Turnover Project

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R Markdown

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When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

Importing data set into R as excel file

Employee number and employee count are not cosidered as they are not related and unique number

```
library(readxl)
Turnover_issues<- read_excel("D:/Project/WA_Fn-UseC_-HR-Employee-Attrition.xls",
                              col_types = c("numeric", "text", "text",
                                            "numeric", "text", "numeric", "numeric",
                                            "text", "numeric",
                                            "text", "numeric", "numeric", "numeric",
                                            "text", "numeric", "text", "numeric",
                                            "numeric", "numeric", "text", "text", "numeric", "numeric",
                                            "numeric", "numeric", "numeric",
                                            "numeric", "numeric", "numeric",
                                            "numeric", "numeric", "numeric",
                                            "numeric"))
```

1. Finding missing values to avoid biased estimation and invalid conclusions

```
sum(is.na(Turnover_issues))
```

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

2. Unclassing Dataset to remove information with equal name second argument

```
Turnover_issues_fac <- as.data.frame (unclass(Turnover_issues))
```

3. Dataset Structure

```
str(Turnover_issues_fac)
```

```
## 'data.frame':    1470 obs. of  33 variables:
##  $ Age                     : num  41 49 37 33 27 32 59 30 38 36 ...
##  $ Attrition               : chr  "Yes" "No" "Yes" "No" ...
##  $ BusinessTravel          : chr  "Travel_Rarely" "Travel_Frequently" "Tra
vel_Rarely" "Travel_Frequently" ...
##  $ DailyRate               : num  1102 279 1373 1392 591 ...
##  $ Department              : chr  "Sales" "Research & Development" "Resear
ch & Development" "Research & Development" ...
##  $ DistanceFromHome        : num  1 8 2 3 2 2 3 24 23 27 ...
##  $ Education               : num  2 1 2 4 1 2 3 1 3 3 ...
##  $ EducationField          : chr  "Life Sciences" "Life Sciences" "Other"
"Life Sciences" ...
##  $ EnvironmentSatisfaction : num  2 3 4 4 1 4 3 4 4 3 ...
##  $ Gender                  : chr  "Female" "Male" "Male" "Female" ...
##  $ HourlyRate              : num  94 61 92 56 40 79 81 67 44 94 ...
##  $ JobInvolvement          : num  3 2 2 3 3 3 4 3 2 3 ...
##  $ JobLevel                : num  2 2 1 1 1 1 1 1 3 2 ...
##  $ JobRole                 : chr  "Sales Executive" "Research Scientist" "
Laboratory Technician" "Research Scientist" ...
##  $ JobSatisfaction         : num  4 2 3 3 2 4 1 3 3 3 ...
##  $ MaritalStatus           : chr  "Single" "Married" "Single" "Married" ..
.
##  $ MonthlyIncome           : num  5993 5130 2090 2909 3468 ...
##  $ MonthlyRate             : num  19479 24907 2396 23159 16632 ...
##  $ NumCompaniesWorked      : num  8 1 6 1 9 0 4 1 0 6 ...
##  $ Over18                  : chr  "Y" "Y" "Y" "Y" ...
##  $ OverTime                : chr  "Yes" "No" "Yes" "Yes" ...
##  $ PercentSalaryHike       : num  11 23 15 11 12 13 20 22 21 13 ...
##  $ PerformanceRating       : num  3 4 3 3 3 3 4 4 4 3 ...
##  $ RelationshipSatisfaction: num  1 4 2 3 4 3 1 2 2 2 ...
##  $ StandardHours           : num  80 80 80 80 80 80 80 80 80 80 ...
##  $ StockOptionLevel        : num  0 1 0 0 1 0 3 1 0 2 ...
##  $ TotalWorkingYears       : num  8 10 7 8 6 8 12 1 10 17 ...
##  $ TrainingTimesLastYear   : num  0 3 3 3 3 2 3 2 2 3 ...
##  $ WorkLifeBalance         : num  1 3 3 3 3 2 2 3 3 2 ...
##  $ YearsAtCompany          : num  6 10 0 8 2 7 1 1 9 7 ...
##  $ YearsInCurrentRole      : num  4 7 0 7 2 7 0 0 7 7 ...
##  $ YearsSinceLastPromotion : num  0 1 0 3 2 3 0 0 1 7 ...
##  $ YearsWithCurrManager    : num  5 7 0 0 2 6 0 0 8 7 ...
```

Converting different attributes

4. Attrition where "Yes" as 1, otherwise 0

```
Attrition_Data<-ifelse(Turnover_issues_fac$Attrition=="Yes","1","0")
Turnover_issues_fac$Attrition<-Attrition_Data
Turnover_issues_fac$Attrition<-as.factor(Turnover_issues_fac$Attrition)
```

5. Business travel

```
BusinessTravel<-Turnover_issues$BusinessTravel
BusinessTravel_factor<-factor(BusinessTravel)
str(BusinessTravel_factor)
```

```
##  Factor w/ 3 levels "Non-Travel","Travel_Frequently",..: 3 2 3 2 3 2 3 3 2
3 ...

Turnover_issues_fac$BusinessTravel<-BusinessTravel_factor
```

6. Department

```
Department<-Turnover_issues$Department
Department_factor<-factor(Department)
str(Department_factor)

##  Factor w/ 3 levels "Human Resources",..: 3 2 2 2 2 2 2 2 2 2 ...

Turnover_issues_fac$Department<-Department_factor
str(Turnover_issues_fac$Department)

##  Factor w/ 3 levels "Human Resources",..: 3 2 2 2 2 2 2 2 2 2 ...
```

7. Education Field

```
EducationField<-Turnover_issues$EducationField
EducationField_factor<-factor(EducationField)
str(EducationField_factor)

##  Factor w/ 6 levels "Human Resources",..: 2 2 5 2 4 2 4 2 2 4 ...

Turnover_issues_fac$EducationField<-EducationField_factor
```

8. Gender

```
Gender<-Turnover_issues$Gender
Gender_factor<-factor(Gender)
str(Gender_factor)

##  Factor w/ 2 levels "Female","Male": 1 2 2 1 2 2 1 2 2 2 ...

Turnover_issues_fac$Gender<-Gender_factor
```

9. Job Role

```
JobRole<-Turnover_issues$JobRole
JobRole_factor<-factor(JobRole)
str(JobRole_factor)

##  Factor w/ 9 levels "Healthcare Representative",..: 8 7 3 7 3 3 3 3 5 1 ..
.

Turnover_issues_fac$JobRole<-JobRole_factor
```

10. MaritalStatus

```
MaritalStatus<-Turnover_issues$MaritalStatus
MaritalStatus_factor<-factor(MaritalStatus)
str(MaritalStatus_factor)

##  Factor w/ 3 levels "Divorced","Married",..: 3 2 3 2 2 3 2 1 3 2 ...
```

```
Turnover_issues_fac$MaritalStatus<-MaritalStatus_factor
```

11. Over18

```
Over18<-Turnover_issues$Over18
Over18_factor<-factor(Over18)
str(Over18_factor)

##  Factor w/ 1 level "Y": 1 1 1 1 1 1 1 1 1 1 ...

Turnover_issues_fac$Over18<-Over18_factor
```

12. OverTime where "Yes" as 1, otherwise 0

```
Overtime_Data<-ifelse(Turnover_issues_fac$OverTime=="Yes","1","0")
Turnover_issues_fac$OverTime<-Overtime_Data
Turnover_issues_fac$OverTime<-as.factor(Turnover_issues_fac$OverTime)
```

13. Changing numeric variables to factor variables

```
Turnover_issues_fac$StockOptionLevel<-as.factor(Turnover_issues_fac$StockOpti
onLevel)
Turnover_issues_fac$Education<-as.factor(Turnover_issues_fac$Education)
Turnover_issues_fac$EnvironmentSatisfaction<-as.factor(Turnover_issues_fac$En
vironmentSatisfaction)
Turnover_issues_fac$JobInvolvement<-as.factor(Turnover_issues_fac$JobInvolvem
ent)
Turnover_issues_fac$JobLevel<-as.factor(Turnover_issues_fac$JobLevel)
Turnover_issues_fac$JobSatisfaction<-as.factor(Turnover_issues_fac$JobSatisfa
ction)
Turnover_issues_fac$TrainingTimesLastYear<-as.factor(Turnover_issues_fac$Trai
ningTimesLastYear)
Turnover_issues_fac$WorkLifeBalance<-as.factor(Turnover_issues_fac$WorkLifeBa
lance)
Turnover_issues_fac$NumCompaniesWorked<-as.factor(Turnover_issues_fac$NumComp
aniesWorked)
Turnover_issues_fac$PerformanceRating<-as.factor(Turnover_issues_fac$Performa
nceRating)
Turnover_issues_fac$RelationshipSatisfaction<-as.factor(Turnover_issues_fac$R
elationshipSatisfaction)
```

14. Observing revised data structure

```
str(Turnover_issues_fac)

## 'data.frame':    1470 obs. of  33 variables:
##  $ Age                     : num  41 49 37 33 27 32 59 30 38 36 ...
##  $ Attrition               : Factor w/ 2 levels "0","1": 2 1 2 1 1 1 1 1 1 1
1 ...
##  $ BusinessTravel          : Factor w/ 3 levels "Non-Travel","Travel_Frequ
ently",..: 3 2 3 2 3 2 3 3 2 3 ...
##  $ DailyRate               : num  1102 279 1373 1392 591 ...
##  $ Department              : Factor w/ 3 levels "Human Resources",..: 3 2
2 2 2 2 2 2 2 ...
```

```
##  $ DistanceFromHome       : num  1 8 2 3 2 2 3 24 23 27 ...
##  $ Education              : Factor w/ 5 levels "1","2","3","4",..: 2 1 2
4 1 2 3 1 3 3 ...
##  $ EducationField         : Factor w/ 6 levels "Human Resources",..: 2 2
5 2 4 2 4 2 2 4 ...
##  $ EnvironmentSatisfaction : Factor w/ 4 levels "1","2","3","4": 2 3 4 4 1
4 3 4 4 3 ...
##  $ Gender                 : Factor w/ 2 levels "Female","Male": 1 2 2 1 2
2 1 2 2 2 ...
##  $ HourlyRate             : num  94 61 92 56 40 79 81 67 44 94 ...
##  $ JobInvolvement         : Factor w/ 4 levels "1","2","3","4": 3 2 2 3 3
3 4 3 2 3 ...
##  $ JobLevel               : Factor w/ 5 levels "1","2","3","4",..: 2 2 1
1 1 1 1 3 2 ...
##  $ JobRole                : Factor w/ 9 levels "Healthcare Representative
",..: 8 7 3 7 3 3 3 3 5 1 ...
##  $ JobSatisfaction        : Factor w/ 4 levels "1","2","3","4": 4 2 3 3 2
4 1 3 3 3 ...
##  $ MaritalStatus          : Factor w/ 3 levels "Divorced","Married",..: 3
2 3 2 2 3 2 1 3 2 ...
##  $ MonthlyIncome          : num  5993 5130 2090 2909 3468 ...
##  $ MonthlyRate            : num  19479 24907 2396 23159 16632 ...
##  $ NumCompaniesWorked     : Factor w/ 10 levels "0","1","2","3",..: 9 2 7
2 10 1 5 2 1 7 ...
##  $ Over18                 : Factor w/ 1 level "Y": 1 1 1 1 1 1 1 1 1 1 ..
.
##  $ OverTime               : Factor w/ 2 levels "0","1": 2 1 2 2 1 1 2 1 1
1 ...
##  $ PercentSalaryHike      : num  11 23 15 11 12 13 20 22 21 13 ...
##  $ PerformanceRating      : Factor w/ 2 levels "3","4": 1 2 1 1 1 1 2 2 2
1 ...
##  $ RelationshipSatisfaction: Factor w/ 4 levels "1","2","3","4": 1 4 2 3 4
3 1 2 2 2 ...
##  $ StandardHours          : num  80 80 80 80 80 80 80 80 80 80 ...
##  $ StockOptionLevel       : Factor w/ 4 levels "0","1","2","3": 1 2 1 1 2
1 4 2 1 3 ...
##  $ TotalWorkingYears      : num  8 10 7 8 6 8 12 1 10 17 ...
##  $ TrainingTimesLastYear  : Factor w/ 7 levels "0","1","2","3",..: 1 4 4
4 4 3 4 3 4 ...
##  $ WorkLifeBalance        : Factor w/ 4 levels "1","2","3","4": 1 3 3 3 3
2 2 3 3 2 ...
##  $ YearsAtCompany         : num  6 10 0 8 2 7 1 1 9 7 ...
##  $ YearsInCurrentRole     : num  4 7 0 7 2 7 0 0 7 7 ...
##  $ YearsSinceLastPromotion : num  0 1 0 3 2 3 0 0 1 7 ...
##  $ YearsWithCurrManager   : num  5 7 0 0 2 6 0 0 8 7 ...
```

Summarization of Dataset

```
summary(Turnover_issues_fac)
```

```
##       Age          Attrition           BusinessTravel   DailyRate
##  Min.   :18.00   0:1233   Non-Travel       : 150   Min.   : 102.0
##  1st Qu.:30.00   1: 237   Travel_Frequently: 277   1st Qu.: 465.0
##  Median :36.00            Travel_Rarely    :1043   Median : 802.0
##  Mean   :36.92                                     Mean   : 802.5
##  3rd Qu.:43.00                                     3rd Qu.:1157.0
##  Max.   :60.00                                     Max.   :1499.0
##
##                    Department  DistanceFromHome Education
##  Human Resources       : 63   Min.   : 1.000   1:170
##  Research & Development:961    1st Qu.: 2.000   2:282
##  Sales                 :446    Median : 7.000   3:572
##                               Mean   : 9.193   4:398
##                               3rd Qu.:14.000   5: 48
##                               Max.   :29.000
##
##          EducationField EnvironmentSatisfaction   Gender      HourlyRate
##  Human Resources : 27   1:284                   Female:588   Min.   : 30.
## 00
##  Life Sciences   :606   2:287                   Male  :882   1st Qu.: 48.
## 00
##  Marketing       :159   3:453                                Median : 66.
## 00
##  Medical         :464   4:446                                Mean   : 65.
## 89
##  Other           : 82                                        3rd Qu.: 83.
## 75
##  Technical Degree:132                                        Max.   :100.
## 00
##
##  JobInvolvement JobLevel                    JobRole    JobSatisfaction
##  1: 83          1:543    Sales Executive        :326   1:289
##  2:375          2:534    Research Scientist     :292   2:280
##  3:868          3:218    Laboratory Technician  :259   3:442
##  4:144          4:106    Manufacturing Director :145   4:459
##                 5: 69    Healthcare Representative:131
##                          Manager                :102
##                          (Other)                :215
##   MaritalStatus MonthlyIncome   MonthlyRate    NumCompaniesWorked Over18
##  Divorced:327   Min.   : 1009   Min.   : 2094   1      :521        Y:1470
##  Married :673   1st Qu.: 2911   1st Qu.: 8047   0      :197
##  Single  :470   Median : 4919   Median :14236   3      :159
##                 Mean   : 6503   Mean   :14313   2      :146
##                 3rd Qu.: 8379   3rd Qu.:20462   4      :139
##                 Max.   :19999   Max.   :26999   7      : 74
##                                                 (Other):234
##  OverTime PercentSalaryHike PerformanceRating RelationshipSatisfaction
##  0:1054   Min.   :11.00     3:1244            1:276
##  1: 416   1st Qu.:12.00     4: 226            2:303
##           Median :14.00                       3:459
```

```
##           Mean   :15.21                        4:432
##           3rd Qu.:18.00
##           Max.   :25.00
##
##   StandardHours StockOptionLevel TotalWorkingYears TrainingTimesLastYear
##   Min.   :80    0:631            Min.   : 0.00     0: 54
##   1st Qu.:80    1:596            1st Qu.: 6.00     1: 71
##   Median :80    2:158            Median :10.00     2:547
##   Mean   :80    3: 85            Mean   :11.28     3:491
##   3rd Qu.:80                     3rd Qu.:15.00     4:123
##   Max.   :80                     Max.   :40.00     5:119
##                                                    6: 65
##   WorkLifeBalance YearsAtCompany   YearsInCurrentRole YearsSinceLastPromoti
## on
##   1: 80           Min.   : 0.000   Min.   : 0.000     Min.   : 0.000
##   2:344           1st Qu.: 3.000   1st Qu.: 2.000     1st Qu.: 0.000
##   3:893           Median : 5.000   Median : 3.000     Median : 1.000
##   4:153           Mean   : 7.008   Mean   : 4.229     Mean   : 2.188
##                   3rd Qu.: 9.000   3rd Qu.: 7.000     3rd Qu.: 3.000
##                   Max.   :40.000   Max.   :18.000     Max.   :15.000
##
##   YearsWithCurrManager
##   Min.   : 0.000
##   1st Qu.: 2.000
##   Median : 3.000
##   Mean   : 4.123
##   3rd Qu.: 7.000
##   Max.   :17.000
##
```

Observing top few outputs

```
head(Turnover_issues_fac)
```

```
##   Age Attrition    BusinessTravel DailyRate               Department
## 1  41         1     Travel_Rarely      1102                    Sales
## 2  49         0 Travel_Frequently       279 Research & Development
## 3  37         1     Travel_Rarely      1373 Research & Development
## 4  33         0 Travel_Frequently      1392 Research & Development
## 5  27         0     Travel_Rarely       591 Research & Development
## 6  32         0 Travel_Frequently      1005 Research & Development
##   DistanceFromHome Education EducationField EnvironmentSatisfaction Gender
## 1                1         2  Life Sciences                       2 Female
## 2                8         1  Life Sciences                       3   Male
## 3                2         2          Other                       4   Male
## 4                3         4  Life Sciences                       4 Female
## 5                2         1        Medical                       1   Male
## 6                2         2  Life Sciences                       4   Male
##   HourlyRate JobInvolvement JobLevel         JobRole JobSatisfaction
## 1         94              3        2 Sales Executive               4
```

```
## 2             61                  2         2     Research Scientist                     2
## 3             92                  2         1 Laboratory Technician                      3
## 4             56                  3         1     Research Scientist                     3
## 5             40                  3         1 Laboratory Technician                      2
## 6             79                  3         1 Laboratory Technician                      4
##     MaritalStatus MonthlyIncome MonthlyRate NumCompaniesWorked Over18 OverTi
me
## 1          Single          5993       19479                  8      Y
1
## 2         Married          5130       24907                  1      Y
0
## 3          Single          2090        2396                  6      Y
1
## 4         Married          2909       23159                  1      Y
1
## 5         Married          3468       16632                  9      Y
0
## 6          Single          3068       11864                  0      Y
0
##     PercentSalaryHike PerformanceRating RelationshipSatisfaction StandardHou
rs
## 1                11                  3                        1
80
## 2                23                  4                        4
80
## 3                15                  3                        2
80
## 4                11                  3                        3
80
## 5                12                  3                        4
80
## 6                13                  3                        3
80
##     StockOptionLevel TotalWorkingYears TrainingTimesLastYear WorkLifeBalance
## 1                0                  8                     0               1
## 2                1                 10                     3               3
## 3                0                  7                     3               3
## 4                0                  8                     3               3
## 5                1                  6                     3               3
## 6                0                  8                     2               2
##     YearsAtCompany YearsInCurrentRole YearsSinceLastPromotion
## 1              6                  4                       0
## 2             10                  7                       1
## 3              0                  0                       0
## 4              8                  7                       3
## 5              2                  2                       2
## 6              7                  7                       3
##     YearsWithCurrManager
## 1                    5
## 2                    7
```

```
## 3                            0
## 4                            0
## 5                            2
## 6                            6
```

Descriptive Analysis

#A. Analyzing each variables #

   i.   Age

```
summary(Turnover_issues_fac$Age)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   18.00   30.00   36.00   36.92   43.00   60.00

hist(Turnover_issues_fac$Age)
```


Histogram of Turnover_issues_fac$Age
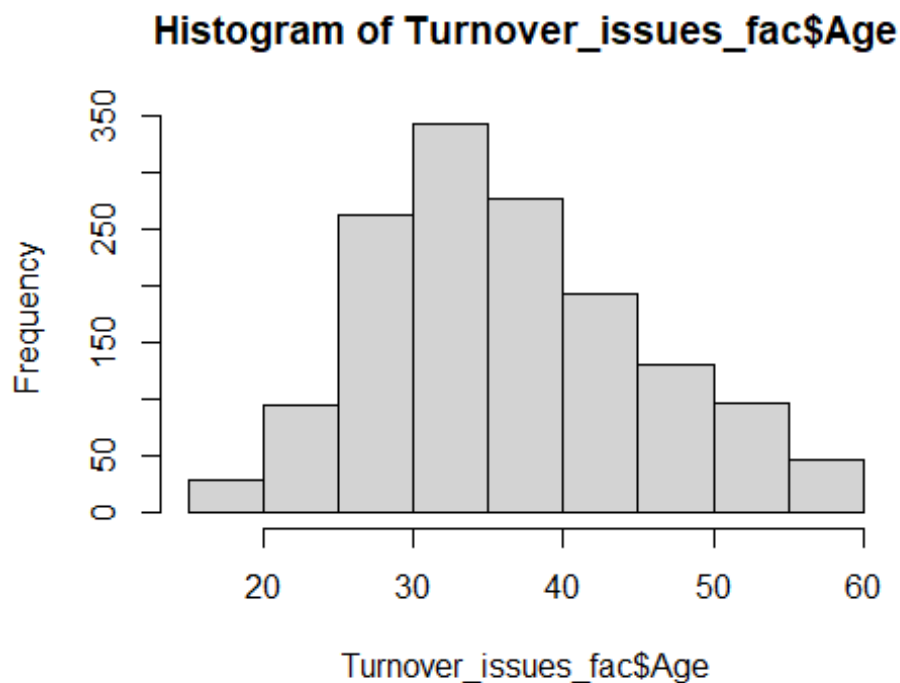
   ii.   Attrition

```
summary(Turnover_issues_fac$Attrition)

##    0    1
## 1233  237

plot(Turnover_issues_fac$Attrition)
```
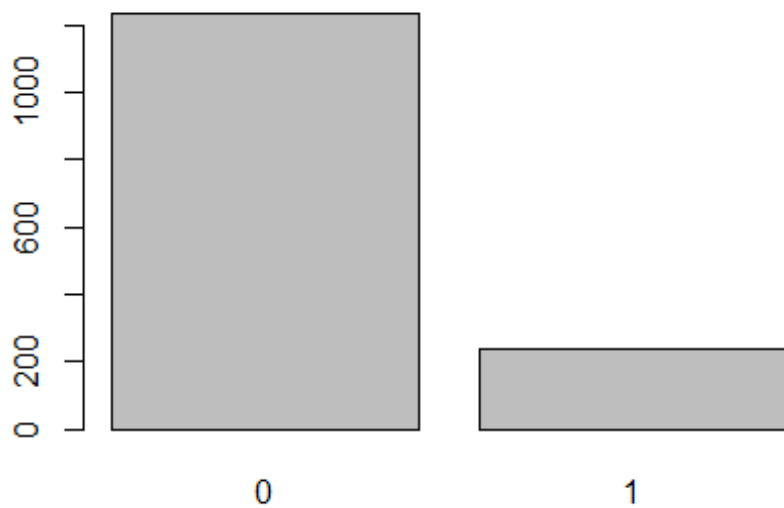
iii. Business Travel

```
summary(Turnover_issues_fac$BusinessTravel)
```

```
##        Non-Travel Travel_Frequently      Travel_Rarely
##               150               277               1043
```

```
plot(Turnover_issues_fac$BusinessTravel)
```
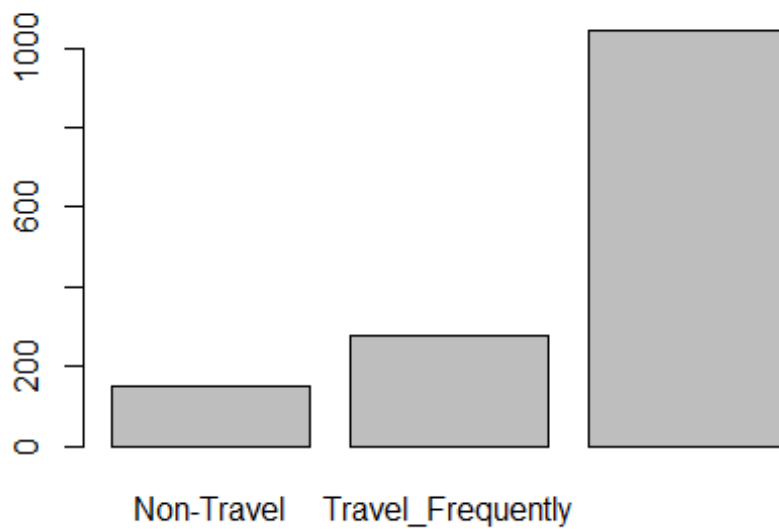
iv. Daily rate

```
summary(Turnover_issues_fac$DailyRate)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   102.0   465.0   802.0   802.5  1157.0  1499.0

plot(density(Turnover_issues_fac$DailyRate),main="Daily_Rate")
```

Daily_Rate

N = 1470   Bandwidth = 84.46
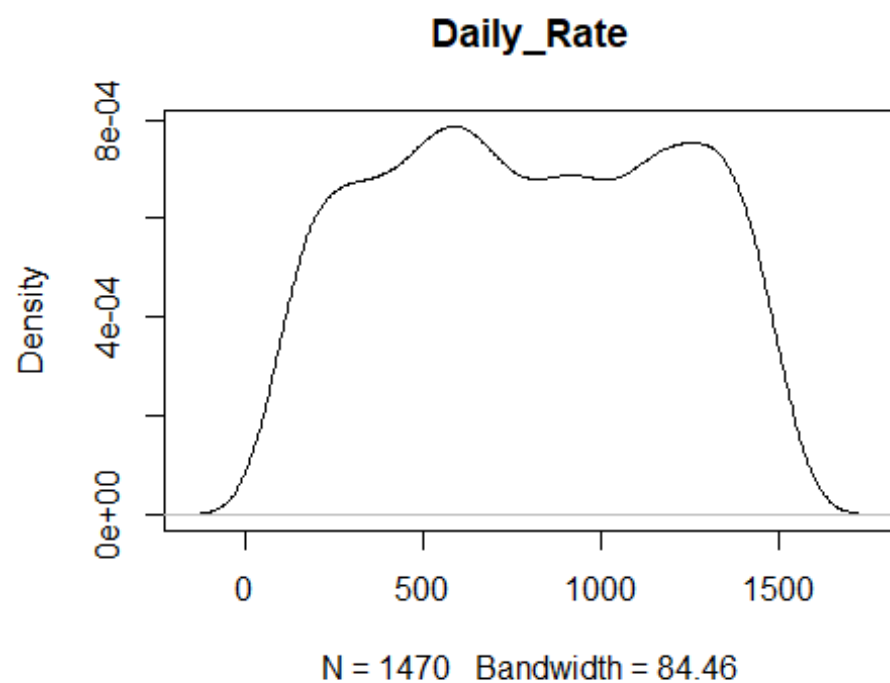
v.   Department

```
summary(Turnover_issues_fac$Department)

##       Human Resources Research & Development                Sales
##                    63                    961                  446

plot(Turnover_issues_fac$Department)
```
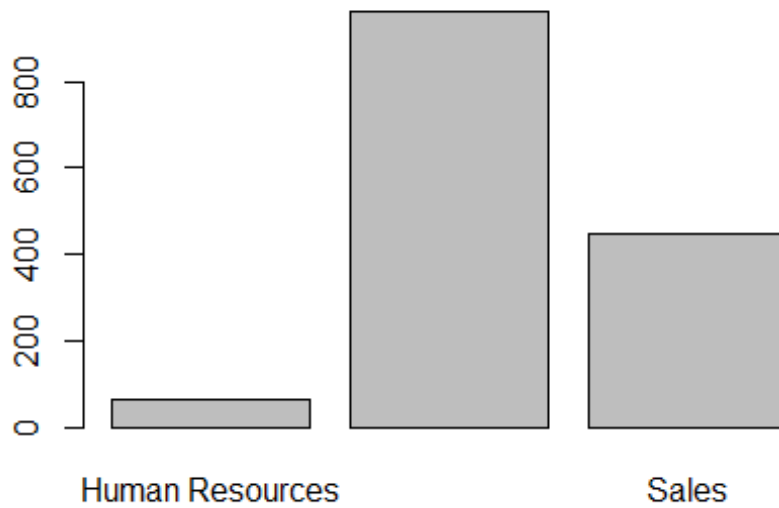
vi. Distance from home

```
summary(Turnover_issues_fac$DistanceFromHome)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   1.000   2.000   7.000   9.193  14.000  29.000

plot(density(Turnover_issues_fac$DistanceFromHome), main="Distance_From_Home"
)
```

Distance_From_Home

N = 1470 Bandwidth = 1.697
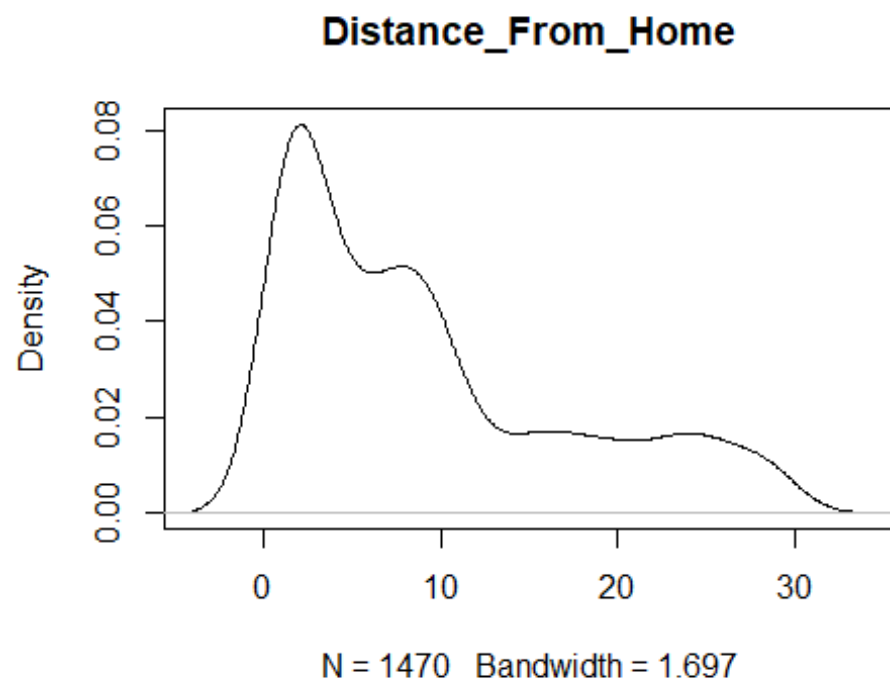
vii. Education

```
summary(Turnover_issues_fac$Education)

##   1   2   3   4   5
## 170 282 572 398  48

plot(Turnover_issues_fac$Education, main ="Education")
```
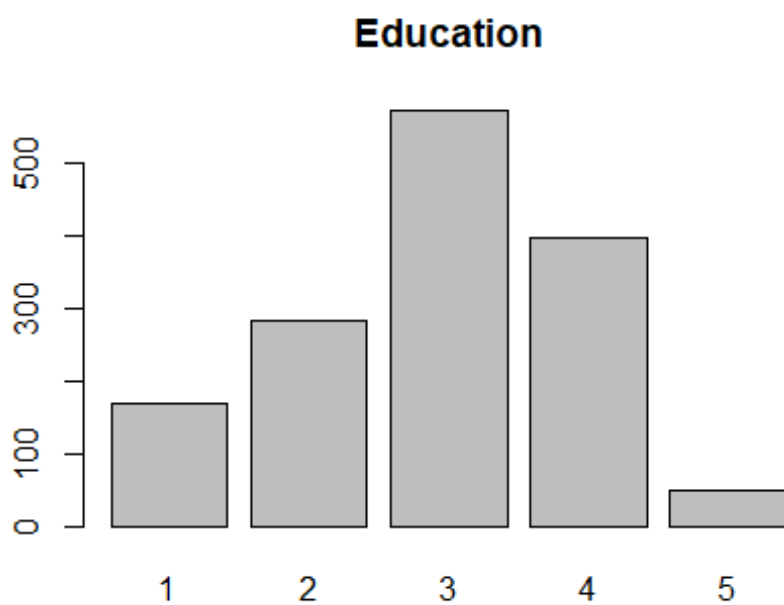
Education

viii. Educationfield

```
summary(Turnover_issues_fac$EducationField)
```

```
##  Human Resources     Life Sciences         Marketing          Medical
##              27               606               159              464
##          Other Technical Degree
##              82               132
```

```
plot(Turnover_issues_fac$EducationField, main = "Education_Field")
```

Education_Field
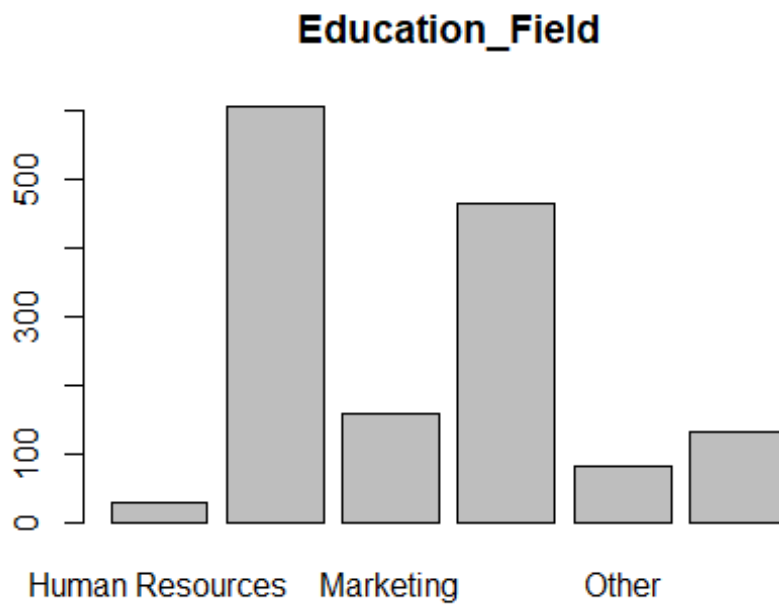
ix. Environment Satisfaction

```
summary(Turnover_issues_fac$EnvironmentSatisfaction)
```

```
##   1   2   3   4
## 284 287 453 446
```

```
plot(Turnover_issues_fac$EnvironmentSatisfaction, main="Environment_Satisfaction")
```

Environment_Satisfaction
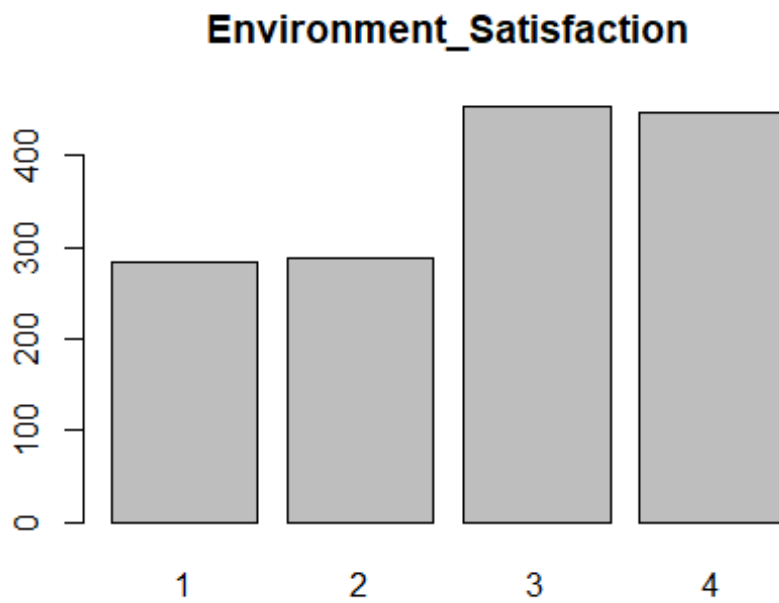
    x.   Gender

```
summary(Turnover_issues_fac$Gender)

## Female    Male
##    588     882

plot(Turnover_issues_fac$Gender, main="Gender")
```

Gender
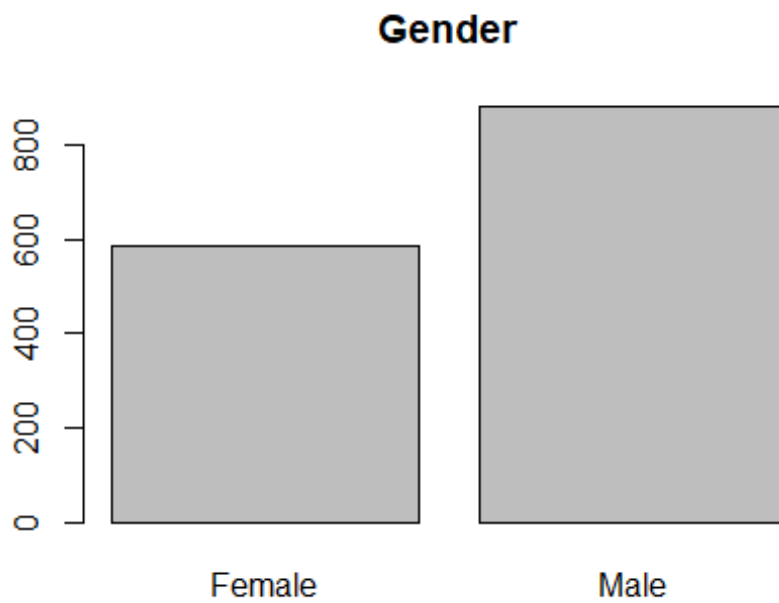
xi. Hourly Rate

```
summary(Turnover_issues_fac$HourlyRate)

##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    30.00   48.00   66.00   65.89   83.75  100.00

plot(density(Turnover_issues_fac$HourlyRate), main = "Hourly_Rate")
```

Hourly_Rate

N = 1470   Bandwidth = 4.255
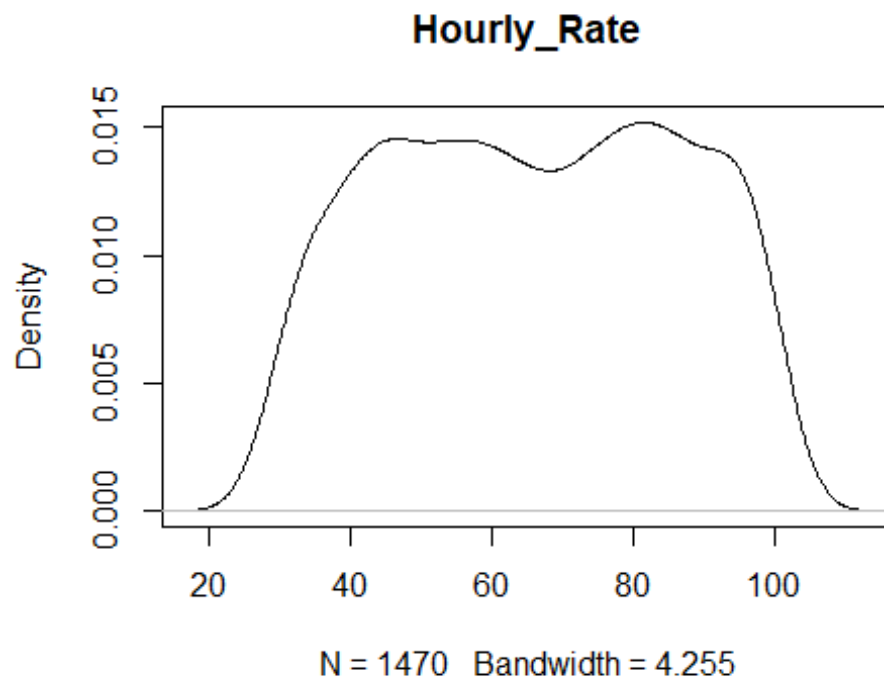
xii. Job involvement

```
summary(Turnover_issues_fac$JobInvolvement)

##    1    2    3    4
##   83  375  868  144

plot(Turnover_issues_fac$JobInvolvement, main="Job_Involement")
```

Job_Involement
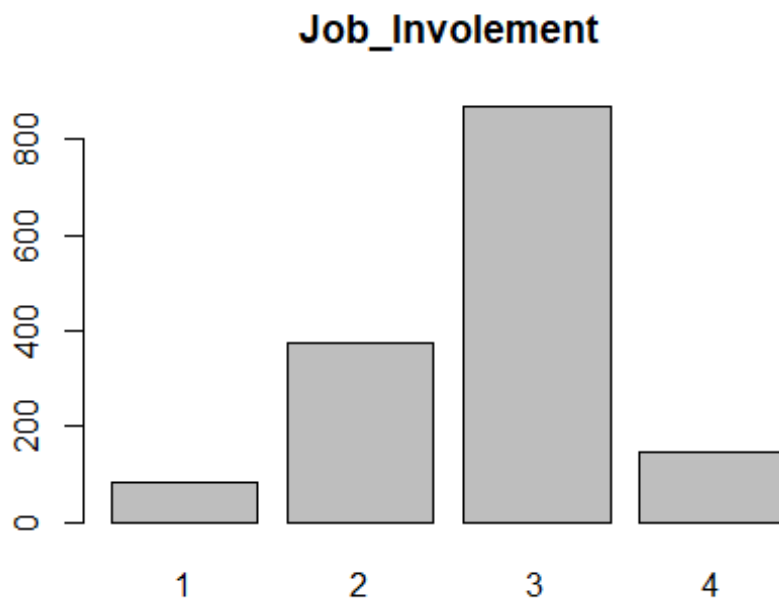
xiii. Job Level

```
summary(Turnover_issues_fac$JobLevel)
```

```
##   1   2   3   4   5
## 543 534 218 106  69
```

```
hist(Turnover_issues$JobLevel, main="Job_Level")
```

Job_Level

xiv. Job Role

```
summary(Turnover_issues_fac$JobRole)
```

```
## Healthcare Representative            Human Resources      Laboratory Technic
ian
##                      131                         52
259
##                  Manager      Manufacturing Director              Research Direc
tor
##                      102                        145
80
##       Research Scientist             Sales Executive          Sales Representat
ive
##                      292                        326
83
```

```
plot(Turnover_issues_fac$JobRole, main="Job_Role")
```

Job_Role
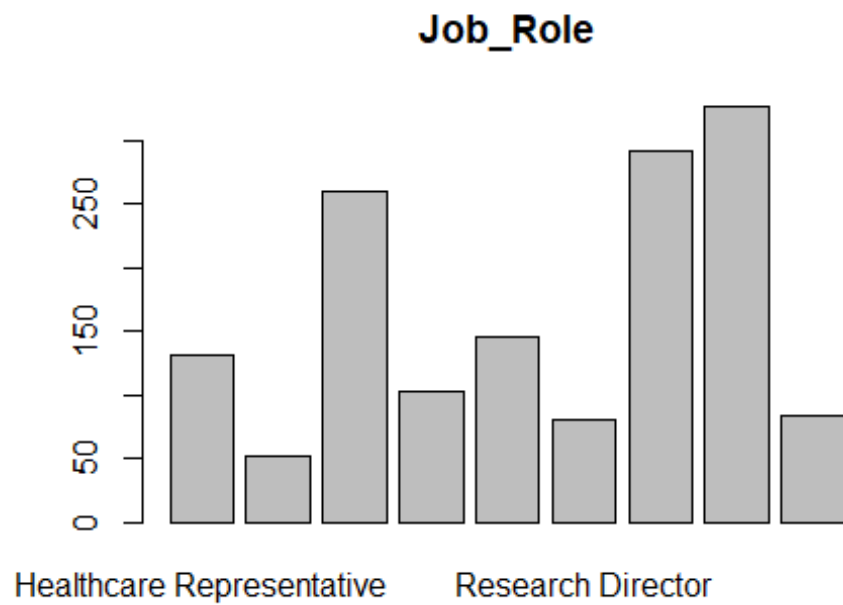
xv. Job Satisfaction

```
summary(Turnover_issues_fac$JobSatisfaction)

##   1   2   3   4
## 289 280 442 459

plot(Turnover_issues_fac$JobSatisfaction, main= "Job_Satisfaction")
```

Job_Satisfaction
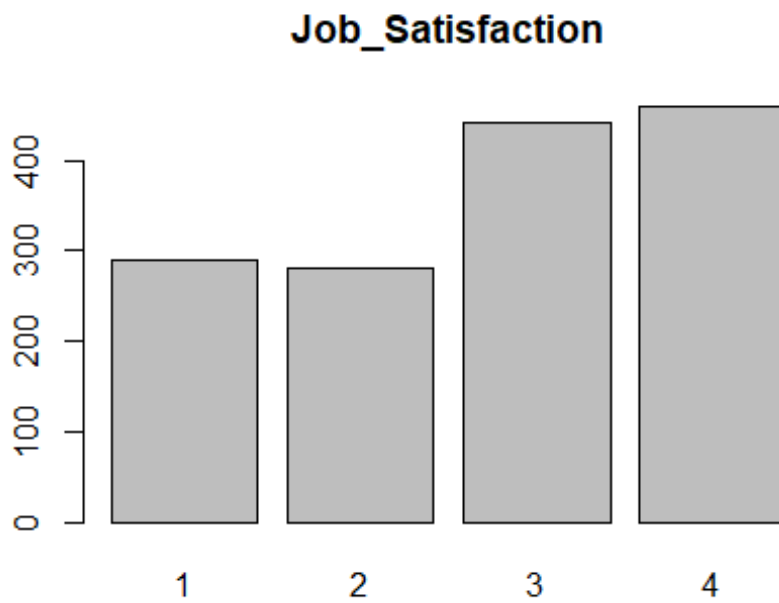
xvi. Marital Status

```
summary(Turnover_issues_fac$MaritalStatus)
```

```
## Divorced  Married   Single
##      327      673      470
```

```
plot(Turnover_issues_fac$MaritalStatus, main="Marital_Status")
```

Marital_Status
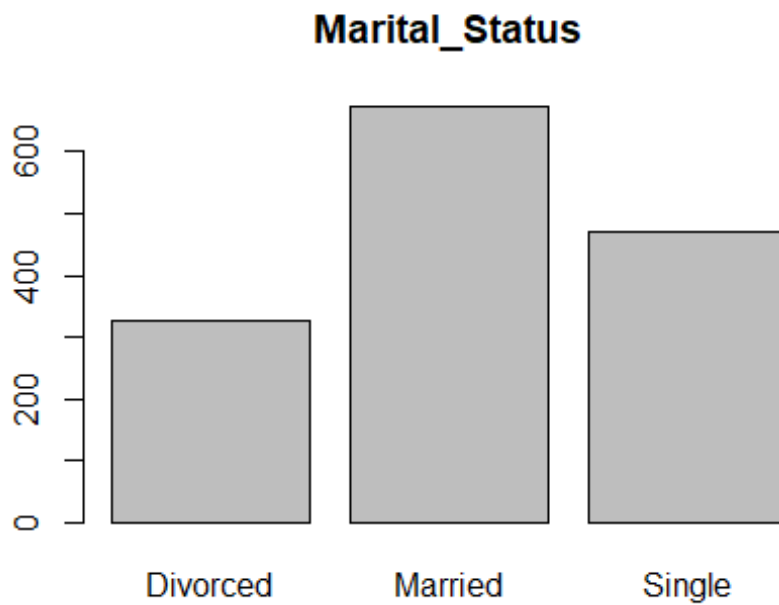
xvii. Monthly Income

```
summary(Turnover_issues_fac$MonthlyIncome)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    1009    2911    4919    6503    8379   19999
```

```
plot(density(Turnover_issues_fac$MonthlyIncome), main = "Monthly_income")
```

Monthly_income

N = 1470   Bandwidth = 854.1
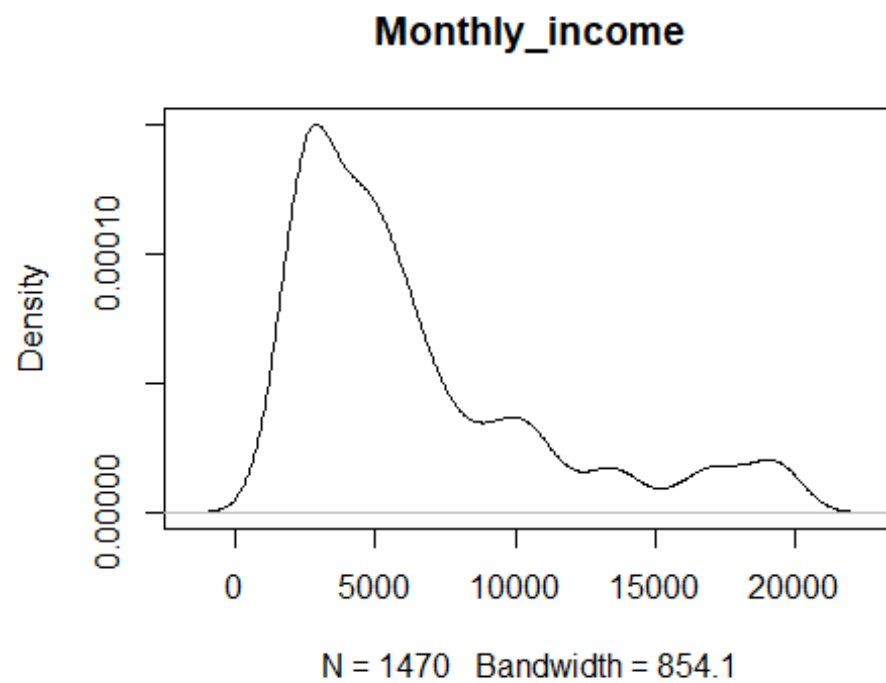
xviii.   Num Companies WOrked

```
summary(Turnover_issues_fac$NumCompaniesWorked)

##   0   1   2   3   4   5   6   7   8   9
## 197 521 146 159 139  63  70  74  49  52

plot(Turnover_issues_fac$NumCompaniesWorked, main="Num_Companies_Worked")
```

Num_Companies_Worked
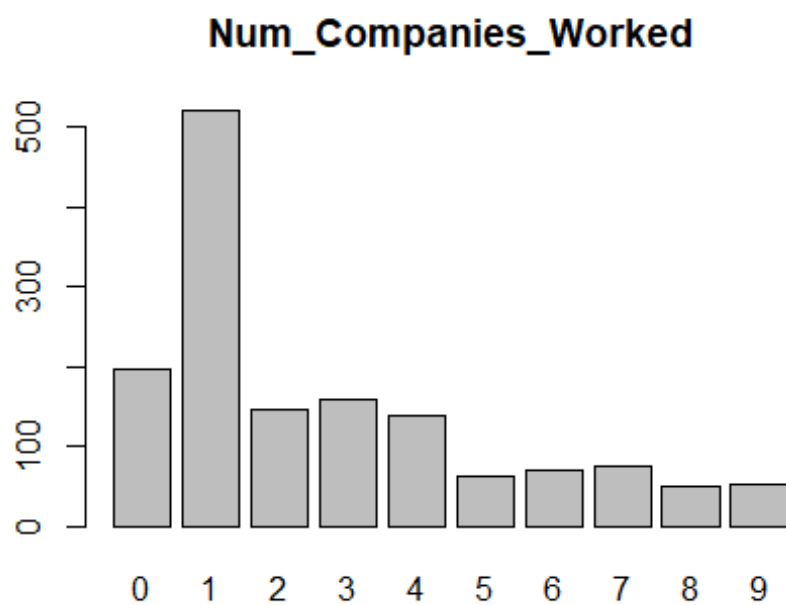
xix. Overtime

```
summary(Turnover_issues_fac$OverTime)

##    0    1
## 1054  416

plot(Turnover_issues_fac$OverTime, main="Over_Time")
```

Over_Time
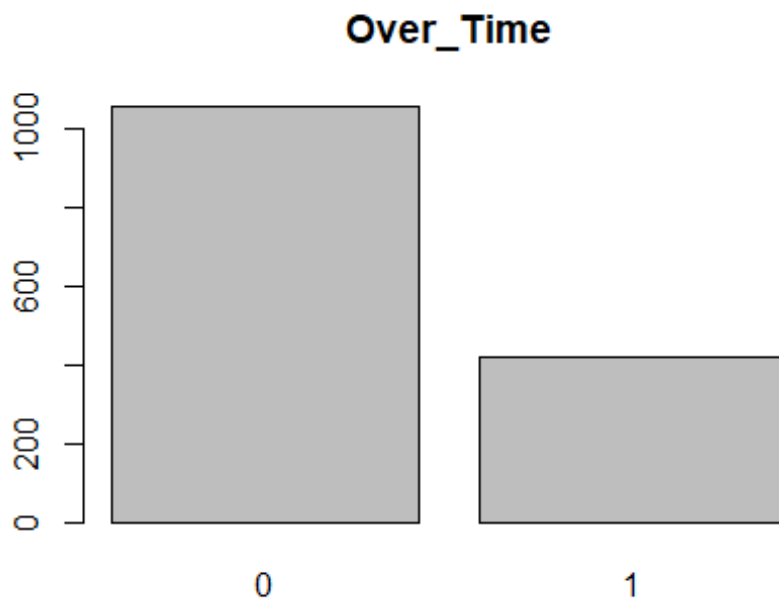
xx.   Percent Salary Hike

```
summary(Turnover_issues_fac$PercentSalaryHike)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   11.00   12.00   14.00   15.21   18.00   25.00

plot(density(Turnover_issues_fac$PercentSalaryHike),main = "Percent_Salary_Hi
kes")
```

Percent_Salary_Hikes

N = 1470   Bandwidth = 0.766
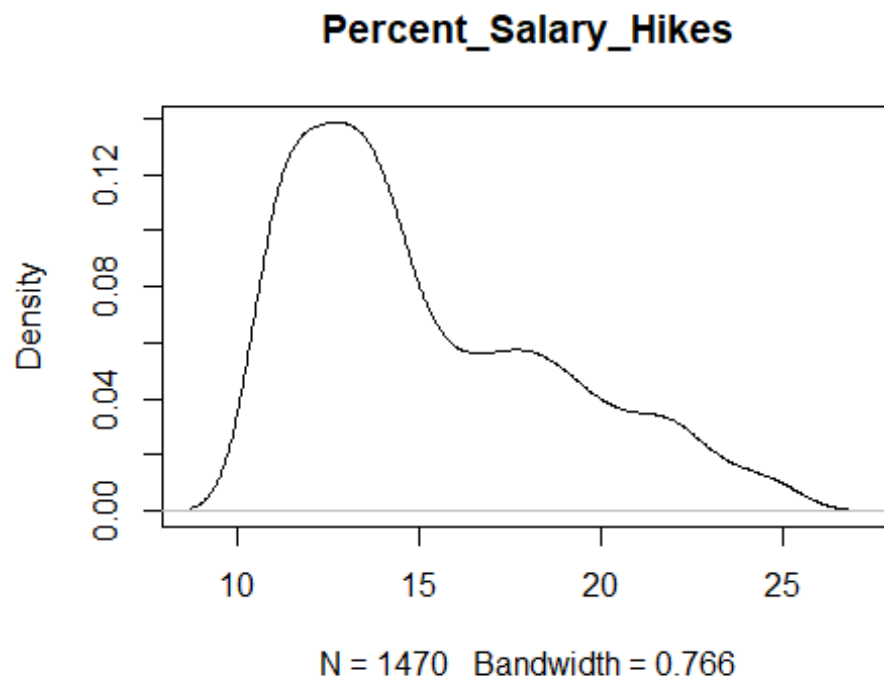
xxi. Performance Rating

```
summary(Turnover_issues_fac$PerformanceRating)

##    3    4
## 1244  226

plot(Turnover_issues_fac$PerformanceRating, main="Performance_Rating")
```

Performance_Rating
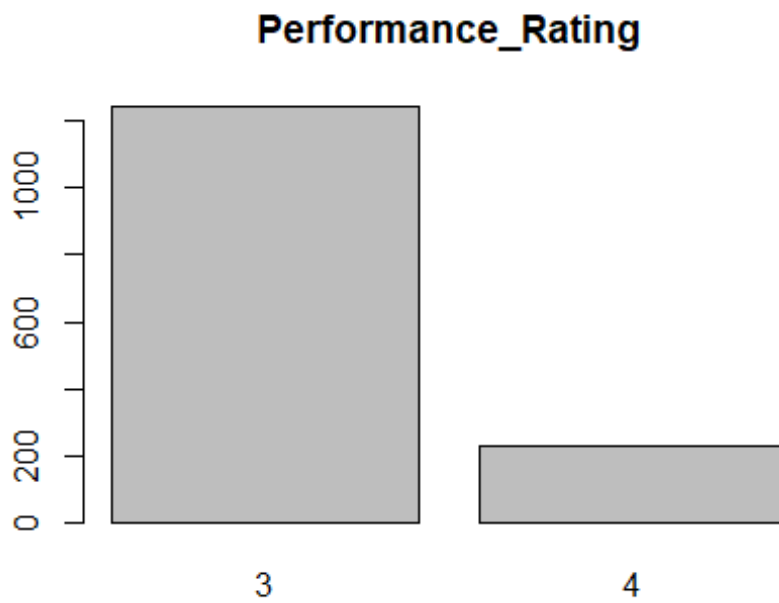
xxii.Relationship Satisfaction

```
summary(Turnover_issues_fac$RelationshipSatisfaction)

##   1   2   3   4
## 276 303 459 432

plot(Turnover_issues_fac$RelationshipSatisfaction, main="Relationhsip_Satisfa
ction")
```

Relationhsip_Satisfaction
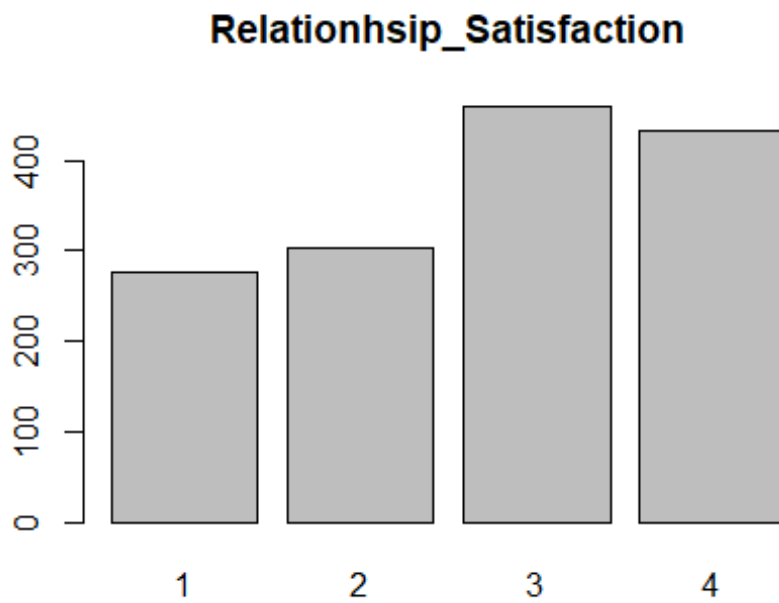
Standard hour input is 80 in all rows, so no analysis done

xxiii.   Stock Option Level

```
summary(Turnover_issues_fac$StockOptionLevel)

##   0   1   2   3
## 631 596 158  85

plot(Turnover_issues_fac$StockOptionLevel, main="Stock_OPtion_Level")
```

Stock_OPtion_Level
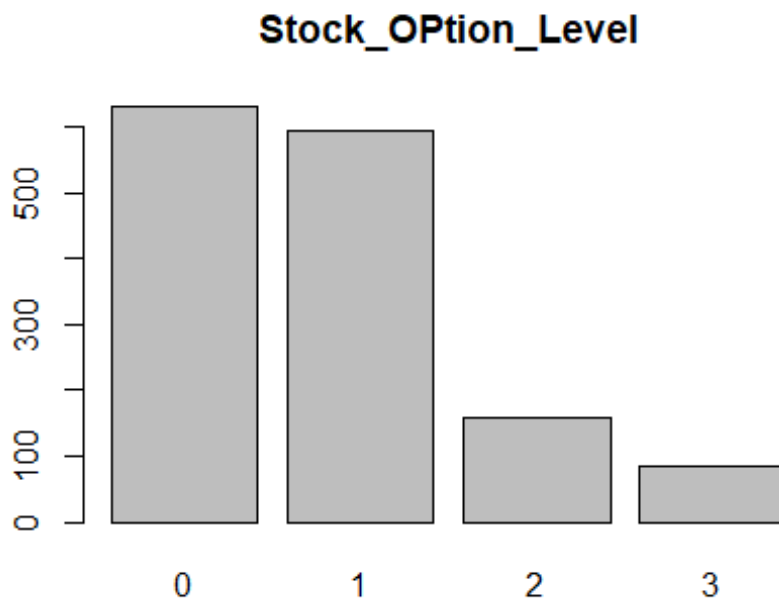
xiv. Total Working Years

```
summary(Turnover_issues_fac$TotalWorkingYears)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00    6.00   10.00   11.28   15.00   40.00
```

Boxplot is used for better visualization

```
boxplot(Turnover_issues_fac$TotalWorkingYears, main="Total_Working_Years")
```

Total_Working_Years
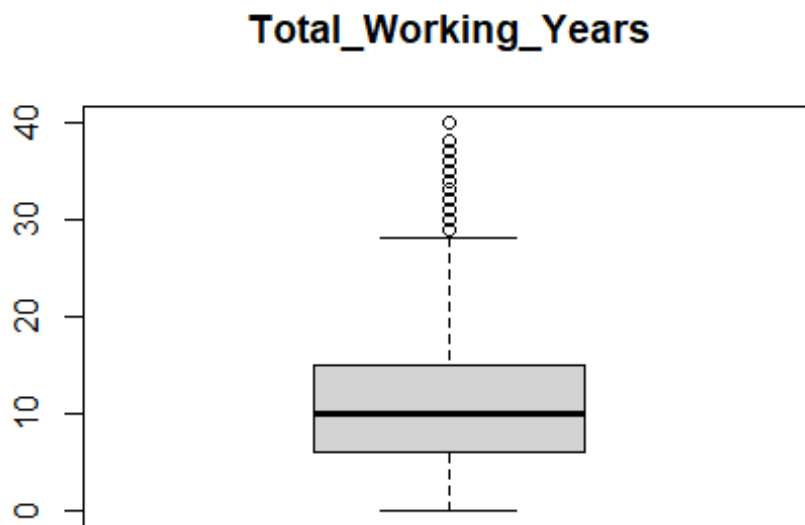
xxv. Training Times Last Year

```
summary(Turnover_issues_fac$TrainingTimesLastYear)
```

```
##    0    1    2    3    4    5    6
##   54   71  547  491  123  119   65
```

```
plot(Turnover_issues_fac$TrainingTimesLastYear, main = "Training_Times_Last_Y
ear")
```

Training_Times_Last_Year

xxvi.Work Life Balance

```
summary(Turnover_issues_fac$WorkLifeBalance)

##    1    2    3    4
##   80  344  893  153

plot(Turnover_issues_fac$WorkLifeBalance, main = "Work_Life_Balance")
```

Work_Life_Balance
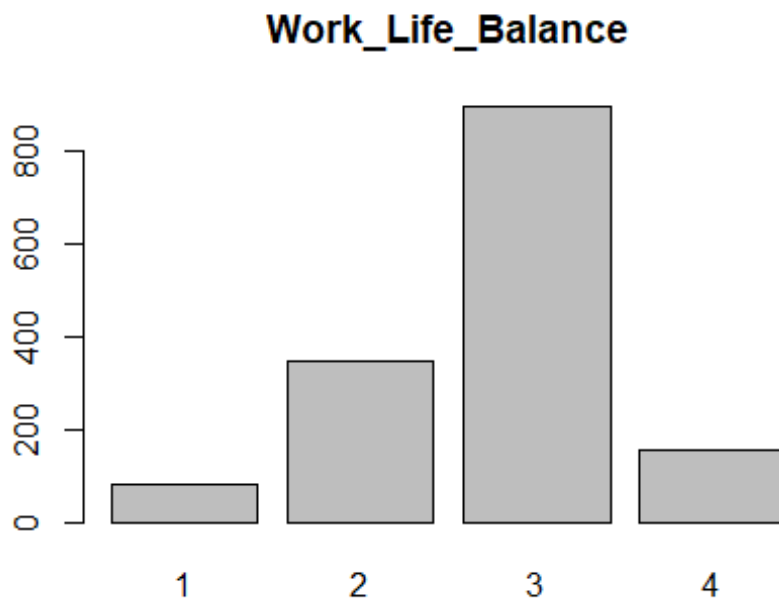
xxvii.   Years at company

```
summary(Turnover_issues_fac$YearsAtCompany)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   3.000   5.000   7.008   9.000  40.000

plot(density(Turnover_issues_fac$YearsAtCompany), main = "Years_At_Company")
```

Years_At_Company

N = 1470   Bandwidth = 0.9372
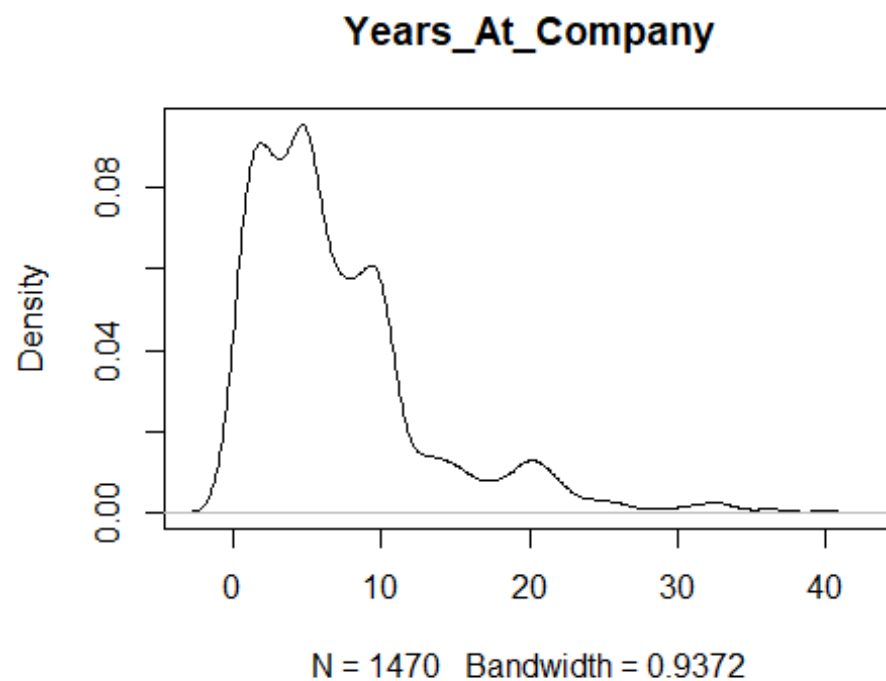
xxviii.Years in Current Role

```
summary(Turnover_issues_fac$YearsInCurrentRole)

##     Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.000   2.000   3.000   4.229   7.000  18.000

plot(density(Turnover_issues_fac$YearsInCurrentRole),main = "Years_In_Current
_Role")
```

Years_In_Current_Role

N = 1470 Bandwidth = 0.7583
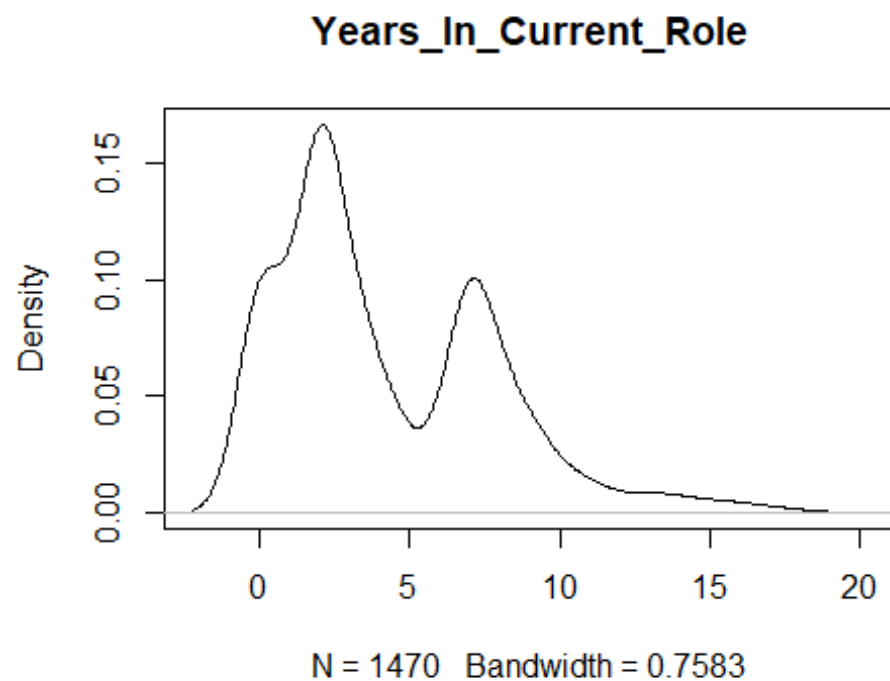
xix. Years Since Last Promotion

```
summary(Turnover_issues_fac$YearsSinceLastPromotion)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   1.000   2.188   3.000  15.000

plot(density(Turnover_issues_fac$YearsSinceLastPromotion),main="Years_Since_L
ast Promotion")
```

Years_Since_Last Promotion

N = 1470 Bandwidth = 0.4686
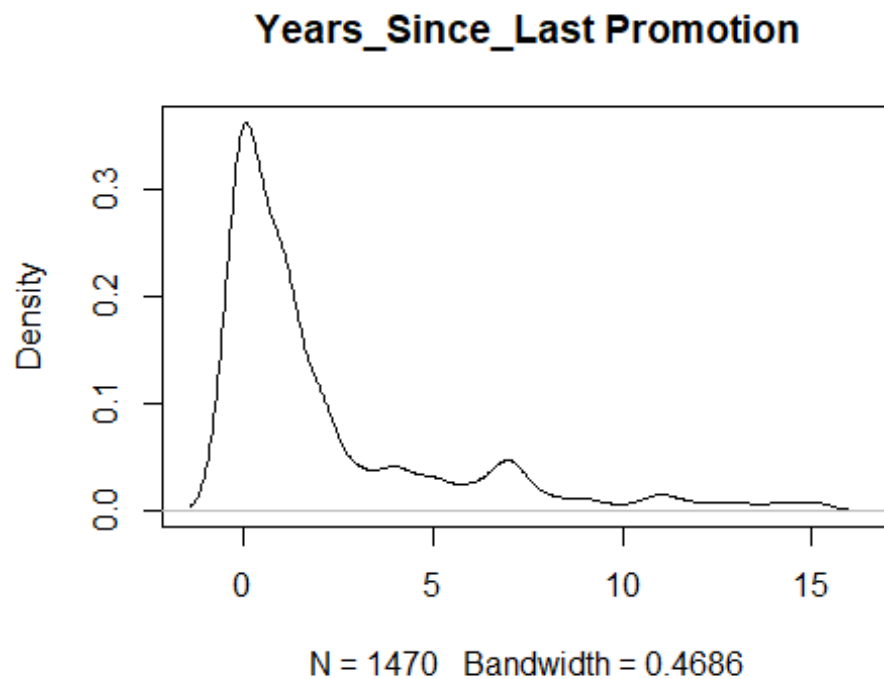
xxx. Years with Current Manager

```
summary(Turnover_issues_fac$YearsWithCurrManager)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   2.000   3.000   4.123   7.000  17.000

plot(density(Turnover_issues_fac$YearsWithCurrManager),main = "Years_With_Cur
r_Manager")
```

Years_With_Curr_Manager

N = 1470 Bandwidth = 0.7468
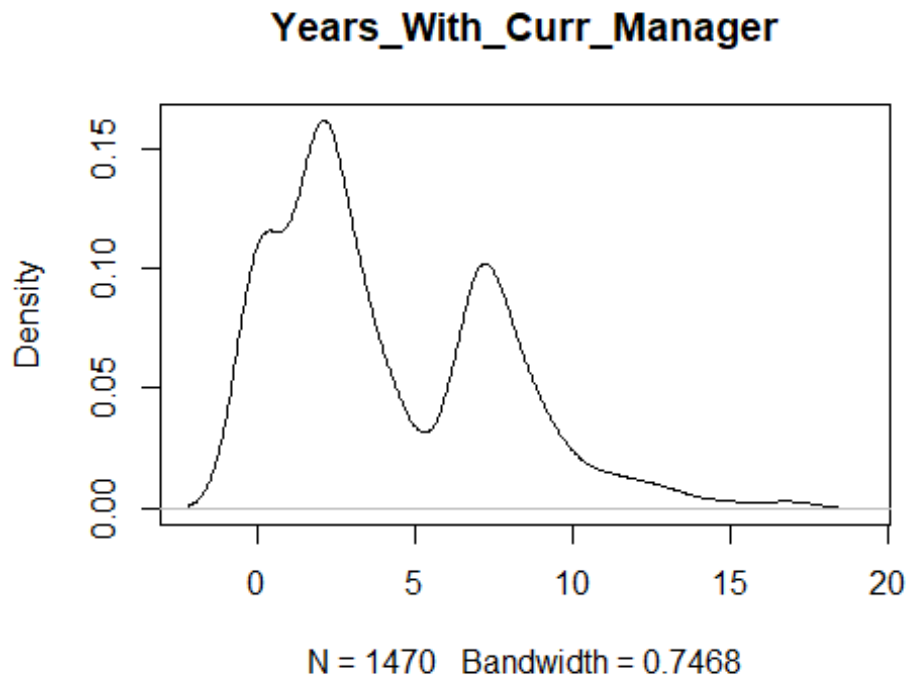
###B. Analyzing with two variables###

#Used cat for concatenating output, cut to convert continuous variable age into categorical variable and break for grouping which started from 18 to highest60#

```
Cat_Age<-cut(Turnover_issues_fac$Age, breaks = c(0,20,30,40,50,60), labels =
c("20","30","40","50","60"))
```

#Used cat for concatenating output, cut to convert continuous variable Monthly Income into categorical variable and break for grouping which started from 1009 to highest 19999#

```
Cat_Monthly_Income<-cut(Turnover_issues_fac$MonthlyIncome, breaks = c(0,2000,
4000,6000,8000,10000,12000,14000,16000,18000,20000), labels = c("2000","4000"
,"6000","8000","10000","12000","14000","16000","18000","20000"))
```

#Used cat for concatenating output, cut to convert continuous variable Percent Salary Hike into categorical variable and break for grouping which started from 10 to highest 25#

```
Cat_Percent_Salary_Hike<-cut(Turnover_issues_fac$PercentSalaryHike, breaks =
c(10,15,20,25), labels = c("10-15","16-20","21-25"))
```

```
### The package "gmodels" need to be installed for utilizing CrossTable(...)
function

# install.packages("gmodels")
library(gmodels)
```

1. Relationship of Age with Attrition

```
CrossTable(Cat_Age,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##              | Turnover_issues_fac$Attrition
##     Cat_Age |        0 |        1 | Row Total |
## ------------|----------|----------|-----------|
##          20 |       12 |       16 |        28 |
##             |    5.617 |   29.223 |           |
##             |    0.429 |    0.571 |     0.019 |
##             |    0.010 |    0.068 |           |
##             |    0.008 |    0.011 |           |
## ------------|----------|----------|-----------|
##          30 |      274 |       84 |       358 |
##             |    2.300 |   11.967 |           |
##             |    0.765 |    0.235 |     0.244 |
##             |    0.222 |    0.354 |           |
##             |    0.186 |    0.057 |           |
## ------------|----------|----------|-----------|
##          40 |      534 |       85 |       619 |
##             |    0.422 |    2.194 |           |
##             |    0.863 |    0.137 |     0.421 |
##             |    0.433 |    0.359 |           |
##             |    0.363 |    0.058 |           |
## ------------|----------|----------|-----------|
##          50 |      288 |       34 |       322 |
##             |    1.188 |    6.182 |           |
##             |    0.894 |    0.106 |     0.219 |
##             |    0.234 |    0.143 |           |
##             |    0.196 |    0.023 |           |
## ------------|----------|----------|-----------|
##          60 |      125 |       18 |       143 |
##             |    0.213 |    1.108 |           |
##             |    0.874 |    0.126 |     0.097 |
##             |    0.101 |    0.076 |           |
##             |    0.085 |    0.012 |           |
```

```
## -------------|-----------|-----------|-----------|
## Column Total |      1233 |       237 |      1470 |
##              |     0.839 |     0.161 |           |
## -------------|-----------|-----------|-----------|
##
##
```

2. Relationship of Business Travel with Attrition

```
CrossTable(Turnover_issues_fac$BusinessTravel,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |  Chi-square contribution |
## |             N / Row Total |
## |             N / Col Total |
## |           N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                 | Turnover_issues_fac$Attrition
## Turnover_issues_fac$BusinessTravel |         0 |         1 | Row Total |
## --------------------------------|-----------|-----------|-----------|
##                      Non-Travel |       138 |        12 |       150 |
##                                 |     1.180 |     6.138 |           |
##                                 |     0.920 |     0.080 |     0.102 |
##                                 |     0.112 |     0.051 |           |
##                                 |     0.094 |     0.008 |           |
## --------------------------------|-----------|-----------|-----------|
##               Travel_Frequently |       208 |        69 |       277 |
##                                 |     2.550 |    13.267 |           |
##                                 |     0.751 |     0.249 |     0.188 |
##                                 |     0.169 |     0.291 |           |
##                                 |     0.141 |     0.047 |           |
## --------------------------------|-----------|-----------|-----------|
##                   Travel_Rarely |       887 |       156 |      1043 |
##                                 |     0.169 |     0.879 |           |
##                                 |     0.850 |     0.150 |     0.710 |
##                                 |     0.719 |     0.658 |           |
##                                 |     0.603 |     0.106 |           |
## --------------------------------|-----------|-----------|-----------|
##                    Column Total |      1233 |       237 |      1470 |
##                                 |     0.839 |     0.161 |           |
## --------------------------------|-----------|-----------|-----------|
```

```
##
##
```

3.   Relationship of Monthly Income with Attrition

```
CrossTable(Cat_Monthly_Income,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |             N / Row Total |
## |             N / Col Total |
## |           N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:   1470
##
##
##                     | Turnover_issues_fac$Attrition
## Cat_Monthly_Income |         0 |         1 | Row Total |
## -------------------|-----------|-----------|-----------|
##               2000 |        15 |        18 |        33 |
##                    |     5.808 |    30.218 |           |
##                    |     0.455 |     0.545 |     0.022 |
##                    |     0.012 |     0.076 |           |
##                    |     0.010 |     0.012 |           |
## -------------------|-----------|-----------|-----------|
##               4000 |       391 |       119 |       510 |
##                    |     3.162 |    16.448 |           |
##                    |     0.767 |     0.233 |     0.347 |
##                    |     0.317 |     0.502 |           |
##                    |     0.266 |     0.081 |           |
## -------------------|-----------|-----------|-----------|
##               6000 |       329 |        42 |       371 |
##                    |     1.020 |     5.306 |           |
##                    |     0.887 |     0.113 |     0.252 |
##                    |     0.267 |     0.177 |           |
##                    |     0.224 |     0.029 |           |
## -------------------|-----------|-----------|-----------|
##               8000 |       157 |        18 |       175 |
##                    |     0.711 |     3.698 |           |
##                    |     0.897 |     0.103 |     0.119 |
##                    |     0.127 |     0.076 |           |
##                    |     0.107 |     0.012 |           |
## -------------------|-----------|-----------|-----------|
##              10000 |        85 |        15 |       100 |
##                    |     0.015 |     0.078 |           |
```

```
##                              |     0.850 |     0.150 |     0.068 |
##                              |     0.069 |     0.063 |           |
##                              |     0.058 |     0.010 |           |
##   -------------------|-----------|-----------|-----------|
##              12000 |        72 |        14 |        86 |
##                              |     0.000 |     0.001 |           |
##                              |     0.837 |     0.163 |     0.059 |
##                              |     0.058 |     0.059 |           |
##                              |     0.049 |     0.010 |           |
##   -------------------|-----------|-----------|-----------|
##              14000 |        47 |         6 |        53 |
##                              |     0.146 |     0.758 |           |
##                              |     0.887 |     0.113 |     0.036 |
##                              |     0.038 |     0.025 |           |
##                              |     0.032 |     0.004 |           |
##   -------------------|-----------|-----------|-----------|
##              16000 |        16 |         0 |        16 |
##                              |     0.496 |     2.580 |           |
##                              |     1.000 |     0.000 |     0.011 |
##                              |     0.013 |     0.000 |           |
##                              |     0.011 |     0.000 |           |
##   -------------------|-----------|-----------|-----------|
##              18000 |        57 |         0 |        57 |
##                              |     1.766 |     9.190 |           |
##                              |     1.000 |     0.000 |     0.039 |
##                              |     0.046 |     0.000 |           |
##                              |     0.039 |     0.000 |           |
##   -------------------|-----------|-----------|-----------|
##              20000 |        64 |         5 |        69 |
##                              |     0.648 |     3.372 |           |
##                              |     0.928 |     0.072 |     0.047 |
##                              |     0.052 |     0.021 |           |
##                              |     0.044 |     0.003 |           |
##   -------------------|-----------|-----------|-----------|
##       Column Total |      1233 |       237 |      1470 |
##                              |     0.839 |     0.161 |           |
##   -------------------|-----------|-----------|-----------|
##
##
```

4. Relationship of department with Attrition

```
CrossTable(Turnover_issues_fac$Department,Turnover_issues_fac$Attrition)
```

```
##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |           N / Row Total |
```

```
## |              N / Col Total |
## |            N / Table Total |
## |----------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                 | Turnover_issues_fac$Attrition
## Turnover_issues_fac$Department  |         0 |         1 | Row Total |
## -------------------------------|-----------|-----------|-----------|
##              Human Resources   |        51 |        12 |        63 |
##                                |     0.064 |     0.334 |           |
##                                |     0.810 |     0.190 |     0.043 |
##                                |     0.041 |     0.051 |           |
##                                |     0.035 |     0.008 |           |
## -------------------------------|-----------|-----------|-----------|
##       Research & Development   |       828 |       133 |       961 |
##                                |     0.597 |     3.106 |           |
##                                |     0.862 |     0.138 |     0.654 |
##                                |     0.672 |     0.561 |           |
##                                |     0.563 |     0.090 |           |
## -------------------------------|-----------|-----------|-----------|
##                        Sales   |       354 |        92 |       446 |
##                                |     1.079 |     5.615 |           |
##                                |     0.794 |     0.206 |     0.303 |
##                                |     0.287 |     0.388 |           |
##                                |     0.241 |     0.063 |           |
## -------------------------------|-----------|-----------|-----------|
##                 Column Total   |      1233 |       237 |      1470 |
##                                |     0.839 |     0.161 |           |
## -------------------------------|-----------|-----------|-----------|
##
##
```

5. Relationship of distance from home with Attrition

```
CrossTable(Turnover_issues_fac$DistanceFromHome,Turnover_issues_fac$Attrition
)
```

```
##
##
##     Cell Contents
## |----------------------------|
## |                          N |
## |   Chi-square contribution  |
## |             N / Row Total  |
## |             N / Col Total  |
## |           N / Table Total  |
## |----------------------------|
##
```

```
## 
## Total Observations in Table:  1470
## 
## 
##                                 | Turnover_issues_fac$Attrition 
## Turnover_issues_fac$DistanceFromHome |         0 |         1 | Row Total | 
## -------------------------------------|-----------|-----------|-----------|
##                                    1 |       182 |        26 |       208 | 
##                                      |     0.325 |     1.693 |           | 
##                                      |     0.875 |     0.125 |     0.141 | 
##                                      |     0.148 |     0.110 |           | 
##                                      |     0.124 |     0.018 |           | 
## -------------------------------------|-----------|-----------|-----------|
##                                    2 |       183 |        28 |       211 | 
##                                      |     0.205 |     1.065 |           | 
##                                      |     0.867 |     0.133 |     0.144 | 
##                                      |     0.148 |     0.118 |           | 
##                                      |     0.124 |     0.019 |           | 
## -------------------------------------|-----------|-----------|-----------|
##                                    3 |        70 |        14 |        84 | 
##                                      |     0.003 |     0.015 |           | 
##                                      |     0.833 |     0.167 |     0.057 | 
##                                      |     0.057 |     0.059 |           | 
##                                      |     0.048 |     0.010 |           | 
## -------------------------------------|-----------|-----------|-----------|
##                                    4 |        55 |         9 |        64 | 
##                                      |     0.032 |     0.168 |           | 
##                                      |     0.859 |     0.141 |     0.044 | 
##                                      |     0.045 |     0.038 |           | 
##                                      |     0.037 |     0.006 |           | 
## -------------------------------------|-----------|-----------|-----------|
##                                    5 |        55 |        10 |        65 | 
##                                      |     0.004 |     0.022 |           | 
##                                      |     0.846 |     0.154 |     0.044 | 
##                                      |     0.045 |     0.042 |           | 
##                                      |     0.037 |     0.007 |           | 
## -------------------------------------|-----------|-----------|-----------|
##                                    6 |        52 |         7 |        59 | 
##                                      |     0.128 |     0.663 |           | 
##                                      |     0.881 |     0.119 |     0.040 | 
##                                      |     0.042 |     0.030 |           | 
##                                      |     0.035 |     0.005 |           | 
## -------------------------------------|-----------|-----------|-----------|
##                                    7 |        73 |        11 |        84 | 
##                                      |     0.092 |     0.477 |           | 
##                                      |     0.869 |     0.131 |     0.057 | 
##                                      |     0.059 |     0.046 |           | 
##                                      |     0.050 |     0.007 |           | 
## -------------------------------------|-----------|-----------|-----------|
##                                    8 |        70 |        10 |        80 | 
```

```
##                                    |    0.125 |    0.651 |          |
##                                    |    0.875 |    0.125 |    0.054 |
##                                    |    0.057 |    0.042 |          |
##                                    |    0.048 |    0.007 |          |
##  -----------------------------------|----------|----------|----------|
##                                  9 |       67 |       18 |       85 |
##                                    |    0.259 |    1.347 |          |
##                                    |    0.788 |    0.212 |    0.058 |
##                                    |    0.054 |    0.076 |          |
##                                    |    0.046 |    0.012 |          |
##  -----------------------------------|----------|----------|----------|
##                                 10 |       75 |       11 |       86 |
##                                    |    0.114 |    0.592 |          |
##                                    |    0.872 |    0.128 |    0.059 |
##                                    |    0.061 |    0.046 |          |
##                                    |    0.051 |    0.007 |          |
##  -----------------------------------|----------|----------|----------|
##                                 11 |       25 |        4 |       29 |
##                                    |    0.019 |    0.098 |          |
##                                    |    0.862 |    0.138 |    0.020 |
##                                    |    0.020 |    0.017 |          |
##                                    |    0.017 |    0.003 |          |
##  -----------------------------------|----------|----------|----------|
##                                 12 |       14 |        6 |       20 |
##                                    |    0.459 |    2.389 |          |
##                                    |    0.700 |    0.300 |    0.014 |
##                                    |    0.011 |    0.025 |          |
##                                    |    0.010 |    0.004 |          |
##  -----------------------------------|----------|----------|----------|
##                                 13 |       13 |        6 |       19 |
##                                    |    0.541 |    2.815 |          |
##                                    |    0.684 |    0.316 |    0.013 |
##                                    |    0.011 |    0.025 |          |
##                                    |    0.009 |    0.004 |          |
##  -----------------------------------|----------|----------|----------|
##                                 14 |       17 |        4 |       21 |
##                                    |    0.021 |    0.111 |          |
##                                    |    0.810 |    0.190 |    0.014 |
##                                    |    0.014 |    0.017 |          |
##                                    |    0.012 |    0.003 |          |
##  -----------------------------------|----------|----------|----------|
##                                 15 |       21 |        5 |       26 |
##                                    |    0.030 |    0.156 |          |
##                                    |    0.808 |    0.192 |    0.018 |
##                                    |    0.017 |    0.021 |          |
##                                    |    0.014 |    0.003 |          |
##  -----------------------------------|----------|----------|----------|
##                                 16 |       25 |        7 |       32 |
##                                    |    0.126 |    0.657 |          |
##                                    |    0.781 |    0.219 |    0.022 |
```

```
##                                |  0.020 |   0.030 |          |
##                                |  0.017 |   0.005 |          |
## ------------------------------|---------|---------|----------|
##                           17 |     15 |       5 |       20 |
##                                |  0.188 |   0.978 |          |
##                                |  0.750 |   0.250 |    0.014 |
##                                |  0.012 |   0.021 |          |
##                                |  0.010 |   0.003 |          |
## ------------------------------|---------|---------|----------|
##                           18 |     22 |       4 |       26 |
##                                |  0.002 |   0.009 |          |
##                                |  0.846 |   0.154 |    0.018 |
##                                |  0.018 |   0.017 |          |
##                                |  0.015 |   0.003 |          |
## ------------------------------|---------|---------|----------|
##                           19 |     19 |       3 |       22 |
##                                |  0.016 |   0.084 |          |
##                                |  0.864 |   0.136 |    0.015 |
##                                |  0.015 |   0.013 |          |
##                                |  0.013 |   0.002 |          |
## ------------------------------|---------|---------|----------|
##                           20 |     21 |       4 |       25 |
##                                |  0.000 |   0.000 |          |
##                                |  0.840 |   0.160 |    0.017 |
##                                |  0.017 |   0.017 |          |
##                                |  0.014 |   0.003 |          |
## ------------------------------|---------|---------|----------|
##                           21 |     15 |       3 |       18 |
##                                |  0.001 |   0.003 |          |
##                                |  0.833 |   0.167 |    0.012 |
##                                |  0.012 |   0.013 |          |
##                                |  0.010 |   0.002 |          |
## ------------------------------|---------|---------|----------|
##                           22 |     13 |       6 |       19 |
##                                |  0.541 |   2.815 |          |
##                                |  0.684 |   0.316 |    0.013 |
##                                |  0.011 |   0.025 |          |
##                                |  0.009 |   0.004 |          |
## ------------------------------|---------|---------|----------|
##                           23 |     22 |       5 |       27 |
##                                |  0.018 |   0.096 |          |
##                                |  0.815 |   0.185 |    0.018 |
##                                |  0.018 |   0.021 |          |
##                                |  0.015 |   0.003 |          |
## ------------------------------|---------|---------|----------|
##                           24 |     16 |      12 |       28 |
##                                |  2.386 |  12.413 |          |
##                                |  0.571 |   0.429 |    0.019 |
##                                |  0.013 |   0.051 |          |
##                                |  0.011 |   0.008 |          |
```

```
## ----------------------------------|-----------|-----------|-----------|
##                                25 |        19 |         6 |        25 |
##                                   |     0.185 |     0.962 |           |
##                                   |     0.760 |     0.240 |     0.017 |
##                                   |     0.015 |     0.025 |           |
##                                   |     0.013 |     0.004 |           |
## ----------------------------------|-----------|-----------|-----------|
##                                26 |        22 |         3 |        25 |
##                                   |     0.051 |     0.264 |           |
##                                   |     0.880 |     0.120 |     0.017 |
##                                   |     0.018 |     0.013 |           |
##                                   |     0.015 |     0.002 |           |
## ----------------------------------|-----------|-----------|-----------|
##                                27 |         9 |         3 |        12 |
##                                   |     0.113 |     0.587 |           |
##                                   |     0.750 |     0.250 |     0.008 |
##                                   |     0.007 |     0.013 |           |
##                                   |     0.006 |     0.002 |           |
## ----------------------------------|-----------|-----------|-----------|
##                                28 |        21 |         2 |        23 |
##                                   |     0.151 |     0.787 |           |
##                                   |     0.913 |     0.087 |     0.016 |
##                                   |     0.017 |     0.008 |           |
##                                   |     0.014 |     0.001 |           |
## ----------------------------------|-----------|-----------|-----------|
##                                29 |        22 |         5 |        27 |
##                                   |     0.018 |     0.096 |           |
##                                   |     0.815 |     0.185 |     0.018 |
##                                   |     0.018 |     0.021 |           |
##                                   |     0.015 |     0.003 |           |
## ----------------------------------|-----------|-----------|-----------|
##                      Column Total |      1233 |       237 |      1470 |
##                                   |     0.839 |     0.161 |           |
## ----------------------------------|-----------|-----------|-----------|
##
##
```

6.   Relationship of Education with attrition

```
CrossTable(Turnover_issues_fac$Education,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
```

```
## 
## 
## Total Observations in Table:  1470
## 
## 
## 
##                               | Turnover_issues_fac$Attrition
## Turnover_issues_fac$Education |         0 |         1 | Row Total |
## -----------------------------|-----------|-----------|-----------|
##                            1 |       139 |        31 |       170 |
##                              |     0.090 |     0.471 |           |
##                              |     0.818 |     0.182 |     0.116 |
##                              |     0.113 |     0.131 |           |
##                              |     0.095 |     0.021 |           |
## -----------------------------|-----------|-----------|-----------|
##                            2 |       238 |        44 |       282 |
##                              |     0.009 |     0.047 |           |
##                              |     0.844 |     0.156 |     0.192 |
##                              |     0.193 |     0.186 |           |
##                              |     0.162 |     0.030 |           |
## -----------------------------|-----------|-----------|-----------|
##                            3 |       473 |        99 |       572 |
##                              |     0.096 |     0.498 |           |
##                              |     0.827 |     0.173 |     0.389 |
##                              |     0.384 |     0.418 |           |
##                              |     0.322 |     0.067 |           |
## -----------------------------|-----------|-----------|-----------|
##                            4 |       340 |        58 |       398 |
##                              |     0.114 |     0.593 |           |
##                              |     0.854 |     0.146 |     0.271 |
##                              |     0.276 |     0.245 |           |
##                              |     0.231 |     0.039 |           |
## -----------------------------|-----------|-----------|-----------|
##                            5 |        43 |         5 |        48 |
##                              |     0.186 |     0.969 |           |
##                              |     0.896 |     0.104 |     0.033 |
##                              |     0.035 |     0.021 |           |
##                              |     0.029 |     0.003 |           |
## -----------------------------|-----------|-----------|-----------|
##                 Column Total |      1233 |       237 |      1470 |
##                              |     0.839 |     0.161 |           |
## -----------------------------|-----------|-----------|-----------|
## 
## 
```

7. Relationship of Education Field with attrition

```
CrossTable(Turnover_issues_fac$EducationField,Turnover_issues_fac$Attrition)
```

```
## 
## 
##      Cell Contents
```

```
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |             N / Row Total |
## |             N / Col Total |
## |           N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                   | Turnover_issues_fac$Attrition
## Turnover_issues_fac$EducationField |         0 |         1 | Row Total |
## ----------------------------------|-----------|-----------|-----------|
##                   Human Resources |        20 |         7 |        27 |
##                                   |     0.309 |     1.610 |           |
##                                   |     0.741 |     0.259 |     0.018 |
##                                   |     0.016 |     0.030 |           |
##                                   |     0.014 |     0.005 |           |
## ----------------------------------|-----------|-----------|-----------|
##                     Life Sciences |       517 |        89 |       606 |
##                                   |     0.149 |     0.775 |           |
##                                   |     0.853 |     0.147 |     0.412 |
##                                   |     0.419 |     0.376 |           |
##                                   |     0.352 |     0.061 |           |
## ----------------------------------|-----------|-----------|-----------|
##                         Marketing |       124 |        35 |       159 |
##                                   |     0.658 |     3.421 |           |
##                                   |     0.780 |     0.220 |     0.108 |
##                                   |     0.101 |     0.148 |           |
##                                   |     0.084 |     0.024 |           |
## ----------------------------------|-----------|-----------|-----------|
##                           Medical |       401 |        63 |       464 |
##                                   |     0.358 |     1.864 |           |
##                                   |     0.864 |     0.136 |     0.316 |
##                                   |     0.325 |     0.266 |           |
##                                   |     0.273 |     0.043 |           |
## ----------------------------------|-----------|-----------|-----------|
##                             Other |        71 |        11 |        82 |
##                                   |     0.072 |     0.373 |           |
##                                   |     0.866 |     0.134 |     0.056 |
##                                   |     0.058 |     0.046 |           |
##                                   |     0.048 |     0.007 |           |
## ----------------------------------|-----------|-----------|-----------|
##                  Technical Degree |       100 |        32 |       132 |
##                                   |     1.038 |     5.398 |           |
##                                   |     0.758 |     0.242 |     0.090 |
##                                   |     0.081 |     0.135 |           |
##                                   |     0.068 |     0.022 |           |
```

```
## ------------------------------------|-----------|-----------|-----------|
##                      Column Total |      1233 |       237 |      1470 |
##                                   |     0.839 |     0.161 |           |
## ------------------------------------|-----------|-----------|-----------|
##
##
```

8.   Relationship of Environment Satisfaction with Attrition

```
CrossTable(Turnover_issues_fac$EnvironmentSatisfaction,Turnover_issues_fac$At
trition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |  Chi-square contribution |
## |            N / Row Total |
## |            N / Col Total |
## |          N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                     | Turnover_issues_fac$Attritio
n
## Turnover_issues_fac$EnvironmentSatisfaction |         0 |         1 | Row
Total |
## -------------------------------------------|-----------|-----------|-----
------|
##                                   1 |       212 |        72 |
284 |
##                                     |     2.884 |    15.006 |
|
##                                     |     0.746 |     0.254 |
0.193 |
##                                     |     0.172 |     0.304 |
|
##                                     |     0.144 |     0.049 |
|
## -------------------------------------------|-----------|-----------|-----
------|
##                                   2 |       244 |        43 |
287 |
##                                     |     0.044 |     0.231 |
|
##                                     |     0.850 |     0.150 |
0.195 |
```

```
##                                                   |    0.198 |    0.181 |
|
##                                                   |    0.166 |    0.029 |
|
## -------------------------------------------------|----------|----------|-----
------|
##                                            3 |      391 |       62 |
453 |
##                                                   |    0.320 |    1.667 |
|
##                                                   |    0.863 |    0.137 |
0.308 |
##                                                   |    0.317 |    0.262 |
|
##                                                   |    0.266 |    0.042 |
|
## -------------------------------------------------|----------|----------|-----
------|
##                                            4 |      386 |       60 |
446 |
##                                                   |    0.379 |    1.971 |
|
##                                                   |    0.865 |    0.135 |
0.303 |
##                                                   |    0.313 |    0.253 |
|
##                                                   |    0.263 |    0.041 |
|
## -------------------------------------------------|----------|----------|-----
------|
##                              Column Total |     1233 |      237 |
1470 |
##                                                   |    0.839 |    0.161 |
|
## -------------------------------------------------|----------|----------|-----
------|
##
##
```

9. Relationship of Gender with Attrition

```
CrossTable(Turnover_issues_fac$Gender,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
```

```
## |          N / Table Total |
## |-------------------------|
## 
## 
## Total Observations in Table:  1470
## 
## 
## 
## |                             | Turnover_issues_fac$Attrition
## Turnover_issues_fac$Gender   |          0 |          1 | Row Total |
## ----------------------------|-----------|-----------|-----------|
## 
##                    Female   |        501 |         87 |        588 |
##                              |      0.123 |      0.642 |           |
##                              |      0.852 |      0.148 |      0.400 |
##                              |      0.406 |      0.367 |           |
##                              |      0.341 |      0.059 |           |
## ----------------------------|-----------|-----------|-----------|
##                      Male   |        732 |        150 |        882 |
##                              |      0.082 |      0.428 |           |
##                              |      0.830 |      0.170 |      0.600 |
##                              |      0.594 |      0.633 |           |
##                              |      0.498 |      0.102 |           |
## ----------------------------|-----------|-----------|-----------|
##               Column Total   |       1233 |        237 |       1470 |
##                              |      0.839 |      0.161 |           |
## ----------------------------|-----------|-----------|-----------|
## 
## 
```

10. Relationship of Job Involvement with Attrition

```
CrossTable(Turnover_issues_fac$JobInvolvement,Turnover_issues_fac$Attrition)

## 
## 
##     Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
## 
## 
## Total Observations in Table:  1470
## 
## 
## 
## |                                   | Turnover_issues_fac$Attrition
## Turnover_issues_fac$JobInvolvement |          0 |          1 | Row Total |
## ----------------------------------|-----------|-----------|-----------|
##                                1 |         55 |         28 |         83 |
```

```
##                                |      3.070 |     15.969 |            |
##                                |      0.663 |      0.337 |      0.056 |
##                                |      0.045 |      0.118 |            |
##                                |      0.037 |      0.019 |            |
## -------------------------------|------------|------------|------------|
##                             2  |        304 |         71 |        375 |
##                                |      0.353 |      1.838 |            |
##                                |      0.811 |      0.189 |      0.255 |
##                                |      0.247 |      0.300 |            |
##                                |      0.207 |      0.048 |            |
## -------------------------------|------------|------------|------------|
##                             3  |        743 |        125 |        868 |
##                                |      0.307 |      1.596 |            |
##                                |      0.856 |      0.144 |      0.590 |
##                                |      0.603 |      0.527 |            |
##                                |      0.505 |      0.085 |            |
## -------------------------------|------------|------------|------------|
##                             4  |        131 |         13 |        144 |
##                                |      0.864 |      4.496 |            |
##                                |      0.910 |      0.090 |      0.098 |
##                                |      0.106 |      0.055 |            |
##                                |      0.089 |      0.009 |            |
## -------------------------------|------------|------------|------------|
##                  Column Total  |       1233 |        237 |       1470 |
##                                |      0.839 |      0.161 |            |
## -------------------------------|------------|------------|------------|
##
##
```

11. Relationship of Job level with Attrition

```
CrossTable(Turnover_issues_fac$JobLevel,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |  Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                              | Turnover_issues_fac$Attrition
## Turnover_issues_fac$JobLevel |          0 |          1 | Row Total |
## -----------------------------|------------|------------|-----------|
```

```
##                                  1 |      400 |      143 |      543 |
##                                    |    6.752 |   35.128 |          |
##                                    |    0.737 |    0.263 |    0.369 |
##                                    |    0.324 |    0.603 |          |
##                                    |    0.272 |    0.097 |          |
## -------------------------------- |----------|----------|----------|
##                                  2 |      482 |       52 |      534 |
##                                    |    2.595 |   13.501 |          |
##                                    |    0.903 |    0.097 |    0.363 |
##                                    |    0.391 |    0.219 |          |
##                                    |    0.328 |    0.035 |          |
## -------------------------------- |----------|----------|----------|
##                                  3 |      186 |       32 |      218 |
##                                    |    0.054 |    0.282 |          |
##                                    |    0.853 |    0.147 |    0.148 |
##                                    |    0.151 |    0.135 |          |
##                                    |    0.127 |    0.022 |          |
## -------------------------------- |----------|----------|----------|
##                                  4 |      101 |        5 |      106 |
##                                    |    1.644 |    8.553 |          |
##                                    |    0.953 |    0.047 |    0.072 |
##                                    |    0.082 |    0.021 |          |
##                                    |    0.069 |    0.003 |          |
## -------------------------------- |----------|----------|----------|
##                                  5 |       64 |        5 |       69 |
##                                    |    0.648 |    3.372 |          |
##                                    |    0.928 |    0.072 |    0.047 |
##                                    |    0.052 |    0.021 |          |
##                                    |    0.044 |    0.003 |          |
## -------------------------------- |----------|----------|----------|
##                     Column Total |     1233 |      237 |     1470 |
##                                    |    0.839 |    0.161 |          |
## -------------------------------- |----------|----------|----------|
##
##
```

12. Relationship of Percentage Job Role with Attrition

```
CrossTable(Turnover_issues_fac$JobRole,Turnover_issues_fac$Attrition)
```

```
##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
```

```
##
## Total Observations in Table:  1470
##
##
##                              | Turnover_issues_fac$Attrition
## Turnover_issues_fac$JobRole  |         0 |         1 | Row Total |
## ----------------------------|-----------|-----------|-----------|
##    Healthcare Representative |       122 |         9 |       131 |
##                             |     1.337 |     6.956 |           |
##                             |     0.931 |     0.069 |     0.089 |
##                             |     0.099 |     0.038 |           |
##                             |     0.083 |     0.006 |           |
## ----------------------------|-----------|-----------|-----------|
##             Human Resources |        40 |        12 |        52 |
##                             |     0.300 |     1.560 |           |
##                             |     0.769 |     0.231 |     0.035 |
##                             |     0.032 |     0.051 |           |
##                             |     0.027 |     0.008 |           |
## ----------------------------|-----------|-----------|-----------|
##         Laboratory Technician |       197 |        62 |       259 |
##                             |     1.886 |     9.813 |           |
##                             |     0.761 |     0.239 |     0.176 |
##                             |     0.160 |     0.262 |           |
##                             |     0.134 |     0.042 |           |
## ----------------------------|-----------|-----------|-----------|
##                     Manager |        97 |         5 |       102 |
##                             |     1.531 |     7.965 |           |
##                             |     0.951 |     0.049 |     0.069 |
##                             |     0.079 |     0.021 |           |
##                             |     0.066 |     0.003 |           |
## ----------------------------|-----------|-----------|-----------|
##        Manufacturing Director |       135 |        10 |       145 |
##                             |     1.471 |     7.655 |           |
##                             |     0.931 |     0.069 |     0.099 |
##                             |     0.109 |     0.042 |           |
##                             |     0.092 |     0.007 |           |
## ----------------------------|-----------|-----------|-----------|
##            Research Director |        78 |         2 |        80 |
##                             |     1.770 |     9.208 |           |
##                             |     0.975 |     0.025 |     0.054 |
##                             |     0.063 |     0.008 |           |
##                             |     0.053 |     0.001 |           |
## ----------------------------|-----------|-----------|-----------|
##            Research Scientist |       245 |        47 |       292 |
##                             |     0.000 |     0.000 |           |
##                             |     0.839 |     0.161 |     0.199 |
##                             |     0.199 |     0.198 |           |
##                             |     0.167 |     0.032 |           |
## ----------------------------|-----------|-----------|-----------|
##               Sales Executive |       269 |        57 |       326 |
```

```
##                              |     0.072 |     0.375 |           |
##                              |     0.825 |     0.175 |     0.222 |
##                              |     0.218 |     0.241 |           |
##                              |     0.183 |     0.039 |           |
## ----------------------------|-----------|-----------|-----------|
##        Sales Representative |        50 |        33 |        83 |
##                              |     5.528 |    28.762 |           |
##                              |     0.602 |     0.398 |     0.056 |
##                              |     0.041 |     0.139 |           |
##                              |     0.034 |     0.022 |           |
## ----------------------------|-----------|-----------|-----------|
##               Column Total |      1233 |       237 |      1470 |
##                              |     0.839 |     0.161 |           |
## ----------------------------|-----------|-----------|-----------|
##
##
```

13. Relationship of Job Satisfaction with Attrition

```
CrossTable(Turnover_issues_fac$JobSatisfaction,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                 | Turnover_issues_fac$Attrition
## Turnover_issues_fac$JobSatisfaction |         0 |         1 | Row Total |
## --------------------------------|-----------|-----------|-----------|
##                               1 |       223 |        66 |       289 |
##                                 |     1.554 |     8.083 |           |
##                                 |     0.772 |     0.228 |     0.197 |
##                                 |     0.181 |     0.278 |           |
##                                 |     0.152 |     0.045 |           |
## --------------------------------|-----------|-----------|-----------|
##                               2 |       234 |        46 |       280 |
##                                 |     0.003 |     0.016 |           |
##                                 |     0.836 |     0.164 |     0.190 |
##                                 |     0.190 |     0.194 |           |
##                                 |     0.159 |     0.031 |           |
## --------------------------------|-----------|-----------|-----------|
```

```
##                                      3 |        369 |         73 |        442 |
##                                        |      0.008 |      0.042 |            |
##                                        |      0.835 |      0.165 |      0.301 |
##                                        |      0.299 |      0.308 |            |
##                                        |      0.251 |      0.050 |            |
## -------------------------------------|-----------|-----------|-----------|
##                                      4 |        407 |         52 |        459 |
##                                        |      1.257 |      6.542 |            |
##                                        |      0.887 |      0.113 |      0.312 |
##                                        |      0.330 |      0.219 |            |
##                                        |      0.277 |      0.035 |            |
## -------------------------------------|-----------|-----------|-----------|
##                           Column Total |       1233 |        237 |       1470 |
##                                        |      0.839 |      0.161 |            |
## -------------------------------------|-----------|-----------|-----------|
##
##
```

14. Relationship of Marital status with Attrition

`CrossTable(Turnover_issues_fac$MaritalStatus,Turnover_issues_fac$Attrition)`

```
##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                | Turnover_issues_fac$Attrition
## Turnover_issues_fac$MaritalStatus |          0 |          1 | Row Total |
## -------------------------------|-----------|-----------|-----------|
##                       Divorced |        294 |         33 |        327 |
##                                |      1.418 |      7.377 |            |
##                                |      0.899 |      0.101 |      0.222 |
##                                |      0.238 |      0.139 |            |
##                                |      0.200 |      0.022 |            |
## -------------------------------|-----------|-----------|-----------|
##                        Married |        589 |         84 |        673 |
##                                |      1.064 |      5.534 |            |
##                                |      0.875 |      0.125 |      0.458 |
##                                |      0.478 |      0.354 |            |
##                                |      0.401 |      0.057 |            |
```

```
## ------------------------------------|-----------|-----------|-----------|
##                            Single |       350 |       120 |       470 |
##                                   |     4.961 |    25.811 |           |
##                                   |     0.745 |     0.255 |     0.320 |
##                                   |     0.284 |     0.506 |           |
##                                   |     0.238 |     0.082 |           |
## ------------------------------------|-----------|-----------|-----------|
##                      Column Total |      1233 |       237 |      1470 |
##                                   |     0.839 |     0.161 |           |
## ------------------------------------|-----------|-----------|-----------|
##
##
```

15. Relationship of number of companies worked with Attrition

CrossTable(Turnover_issues_fac$NumCompaniesWorked,Turnover_issues_fac$Attrition)

```
##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:   1470
##
##
##                                     | Turnover_issues_fac$Attrition
## Turnover_issues_fac$NumCompaniesWorked |         0 |         1 | Row Total
|
## ----------------------------------------|-----------|-----------|----------
-|
##                                   0 |       174 |        23 |       197
|
##                                     |     0.465 |     2.417 |
|
##                                     |     0.883 |     0.117 |     0.134
|
##                                     |     0.141 |     0.097 |
|
##                                     |     0.118 |     0.016 |
|
## ----------------------------------------|-----------|-----------|----------
-|
##                                   1 |       423 |        98 |       521
```

```
##                                                   |   0.449 |   2.334 |
##                                                   |   0.812 |   0.188 |    0.354
##                                                   |   0.343 |   0.414 |
##                                                   |   0.288 |   0.067 |
## ------------------------------------------------|----------|----------|----------
-|
##                                             2 |      130 |       16 |       146
##                                                   |   0.464 |   2.414 |
##                                                   |   0.890 |   0.110 |    0.099
##                                                   |   0.105 |   0.068 |
##                                                   |   0.088 |   0.011 |
## ------------------------------------------------|----------|----------|----------
-|
##                                             3 |      143 |       16 |       159
##                                                   |   0.696 |   3.621 |
##                                                   |   0.899 |   0.101 |    0.108
##                                                   |   0.116 |   0.068 |
##                                                   |   0.097 |   0.011 |
## ------------------------------------------------|----------|----------|----------
-|
##                                             4 |      122 |       17 |       139
##                                                   |   0.251 |   1.306 |
##                                                   |   0.878 |   0.122 |    0.095
##                                                   |   0.099 |   0.072 |
##                                                   |   0.083 |   0.012 |
## ------------------------------------------------|----------|----------|----------
-|
##                                             5 |       47 |       16 |        63
##                                                   |   0.646 |   3.361 |
```

```
## |                                         |        0.746 |        0.254 |        0.043 |
## |                                         |        0.038 |        0.068 |              |
## |                                         |        0.032 |        0.011 |              |
## -----------------------------------------|-----------|-----------|-----------
-|
## |                                      6 |          54 |          16 |          70 |
## |                                         |        0.379 |        1.969 |              |
## |                                         |        0.771 |        0.229 |        0.048 |
## |                                         |        0.044 |        0.068 |              |
## |                                         |        0.037 |        0.011 |              |
## -----------------------------------------|-----------|-----------|-----------
-|
## |                                      7 |          57 |          17 |          74 |
## |                                         |        0.414 |        2.154 |              |
## |                                         |        0.770 |        0.230 |        0.050 |
## |                                         |        0.046 |        0.072 |              |
## |                                         |        0.039 |        0.012 |              |
## -----------------------------------------|-----------|-----------|-----------
-|
## |                                      8 |          43 |           6 |          49 |
## |                                         |        0.088 |        0.457 |              |
## |                                         |        0.878 |        0.122 |        0.033 |
## |                                         |        0.035 |        0.025 |              |
## |                                         |        0.029 |        0.004 |              |
## -----------------------------------------|-----------|-----------|-----------
-|
## |                                      9 |          40 |          12 |          52 |
## |                                         |        0.300 |        1.560 |              |
## |                                         |        0.769 |        0.231 |        0.035 |
```

```
         |
##                                       |      0.032 |      0.051 |
         |
##                                       |      0.027 |      0.008 |
         |
## -----------------------------------|-----------|-----------|----------
-|
##                       Column Total |       1233 |        237 |       1470
         |
##                                       |      0.839 |      0.161 |
         |
## -----------------------------------|-----------|-----------|----------
-|
##
##
```

16. Relationship of overtime with Attrition

```
CrossTable(Turnover_issues_fac$OverTime,Turnover_issues_fac$Attrition)

##
##
##      Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |             N / Row Total |
## |             N / Col Total |
## |           N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:   1470
##
##
##                                 | Turnover_issues_fac$Attrition
## Turnover_issues_fac$OverTime |          0 |          1 | Row Total |
## ----------------------------|-----------|-----------|-----------|
##                            0 |        944 |        110 |       1054 |
##                              |      4.063 |     21.136 |           |
##                              |      0.896 |      0.104 |      0.717 |
##                              |      0.766 |      0.464 |           |
##                              |      0.642 |      0.075 |           |
## ----------------------------|-----------|-----------|-----------|
##                            1 |        289 |        127 |        416 |
##                              |     10.293 |     53.552 |           |
##                              |      0.695 |      0.305 |      0.283 |
##                              |      0.234 |      0.536 |           |
##                              |      0.197 |      0.086 |           |
## ----------------------------|-----------|-----------|-----------|
##                 Column Total |       1233 |        237 |       1470 |
```

```
##                                       |     0.839 |     0.161 |           |
## ----------------------------|-----------|-----------|-----------|
##
##
```

17. Relationship of Percent Salary Hike with Attrition

```
CrossTable(Cat_Percent_Salary_Hike,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                          | Turnover_issues_fac$Attrition
## Cat_Percent_Salary_Hike |         0 |         1 | Row Total |
## ------------------------|-----------|-----------|-----------|
##                   10-15 |       769 |       150 |       919 |
##                         |     0.004 |     0.023 |           |
##                         |     0.837 |     0.163 |     0.625 |
##                         |     0.624 |     0.633 |           |
##                         |     0.523 |     0.102 |           |
## ------------------------|-----------|-----------|-----------|
##                   16-20 |       323 |        57 |       380 |
##                         |     0.057 |     0.297 |           |
##                         |     0.850 |     0.150 |     0.259 |
##                         |     0.262 |     0.241 |           |
##                         |     0.220 |     0.039 |           |
## ------------------------|-----------|-----------|-----------|
##                   21-25 |       141 |        30 |       171 |
##                         |     0.041 |     0.214 |           |
##                         |     0.825 |     0.175 |     0.116 |
##                         |     0.114 |     0.127 |           |
##                         |     0.096 |     0.020 |           |
## ------------------------|-----------|-----------|-----------|
##            Column Total |      1233 |       237 |      1470 |
##                         |     0.839 |     0.161 |           |
## ------------------------|-----------|-----------|-----------|
##
##
```

18. Relationship of Performance rating with Attrition

```
CrossTable(Turnover_issues_fac$PerformanceRating,Turnover_issues_fac$Attritio
n)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                  | Turnover_issues_fac$Attrition
## Turnover_issues_fac$PerformanceRating |          0 |          1 | Row Total
|
## --------------------------------------|-----------|-----------|-----------
|
##                                     3 |     1044 |       200 |       1244
|
##                                       |    0.000 |     0.002 |
|
##                                       |    0.839 |     0.161 |      0.846
|
##                                       |    0.847 |     0.844 |
|
##                                       |    0.710 |     0.136 |
|
## --------------------------------------|-----------|-----------|-----------
|
##                                     4 |      189 |        37 |        226
|
##                                       |    0.002 |     0.009 |
|
##                                       |    0.836 |     0.164 |      0.154
|
##                                       |    0.153 |     0.156 |
|
##                                       |    0.129 |     0.025 |
|
## --------------------------------------|-----------|-----------|-----------
|
##                          Column Total |     1233 |       237 |       1470
|
```

```
##                                           |   0.839 |    0.161 |
|
## --------------------------------------|----------|----------|-----------
|
##
##
```

19.   Affect of Relationship Satisfactoin with Attrition

```
CrossTable(Turnover_issues_fac$RelationshipSatisfaction,Turnover_issues_fac$A
ttrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                         | Turnover_issues_fac$Attriti
on
## Turnover_issues_fac$RelationshipSatisfaction |        0 |        1 | Row
Total |
## --------------------------------------------|----------|----------|----
-------|
##                                         1 |      219 |       57 |
276 |
##                                           |    0.675 |    3.513 |
|
##                                           |    0.793 |    0.207 |
0.188 |
##                                           |    0.178 |    0.241 |
|
##                                           |    0.149 |    0.039 |
|
## --------------------------------------------|----------|----------|----
-------|
##                                         2 |      258 |       45 |
303 |
##                                           |    0.058 |    0.304 |
|
##                                           |    0.851 |    0.149 |
0.206 |
```

```
##                                      |    0.209 |    0.190 |
|
##                                      |    0.176 |    0.031 |
|
## -------------------------------------|----------|----------|----
-------|
##                                    3 |      388 |       71 |
459 |
##                                      |    0.023 |    0.122 |
|
##                                      |    0.845 |    0.155 |
0.312 |
##                                      |    0.315 |    0.300 |
|
##                                      |    0.264 |    0.048 |
|
## -------------------------------------|----------|----------|----
-------|
##                                    4 |      368 |       64 |
432 |
##                                      |    0.088 |    0.458 |
|
##                                      |    0.852 |    0.148 |
0.294 |
##                                      |    0.298 |    0.270 |
|
##                                      |    0.250 |    0.044 |
|
## -------------------------------------|----------|----------|----
-------|
##                         Column Total |     1233 |      237 |
1470 |
##                                      |    0.839 |    0.161 |
|
## -------------------------------------|----------|----------|----
-------|
##
##
```

20. Relationship of Stock Option Level with Attrition

```
CrossTable(Turnover_issues_fac$StockOptionLevel,Turnover_issues_fac$Attrition
)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
```

```
## |              N / Col Total |
## |            N / Table Total |
## |---------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                    | Turnover_issues_fac$Attrition
## Turnover_issues_fac$StockOptionLevel |        0 |        1 | Row Total |
## -----------------------------------|----------|----------|-----------|
##                                   0 |      477 |      154 |       631 |
##                                     |    5.162 |   26.853 |           |
##                                     |    0.756 |    0.244 |     0.429 |
##                                     |    0.387 |    0.650 |           |
##                                     |    0.324 |    0.105 |           |
## -----------------------------------|----------|----------|-----------|
##                                   1 |      540 |       56 |       596 |
##                                     |    3.215 |   16.726 |           |
##                                     |    0.906 |    0.094 |     0.405 |
##                                     |    0.438 |    0.236 |           |
##                                     |    0.367 |    0.038 |           |
## -----------------------------------|----------|----------|-----------|
##                                   2 |      146 |       12 |       158 |
##                                     |    1.370 |    7.126 |           |
##                                     |    0.924 |    0.076 |     0.107 |
##                                     |    0.118 |    0.051 |           |
##                                     |    0.099 |    0.008 |           |
## -----------------------------------|----------|----------|-----------|
##                                   3 |       70 |       15 |        85 |
##                                     |    0.024 |    0.123 |           |
##                                     |    0.824 |    0.176 |     0.058 |
##                                     |    0.057 |    0.063 |           |
##                                     |    0.048 |    0.010 |           |
## -----------------------------------|----------|----------|-----------|
##                        Column Total |     1233 |      237 |      1470 |
##                                     |    0.839 |    0.161 |           |
## -----------------------------------|----------|----------|-----------|
##
##
```

21. Relationship of Total Working Years with Attrition

```
CrossTable(Turnover_issues_fac$TotalWorkingYears,Turnover_issues_fac$Attritio
n)
```

```
##
##
##    Cell Contents
## |-------------------------|
## |                       N |
```

```
## | Chi-square contribution |
## |             N / Row Total |
## |             N / Col Total |
## |           N / Table Total |
## |------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                       | Turnover_issues_fac$Attrition
## Turnover_issues_fac$TotalWorkingYears |          0 |          1 | Row Total
|
## -------------------------------------|-----------|-----------|-----------
|
##                                    0 |         6 |         5 |        11
|
##                                      |     1.128 |     5.870 |
|
##                                      |     0.545 |     0.455 |     0.007
|
##                                      |     0.005 |     0.021 |
|
##                                      |     0.004 |     0.003 |
|
## -------------------------------------|-----------|-----------|-----------
|
##                                    1 |        41 |        40 |        81
|
##                                      |    10.683 |    55.578 |
|
##                                      |     0.506 |     0.494 |     0.055
|
##                                      |     0.033 |     0.169 |
|
##                                      |     0.028 |     0.027 |
|
## -------------------------------------|-----------|-----------|-----------
|
##                                    2 |        22 |         9 |        31
|
##                                      |     0.616 |     3.205 |
|
##                                      |     0.710 |     0.290 |     0.021
|
##                                      |     0.018 |     0.038 |
|
##                                      |     0.015 |     0.006 |
|
## -------------------------------------|-----------|-----------|-----------
```

```
## |
## |                                    3 |         33 |          9 |         42
## |
## |                                      |      0.141 |      0.733 |
## |
## |                                      |      0.786 |      0.214 |      0.029
## |
## |                                      |      0.027 |      0.038 |
## |
## |                                      |      0.022 |      0.006 |
## |
## ------------------------------------|-----------|-----------|-----------
## |
## |                                    4 |         51 |         12 |         63
## |
## |                                      |      0.064 |      0.334 |
## |
## |                                      |      0.810 |      0.190 |      0.043
## |
## |                                      |      0.041 |      0.051 |
## |
## |                                      |      0.035 |      0.008 |
## |
## ------------------------------------|-----------|-----------|-----------
## |
## |                                    5 |         72 |         16 |         88
## |
## |                                      |      0.044 |      0.231 |
## |
## |                                      |      0.818 |      0.182 |      0.060
## |
## |                                      |      0.058 |      0.068 |
## |
## |                                      |      0.049 |      0.011 |
## |
## ------------------------------------|-----------|-----------|-----------
## |
## |                                    6 |        103 |         22 |        125
## |
## |                                      |      0.033 |      0.169 |
## |
## |                                      |      0.824 |      0.176 |      0.085
## |
## |                                      |      0.084 |      0.093 |
## |
## |                                      |      0.070 |      0.015 |
## |
## ------------------------------------|-----------|-----------|-----------
## |
## |                                    7 |         63 |         18 |         81
```

```
##                                        |   0.359 |   1.869 |
##                                        |   0.778 |   0.222 |     0.055
##                                        |   0.051 |   0.076 |
##                                        |   0.043 |   0.012 |
## -------------------------------------|---------|---------|----------
##                                  8 |      87 |      16 |       103
##                                        |   0.004 |   0.022 |
##                                        |   0.845 |   0.155 |     0.070
##                                        |   0.071 |   0.068 |
##                                        |   0.059 |   0.011 |
## -------------------------------------|---------|---------|----------
##                                  9 |      86 |      10 |        96
##                                        |   0.373 |   1.939 |
##                                        |   0.896 |   0.104 |     0.065
##                                        |   0.070 |   0.042 |
##                                        |   0.059 |   0.007 |
## -------------------------------------|---------|---------|----------
##                                 10 |     177 |      25 |       202
##                                        |   0.338 |   1.758 |
##                                        |   0.876 |   0.124 |     0.137
##                                        |   0.144 |   0.105 |
##                                        |   0.120 |   0.017 |
## -------------------------------------|---------|---------|----------
##                                 11 |      29 |       7 |        36
##                                        |   0.047 |   0.246 |
```

```
## |                                            |     0.806 |     0.194 |     0.024
## |                                            |     0.024 |     0.030 |
## |                                            |     0.020 |     0.005 |
## -------------------------------------------|-----------|-----------|-----------
## |                                       12 |        43 |         5 |        48
## |                                            |     0.186 |     0.969 |
## |                                            |     0.896 |     0.104 |     0.033
## |                                            |     0.035 |     0.021 |
## |                                            |     0.029 |     0.003 |
## -------------------------------------------|-----------|-----------|-----------
## |                                       13 |        33 |         3 |        36
## |                                            |     0.260 |     1.355 |
## |                                            |     0.917 |     0.083 |     0.024
## |                                            |     0.027 |     0.013 |
## |                                            |     0.022 |     0.002 |
## -------------------------------------------|-----------|-----------|-----------
## |                                       14 |        27 |         4 |        31
## |                                            |     0.038 |     0.199 |
## |                                            |     0.871 |     0.129 |     0.021
## |                                            |     0.022 |     0.017 |
## |                                            |     0.018 |     0.003 |
## -------------------------------------------|-----------|-----------|-----------
## |                                       15 |        35 |         5 |        40
## |                                            |     0.063 |     0.326 |
## |                                            |     0.875 |     0.125 |     0.027
```

```
## |                                    |           |  0.028 |   0.021 |
## |                                    |           |  0.024 |   0.003 |
## ------------------------------------|-----------|-----------|-----------
## |                                 16 |        34 |         3 |        37
## |                                    |           |  0.283 |   1.474 |
## |                                    |           |  0.919 |   0.081 |     0.025
## |                                    |           |  0.028 |   0.013 |
## |                                    |           |  0.023 |   0.002 |
## ------------------------------------|-----------|-----------|-----------
## |                                 17 |        30 |         3 |        33
## |                                    |           |  0.195 |   1.012 |
## |                                    |           |  0.909 |   0.091 |     0.022
## |                                    |           |  0.024 |   0.013 |
## |                                    |           |  0.020 |   0.002 |
## ------------------------------------|-----------|-----------|-----------
## |                                 18 |        23 |         4 |        27
## |                                    |           |  0.006 |   0.029 |
## |                                    |           |  0.852 |   0.148 |     0.018
## |                                    |           |  0.019 |   0.017 |
## |                                    |           |  0.016 |   0.003 |
## ------------------------------------|-----------|-----------|-----------
## |                                 19 |        19 |         3 |        22
## |                                    |           |  0.016 |   0.084 |
## |                                    |           |  0.864 |   0.136 |     0.015
## |                                    |           |  0.015 |   0.013 |
```

```
## |                                      |           |  0.013  |   0.002  |
## -------------------------------------|-----------|-----------|-----------
## |                                 20 |       28  |      2  |      30
## |                                      |           |  0.320  |   1.664  |
## |                                      |           |  0.933  |   0.067  |      0.020
## |                                      |           |  0.023  |   0.008  |
## |                                      |           |  0.019  |   0.001  |
## -------------------------------------|-----------|-----------|-----------
## |                                 21 |       33  |      1  |      34
## |                                      |           |  0.704  |   3.664  |
## |                                      |           |  0.971  |   0.029  |      0.023
## |                                      |           |  0.027  |   0.004  |
## |                                      |           |  0.022  |   0.001  |
## -------------------------------------|-----------|-----------|-----------
## |                                 22 |       19  |      2  |      21
## |                                      |           |  0.109  |   0.567  |
## |                                      |           |  0.905  |   0.095  |      0.014
## |                                      |           |  0.015  |   0.008  |
## |                                      |           |  0.013  |   0.001  |
## -------------------------------------|-----------|-----------|-----------
## |                                 23 |       20  |      2  |      22
## |                                      |           |  0.130  |   0.675  |
## |                                      |           |  0.909  |   0.091  |      0.015
## |                                      |           |  0.016  |   0.008  |
## |                                      |           |  0.014  |   0.001  |
```

```
## -------------------------------------|-----------|-----------|----------
## |
## |                                24 |        15 |         3 |        18
## |                                   |     0.001 |     0.003 |
## |                                   |     0.833 |     0.167 |     0.012
## |                                   |     0.012 |     0.013 |
## |                                   |     0.010 |     0.002 |
## -------------------------------------|-----------|-----------|----------
## |
## |                                25 |        13 |         1 |        14
## |                                   |     0.135 |     0.700 |
## |                                   |     0.929 |     0.071 |     0.010
## |                                   |     0.011 |     0.004 |
## |                                   |     0.009 |     0.001 |
## -------------------------------------|-----------|-----------|----------
## |
## |                                26 |        13 |         1 |        14
## |                                   |     0.135 |     0.700 |
## |                                   |     0.929 |     0.071 |     0.010
## |                                   |     0.011 |     0.004 |
## |                                   |     0.009 |     0.001 |
## -------------------------------------|-----------|-----------|----------
## |
## |                                27 |         7 |         0 |         7
## |                                   |     0.217 |     1.129 |
## |                                   |     1.000 |     0.000 |     0.005
## |                                   |     0.006 |     0.000 |
## |                                   |     0.005 |     0.000 |
## -------------------------------------|-----------|-----------|----------
```

```
## |
## |                                           28 |          13 |          1 |          14
## |
## |                                              |       0.135 |      0.700 |
## |
## |                                              |       0.929 |      0.071 |       0.010
## |
## |                                              |       0.011 |      0.004 |
## |
## |                                              |       0.009 |      0.001 |
## |
## -----------------------------------------------|------------|------------|-----------
## |
## |                                           29 |          10 |          0 |          10
## |
## |                                              |       0.310 |      1.612 |
## |
## |                                              |       1.000 |      0.000 |       0.007
## |
## |                                              |       0.008 |      0.000 |
## |
## |                                              |       0.007 |      0.000 |
## |
## -----------------------------------------------|------------|------------|-----------
## |
## |                                           30 |           7 |          0 |           7
## |
## |                                              |       0.217 |      1.129 |
## |
## |                                              |       1.000 |      0.000 |       0.005
## |
## |                                              |       0.006 |      0.000 |
## |
## |                                              |       0.005 |      0.000 |
## |
## -----------------------------------------------|------------|------------|-----------
## |
## |                                           31 |           8 |          1 |           9
## |
## |                                              |       0.027 |      0.140 |
## |
## |                                              |       0.889 |      0.111 |       0.006
## |
## |                                              |       0.006 |      0.004 |
## |
## |                                              |       0.005 |      0.001 |
## |
## -----------------------------------------------|------------|------------|-----------
## |
## |                                           32 |           9 |          0 |           9
```

```
##                                     |          0.279 |          1.451 |
##                                     |          1.000 |          0.000 |          0.006
##                                     |          0.007 |          0.000 |
##                                     |          0.006 |          0.000 |
## -----------------------------------|-----------|-----------|-----------
##                                  33 |             6 |             1 |             7
##                                     |          0.003 |          0.015 |
##                                     |          0.857 |          0.143 |          0.005
##                                     |          0.005 |          0.004 |
##                                     |          0.004 |          0.001 |
## -----------------------------------|-----------|-----------|-----------
##                                  34 |             4 |             1 |             5
##                                     |          0.009 |          0.047 |
##                                     |          0.800 |          0.200 |          0.003
##                                     |          0.003 |          0.004 |
##                                     |          0.003 |          0.001 |
## -----------------------------------|-----------|-----------|-----------
##                                  35 |             3 |             0 |             3
##                                     |          0.093 |          0.484 |
##                                     |          1.000 |          0.000 |          0.002
##                                     |          0.002 |          0.000 |
##                                     |          0.002 |          0.000 |
## -----------------------------------|-----------|-----------|-----------
##                                  36 |             6 |             0 |             6
##                                     |          0.186 |          0.967 |
```

```
##                                    |    1.000 |    0.000 |     0.004
##                                    |    0.005 |    0.000 |
##                                    |    0.004 |    0.000 |
## ----------------------------------|----------|----------|----------
##                              37 |        4 |        0 |        4
##                                    |    0.124 |    0.645 |
##                                    |    1.000 |    0.000 |     0.003
##                                    |    0.003 |    0.000 |
##                                    |    0.003 |    0.000 |
## ----------------------------------|----------|----------|----------
##                              38 |        1 |        0 |        1
##                                    |    0.031 |    0.161 |
##                                    |    1.000 |    0.000 |     0.001
##                                    |    0.001 |    0.000 |
##                                    |    0.001 |    0.000 |
## ----------------------------------|----------|----------|----------
##                              40 |        0 |        2 |        2
##                                    |    1.678 |    8.728 |
##                                    |    0.000 |    1.000 |     0.001
##                                    |    0.000 |    0.008 |
##                                    |    0.000 |    0.001 |
## ----------------------------------|----------|----------|----------
##                    Column Total |     1233 |      237 |     1470
##                                    |    0.839 |    0.161 |
## ----------------------------------|----------|----------|----------
```

```
|
##
##
```

22. Relationship of Training Times Last Year with Attrition

```
CrossTable(Turnover_issues_fac$TrainingTimesLastYear,Turnover_issues_fac$Attr
ition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                       | Turnover_issues_fac$Attrition
## Turnover_issues_fac$TrainingTimesLastYear |         0 |         1 | Row To
tal |
## -------------------------------------------|-----------|-----------|-------
----|
##                                       0 |        39 |        15 |
54 |
##                                         |     0.875 |     4.550 |
|
##                                         |     0.722 |     0.278 |      0.
037 |
##                                         |     0.032 |     0.063 |
|
##                                         |     0.027 |     0.010 |
|
## -------------------------------------------|-----------|-----------|-------
----|
##                                       1 |        62 |         9 |
71 |
##                                         |     0.101 |     0.523 |
|
##                                         |     0.873 |     0.127 |      0.
048 |
##                                         |     0.050 |     0.038 |
|
##                                         |     0.042 |     0.006 |
|
```

```
## -------------------------------------------|----------|----------|-------
----|
##                                          2 |      449 |       98 |
547 |
##                                            |    0.210 |    1.091 |
|
##                                            |    0.821 |    0.179 |      0.
372 |
##                                            |    0.364 |    0.414 |
|
##                                            |    0.305 |    0.067 |
|
## -------------------------------------------|----------|----------|-------
----|
##                                          3 |      422 |       69 |
491 |
##                                            |    0.251 |    1.304 |
|
##                                            |    0.859 |    0.141 |      0.
334 |
##                                            |    0.342 |    0.291 |
|
##                                            |    0.287 |    0.047 |
|
## -------------------------------------------|----------|----------|-------
----|
##                                          4 |       97 |       26 |
123 |
##                                            |    0.369 |    1.919 |
|
##                                            |    0.789 |    0.211 |      0.
084 |
##                                            |    0.079 |    0.110 |
|
##                                            |    0.066 |    0.018 |
|
## -------------------------------------------|----------|----------|-------
----|
##                                          5 |      105 |       14 |
119 |
##                                            |    0.269 |    1.402 |
|
##                                            |    0.882 |    0.118 |      0.
081 |
##                                            |    0.085 |    0.059 |
|
##                                            |    0.071 |    0.010 |
|
## -------------------------------------------|----------|----------|-------
----|
```

```
##                                           6 |          59 |           6 |
65 |
##                                             |       0.368 |       1.915 |
|
##                                             |       0.908 |       0.092 |      0.
044 |
##                                             |       0.048 |       0.025 |
|
##                                             |       0.040 |       0.004 |
|
## --------------------------------------------|-----------|-----------|-------
----|
##                               Column Total |        1233 |         237 |         1
470 |
##                                             |       0.839 |       0.161 |
|
## --------------------------------------------|-----------|-----------|-------
----|
##
##
```

23. Relationship of Work Life Balance with Attrition

```
CrossTable(Turnover_issues_fac$WorkLifeBalance,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                 | Turnover_issues_fac$Attrition
## Turnover_issues_fac$WorkLifeBalance |          0 |           1 | Row Total |
## ----------------------------------|-----------|-----------|-----------|
##                                 1 |         55 |          25 |         80 |
##                                   |       2.183 |      11.355 |           |
##                                   |       0.688 |       0.312 |      0.054 |
##                                   |       0.045 |       0.105 |           |
##                                   |       0.037 |       0.017 |           |
## ----------------------------------|-----------|-----------|-----------|
##                                 2 |        286 |          58 |        344 |
##                                   |       0.022 |       0.116 |           |
```

```
##                                         |    0.831 |    0.169 |    0.234 |
##                                         |    0.232 |    0.245 |          |
##                                         |    0.195 |    0.039 |          |
## -------------------------------|----------|----------|----------|
##                              3 |      766 |      127 |      893 |
##                                 |    0.385 |    2.001 |          |
##                                 |    0.858 |    0.142 |    0.607 |
##                                 |    0.621 |    0.536 |          |
##                                 |    0.521 |    0.086 |          |
## -------------------------------|----------|----------|----------|
##                              4 |      126 |       27 |      153 |
##                                 |    0.042 |    0.221 |          |
##                                 |    0.824 |    0.176 |    0.104 |
##                                 |    0.102 |    0.114 |          |
##                                 |    0.086 |    0.018 |          |
## -------------------------------|----------|----------|----------|
##                   Column Total |     1233 |      237 |     1470 |
##                                 |    0.839 |    0.161 |          |
## -------------------------------|----------|----------|----------|
##
##
```

24. Relationship of number of Years At Company with attrition

```
CrossTable(Turnover_issues_fac$YearsAtCompany,Turnover_issues_fac$Attrition)

##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |   Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
##
##                                  | Turnover_issues_fac$Attrition
## Turnover_issues_fac$YearsAtCompany |        0 |        1 | Row Total |
## -------------------------------|----------|----------|----------|
##                              0 |       28 |       16 |       44 |
##                                 |    2.149 |   11.181 |          |
##                                 |    0.636 |    0.364 |    0.030 |
##                                 |    0.023 |    0.068 |          |
##                                 |    0.019 |    0.011 |          |
## -------------------------------|----------|----------|----------|
##                              1 |      112 |       59 |      171 |
```

```
##                                  |     6.888 |    35.833 |           |
##                                  |     0.655 |     0.345 |     0.116 |
##                                  |     0.091 |     0.249 |           |
##                                  |     0.076 |     0.040 |           |
##  --------------------------------|-----------|-----------|-----------|
##                               2  |       100 |        27 |       127 |
##                                  |     0.400 |     2.079 |           |
##                                  |     0.787 |     0.213 |     0.086 |
##                                  |     0.081 |     0.114 |           |
##                                  |     0.068 |     0.018 |           |
##  --------------------------------|-----------|-----------|-----------|
##                               3  |       108 |        20 |       128 |
##                                  |     0.004 |     0.020 |           |
##                                  |     0.844 |     0.156 |     0.087 |
##                                  |     0.088 |     0.084 |           |
##                                  |     0.073 |     0.014 |           |
##  --------------------------------|-----------|-----------|-----------|
##                               4  |        91 |        19 |       110 |
##                                  |     0.017 |     0.090 |           |
##                                  |     0.827 |     0.173 |     0.075 |
##                                  |     0.074 |     0.080 |           |
##                                  |     0.062 |     0.013 |           |
##  --------------------------------|-----------|-----------|-----------|
##                               5  |       175 |        21 |       196 |
##                                  |     0.683 |     3.556 |           |
##                                  |     0.893 |     0.107 |     0.133 |
##                                  |     0.142 |     0.089 |           |
##                                  |     0.119 |     0.014 |           |
##  --------------------------------|-----------|-----------|-----------|
##                               6  |        67 |         9 |        76 |
##                                  |     0.166 |     0.864 |           |
##                                  |     0.882 |     0.118 |     0.052 |
##                                  |     0.054 |     0.038 |           |
##                                  |     0.046 |     0.006 |           |
##  --------------------------------|-----------|-----------|-----------|
##                               7  |        79 |        11 |        90 |
##                                  |     0.163 |     0.849 |           |
##                                  |     0.878 |     0.122 |     0.061 |
##                                  |     0.064 |     0.046 |           |
##                                  |     0.054 |     0.007 |           |
##  --------------------------------|-----------|-----------|-----------|
##                               8  |        71 |         9 |        80 |
##                                  |     0.226 |     1.178 |           |
##                                  |     0.887 |     0.112 |     0.054 |
##                                  |     0.058 |     0.038 |           |
##                                  |     0.048 |     0.006 |           |
##  --------------------------------|-----------|-----------|-----------|
##                               9  |        74 |         8 |        82 |
##                                  |     0.396 |     2.061 |           |
##                                  |     0.902 |     0.098 |     0.056 |
```

```
##                                      |    0.060 |    0.034 |          |
##                                      |    0.050 |    0.005 |          |
## -------------------------------------|----------|----------|----------|
##                                   10 |      102 |       18 |      120 |
##                                      |    0.018 |    0.094 |          |
##                                      |    0.850 |    0.150 |    0.082 |
##                                      |    0.083 |    0.076 |          |
##                                      |    0.069 |    0.012 |          |
## -------------------------------------|----------|----------|----------|
##                                   11 |       30 |        2 |       32 |
##                                      |    0.372 |    1.935 |          |
##                                      |    0.938 |    0.062 |    0.022 |
##                                      |    0.024 |    0.008 |          |
##                                      |    0.020 |    0.001 |          |
## -------------------------------------|----------|----------|----------|
##                                   12 |       14 |        0 |       14 |
##                                      |    0.434 |    2.257 |          |
##                                      |    1.000 |    0.000 |    0.010 |
##                                      |    0.011 |    0.000 |          |
##                                      |    0.010 |    0.000 |          |
## -------------------------------------|----------|----------|----------|
##                                   13 |       22 |        2 |       24 |
##                                      |    0.174 |    0.903 |          |
##                                      |    0.917 |    0.083 |    0.016 |
##                                      |    0.018 |    0.008 |          |
##                                      |    0.015 |    0.001 |          |
## -------------------------------------|----------|----------|----------|
##                                   14 |       16 |        2 |       18 |
##                                      |    0.054 |    0.280 |          |
##                                      |    0.889 |    0.111 |    0.012 |
##                                      |    0.013 |    0.008 |          |
##                                      |    0.011 |    0.001 |          |
## -------------------------------------|----------|----------|----------|
##                                   15 |       19 |        1 |       20 |
##                                      |    0.295 |    1.535 |          |
##                                      |    0.950 |    0.050 |    0.014 |
##                                      |    0.015 |    0.004 |          |
##                                      |    0.013 |    0.001 |          |
## -------------------------------------|----------|----------|----------|
##                                   16 |       11 |        1 |       12 |
##                                      |    0.087 |    0.452 |          |
##                                      |    0.917 |    0.083 |    0.008 |
##                                      |    0.009 |    0.004 |          |
##                                      |    0.007 |    0.001 |          |
## -------------------------------------|----------|----------|----------|
##                                   17 |        8 |        1 |        9 |
##                                      |    0.027 |    0.140 |          |
##                                      |    0.889 |    0.111 |    0.006 |
##                                      |    0.006 |    0.004 |          |
##                                      |    0.005 |    0.001 |          |
```

```
## ----------------------------------------|-----------|-----------|-----------|
##                                       18 |        12 |         1 |        13 |
##                                          |     0.110 |     0.573 |           |
##                                          |     0.923 |     0.077 |     0.009 |
##                                          |     0.010 |     0.004 |           |
##                                          |     0.008 |     0.001 |           |
## ----------------------------------------|-----------|-----------|-----------|
##                                       19 |        10 |         1 |        11 |
##                                          |     0.065 |     0.337 |           |
##                                          |     0.909 |     0.091 |     0.007 |
##                                          |     0.008 |     0.004 |           |
##                                          |     0.007 |     0.001 |           |
## ----------------------------------------|-----------|-----------|-----------|
##                                       20 |        26 |         1 |        27 |
##                                          |     0.496 |     2.583 |           |
##                                          |     0.963 |     0.037 |     0.018 |
##                                          |     0.021 |     0.004 |           |
##                                          |     0.018 |     0.001 |           |
## ----------------------------------------|-----------|-----------|-----------|
##                                       21 |        13 |         1 |        14 |
##                                          |     0.135 |     0.700 |           |
##                                          |     0.929 |     0.071 |     0.010 |
##                                          |     0.011 |     0.004 |           |
##                                          |     0.009 |     0.001 |           |
## ----------------------------------------|-----------|-----------|-----------|
##                                       22 |        14 |         1 |        15 |
##                                          |     0.160 |     0.832 |           |
##                                          |     0.933 |     0.067 |     0.010 |
##                                          |     0.011 |     0.004 |           |
##                                          |     0.010 |     0.001 |           |
## ----------------------------------------|-----------|-----------|-----------|
##                                       23 |         1 |         1 |         2 |
##                                          |     0.274 |     1.424 |           |
##                                          |     0.500 |     0.500 |     0.001 |
##                                          |     0.001 |     0.004 |           |
##                                          |     0.001 |     0.001 |           |
## ----------------------------------------|-----------|-----------|-----------|
##                                       24 |         5 |         1 |         6 |
##                                          |     0.000 |     0.001 |           |
##                                          |     0.833 |     0.167 |     0.004 |
##                                          |     0.004 |     0.004 |           |
##                                          |     0.003 |     0.001 |           |
## ----------------------------------------|-----------|-----------|-----------|
##                                       25 |         4 |         0 |         4 |
##                                          |     0.124 |     0.645 |           |
##                                          |     1.000 |     0.000 |     0.003 |
##                                          |     0.003 |     0.000 |           |
##                                          |     0.003 |     0.000 |           |
## ----------------------------------------|-----------|-----------|-----------|
##                                       26 |         4 |         0 |         4 |
```

```
##                                         |   0.124 |   0.645 |         |
##                                         |   1.000 |   0.000 |   0.003 |
##                                         |   0.003 |   0.000 |         |
##                                         |   0.003 |   0.000 |         |
##          -------------------------------|---------|---------|---------|
##                                    27 | |       2 |       0 |       2 |
##                                         |   0.062 |   0.322 |         |
##                                         |   1.000 |   0.000 |   0.001 |
##                                         |   0.002 |   0.000 |         |
##                                         |   0.001 |   0.000 |         |
##          -------------------------------|---------|---------|---------|
##                                    29 | |       2 |       0 |       2 |
##                                         |   0.062 |   0.322 |         |
##                                         |   1.000 |   0.000 |   0.001 |
##                                         |   0.002 |   0.000 |         |
##                                         |   0.001 |   0.000 |         |
##          -------------------------------|---------|---------|---------|
##                                    30 | |       1 |       0 |       1 |
##                                         |   0.031 |   0.161 |         |
##                                         |   1.000 |   0.000 |   0.001 |
##                                         |   0.001 |   0.000 |         |
##                                         |   0.001 |   0.000 |         |
##          -------------------------------|---------|---------|---------|
##                                    31 | |       2 |       1 |       3 |
##                                         |   0.106 |   0.551 |         |
##                                         |   0.667 |   0.333 |   0.002 |
##                                         |   0.002 |   0.004 |         |
##                                         |   0.001 |   0.001 |         |
##          -------------------------------|---------|---------|---------|
##                                    32 | |       2 |       1 |       3 |
##                                         |   0.106 |   0.551 |         |
##                                         |   0.667 |   0.333 |   0.002 |
##                                         |   0.002 |   0.004 |         |
##                                         |   0.001 |   0.001 |         |
##          -------------------------------|---------|---------|---------|
##                                    33 | |       4 |       1 |       5 |
##                                         |   0.009 |   0.047 |         |
##                                         |   0.800 |   0.200 |   0.003 |
##                                         |   0.003 |   0.004 |         |
##                                         |   0.003 |   0.001 |         |
##          -------------------------------|---------|---------|---------|
##                                    34 | |       1 |       0 |       1 |
##                                         |   0.031 |   0.161 |         |
##                                         |   1.000 |   0.000 |   0.001 |
##                                         |   0.001 |   0.000 |         |
##                                         |   0.001 |   0.000 |         |
##          -------------------------------|---------|---------|---------|
##                                    36 | |       2 |       0 |       2 |
##                                         |   0.062 |   0.322 |         |
##                                         |   1.000 |   0.000 |   0.001 |
```

```
##                                    |    0.002 |    0.000 |          |
##                                    |    0.001 |    0.000 |          |
## ----------------------------------|----------|----------|----------|
##                               37 |        1 |        0 |        1 |
##                                    |    0.031 |    0.161 |          |
##                                    |    1.000 |    0.000 |    0.001 |
##                                    |    0.001 |    0.000 |          |
##                                    |    0.001 |    0.000 |          |
## ----------------------------------|----------|----------|----------|
##                               40 |        0 |        1 |        1 |
##                                    |    0.839 |    4.364 |          |
##                                    |    0.000 |    1.000 |    0.001 |
##                                    |    0.000 |    0.004 |          |
##                                    |    0.000 |    0.001 |          |
## ----------------------------------|----------|----------|----------|
##                     Column Total |     1233 |      237 |     1470 |
##                                    |    0.839 |    0.161 |          |
## ----------------------------------|----------|----------|----------|
##
##
```

25. Relationship of number of Years In Current Role with attrition

```
CrossTable(Turnover_issues_fac$YearsInCurrentRole,Turnover_issues_fac$Attriti
on)
```

```
##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## |  Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:   1470
##
##
##                                    | Turnover_issues_fac$Attrition
## Turnover_issues_fac$YearsInCurrentRole |        0 |        1 | Row Total
|
## -------------------------------------|----------|----------|----------
-|
##                                  0 |      171 |       73 |      244
|
##                                    |    5.536 |   28.803 |
|
##                                    |    0.701 |    0.299 |      0.166
```

```
##                                                   |          0.139 |          0.308 |
##                                                   |          0.116 |          0.050 |
## --------------------------------------------------|-----------|-----------|-----------|
##                                                1 |            46 |            11 |            57
##                                                   |          0.069 |          0.357 |
##                                                   |          0.807 |          0.193 |          0.039
##                                                   |          0.037 |          0.046 |
##                                                   |          0.031 |          0.007 |
## --------------------------------------------------|-----------|-----------|-----------|
##                                                2 |           304 |            68 |           372
##                                                   |          0.206 |          1.074 |
##                                                   |          0.817 |          0.183 |          0.253
##                                                   |          0.247 |          0.287 |
##                                                   |          0.207 |          0.046 |
## --------------------------------------------------|-----------|-----------|-----------|
##                                                3 |           119 |            16 |           135
##                                                   |          0.294 |          1.527 |
##                                                   |          0.881 |          0.119 |          0.092
##                                                   |          0.097 |          0.068 |
##                                                   |          0.081 |          0.011 |
## --------------------------------------------------|-----------|-----------|-----------|
##                                                4 |            89 |            15 |           104
##                                                   |          0.036 |          0.186 |
##                                                   |          0.856 |          0.144 |          0.071
##                                                   |          0.072 |          0.063 |
```

```
## |                                 |           |           |
## |                                 |    0.061  |    0.010  |
## |                                 |           |           |
## -------------------------------|-----------|-----------|----------
## -|
## |                             5 |       35  |        1  |       36
## |
## |                                 |    0.764  |    3.976  |
## |
## |                                 |    0.972  |    0.028  |    0.024
## |
## |                                 |    0.028  |    0.004  |
## |
## |                                 |    0.024  |    0.001  |
## |
## -------------------------------|-----------|-----------|----------
## -|
## |                             6 |       35  |        2  |       37
## |
## |                                 |    0.507  |    2.636  |
## |
## |                                 |    0.946  |    0.054  |    0.025
## |
## |                                 |    0.028  |    0.008  |
## |
## |                                 |    0.024  |    0.001  |
## |
## -------------------------------|-----------|-----------|----------
## -|
## |                             7 |      191  |       31  |      222
## |
## |                                 |    0.123  |    0.642  |
## |
## |                                 |    0.860  |    0.140  |    0.151
## |
## |                                 |    0.155  |    0.131  |
## |
## |                                 |    0.130  |    0.021  |
## |
## -------------------------------|-----------|-----------|----------
## -|
## |                             8 |       82  |        7  |       89
## |
## |                                 |    0.723  |    3.764  |
## |
## |                                 |    0.921  |    0.079  |    0.061
## |
## |                                 |    0.067  |    0.030  |
## |
## |                                 |    0.056  |    0.005  |
```

```
   |
## --------------------------------------|----------|----------|----------
 -|
##                                    9 |      61 |       6 |       67
 |
##                                      |   0.410 |   2.135 |
 |
##                                      |   0.910 |   0.090 |    0.046
 |
##                                      |   0.049 |   0.025 |
 |
##                                      |   0.041 |   0.004 |
 |
## --------------------------------------|----------|----------|----------
 -|
##                                   10 |      27 |       2 |       29
 |
##                                      |   0.294 |   1.531 |
 |
##                                      |   0.931 |   0.069 |    0.020
 |
##                                      |   0.022 |   0.008 |
 |
##                                      |   0.018 |   0.001 |
 |
## --------------------------------------|----------|----------|----------
 -|
##                                   11 |      22 |       0 |       22
 |
##                                      |   0.682 |   3.547 |
 |
##                                      |   1.000 |   0.000 |    0.015
 |
##                                      |   0.018 |   0.000 |
 |
##                                      |   0.015 |   0.000 |
 |
## --------------------------------------|----------|----------|----------
 -|
##                                   12 |       9 |       1 |       10
 |
##                                      |   0.045 |   0.232 |
 |
##                                      |   0.900 |   0.100 |    0.007
 |
##                                      |   0.007 |   0.004 |
 |
##                                      |   0.006 |   0.001 |
 |
## --------------------------------------|----------|----------|----------
```

```
-|
##                                     13 |        13 |         1 |          14
|
##                                        |     0.135 |     0.700 |
|
##                                        |     0.929 |     0.071 |       0.010
|
##                                        |     0.011 |     0.004 |
|
##                                        |     0.009 |     0.001 |
|
## --------------------------------------|-----------|-----------|----------
-|
##                                     14 |        10 |         1 |          11
|
##                                        |     0.065 |     0.337 |
|
##                                        |     0.909 |     0.091 |       0.007
|
##                                        |     0.008 |     0.004 |
|
##                                        |     0.007 |     0.001 |
|
## --------------------------------------|-----------|-----------|----------
-|
##                                     15 |         6 |         2 |           8
|
##                                        |     0.075 |     0.391 |
|
##                                        |     0.750 |     0.250 |       0.005
|
##                                        |     0.005 |     0.008 |
|
##                                        |     0.004 |     0.001 |
|
## --------------------------------------|-----------|-----------|----------
-|
##                                     16 |         7 |         0 |           7
|
##                                        |     0.217 |     1.129 |
|
##                                        |     1.000 |     0.000 |       0.005
|
##                                        |     0.006 |     0.000 |
|
##                                        |     0.005 |     0.000 |
|
## --------------------------------------|-----------|-----------|----------
-|
##                                     17 |         4 |         0 |           4
```

```
##                                             |   0.124 |   0.645 |
##                                             |   1.000 |   0.000 |     0.003
##                                             |   0.003 |   0.000 |
##                                             |   0.003 |   0.000 |
## --------------------------------------|-----------|-----------|----------
-|
##                                   18 |       2 |       0 |       2
##                                             |   0.062 |   0.322 |
##                                             |   1.000 |   0.000 |     0.001
##                                             |   0.002 |   0.000 |
##                                             |   0.001 |   0.000 |
## --------------------------------------|-----------|-----------|----------
-|
##                      Column Total |    1233 |     237 |    1470
##                                             |   0.839 |   0.161 |
## --------------------------------------|-----------|-----------|----------
-|
##
##
```

26. Relationship of Years Since Last Promotion with Attrition

```
CrossTable(Turnover_issues_fac$YearsSinceLastPromotion,Turnover_issues_fac$At
trition)
```

```
##
##
##    Cell Contents
## |-------------------------|
## |                       N |
## | Chi-square contribution |
## |           N / Row Total |
## |           N / Col Total |
## |         N / Table Total |
## |-------------------------|
##
##
## Total Observations in Table:  1470
##
```

```
##
##                                           | Turnover_issues_fac$Attritio
n
## Turnover_issues_fac$YearsSinceLastPromotion |        0 |        1 | Row
Total |
## ----------------------------------------------|----------|----------|-----
------|
##                                         0 |      471 |      110 |
581 |
##                                           |    0.547 |    2.846 |
|
##                                           |    0.811 |    0.189 |
0.395 |
##                                           |    0.382 |    0.464 |
|
##                                           |    0.320 |    0.075 |
|
## ----------------------------------------------|----------|----------|-----
------|
##                                         1 |      308 |       49 |
357 |
##                                           |    0.245 |    1.272 |
|
##                                           |    0.863 |    0.137 |
0.243 |
##                                           |    0.250 |    0.207 |
|
##                                           |    0.210 |    0.033 |
|
## ----------------------------------------------|----------|----------|-----
------|
##                                         2 |      132 |       27 |
159 |
##                                           |    0.014 |    0.073 |
|
##                                           |    0.830 |    0.170 |
0.108 |
##                                           |    0.107 |    0.114 |
|
##                                           |    0.090 |    0.018 |
|
## ----------------------------------------------|----------|----------|-----
------|
##                                         3 |       43 |        9 |
52 |
##                                           |    0.009 |    0.045 |
|
##                                           |    0.827 |    0.173 |
0.035 |
##                                           |    0.035 |    0.038 |
```

```
##                                                 |     0.029 |     0.006 |
|
## -------------------------------------------------|-----------|-----------|-----
------|
##                                              4 |        56 |         5 |
61 |
##                                                 |     0.457 |     2.377 |
|
##                                                 |     0.918 |     0.082 |
0.041 |
##                                                 |     0.045 |     0.021 |
|
##                                                 |     0.038 |     0.003 |
|
## -------------------------------------------------|-----------|-----------|-----
------|
##                                              5 |        43 |         2 |
45 |
##                                                 |     0.732 |     3.806 |
|
##                                                 |     0.956 |     0.044 |
0.031 |
##                                                 |     0.035 |     0.008 |
|
##                                                 |     0.029 |     0.001 |
|
## -------------------------------------------------|-----------|-----------|-----
------|
##                                              6 |        26 |         6 |
32 |
##                                                 |     0.026 |     0.137 |
|
##                                                 |     0.812 |     0.188 |
0.022 |
##                                                 |     0.021 |     0.025 |
|
##                                                 |     0.018 |     0.004 |
|
## -------------------------------------------------|-----------|-----------|-----
------|
##                                              7 |        60 |        16 |
76 |
##                                                 |     0.220 |     1.146 |
|
##                                                 |     0.789 |     0.211 |
0.052 |
##                                                 |     0.049 |     0.068 |
|
##                                                 |     0.041 |     0.011 |
```

```
   |
## ------------------------------------------------|-----------|-----------|-----
------|
##                                           8 |        18 |         0 |
18 |
##                                             |     0.558 |     2.902 |
   |
##                                             |     1.000 |     0.000 |
0.012 |
##                                             |     0.015 |     0.000 |
   |
##                                             |     0.012 |     0.000 |
   |
## ------------------------------------------------|-----------|-----------|-----
------|
##                                           9 |        13 |         4 |
17 |
##                                             |     0.111 |     0.578 |
   |
##                                             |     0.765 |     0.235 |
0.012 |
##                                             |     0.011 |     0.017 |
   |
##                                             |     0.009 |     0.003 |
   |
## ------------------------------------------------|-----------|-----------|-----
------|
##                                          10 |         5 |         1 |
6 |
##                                             |     0.000 |     0.001 |
   |
##                                             |     0.833 |     0.167 |
0.004 |
##                                             |     0.004 |     0.004 |
   |
##                                             |     0.003 |     0.001 |
   |
## ------------------------------------------------|-----------|-----------|-----
------|
##                                          11 |        22 |         2 |
24 |
##                                             |     0.174 |     0.903 |
   |
##                                             |     0.917 |     0.083 |
0.016 |
##                                             |     0.018 |     0.008 |
   |
##                                             |     0.015 |     0.001 |
   |
## ------------------------------------------------|-----------|-----------|-----
```

```
------|
##                                             12 |        10 |         0 |
10 |
##                                                |     0.310 |     1.612 |
|
##                                                |     1.000 |     0.000 |
0.007 |
##                                                |     0.008 |     0.000 |
|
##                                                |     0.007 |     0.000 |
|
## -----------------------------------------------|-----------|-----------|-----
------|
##                                             13 |         8 |         2 |
10 |
##                                                |     0.018 |     0.093 |
|
##                                                |     0.800 |     0.200 |
0.007 |
##                                                |     0.006 |     0.008 |
|
##                                                |     0.005 |     0.001 |
|
## -----------------------------------------------|-----------|-----------|-----
------|
##                                             14 |         8 |         1 |
9 |
##                                                |     0.027 |     0.140 |
|
##                                                |     0.889 |     0.111 |
0.006 |
##                                                |     0.006 |     0.004 |
|
##                                                |     0.005 |     0.001 |
|
## -----------------------------------------------|-----------|-----------|-----
------|
##                                             15 |        10 |         3 |
13 |
##                                                |     0.075 |     0.390 |
|
##                                                |     0.769 |     0.231 |
0.009 |
##                                                |     0.008 |     0.013 |
|
##                                                |     0.007 |     0.002 |
|
## -----------------------------------------------|-----------|-----------|-----
------|
##                                  Column Total |      1233 |       237 |
```

```
1470 |
##                                                    |      0.839 |      0.161 |
|
## ----------------------------------------------|-----------|-----------|-----
------|
##
##
```

Logistic Regressoin Model

#set.seed() function is used for generating randoms numbers#

#Looking for most significant variables with Attrition#

1. Dividing Data set into Training (70%) and Test (30%) set to predict Attrition. It ensures the data sets are marginally different, and thus, it may find out better solution.

```
set.seed(1234)
div <- sample(2, nrow(Turnover_issues_fac), replace = T, prob = c(0.7, 0.3))
train <- Turnover_issues_fac[div==1,]
test <- Turnover_issues_fac[div==2,]
```

2. Logistic Regression Model

#Logistic regression is used to find out probability of event success and event failure by categorizing data into discrete classes#

```
turnover_model <- glm(Attrition ~ Age+BusinessTravel+DailyRate+Department+Dis
tanceFromHome+Education+EducationField+EnvironmentSatisfaction+Gender+HourlyR
ate+JobInvolvement+JobLevel+JobRole+JobSatisfaction+MaritalStatus+MonthlyInco
me+NumCompaniesWorked+OverTime+PercentSalaryHike+PerformanceRating+Relationsh
ipSatisfaction+StockOptionLevel+TotalWorkingYears+TrainingTimesLastYear+WorkL
ifeBalance+YearsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWit
hCurrManager, data = train, family = 'binomial')
summary(turnover_model)

##
## Call:
## glm(formula = Attrition ~ Age + BusinessTravel + DailyRate +
##     Department + DistanceFromHome + Education + EducationField +
##     EnvironmentSatisfaction + Gender + HourlyRate + JobInvolvement +
##     JobLevel + JobRole + JobSatisfaction + MaritalStatus + MonthlyIncome +
##     NumCompaniesWorked + OverTime + PercentSalaryHike + PerformanceRating
+
##     RelationshipSatisfaction + StockOptionLevel + TotalWorkingYears +
##     TrainingTimesLastYear + WorkLifeBalance + YearsAtCompany +
##     YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager,
##     family = "binomial", data = train)
##
## Deviance Residuals:
##     Min        1Q    Median        3Q       Max
```

```
## -1.9532  -0.4283  -0.1854  -0.0455   3.5653
##
## Coefficients:
##                                      Estimate Std. Error z value Pr(>|z|)
## (Intercept)                         -8.510e+00  4.874e+02  -0.017 0.986068
## Age                                 -4.496e-02  1.819e-02  -2.472 0.013442 *
## BusinessTravelTravel_Frequently      1.929e+00  5.230e-01   3.689 0.000225 **
*
## BusinessTravelTravel_Rarely          9.431e-01  4.778e-01   1.974 0.048392 *
## DailyRate                           -4.426e-04  2.935e-04  -1.508 0.131567
## DepartmentResearch & Development     1.426e+01  4.874e+02   0.029 0.976665
## DepartmentSales                      1.383e+01  4.874e+02   0.028 0.977356
## DistanceFromHome                     4.688e-02  1.439e-02   3.259 0.001119 **
## Education2                          -1.489e-01  4.113e-01  -0.362 0.717403
## Education3                           5.125e-02  3.644e-01   0.141 0.888157
## Education4                           1.067e-01  3.934e-01   0.271 0.786305
## Education5                          -4.439e-01  9.727e-01  -0.456 0.648130
## EducationFieldLife Sciences         -1.259e+00  1.073e+00  -1.173 0.240920
## EducationFieldMarketing             -5.851e-01  1.139e+00  -0.514 0.607586
## EducationFieldMedical               -1.049e+00  1.072e+00  -0.979 0.327710
## EducationFieldOther                 -9.540e-01  1.150e+00  -0.829 0.406925
## EducationFieldTechnical Degree      -9.581e-02  1.071e+00  -0.089 0.928709
## EnvironmentSatisfaction2            -1.241e+00  3.558e-01  -3.488 0.000487 **
*
## EnvironmentSatisfaction3            -1.467e+00  3.434e-01  -4.273 1.93e-05 **
*
## EnvironmentSatisfaction4            -1.423e+00  3.368e-01  -4.226 2.38e-05 **
*
## GenderMale                           4.569e-01  2.426e-01   1.883 0.059677 .
## HourlyRate                           6.828e-04  5.813e-03   0.117 0.906498
## JobInvolvement2                     -1.389e+00  4.498e-01  -3.088 0.002014 **
## JobInvolvement3                     -1.549e+00  4.227e-01  -3.665 0.000247 **
*
## JobInvolvement4                     -2.626e+00  6.338e-01  -4.144 3.42e-05 **
*
## JobLevel2                           -1.195e+00  5.329e-01  -2.242 0.024947 *
## JobLevel3                           -2.347e-03  8.754e-01  -0.003 0.997861
## JobLevel4                           -8.183e-01  1.496e+00  -0.547 0.584482
## JobLevel5                            2.687e+00  2.080e+00   1.292 0.196443
## JobRoleHuman Resources               1.482e+01  4.874e+02   0.030 0.975749
## JobRoleLaboratory Technician         1.044e+00  7.199e-01   1.450 0.147197
## JobRoleManager                      -2.187e+00  1.450e+00  -1.509 0.131395
## JobRoleManufacturing Director        2.902e-01  7.099e-01   0.409 0.682751
## JobRoleResearch Director            -3.849e+00  1.538e+00  -2.502 0.012337 *
## JobRoleResearch Scientist           -1.217e-01  7.270e-01  -0.167 0.867010
## JobRoleSales Executive               1.721e+00  1.523e+00   1.130 0.258636
## JobRoleSales Representative           2.100e+00  1.611e+00   1.304 0.192308
## JobSatisfaction2                    -8.360e-01  3.583e-01  -2.333 0.019638 *
## JobSatisfaction3                    -9.204e-01  3.135e-01  -2.935 0.003332 **
## JobSatisfaction4                    -1.411e+00  3.306e-01  -4.270 1.96e-05 **
```

```
*
## MaritalStatusMarried              4.965e-01  3.500e-01   1.419 0.156039
## MaritalStatusSingle               5.186e-01  5.023e-01   1.032 0.301888
## MonthlyIncome                     -1.619e-05 1.144e-04  -0.142 0.887462
## NumCompaniesWorked1               5.367e-01  3.962e-01   1.355 0.175496
## NumCompaniesWorked2               4.977e-01  5.565e-01   0.894 0.371166
## NumCompaniesWorked3               5.008e-01  5.841e-01   0.857 0.391265
## NumCompaniesWorked4               1.124e+00  5.926e-01   1.897 0.057858 .
## NumCompaniesWorked5               1.897e+00  6.286e-01   3.019 0.002540 **
## NumCompaniesWorked6               1.761e+00  5.959e-01   2.955 0.003128 **
## NumCompaniesWorked7               2.366e+00  6.190e-01   3.822 0.000132 **
*
## NumCompaniesWorked8               1.070e+00  7.732e-01   1.384 0.166210
## NumCompaniesWorked9               2.214e+00  6.903e-01   3.207 0.001339 **
## OverTime1                         2.358e+00  2.615e-01   9.019  < 2e-16 **
*
## PercentSalaryHike                 -4.344e-02 4.998e-02  -0.869 0.384810
## PerformanceRating4                3.390e-01  5.235e-01   0.647 0.517317
## RelationshipSatisfaction2         -6.249e-01 3.616e-01  -1.728 0.083914 .
## RelationshipSatisfaction3         -6.803e-01 3.269e-01  -2.081 0.037409 *
## RelationshipSatisfaction4         -9.421e-01 3.386e-01  -2.782 0.005405 **
## StockOptionLevel1                 -1.239e+00 4.106e-01  -3.018 0.002543 **
## StockOptionLevel2                 -1.123e+00 5.211e-01  -2.154 0.031210 *
## StockOptionLevel3                 -7.314e-01 6.085e-01  -1.202 0.229405
## TotalWorkingYears                 -4.059e-02 3.852e-02  -1.054 0.291998
## TrainingTimesLastYear1            -1.363e+00 7.161e-01  -1.903 0.057048 .
## TrainingTimesLastYear2            -1.692e+00 5.559e-01  -3.043 0.002339 **
## TrainingTimesLastYear3            -1.838e+00 5.664e-01  -3.245 0.001175 **
## TrainingTimesLastYear4            -1.250e+00 6.370e-01  -1.963 0.049702 *
## TrainingTimesLastYear5            -1.880e+00 6.899e-01  -2.725 0.006423 **
## TrainingTimesLastYear6            -2.297e+00 8.071e-01  -2.846 0.004427 **
## WorkLifeBalance2                  -1.225e+00 5.137e-01  -2.385 0.017100 *
## WorkLifeBalance3                  -1.686e+00 4.898e-01  -3.442 0.000577 **
*
## WorkLifeBalance4                  -1.310e+00 5.868e-01  -2.233 0.025574 *
## YearsAtCompany                    1.543e-01  4.888e-02   3.157 0.001595 **
## YearsInCurrentRole                -1.961e-01 6.409e-02  -3.061 0.002209 **
## YearsSinceLastPromotion           1.759e-01  5.580e-02   3.152 0.001619 **
## YearsWithCurrManager              -1.969e-01 6.090e-02  -3.234 0.001222 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 965.32  on 1041  degrees of freedom
## Residual deviance: 551.79  on  967  degrees of freedom
## AIC: 701.79
##
## Number of Fisher Scoring iterations: 14
```

#Picking significant variables with p<0.05#

#Age(-) #Business Travel(+) #Distance From Home(+) #Environment Satisfaction(-) #Job Involvement(-) #Job Level(-) #Job Role #Job Satisfaction(-) #NumCompaniesWorked(+) #Relationship Satisfaction(-) #Stock Option Level(-) #Work Life Balance(-) #Years At company(-) #Years In Current Role(-) #Years Since Last promotion(+) #Years With Curr Manager(-)

#Retaining statistically significant variables#

```
turnover_model <- glm(Attrition ~ Age+BusinessTravel+DistanceFromHome+Environ
mentSatisfaction+JobInvolvement+JobLevel+JobRole+JobSatisfaction+NumCompanies
Worked+OverTime+RelationshipSatisfaction+StockOptionLevel+WorkLifeBalance+Yea
rsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrManager,
data = train, family = 'binomial')
summary(turnover_model)

##
## Call:
## glm(formula = Attrition ~ Age + BusinessTravel + DistanceFromHome +
##      EnvironmentSatisfaction + JobInvolvement + JobLevel + JobRole +
##      JobSatisfaction + NumCompaniesWorked + OverTime + RelationshipSatisfac
tion +
##      StockOptionLevel + WorkLifeBalance + YearsAtCompany + YearsInCurrentRo
le +
##      YearsSinceLastPromotion + YearsWithCurrManager, family = "binomial",
##      data = train)
##
## Deviance Residuals:
##     Min      1Q   Median       3Q      Max
## -1.9634  -0.4605  -0.2251  -0.0667   3.4878
##
## Coefficients:
##                                 Estimate Std. Error z value Pr(>|z|)
## (Intercept)                      2.87199    1.13707   2.526 0.011544 *
## Age                             -0.05516    0.01605  -3.437 0.000589 ***
## BusinessTravelTravel_Frequently  1.87303    0.48791   3.839 0.000124 ***
## BusinessTravelTravel_Rarely      0.93626    0.44817   2.089 0.036699 *
## DistanceFromHome                 0.03935    0.01351   2.913 0.003578 **
## EnvironmentSatisfaction2        -1.03210    0.33038  -3.124 0.001784 **
## EnvironmentSatisfaction3        -1.18340    0.31206  -3.792 0.000149 ***
## EnvironmentSatisfaction4        -1.17292    0.30854  -3.801 0.000144 ***
## JobInvolvement2                 -1.26975    0.41614  -3.051 0.002279 **
## JobInvolvement3                 -1.46453    0.39158  -3.740 0.000184 ***
## JobInvolvement4                 -2.32429    0.58397  -3.980 6.89e-05 ***
## JobLevel2                       -1.41667    0.46964  -3.016 0.002557 **
## JobLevel3                       -0.48716    0.59121  -0.824 0.409934
## JobLevel4                       -1.09975    0.97496  -1.128 0.259322
## JobLevel5                        2.07255    1.48456   1.396 0.162694
## JobRoleHuman Resources           1.06807    0.77468   1.379 0.167983
```

```
## JobRoleLaboratory Technician      0.85313    0.67929    1.256 0.209142
## JobRoleManager                    -2.42607    1.32285   -1.834 0.066658 .
## JobRoleManufacturing Director      0.40462    0.66768    0.606 0.544510
## JobRoleResearch Director          -3.86723    1.37053   -2.822 0.004777 **
## JobRoleResearch Scientist         -0.12954    0.68208   -0.190 0.849370
## JobRoleSales Executive             1.38834    0.54202    2.561 0.010424 *
## JobRoleSales Representative        1.53576    0.73450    2.091 0.036537 *
## JobSatisfaction2                  -0.81683    0.34093   -2.396 0.016580 *
## JobSatisfaction3                  -0.80298    0.29304   -2.740 0.006141 **
## JobSatisfaction4                  -1.26441    0.30575   -4.135 3.54e-05 ***
## NumCompaniesWorked1                0.48123    0.37153    1.295 0.195224
## NumCompaniesWorked2                0.45447    0.51184    0.888 0.374589
## NumCompaniesWorked3                0.49750    0.52095    0.955 0.339587
## NumCompaniesWorked4                0.88082    0.54262    1.623 0.104535
## NumCompaniesWorked5                1.70565    0.57010    2.992 0.002773 **
## NumCompaniesWorked6                1.56968    0.53878    2.913 0.003575 **
## NumCompaniesWorked7                2.25332    0.57134    3.944 8.02e-05 ***
## NumCompaniesWorked8                1.10838    0.70989    1.561 0.118447
## NumCompaniesWorked9                2.02827    0.63774    3.180 0.001471 **
## OverTime1                          2.18701    0.23994    9.115  < 2e-16 ***
## RelationshipSatisfaction2         -0.57526    0.34051   -1.689 0.091140 .
## RelationshipSatisfaction3         -0.57523    0.30788   -1.868 0.061715 .
## RelationshipSatisfaction4         -0.84977    0.32147   -2.643 0.008207 **
## StockOptionLevel1                 -1.31806    0.25107   -5.250 1.52e-07 ***
## StockOptionLevel2                 -1.26911    0.39362   -3.224 0.001263 **
## StockOptionLevel3                 -0.97094    0.48819   -1.989 0.046720 *
## WorkLifeBalance2                  -1.23363    0.48571   -2.540 0.011090 *
## WorkLifeBalance3                  -1.53361    0.45899   -3.341 0.000834 ***
## WorkLifeBalance4                  -1.14309    0.55317   -2.066 0.038788 *
## YearsAtCompany                     0.10574    0.04242    2.492 0.012690 *
## YearsInCurrentRole                -0.14631    0.05897   -2.481 0.013100 *
## YearsSinceLastPromotion            0.16849    0.05169    3.259 0.001117 **
## YearsWithCurrManager              -0.18701    0.05749   -3.253 0.001143 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 965.32  on 1041  degrees of freedom
## Residual deviance: 590.60  on  993  degrees of freedom
## AIC: 688.6
##
## Number of Fisher Scoring iterations: 7
```

Prediction of associates leaving company

```
prediction <- predict (turnover_model, train, type = 'response')
head(prediction)
```

```
##          1          2          3          4          6          7
## 0.551320543 0.001127055 0.750483345 0.588867808 0.062987992 0.266209730
```

Observing few top output to predict attrition of assocaites

```
head(train)
```

```
##   Age Attrition    BusinessTravel DailyRate             Department
## 1  41         1     Travel_Rarely      1102                  Sales
## 2  49         0 Travel_Frequently       279 Research & Development
## 3  37         1     Travel_Rarely      1373 Research & Development
## 4  33         0 Travel_Frequently      1392 Research & Development
## 6  32         0 Travel_Frequently      1005 Research & Development
## 7  59         0     Travel_Rarely      1324 Research & Development
##   DistanceFromHome Education EducationField EnvironmentSatisfaction Gender
## 1                1         2  Life Sciences                       2 Female
## 2                8         1  Life Sciences                       3   Male
## 3                2         2          Other                       4   Male
## 4                3         4  Life Sciences                       4 Female
## 6                2         2  Life Sciences                       4   Male
## 7                3         3        Medical                       3 Female
##   HourlyRate JobInvolvement JobLevel             JobRole JobSatisfaction
## 1         94              3        2     Sales Executive               4
## 2         61              2        2   Research Scientist               2
## 3         92              2        1 Laboratory Technician               3
## 4         56              3        1   Research Scientist               3
## 6         79              3        1 Laboratory Technician               4
## 7         81              4        1 Laboratory Technician               1
##   MaritalStatus MonthlyIncome MonthlyRate NumCompaniesWorked Over18 OverTi
## me
## 1        Single          5993       19479                  8      Y
## 1
## 2       Married          5130       24907                  1      Y
## 0
## 3        Single          2090        2396                  6      Y
## 1
## 4       Married          2909       23159                  1      Y
## 1
## 6        Single          3068       11864                  0      Y
## 0
## 7       Married          2670        9964                  4      Y
## 1
##   PercentSalaryHike PerformanceRating RelationshipSatisfaction StandardHou
## rs
## 1                11                 3                        1           1
## 80
## 2                23                 4                        4           4
## 80
## 3                15                 3                        2           2
## 80
## 4                11                 3                        3           3
## 80
## 6                13                 3                        3           3
## 80
```

```
## 7                  20                    4                       1
80
##    StockOptionLevel TotalWorkingYears TrainingTimesLastYear WorkLifeBalance
## 1                 0                 8                     0               1
## 2                 1                10                     3               3
## 3                 0                 7                     3               3
## 4                 0                 8                     3               3
## 6                 0                 8                     2               2
## 7                 3                12                     3               2
##    YearsAtCompany YearsInCurrentRole YearsSinceLastPromotion
## 1               6                  4                       0
## 2              10                  7                       1
## 3               0                  0                       0
## 4               8                  7                       3
## 6               7                  7                       3
## 7               1                  0                       0
##    YearsWithCurrManager
## 1                     5
## 2                     7
## 3                     0
## 4                     0
## 6                     6
## 7                     0
```

Confusion Matrix to find out misclassification error in training data

```
predic1 <- ifelse(prediction>0.5, 1, 0)
table1<-table(Predicted = predic1, Actual = train$Attrition)
table1
```

```
##          Actual
## Predicted   0    1
##         0 834   84
##         1  26   98
```

Number of associates who do not quit job are 834. Here it is predicted and truly do not happen. Again, 98 associates is predicted to quit and really it's happened. Moreover, 26 associates predicted to quit, but it's not happen. Furthermore, 84 associates predicted won't quit, but originally it's happened.

Misclassification Percentage in training data

```
1-sum(diag(table1))/sum(table1)
```

```
## [1] 0.1055662
```

So it will be 10.56%

Measuring misclassification error of Test Data

```
prediction1 <- predict(turnover_model, test, type = 'response')
predic2 <- ifelse(prediction1>0.5, 1, 0)
table2 <- table(Predicted = predic2, Actual = test$Attrition)
table2
```

```
##          Actual
## Predicted  0   1
##         0 353  31
##         1  20  24
```

Number of associates who do not quit job are 353. Here it is predicted and truly do not happen. Again, 24 associates is predicted to quit and really it's happened. Moreover, 20 associates predicted to quit, but it's not happen. Furthermore, 31 associates predicted won't quit, but originally it's happened.

Misclassification Percentage of test data

```
1-sum(diag(table2))/sum(table2)
```

```
## [1] 0.1191589
```

So it will be 11.91%

Finding satisfaction of staff

1. Based on Environment Satisfaction

```
plot(Turnover_issues_fac$EnvironmentSatisfaction)
```
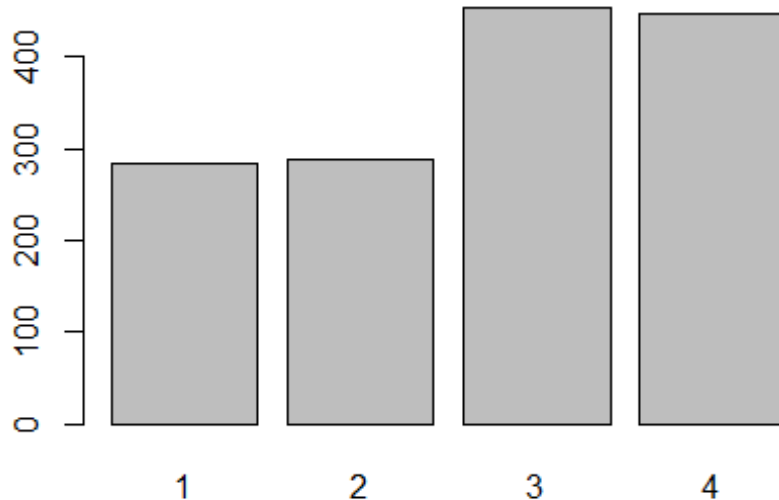


```
median(as.numeric(Turnover_issues_fac$EnvironmentSatisfaction))
```

```
## [1] 3
```

```
mean(as.numeric(Turnover_issues_fac$EnvironmentSatisfaction))
```

```
## [1] 2.721769
```

2. Based on Relationship Satisfaction

```
plot(Turnover_issues_fac$RelationshipSatisfaction)
```
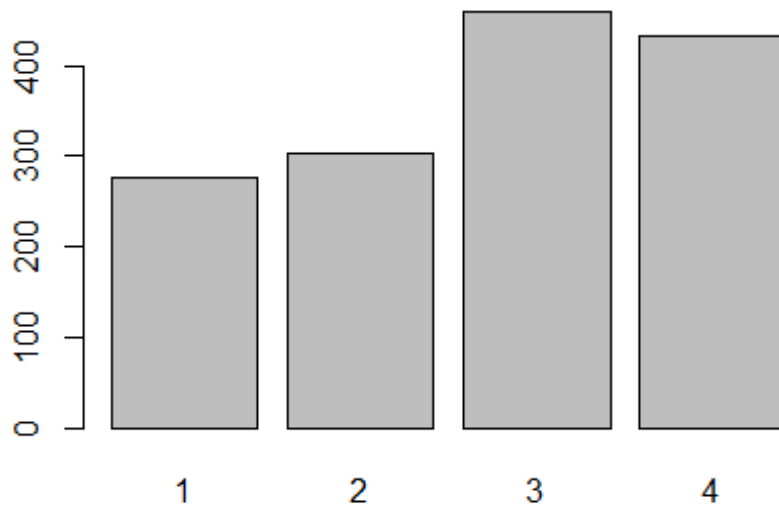


```
median(as.numeric(Turnover_issues_fac$RelationshipSatisfaction))
```
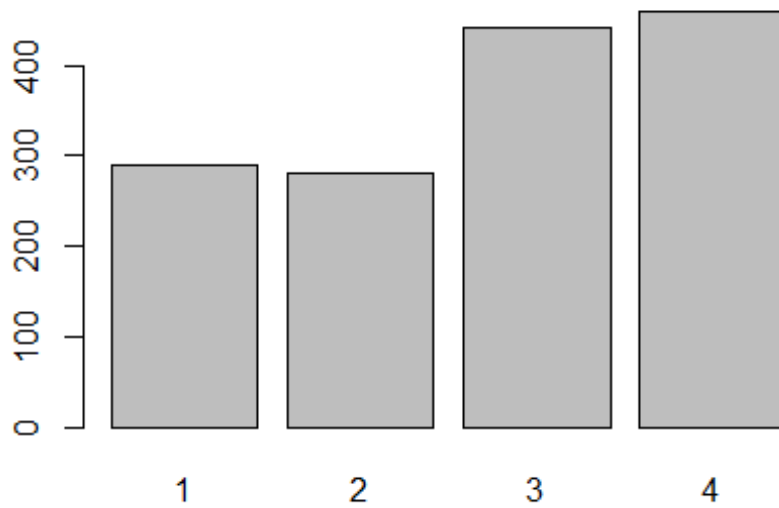
```
## [1] 3
```

```
mean(as.numeric(Turnover_issues_fac$RelationshipSatisfaction))
```

```
## [1] 2.712245
```

3. Based on Job Satisfaction

```
plot(Turnover_issues_fac$JobSatisfaction)
```

```
median(as.numeric(Turnover_issues_fac$JobSatisfaction))
```

```
## [1] 3
```

```
mean(as.numeric(Turnover_issues_fac$JobSatisfaction))
```

```
## [1] 2.728571
```

Here, median is 3 out of 4 which is higher than mean 2.7 out of 4, so we can say that more than half of the associates have job satisfaction above average (2.7).