)+
  geom_bar()+
  facet_wrap(~promotion_last_5years) +
  scale_y_continuous(limits=c(0,4000),breaks=seq(0,4000,500))

## Warning: Removed 1 rows containing missing values (geom_bar).
```

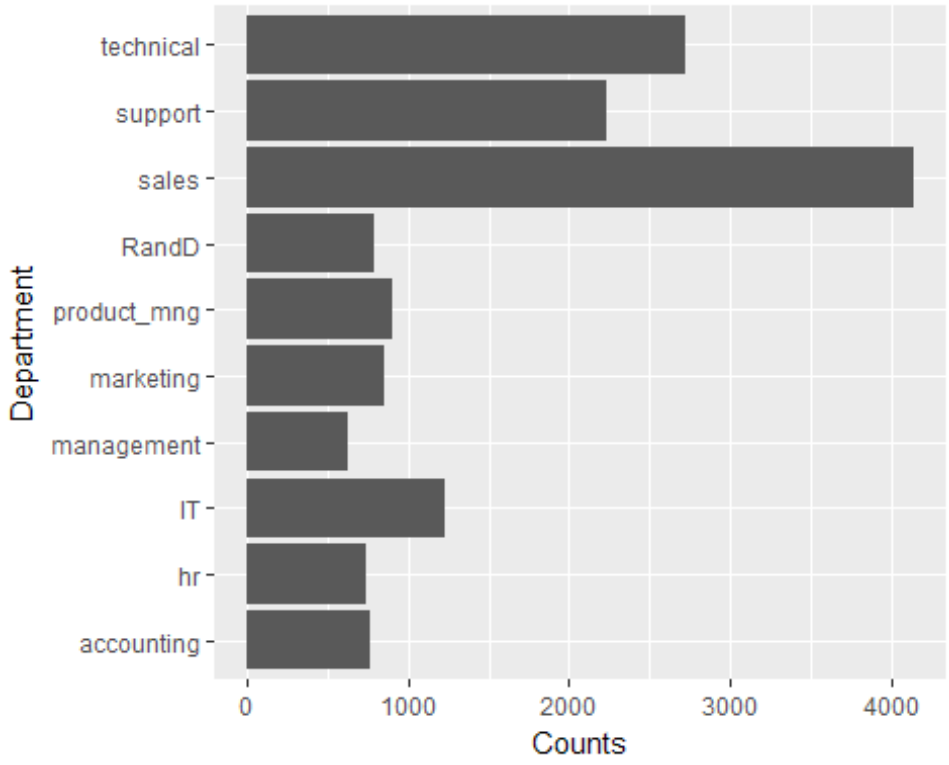



```
#Time spend vs Department of Work

by(time_spend_company,sales,summary)
```

```
## sales: accounting
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.523   4.000  10.000
## ------------------------------------------------------------
## sales: hr
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.356   4.000   8.000
## ------------------------------------------------------------
## sales: IT
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.469   4.000  10.000
## ------------------------------------------------------------
## sales: management
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   4.303   5.000  10.000
## ------------------------------------------------------------
## sales: marketing
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2.00    3.00    3.00    3.57    4.00   10.00
## ------------------------------------------------------------
## sales: product_mng
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.476   4.000  10.000
```

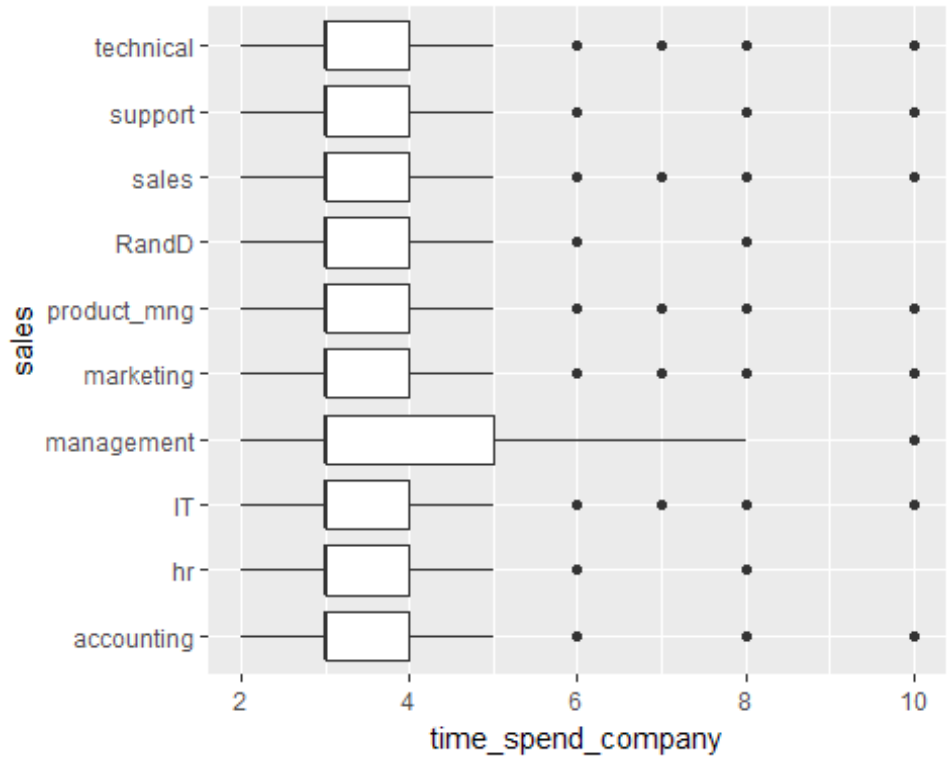
```
## ------------------------------------------------------------
## sales: RandD
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##   2.000   3.000   3.000   3.367   4.000   8.000 
## ------------------------------------------------------------
## sales: sales
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##   2.000   3.000   3.000   3.534   4.000  10.000 
## ------------------------------------------------------------
## sales: support
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##   2.000   3.000   3.000   3.393   4.000  10.000 
## ------------------------------------------------------------
## sales: technical
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##   2.000   3.000   3.000   3.411   4.000  10.000
```

```
ggplot(aes(x =sales),data = hrm ) +
  geom_bar()  +
  xlab('Department') +
  ylab('Counts') +
  coord_flip()
```



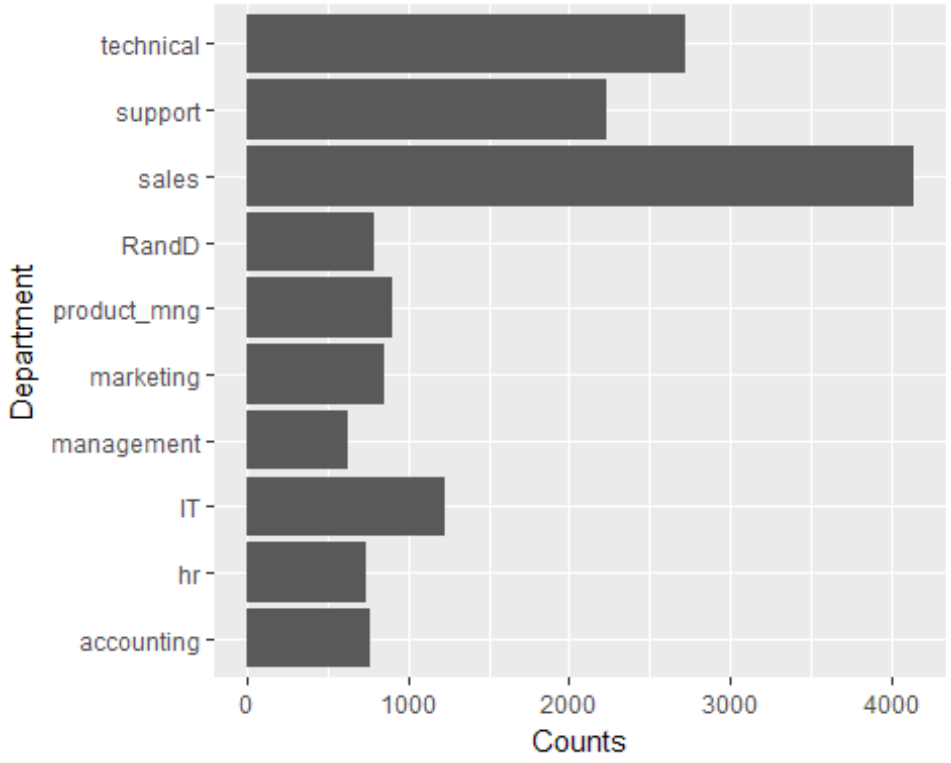

```
#highest count is for Sales department then Technical  and least for
#Management

ggplot(aes(x = sales,y = time_spend_company),data = hrm) +
```

```
  geom_boxplot() +
  coord_flip()
```



Analysis of Department of Work

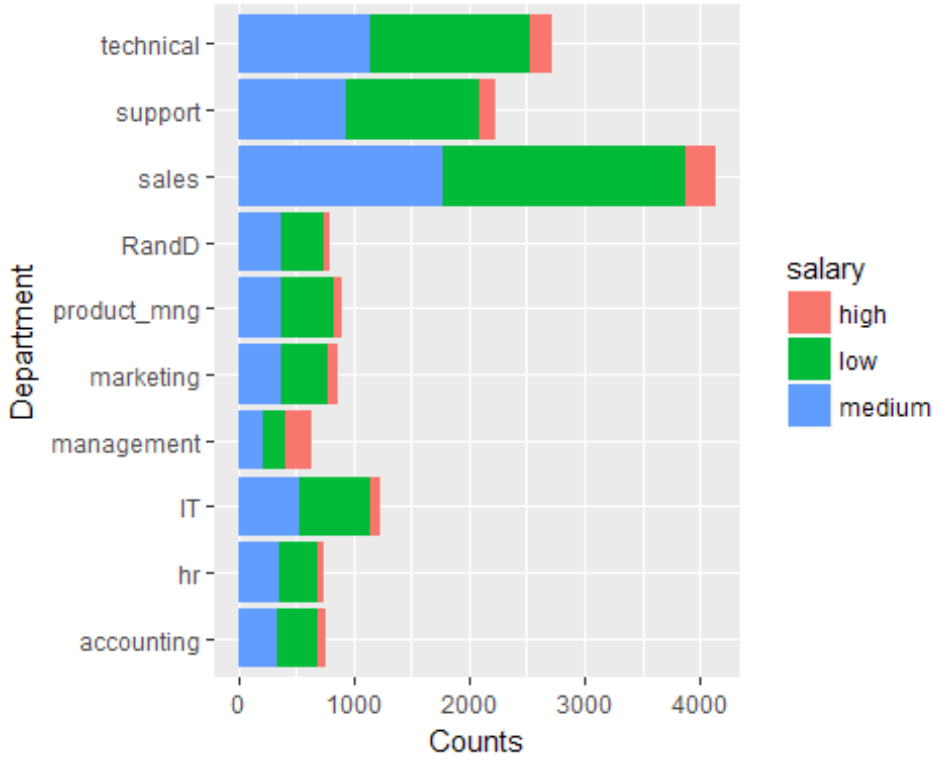
```
ggplot(aes(x =sales),data = hrm ) +
  geom_bar()  +
  xlab('Department') +
  ylab('Counts') +
  coord_flip()
```



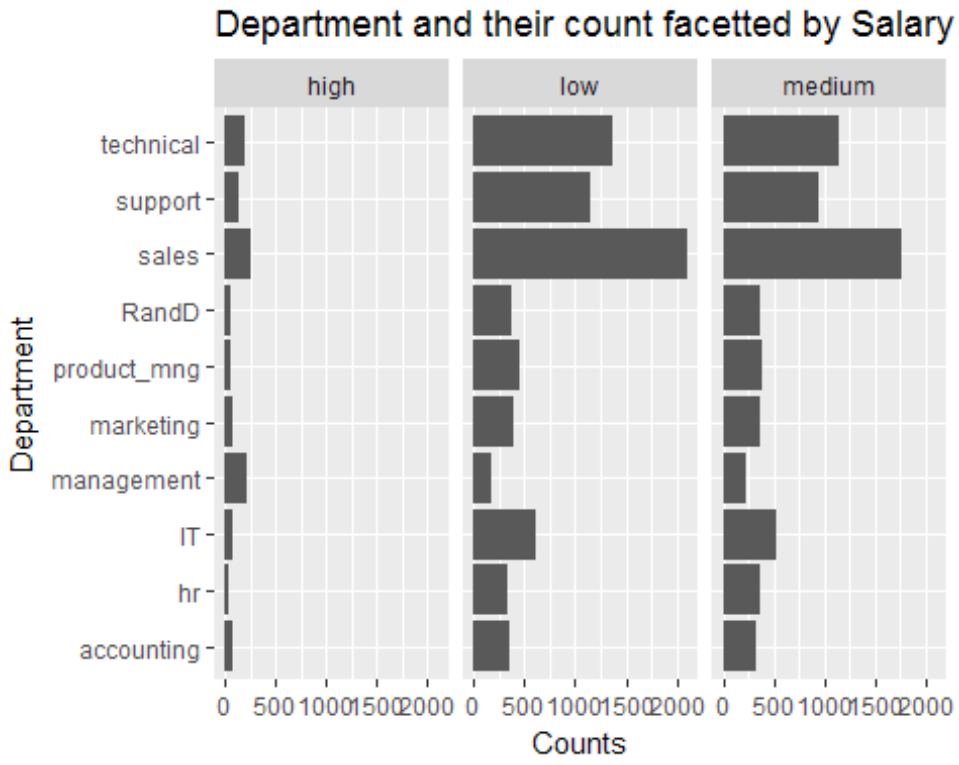

```
#highest count is for Sales department then Technical  and least for
#Management


#Department vs sallary

table(Dept = sales , Salary  = salary)
```

```
##               Salary
## Dept           high  low medium
##   accounting    74  358    335
##   hr            45  335    359
##   IT            83  609    535
##   management   225  180    225
##   marketing     80  402    376
##   product_mng   68  451    383
##   RandD         51  364    372
##   sales        269 2099   1772
##   support      141 1146    942
##   technical    201 1372   1147
```

```
ggplot(aes(x =sales),data = hrm ) +
  geom_bar(aes(fill=salary))  +
  xlab('Department') +
  ylab('Counts') +
  coord_flip()
```




```
ggplot(aes(x =sales),data = hrm ) +
  geom_bar()  +
  xlab('Department') +
  ylab('Counts') +
  labs(title = "Department and their count facetted by Salary ranges")+
  facet_wrap(~salary) +
  coord_flip()
```




```
chisq.test(sales,salary)
```

```
##
##  Pearson's Chi-squared test
##
## data:  sales and salary
## X-squared = 700.92, df = 18, p-value < 2.2e-16
```

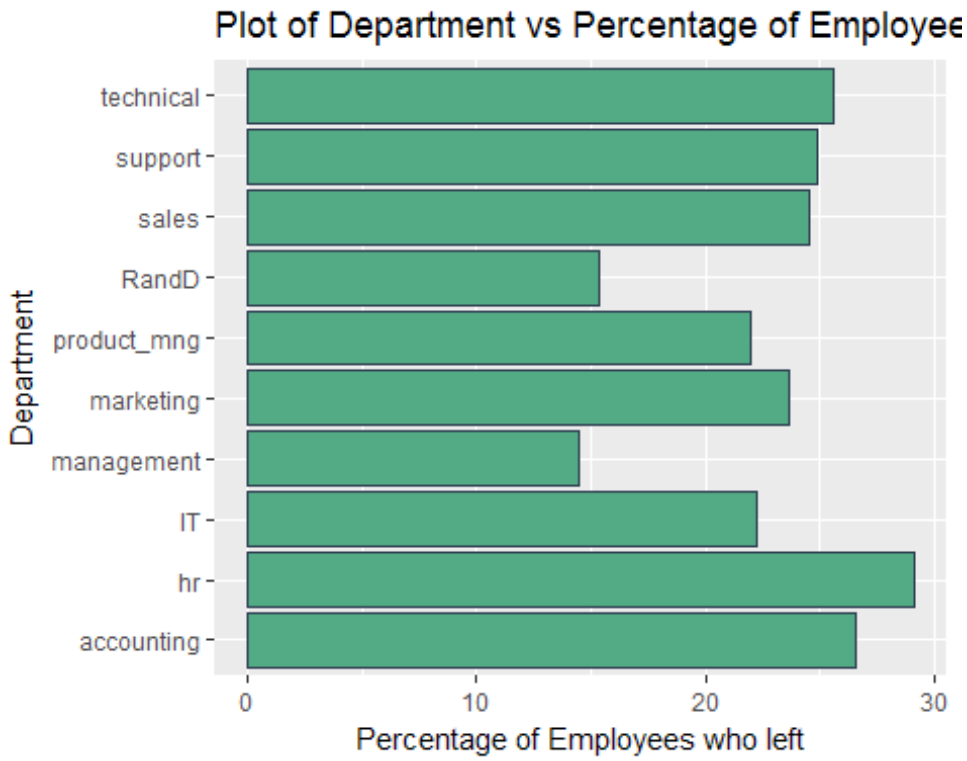
```
#Department and Salary is dependent on each other .
```

```
#finding proportions
prop.table(table(Dept = sales , left = left))*100
```

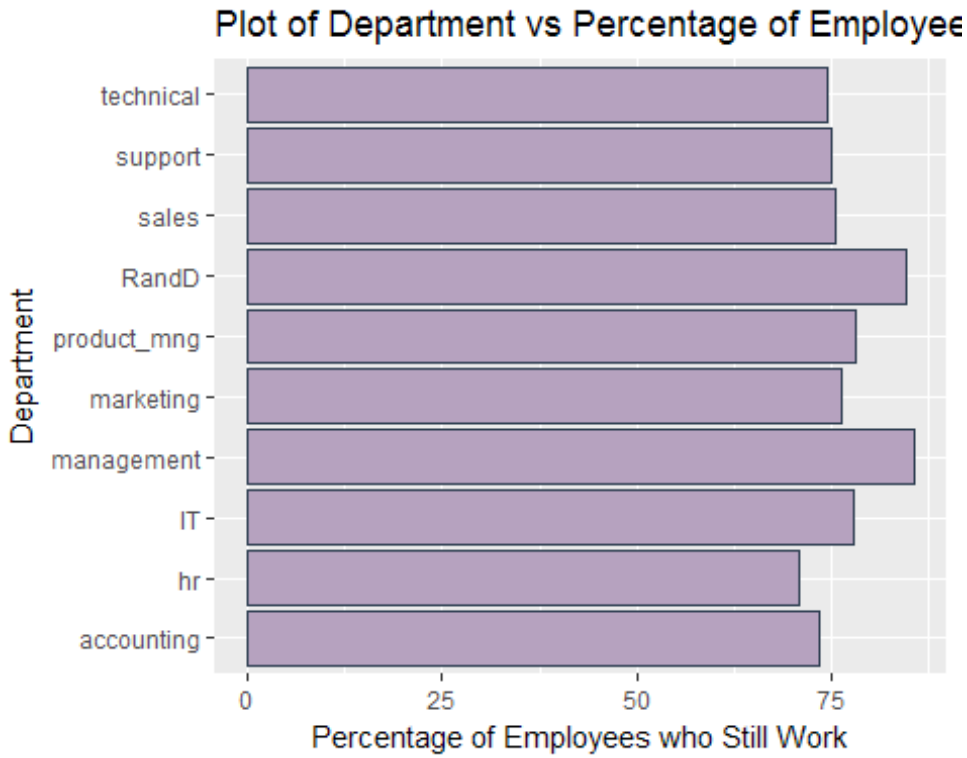
```
##              left
## Dept                    0          1
##   accounting   3.7535836  1.3600907
##   hr           3.4935662  1.4334289
##   IT           6.3604240  1.8201213
##   management   3.5935729  0.6067071
##   marketing    4.3669578  1.3534236
##   product_mng  4.6936462  1.3200880
##   RandD        4.4402960  0.8067204
##   sales       20.8413894  6.7604507
```

```
##   support     11.1607440  3.7002467
##   technical   13.4875658  4.6469765

as.data.frame(table(sales , left))->deptdf
deptdf

##          sales left Freq
## 1   accounting    0  563
## 2           hr    0  524
## 3           IT    0  954
## 4   management    0  539
## 5    marketing    0  655
## 6  product_mng    0  704
## 7        RandD    0  666
## 8        sales    0 3126
## 9      support    0 1674
## 10   technical    0 2023
## 11  accounting    1  204
## 12          hr    1  215
## 13          IT    1  273
## 14  management    1   91
## 15   marketing    1  203
## 16 product_mng    1  198
## 17       RandD    1  121
## 18       sales    1 1014
## 19     support    1  555
## 20   technical    1  697

deptdf<-hrm %>% group_by(sales,left) %>%
      summarise(count=n())

#making a data frame of Departments and the count of workers who left or not
deptdf<-spread(deptdf,left,count)

deptdf<-transform(deptdf,Perleft=(True/(True+False))*100 ,
PerWork=(False/(True+False))*100)
deptdf

##          sales True False  Perleft  PerWork
## 1   accounting  204   563 26.59713 73.40287
## 2           hr  215   524 29.09337 70.90663
## 3           IT  273   954 22.24939 77.75061
## 4   management   91   539 14.44444 85.55556
## 5    marketing  203   655 23.65967 76.34033
## 6  product_mng  198   704 21.95122 78.04878
## 7        RandD  121   666 15.37484 84.62516
## 8        sales 1014  3126 24.49275 75.50725
## 9      support  555  1674 24.89906 75.10094
## 10   technical  697  2023 25.62500 74.37500
```

```r
#Plot of Department vs Percentage of Employees who left
ggplot(aes(x=sales, y = Perleft),data = deptdf) +
  geom_col(fill='#53ab85',color='#2f3f52') +
  coord_flip()+
  xlab("Department") +
  ylab("Percentage of Employees who left") +
  labs(title="Plot of Department vs Percentage of Employee left")
```



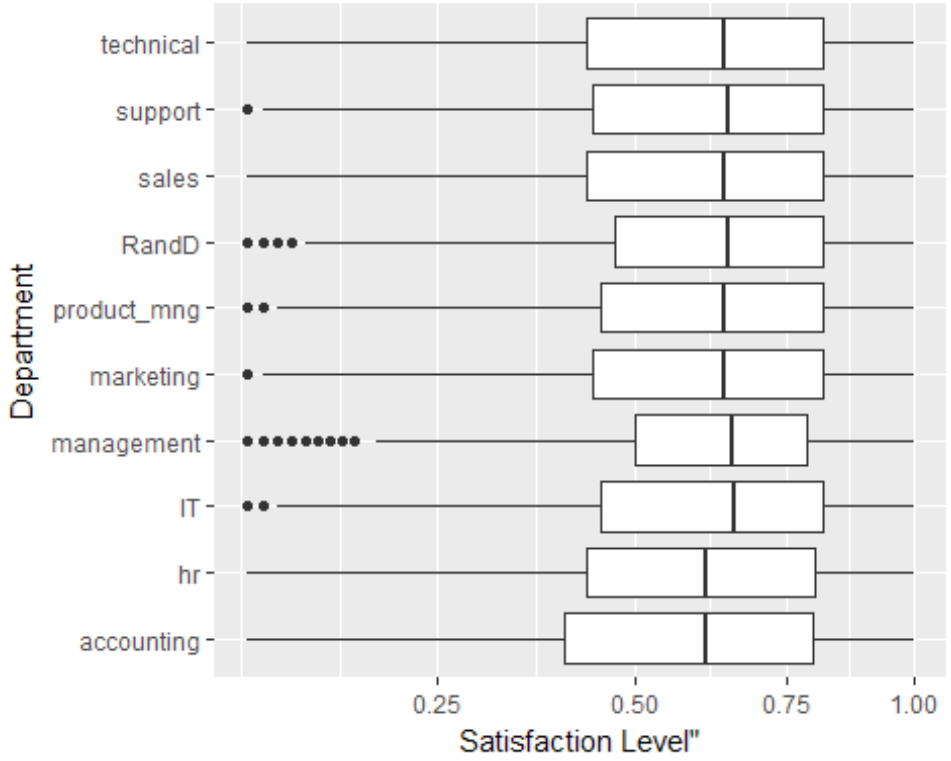

```r
#highest percentage of employees belonged to HR dept then accounting
# least for management dept who left



#Plot of Department vs Percentage of People Working
ggplot(aes(x=sales, y = PerWork),data = deptdf) +
  geom_col(fill='#b6a2bf',color='#2f3f52') +
  coord_flip()+
  xlab("Department") +
  ylab("Percentage of Employees who Still Work") +
  labs(title="Plot of Department vs Percentage of Employees Working")
```




```
#Department vs Satisfaction level

by(satisfaction_level,sales,summary)

## sales: accounting
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.4000  0.6100  0.5822  0.8000  1.0000
## ------------------------------------------------------------
## sales: hr
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.4300  0.6100  0.5988  0.8050  1.0000
## ------------------------------------------------------------
## sales: IT
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.4500  0.6600  0.6181  0.8200  1.0000
## ------------------------------------------------------------
## sales: management
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.5000  0.6550  0.6213  0.7900  1.0000
## ------------------------------------------------------------
## sales: marketing
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.4400  0.6400  0.6186  0.8200  1.0000
## ------------------------------------------------------------
## sales: product_mng
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0900  0.4500  0.6400  0.6196  0.8200  1.0000
```

```
## ------------------------------------------------------------
## sales: RandD
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##  0.0900  0.4700  0.6500  0.6198  0.8200  1.0000 
## ------------------------------------------------------------
## sales: sales
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##  0.0900  0.4300  0.6400  0.6144  0.8200  1.0000 
## ------------------------------------------------------------
## sales: support
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##  0.0900  0.4400  0.6500  0.6183  0.8200  1.0000 
## ------------------------------------------------------------
## sales: technical
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##  0.0900  0.4300  0.6400  0.6079  0.8200  1.0000
```

```
#highest mean satisfaction for R&D and Management Dept

ggplot(aes(x = sales, y = satisfaction_level),data = hrm)+
  geom_boxplot() +
  scale_y_sqrt()+
  xlab('Department') +
  ylab('Satisfaction Level"') +
  coord_flip()
```



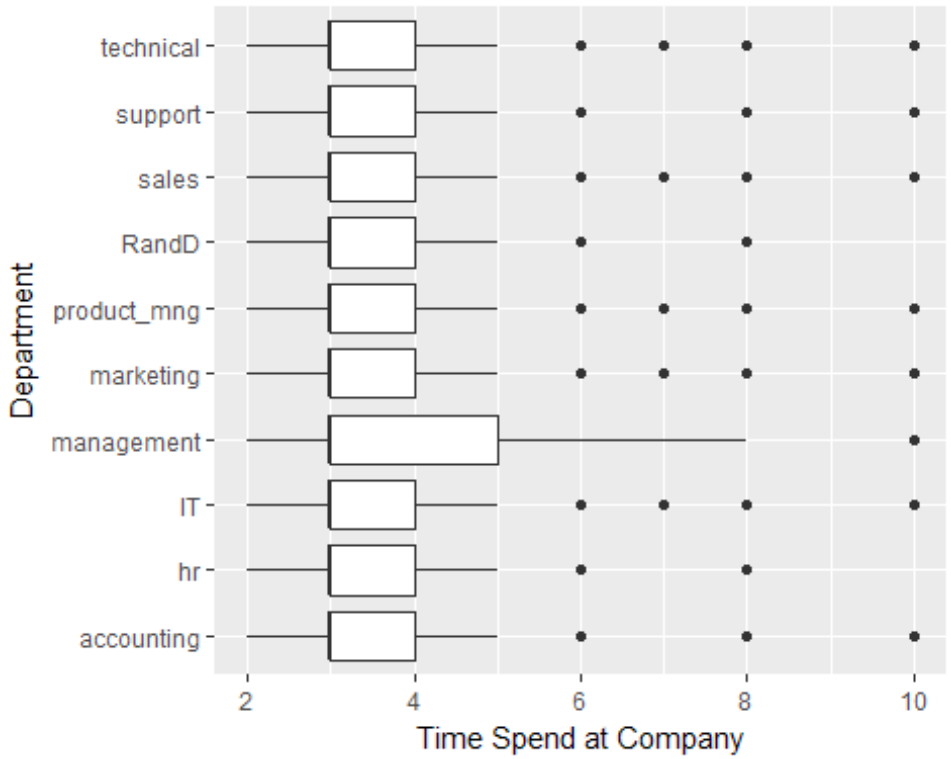
```
#Highest Median Satisfaction for IT dept, R&D and , Management
#Least Median Satifaction level for HR and Accounting
```

```
#Analysis of Department vs Time spend at company
```

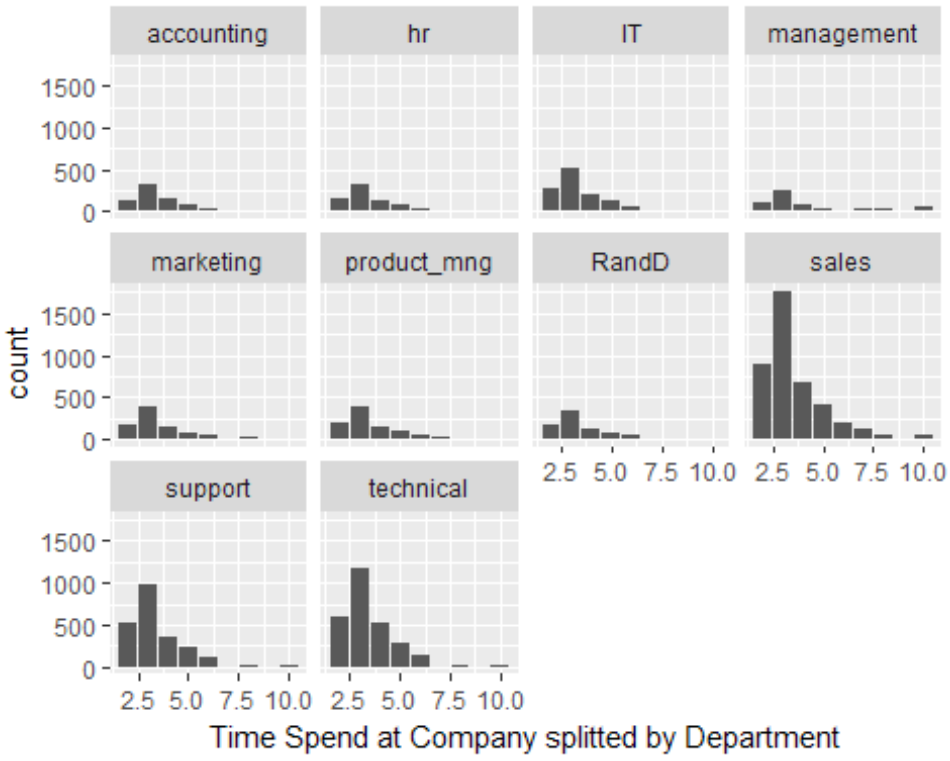
```
by(time_spend_company,sales,summary)
```

```
## sales: accounting
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.523   4.000  10.000
## ------------------------------------------------------------
## sales: hr
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.356   4.000   8.000
## ------------------------------------------------------------
## sales: IT
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.469   4.000  10.000
## ------------------------------------------------------------
## sales: management
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   4.303   5.000  10.000
## ------------------------------------------------------------
## sales: marketing
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2.00    3.00    3.00    3.57    4.00   10.00
## ------------------------------------------------------------
## sales: product_mng
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.476   4.000  10.000
## ------------------------------------------------------------
## sales: RandD
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.367   4.000   8.000
## ------------------------------------------------------------
## sales: sales
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.534   4.000  10.000
## ------------------------------------------------------------
## sales: support
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.393   4.000  10.000
## ------------------------------------------------------------
```

```
## sales: technical
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   3.000   3.411   4.000  10.000

#Maximum  Mean Time spent by Managaement Employees

ggplot(aes(x = sales,y = time_spend_company),data = hrm) +
  geom_boxplot() +
  xlab('Department') +
  ylab("Time Spend at Company") +
  coord_flip()
```



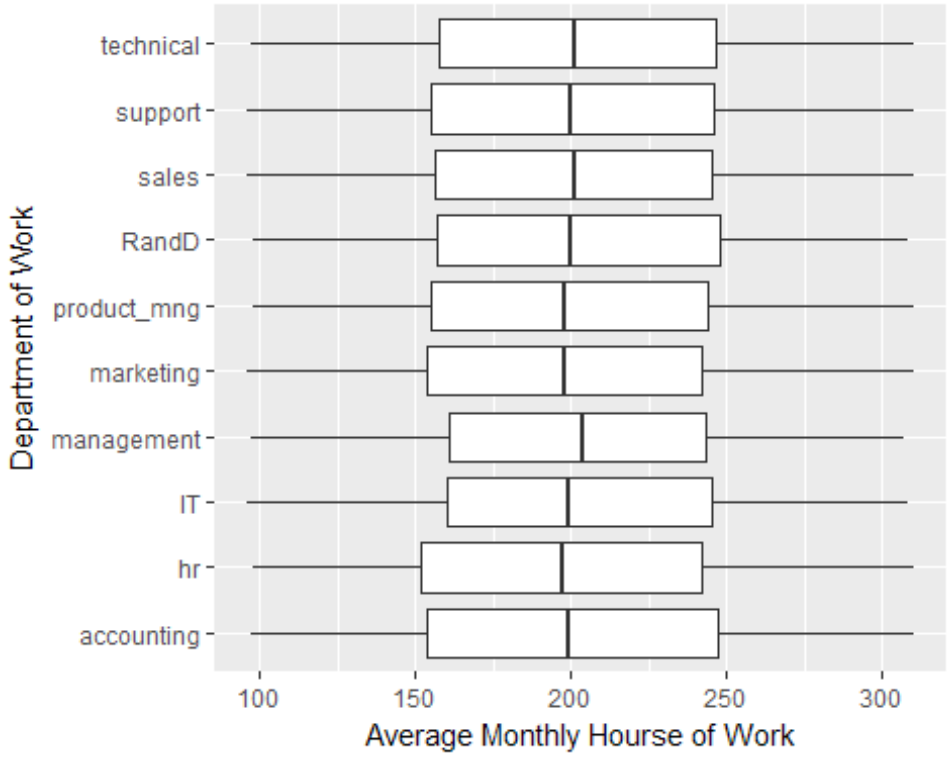

```
ggplot(aes(x = time_spend_company),data = hrm) +
  geom_bar() +
   xlab("Time Spend at Company splitted by Department") +
facet_wrap(~sales)
```




```
#In every department there is very less count of Employees
# working for over 5 years




#Department vs Time average monthly hours

by(average_montly_hours,sales , summary)

## sales: accounting
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    97.0   153.5   199.0   201.2   247.0   310.0
## ------------------------------------------------------------
## sales: hr
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    98.0   152.0   197.0   198.7   242.0   310.0
## ------------------------------------------------------------
## sales: IT
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    96.0   160.0   199.0   202.2   245.0   308.0
## ------------------------------------------------------------
## sales: management
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
```

```
##    97.0   161.0   204.0   201.2   243.0   307.0
## ------------------------------------------------------------
## sales: marketing
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    96.0   154.0   198.0   199.4   242.0   310.0
## ------------------------------------------------------------
## sales: product_mng
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##      98     155     198     200     244     310
## ------------------------------------------------------------
## sales: RandD
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    98.0   157.0   200.0   200.8   248.0   308.0
## ------------------------------------------------------------
## sales: sales
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    96.0   156.0   201.0   200.9   245.0   310.0
## ------------------------------------------------------------
## sales: support
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    96.0   155.0   200.0   200.8   246.0   310.0
## ------------------------------------------------------------
## sales: technical
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    97.0   157.8   201.0   202.5   246.2   310.0
```

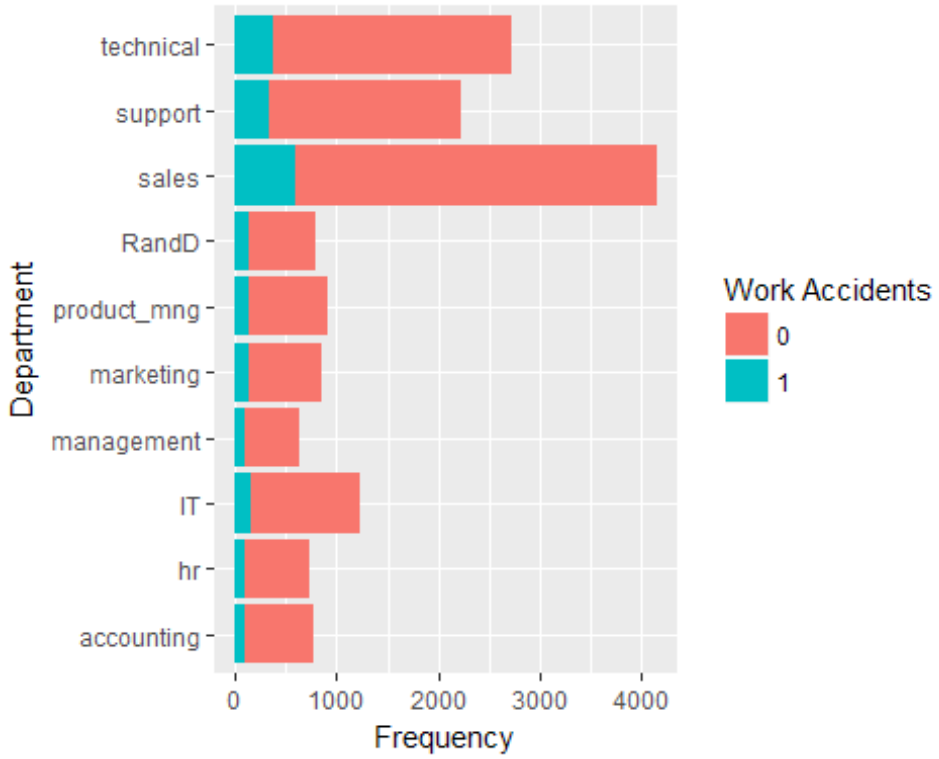
```r
#Highest average working time for IT and Technical departments

ggplot(aes(x = sales , y = average_montly_hours),data =hrm) +
  geom_boxplot() +
  xlab('Department of Work') +
  ylab('Average Monthly Hourse of Work') +
  coord_flip()
```



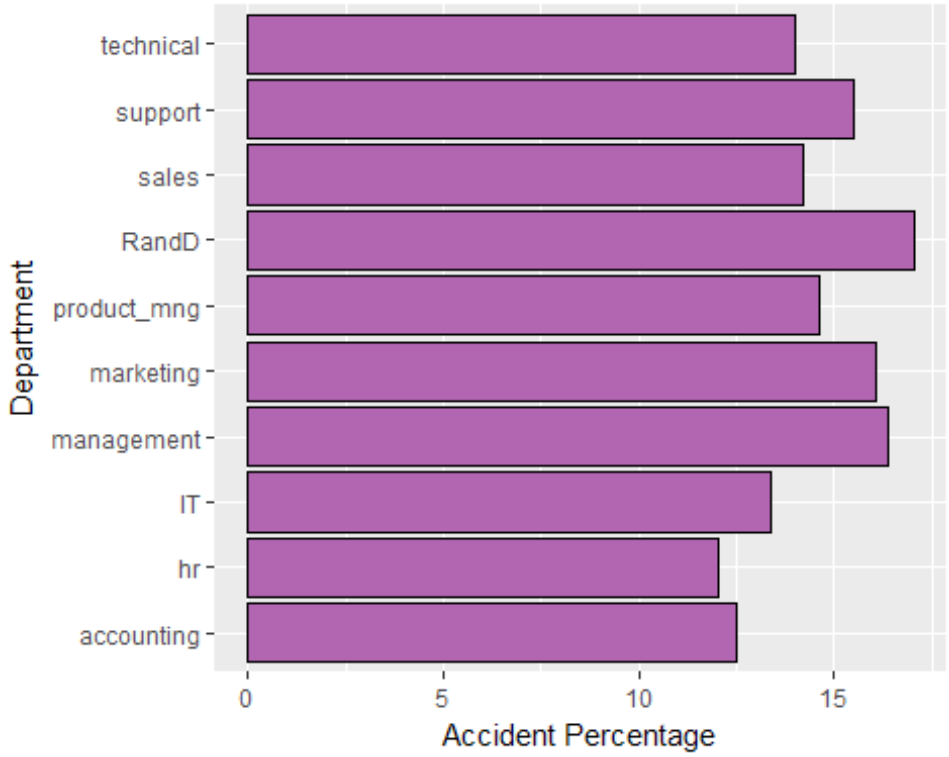

```
#Highest Median working time of Management department




#Department vs Work Accident

table(Work_accident)

## Work_accident
##     0     1
## 12830  2169

table(sales,Work_accident)

##              Work_accident
## sales            0    1
##   accounting   671   96
##   hr           650   89
##   IT          1063  164
##   management   527  103
##   marketing    720  138
##   product_mng  770  132
##   RandD        653  134
##   sales       3553  587
```

```
##   support     1884  345
##   technical   2339  381
```

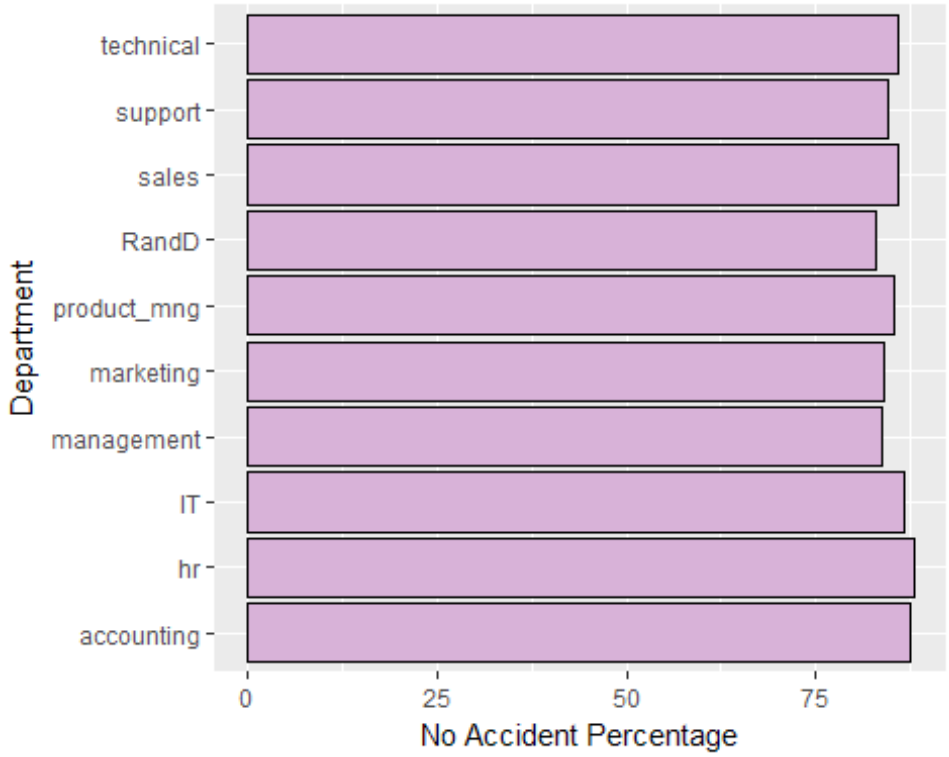
```
ggplot(aes(x = sales),data = hrm) +
  geom_bar(aes(fill=factor(Work_accident))) +
  coord_flip() +
  labs(x = "Department",y ="Frequency", fill="Work Accidents" )
```




```
hrm$Work_accident<-factor(Work_accident,labels = c('False','True'))

accidentdf<-hrm %>% group_by(sales,Work_accident) %>%
  summarise(Count= n())

accidentdf<-spread(accidentdf,Work_accident,Count)

accidentdf<-
transform(accidentdf,TrueRate=(True/(True+False))*100,FalseRate=(False/(True+
False))*100)

#Plot of Departent vs Accidental Rate
ggplot(aes(x = sales,y = TrueRate),data = accidentdf) +
  geom_col(color='black',fill="#b266b2") +
  xlab('Department') +
  ylab('Accident Percentage') +
  coord_flip()
```




```
#Highest number of accidents in R and D department



ggplot(aes(x = sales,y = FalseRate),data = accidentdf) +
  geom_col(color='black',fill="#d8b2d8") +
  xlab('Department') +
  ylab('No Accident Percentage') +
  coord_flip()
```

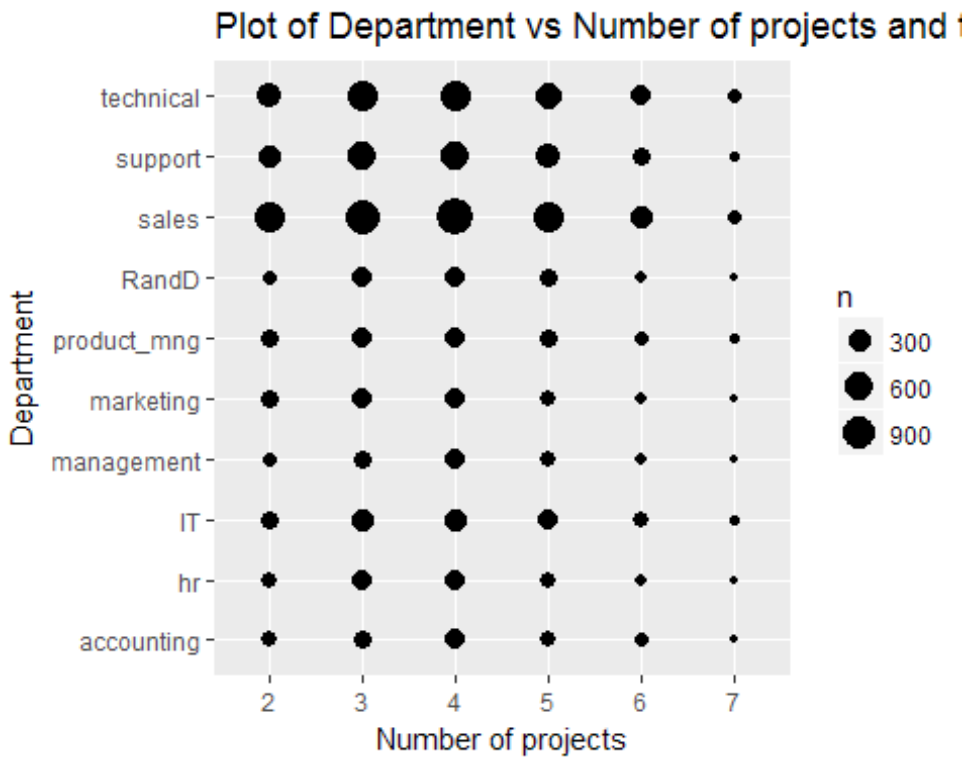



```
#Maximum for HR department



#Department vs number_projects made

by(number_project,sales,summary)
```

```
## sales: accounting
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.825   5.000   7.000
## ------------------------------------------------------------
## sales: hr
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.655   4.000   7.000
## ------------------------------------------------------------
## sales: IT
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.817   5.000   7.000
## ------------------------------------------------------------
## sales: management
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2.00    3.00    4.00    3.86    5.00    7.00
## ------------------------------------------------------------
```

```
## sales: marketing
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.688   4.000   7.000
## ------------------------------------------------------------
## sales: product_mng
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.807   5.000   7.000
## ------------------------------------------------------------
## sales: RandD
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.854   5.000   7.000
## ------------------------------------------------------------
## sales: sales
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.776   5.000   7.000
## ------------------------------------------------------------
## sales: support
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.804   5.000   7.000
## ------------------------------------------------------------
## sales: technical
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   3.000   4.000   3.878   5.000   7.000
```

```
ggplot(aes(x = sales, y =factor(number_project)),data = hrm) +
  geom_count() +
  xlab("Department") +
  ylab("Number of projects") +
  labs(title = "Plot of Department vs Number of projects and their count ") +
  coord_flip()
```

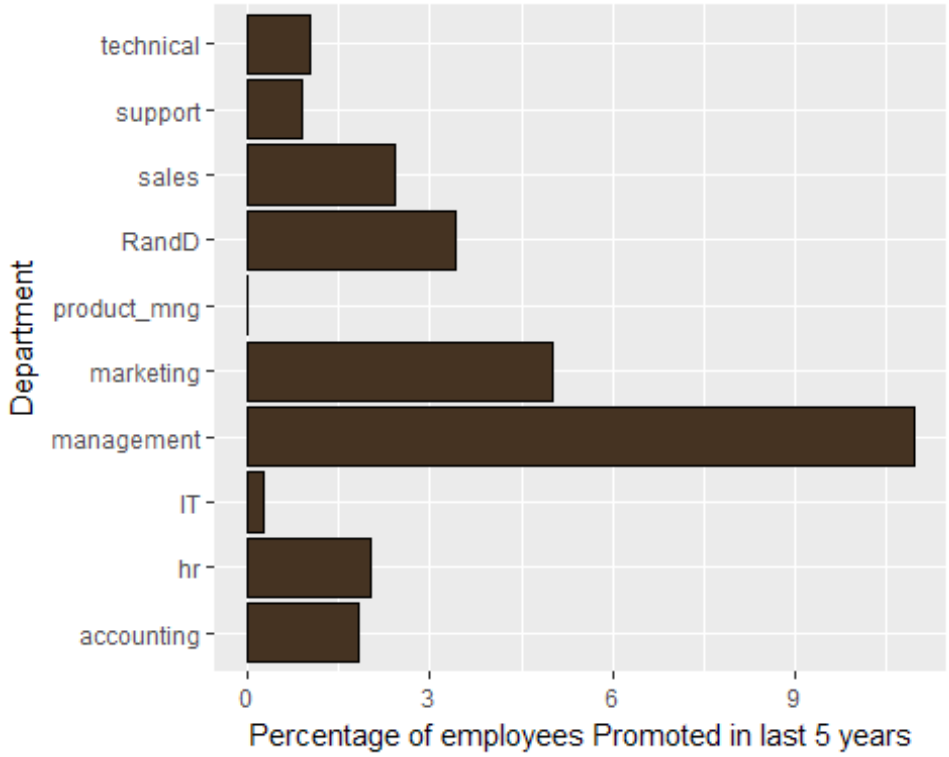



```
#Department vs Promotion in last 5 years

table(sales , hrm$promotion_last_5years)

##
## sales            0    1
##   accounting   753   14
##   hr           724   15
##   IT          1224    3
##   management   561   69
##   marketing    815   43
##   product_mng  902    0
##   RandD        760   27
##   sales       4040  100
##   support     2209   20
##   technical   2692   28

#Transforming Promotion Column to Factor with True and False values
hrm$promotion_last_5years<-
factor(promotion_last_5years,labels=c('False',"True"))

#Generating a promotions Data frame
promotiondf<-hrm %>% group_by(sales,promotion_last_5years) %>%
  summarise(Count = n())

#Spreading the data
promotiondf<-promotiondf %>% spread(promotion_last_5years,Count)
```

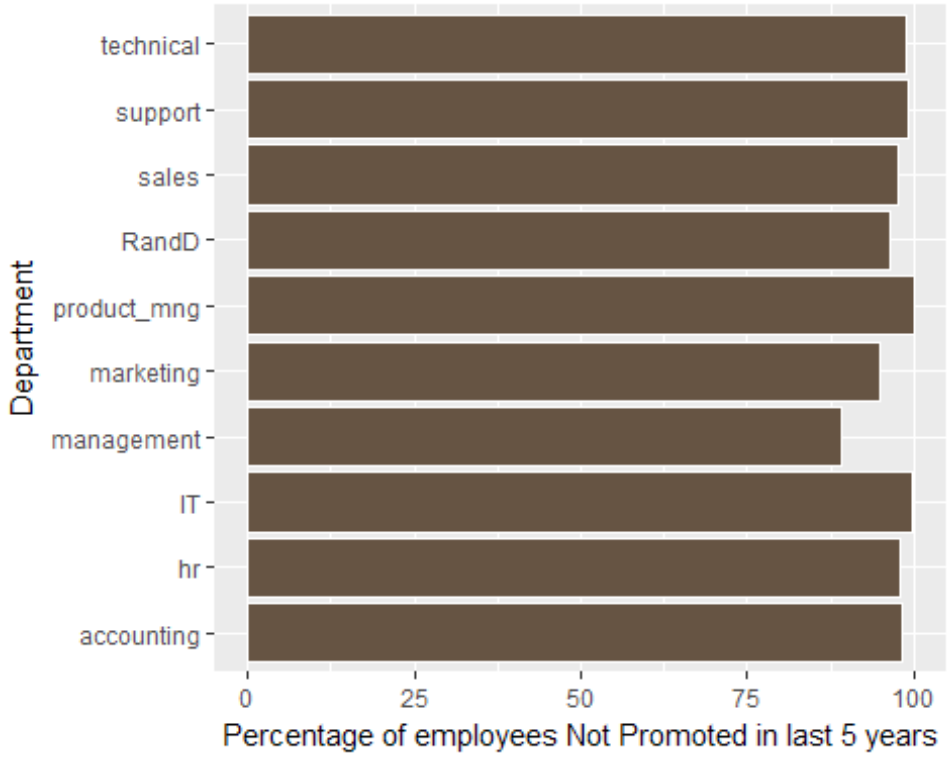
```r
#changing the names of columns
names(promotiondf)<-c("Department","Nopromotion","Promotion")

#replacing NA value with 0
promotiondf[is.na(promotiondf)]<-0

promotiondf<-promotiondf %>%
transform(PerPromotion=(Promotion/(Promotion+Nopromotion))*100,
                                    PerNopromotion = (Nopromotion/(Promotion
+ Nopromotion))*100)
#Most number of Promotions done in Management and Marketing Departments
#Least in IT , Technical and Product Manager
promotiondf
```

```
##     Department Nopromotion Promotion PerPromotion PerNopromotion
## 1   accounting         753        14    1.8252934       98.17471
## 2           hr         724        15    2.0297700       97.97023
## 3           IT        1224         3    0.2444988       99.75550
## 4   management         561        69   10.9523810       89.04762
## 5    marketing         815        43    5.0116550       94.98834
## 6  product_mng         902         0    0.0000000      100.00000
## 7        RandD         760        27    3.4307497       96.56925
## 8        sales        4040       100    2.4154589       97.58454
## 9      support        2209        20    0.8972633       99.10274
## 10   technical        2692        28    1.0294118       98.97059
```

```r
#Plotting Department vs Promotion Percentage
ggplot(aes(x =Department, y =PerPromotion ),data = promotiondf) +
  geom_col(color='black',fill = '#453322') +
  xlab("Department") +
  ylab("Percentage of employees Promoted in last 5 years") +
  coord_flip()
```




```
#Highest in Management Department

#Plotting Department vs No Promotion Percentage
ggplot(aes(x =Department, y =PerNopromotion ),data = promotiondf) +
  geom_col(color="white",fill = "#665443") +
  xlab("Department") +
  ylab("Percentage of employees Not Promoted in last 5 years") +
  coord_flip()
```




```
#No promotion in IT and Product Management Dept
```