

```

> ##Importing Data and initial analyses
> #Importing csv file from a location
> attr<- read.csv(file="MVA/Attrition Dataset.csv", header=TRUE, sep=",")
> attr <- as.data.frame(attr)
> glimpse(attr)

```

Observations: 1,470

Variables: 35

\$ Age	<int> 41, 49, 37, 33, 27, 32, 59, 30, 38, 36, 35, 29, 31, 34, 28,
29, 32, 22, 5...	
\$ Attrition	<fct> Yes, No, Yes, No, No, No, No, No, No, No, No, No, No, No, Y
es, No, No, No...	
\$ BusinessTravel	<fct> Travel_Rarely, Travel_Frequently, Travel_Rarely, Travel_Fre
quently, Trave...	
\$ DailyRate	<int> 1102, 279, 1373, 1392, 591, 1005, 1324, 1358, 216, 1299, 80
9, 153, 670, 1...	
\$ Department	<fct> Sales, Research & Development, Research & Development, Rese
arch & Develop...	
\$ DistanceFromHome	<int> 1, 8, 2, 3, 2, 2, 3, 24, 23, 27, 16, 15, 26, 19, 24, 21, 5,
16, 2, 2, 11,...	
\$ Education	<int> 2, 1, 2, 4, 1, 2, 3, 1, 3, 3, 3, 2, 1, 2, 3, 4, 2, 2, 4, 3,
2, 4, 4, 2, 1...	
\$ EducationField	<fct> Life Sciences, Life Sciences, Other, Life Sciences, Medical
, Life Science...	
\$ EmployeeCount	<int> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
1, 1, 1, 1, 1...	
\$ EmployeeNumber	<int> 1, 2, 4, 5, 7, 8, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 2
1, 22, 23, 24,...	
\$ EnvironmentSatisfaction	<int> 2, 3, 4, 4, 1, 4, 3, 4, 4, 3, 1, 4, 1, 2, 3, 2, 1, 4, 1, 4,
1, 3, 1, 3, 2...	
\$ Gender	<fct> Female, Male, Male, Female, Male, Male, Female, Male, Male,
Male, Male, F...	
\$ HourlyRate	<int> 94, 61, 92, 56, 40, 79, 81, 67, 44, 94, 84, 49, 31, 93, 50,
51, 80, 96, 7...	
\$ JobInvolvement	<int> 3, 2, 2, 3, 3, 3, 4, 3, 2, 3, 4, 2, 3, 3, 2, 4, 4, 4, 2, 3,
4, 2, 3, 3, 3...	
\$ JobLevel	<int> 2, 2, 1, 1, 1, 1, 1, 1, 3, 2, 1, 2, 1, 1, 1, 3, 1, 1, 4, 1,
2, 1, 3, 1, 1...	
\$ JobRole	<fct> Sales Executive, Research Scientist, Laboratory Technician,
Research Scie...	
\$ JobSatisfaction	<int> 4, 2, 3, 3, 2, 4, 1, 3, 3, 3, 2, 3, 3, 4, 3, 1, 2, 4, 4, 4,
3, 1, 2, 4, 1...	
\$ MaritalStatus	<fct> Single, Married, Single, Married, Married, Single, Married,
Divorced, Sin...	
\$ MonthlyIncome	<int> 5993, 5130, 2090, 2909, 3468, 3068, 2670, 2693, 9526, 5237,
2426, 4193, 2...	
\$ MonthlyRate	<int> 19479, 24907, 2396, 23159, 16632, 11864, 9964, 13335, 8787,
16577, 16479,...	
\$ NumCompaniesWorked	<int> 8, 1, 6, 1, 9, 0, 4, 1, 0, 6, 0, 0, 1, 0, 5, 1, 0, 1, 2, 5,
0, 7, 0, 1, 2...	
\$ Over18	<fct> Y,
Y, Y, Y, Y, Y...	
\$ OverTime	<fct> Yes, No, Yes, Yes, No, No, Yes, No, No, No, No, Yes, No, No
, Yes, No, Yes...	
\$ PercentSalaryHike	<int> 11, 23, 15, 11, 12, 13, 20, 22, 21, 13, 13, 12, 17, 11, 14,
11, 12, 13, 1...	
\$ PerformanceRating	<int> 3, 4, 3, 3, 3, 3, 4, 4, 4, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 4, 3, 3, 3...	
\$ RelationshipSatisfaction	<int> 1, 4, 2, 3, 4, 3, 1, 2, 2, 2, 3, 4, 4, 3, 2, 3, 4, 2, 3, 3,
4, 2, 3, 4, 3...	
\$ StandardHours	<int> 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80, 80,
80, 80, 80, 8...	
\$ StockOptionLevel	<int> 0, 1, 0, 0, 1, 0, 3, 1, 0, 2, 1, 0, 1, 1, 0, 1, 2, 2, 0, 0,
1, 0, 0, 0, 0...	

```

$ TotalWorkingYears      <int> 8, 10, 7, 8, 6, 8, 12, 1, 10, 17, 6, 10, 5, 3, 6, 10, 7, 1,
31, 6, 5, 10,...
$ TrainingTimesLastYear  <int> 0, 3, 3, 3, 3, 2, 3, 2, 2, 3, 5, 3, 1, 2, 4, 1, 5, 2, 3, 3,
5, 4, 4, 6, 2...
$ WorkLifeBalance        <int> 1, 3, 3, 3, 3, 2, 2, 3, 3, 2, 3, 3, 2, 3, 3, 2, 2, 3, 3,
2, 3, 3, 3, 3...
$ YearsAtCompany          <int> 6, 10, 0, 8, 2, 7, 1, 1, 9, 7, 5, 9, 5, 2, 4, 10, 6, 1, 25,
3, 4, 5, 12, ...
$ YearsInCurrentRole      <int> 4, 7, 0, 7, 2, 7, 0, 0, 7, 7, 4, 5, 2, 2, 2, 9, 2, 0, 8, 2,
2, 3, 6, 0, 2...
$ YearsSinceLastPromotion <int> 0, 1, 0, 3, 2, 3, 0, 0, 1, 7, 0, 0, 4, 1, 0, 8, 0, 0, 3, 1,
1, 0, 2, 0, 1...
$ YearsWithCurrManager    <int> 5, 7, 0, 0, 2, 6, 0, 0, 8, 7, 3, 8, 3, 2, 3, 8, 5, 0, 7, 2,
3, 3, 11, 0, ...

```

> #Dimension of the dataset

```
> dim(attr)
```

```
[1] 1470 35
```

> #View the first 5 rows of the dataset

```
> head(attr)
```

Age	Attrition	BusinessTravel	DailyRate	Department	DistanceFromHome	Education
1 41	Yes	Travel_Rarely	1102	Sales		1
2 Life Sciences						
2 49	No	Travel_Frequently	279	Research & Development		8
1 Life Sciences						
3 37	Yes	Travel_Rarely	1373	Research & Development		2
2 Other						
4 33	No	Travel_Frequently	1392	Research & Development		3
4 Life Sciences						
5 27	No	Travel_Rarely	591	Research & Development		2
1 Medical						
6 32	No	Travel_Frequently	1005	Research & Development		2
2 Life Sciences						
EmployeeCount	EmployeeNumber	EnvironmentSatisfaction	Gender	HourlyRate	JobInvolvement	JobLevel
1	1	1	2 Female	94		3
2	1	2	3 Male	61		2
2	1	4	4 Male	92		2
1	1	5	4 Female	56		3
4	1	7	1 Male	40		3
1	1	8	4 Male	79		3
1						
JobRole	JobSatisfaction	MaritalStatus	MonthlyIncome	MonthlyRate	NumCompaniesworked	Over18
1 Sales Executive		4	Single	5993	19479	
8 Y						
2 Research Scientist		2	Married	5130	24907	
1 Y						
3 Laboratory Technician		3	Single	2090	2396	
6 Y						
4 Research Scientist		3	Married	2909	23159	
1 Y						
5 Laboratory Technician		2	Married	3468	16632	
9 Y						
6 Laboratory Technician		4	Single	3068	11864	
0 Y						

OverTime	PercentSalaryHike	PerformanceRating	RelationshipSatisfaction	StandardHours	StockOptionLevel
1	Yes	11	3	1	80
0					
2	No	23	4	4	80
1					
3	Yes	15	3	2	80
0					
4	Yes	11	3	3	80
0					
5	No	12	3	4	80
1					
6	No	13	3	3	80
0					

TotalWorkingYears	TrainingTimesLastYear	WorkLifeBalance	YearsAtCompany	YearsInCurrentRole
1	8	0	1	6
2	10	3	3	10
3	7	3	3	0
4	8	3	3	8
5	6	3	3	2
6	8	2	2	7

YearsSinceLastPromotion	YearsWithCurrManager
1	0
2	1
3	0
4	3
5	2
6	3

> summary(attr)

Age	Attrition	BusinessTravel	DailyRate	Department
Min. :18.00	No :1233	Non-Travel : 150	Min. : 102.0	Human Resources :
1st Qu.:30.00	Yes: 237	Travel_Frequently: 277	1st Qu.: 465.0	Research & Development:
Median :36.00		Travel_Rarely :1043	Median : 802.0	Sales :
Mean :36.92			Mean : 802.5	
3rd Qu.:43.00			3rd Qu.:1157.0	
Max. :60.00			Max. :1499.0	

DistanceFromHome	Education	EducationField	EmployeeCount	EmployeeNumber
Min. : 1.000	Min. :1.000	Human Resources : 27	Min. :1	Min. : 1.0
1st Qu.: 2.000	1st Qu.:2.000	Life Sciences :606	1st Qu.:1	1st Qu.: 491.2
Median : 7.000	Median :3.000	Marketing :159	Median :1	Median :1020.5
Mean : 9.193	Mean :2.913	Medical :464	Mean :1	Mean :1024.9
3rd Qu.:14.000	3rd Qu.:4.000	Other : 82	3rd Qu.:1	3rd Qu.:1555.8
Max. :29.000	Max. :5.000	Technical Degree:132	Max. :1	Max. :2068.0

EnvironmentSatisfaction	Gender	HourlyRate	JobInvolvement	JobLevel
Min. :1.000	Female:588	Min. : 30.00	Min. :1.00	Min. :1.000
1st Qu.:2.000	Male :882	1st Qu.: 48.00	1st Qu.:2.00	1st Qu.:1.000
Median :3.000		Median : 66.00	Median :3.00	Median :2.000
Mean :2.722		Mean : 65.89	Mean :2.73	Mean :2.064
3rd Qu.:4.000		3rd Qu.: 83.75	3rd Qu.:3.00	3rd Qu.:3.000
Max. :4.000		Max. :100.00	Max. :4.00	Max. :5.000

JobRole	JobSatisfaction	MaritalStatus	MonthlyIncome	MonthlyRate
Sales Executive	:326	Min. :1.000	Divorced:327	Min. : 1009
Research Scientist	:292	1st Qu.:2.000	Married :673	1st Qu.: 2911
Laboratory Technician	:259	Median :3.000	Single :470	Median : 4919
Manufacturing Director	:145	Mean :2.729		Mean : 6503
Healthcare Representative	:131	3rd Qu.:4.000		3rd Qu.: 8379
Manager	:102	Max. :4.000		Max. :19999
(Other)	:215			Max. :26999

NumCompaniesWorked	Over18	OverTime	PercentSalaryHike	PerformanceRating	RelationshipSatisfaction
Min. :0.000	Y:1470	No :1054	Min. :11.00	Min. :3.000	Min. :1.000
1st Qu.:1.000		Yes: 416	1st Qu.:12.00	1st Qu.:3.000	1st Qu.:2.000
Median :2.000			Median :14.00	Median :3.000	Median :3.000
Mean :2.693			Mean :15.21	Mean :3.154	Mean :2.712
3rd Qu.:4.000			3rd Qu.:18.00	3rd Qu.:3.000	3rd Qu.:4.000
Max. :9.000			Max. :25.00	Max. :4.000	Max. :4.000

StandardHours	StockOptionLevel	TotalWorkingYears	TrainingTimesLastYear	WorkLifeBalance	YearsAtCompany
Min. :80	Min. :0.0000	Min. : 0.00	Min. :0.000	Min. :1.000	Min. :0.000
1st Qu.:80	1st Qu.:0.0000	1st Qu.: 6.00	1st Qu.:2.000	1st Qu.:2.000	1st Qu.:3.000
Median :80	Median :1.0000	Median :10.00	Median :3.000	Median :3.000	Median :5.000
Mean :80	Mean :0.7939	Mean :11.28	Mean :2.799	Mean :2.761	Mean :7.008
3rd Qu.:80	3rd Qu.:1.0000	3rd Qu.:15.00	3rd Qu.:3.000	3rd Qu.:3.000	3rd Qu.:9.000
Max. :80	Max. :3.0000	Max. :40.00	Max. :6.000	Max. :4.000	Max. :40.000

YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager
Min. : 0.000	Min. : 0.000	Min. : 0.000
1st Qu.: 2.000	1st Qu.: 0.000	1st Qu.: 2.000
Median : 3.000	Median : 1.000	Median : 3.000
Mean : 4.229	Mean : 2.188	Mean : 4.123
3rd Qu.: 7.000	3rd Qu.: 3.000	3rd Qu.: 7.000
Max. :18.000	Max. :15.000	Max. :17.000

```

> #Rename the Age column
> colnames(attr)[1] <- "Age"
> #Calculating the number of null values in each of the columns
> colsums(sapply(attr,is.na))

```

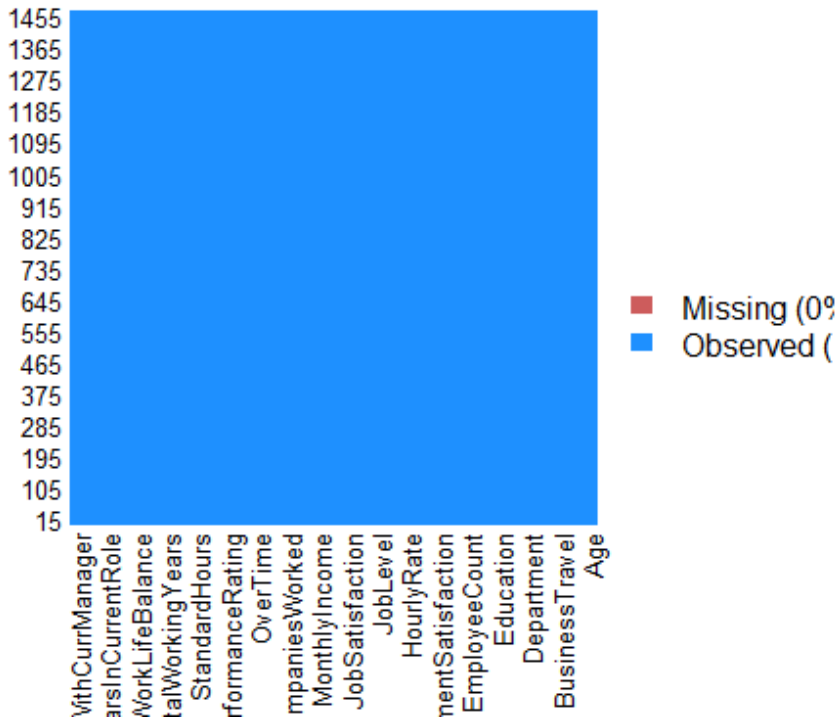
Age	Attrition	BusinessTravel	DailyRate
0	0	0	0
Department	DistanceFromHome	Education	EducationField
0	0	0	0
EmployeeCount	EmployeeNumber	EnvironmentSatisfaction	Gender
0	0	0	0
HourlyRate	JobInvolvement	JobLevel	JobRole
0	0	0	0
JobSatisfaction	MaritalStatus	MonthlyIncome	MonthlyRate
0	0	0	0
NumCompaniesWorked	Over18	OverTime	PercentSalaryHike
0	0	0	0
PerformanceRating	RelationshipSatisfaction	StandardHours	StockOptionLevel
0	0	0	0
TotalWorkingYears	TrainingTimesLastYear	WorkLifeBalance	YearsAtCompany
0	0	0	0
YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager	
0	0	0	

```

> missmap(attr,main="Missing values vs Observed")

```

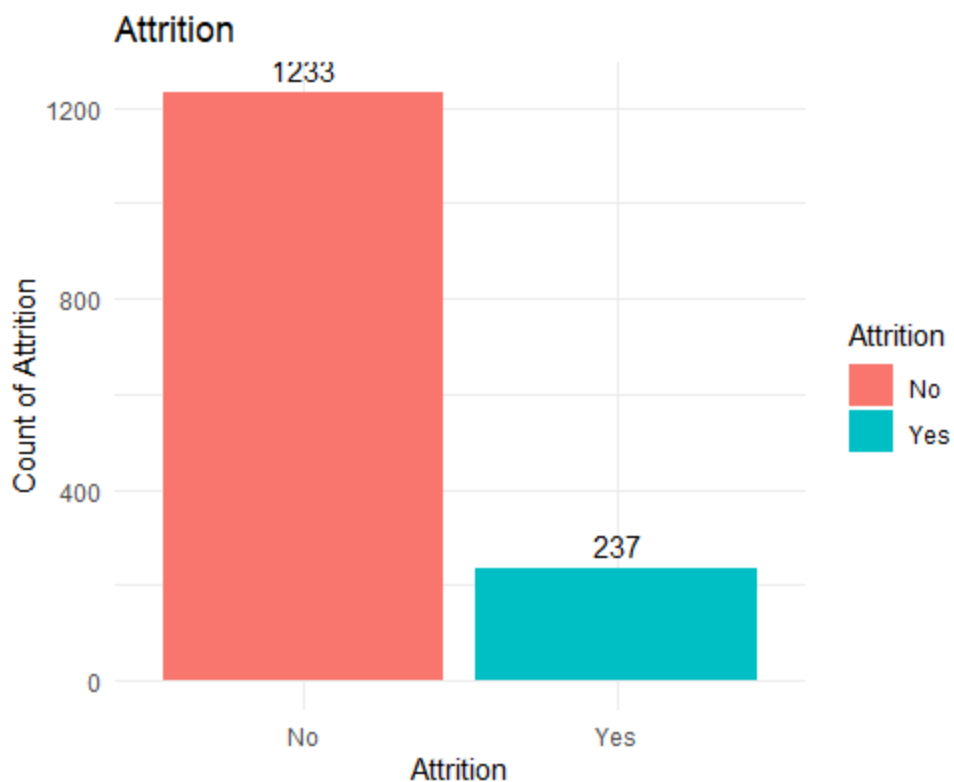
Missing Values VS Observed



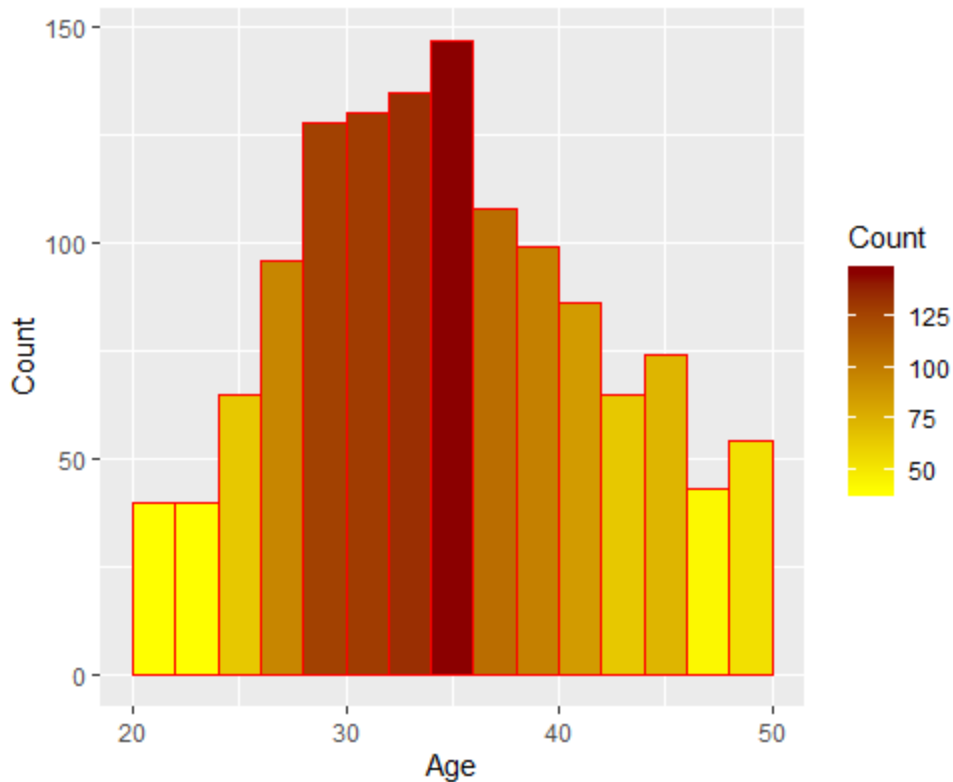
```
> #Removing redundant columns
> attr$EmployeeNumber<- NULL
> attr$StandardHours <- NULL
> attr$Over18 <- NULL
> attr$EmployeeCount <- NULL
> #Converting data type of categorical column
> attr$Education <- factor(attr$Education)
> attr$EnvironmentSatisfaction <- factor(attr$EnvironmentSatisfaction)
> attr$JobInvolvement <- factor(attr$JobInvolvement)
> attr$JobLevel <- factor(attr$JobLevel)
> attr$JobSatisfaction <- factor(attr$JobSatisfaction)
> attr$PerformanceRating <- factor(attr$PerformanceRating)
> attr$RelationshipSatisfaction <- factor(attr$RelationshipSatisfaction)
> attr$StockOptionLevel <- factor(attr$StockOptionLevel)
> attr$WorkLifeBalance <- factor(attr$WorkLifeBalance)
> #Assigning categorical and numerical variable to temporary variable
> catvar<-c('BusinessTravel','Department','Education','EducationField','EnvironmentSatisfaction','Gender',
+           'JobRole','JobInvolvement','JobLevel','JobSatisfaction',
+           'MaritalStatus','PerformanceRating','RelationshipSatisfaction','StockOptionLevel',
+           'WorkLifeBalance')
> numvar<-c('Age','DailyRate','DistanceFromHome','HourlyRate',
+           'MonthlyIncome','MonthlyRate','NumCompaniesWorked','PercentSalaryHike','TotalWorkingYears',
+           'TrainingTimesLastYear','YearsAtCompany',
+           'YearsInCurrentRole','YearsSinceLastPromotion','YearsWithCurrManager')

> ##Exploratory Data Analysis
>
> #Vizualization of Attrition
> attr %>%
+   group_by(Attrition) %>%
+   tally() %>%
```

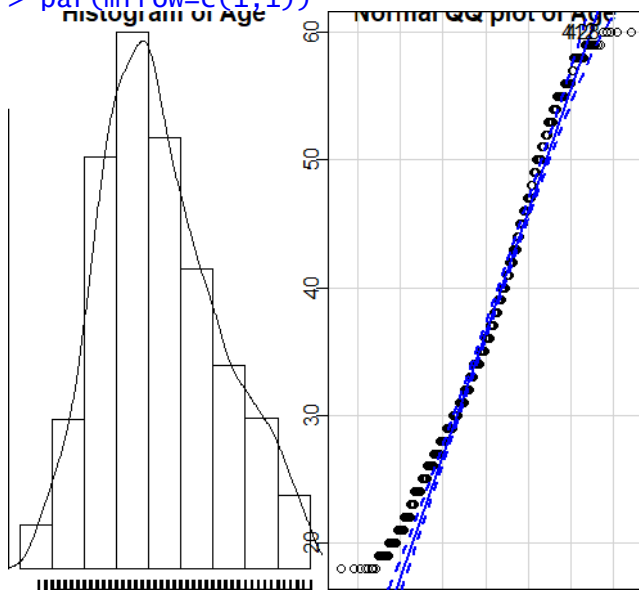
```
+ ggplot(aes(x =Attrition,y = n,fill=Attrition)) +
+ geom_bar(stat = "identity") +
+ theme_minimal()+
+ labs(x="Attrition", y="Count of Attrition")+
+ ggtitle("Attrition")+
+ geom_text(aes(label = n), vjust = -0.5, position = position_dodge(0.9))
```



```
#Influence of features on Attrition
> ggplot(data=attr, aes(attr$Age)) +
+ geom_histogram(breaks=seq(20, 50, by=2),
+               col="red",
+               aes(fill=..count..))+
+ labs(x="Age", y="Count")+
+ scale_fill_gradient("Count", low="yellow", high="dark red")
```

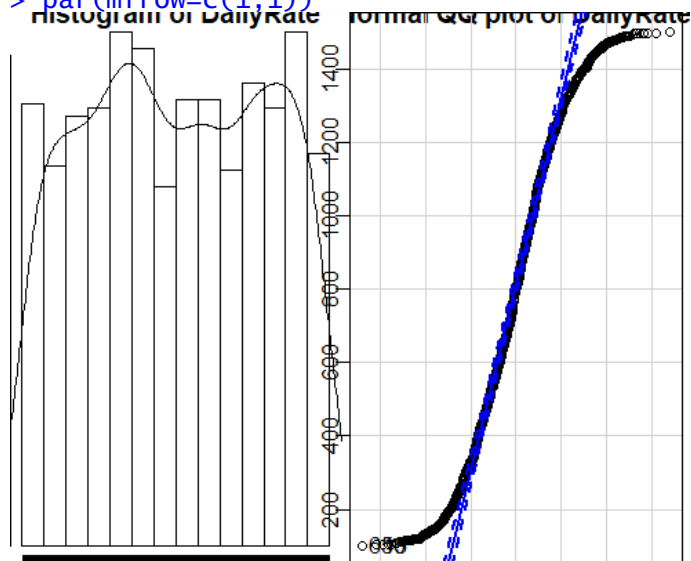


```
> #Checking for distributions in numerical columns
> #The qqPlot show a few extreme outliers which break the assumption of 95% confidence
> #normal distribution
> par(mfrow = c(1,2))
> hist(attr$Age,xlab='',main = 'Histogram of Age',freq = FALSE)
> lines(density(attr$Age,na.rm = T))
> rug(jitter(attr$Age))
> qqPlot(attr$Age,main='Normal QQ plot of Age')
[1] 412 428
> par(mfrow=c(1,1))
```

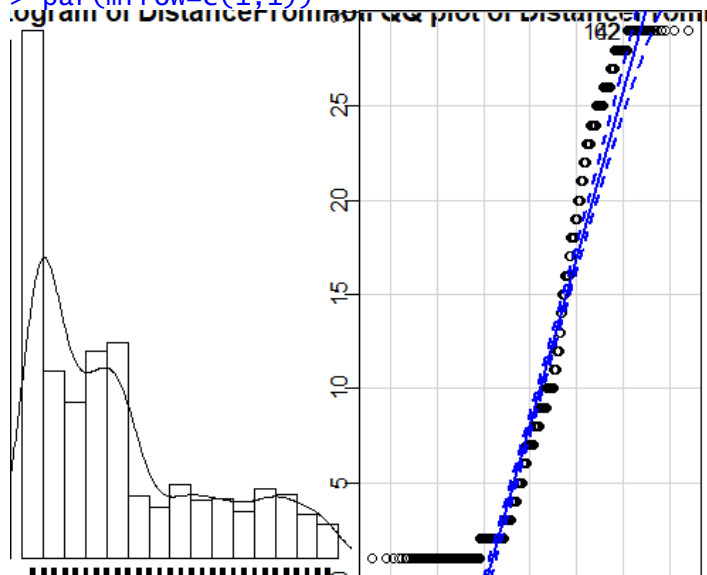


```
> par(mfrow = c(1,2))
```

```
> hist(attr$DailyRate,xlab='',main = 'Histogram of DailyRate',freq = FALSE)
> lines(density(attr$DailyRate,na.rm = T))
> rug(jitter(attr$DailyRate))
> qqPlot(attr$DailyRate,main='Normal QQ plot of DailyRate')
[1] 650 15
> par(mfrow=c(1,1))
```



```
> par(mfrow = c(1,2))
> hist(attr$DistanceFromHome,xlab='',main = 'Histogram of DistanceFromHome',freq = FALSE)
> lines(density(attr$DistanceFromHome,na.rm = T))
> rug(jitter(attr$DistanceFromHome))
> qqPlot(attr$DistanceFromHome,main='Normal QQ plot of DistanceFromHome')
[1] 62 142
> par(mfrow=c(1,1))
```

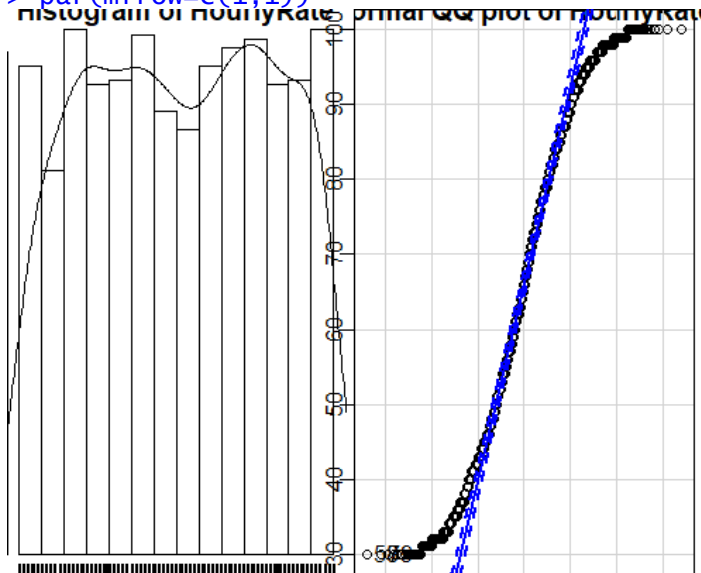


```
> par(mfrow = c(1,2))
> hist(attr$HourlyRate,xlab='',main = 'Histogram of HourlyRate',freq = FALSE)
> lines(density(attr$HourlyRate,na.rm = T))
> rug(jitter(attr$HourlyRate))
> qqPlot(attr$HourlyRate,main='Normal QQ plot of HourlyRate')
```



```
[1] 58 79
```

```
> par(mfrow=c(1,1))
```



```
> par(mfrow = c(1,2))
```

```
> hist(attr$MonthlyIncome,xlab='',main = 'Histogram of Monthly Income',freq = FALSE)
```

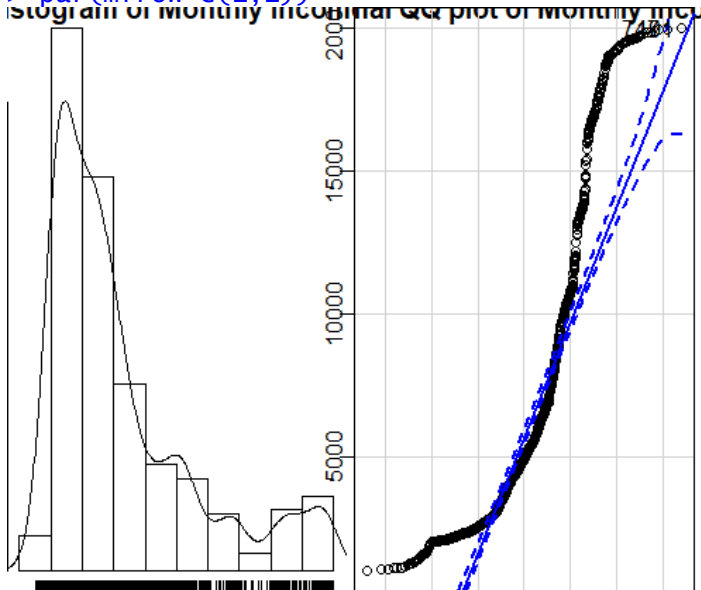
```
> lines(density(attr$MonthlyIncome,na.rm = T))
```

```
> rug(jitter(attr$MonthlyIncome))
```

```
> qqPlot(attr$MonthlyIncome,main='Normal QQ plot of Monthly Income')
```

```
[1] 191 747
```

```
> par(mfrow=c(1,1))
```



```
> par(mfrow = c(1,2))
```

```
> hist(attr$NumCompaniesWorked,xlab='',main = 'Histogram of NumCompaniesWorked',freq = FALSE)
```

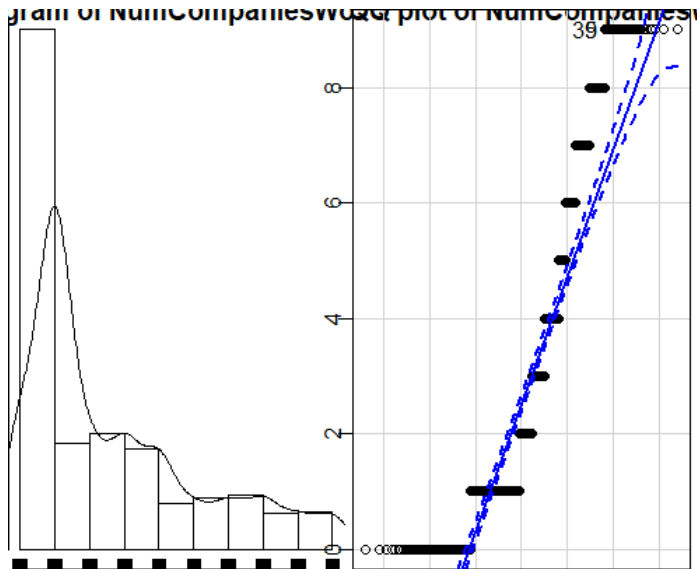
```
> lines(density(attr$NumCompaniesWorked,na.rm = T))
```

```
> rug(jitter(attr$NumCompaniesWorked))
```

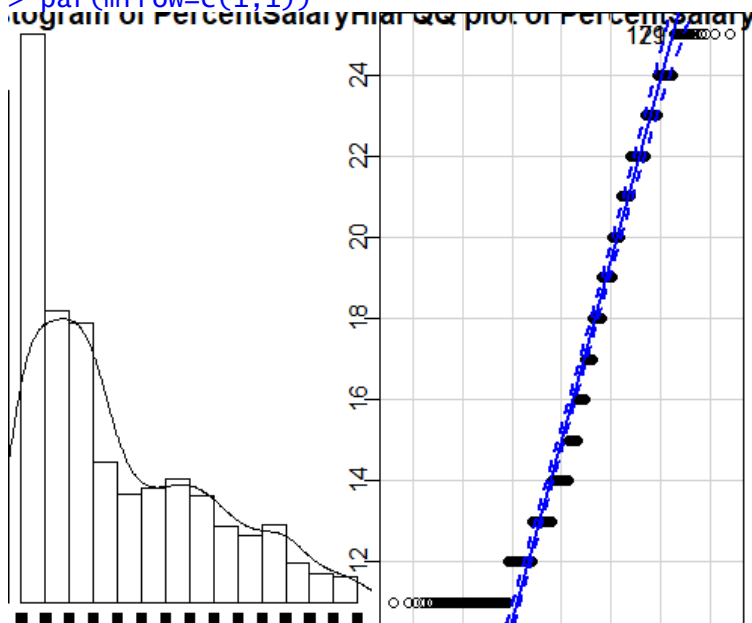
```
> qqPlot(attr$NumCompaniesWorked,main='Normal QQ plot of NumCompaniesWorked')
```

```
[1] 5 39
```

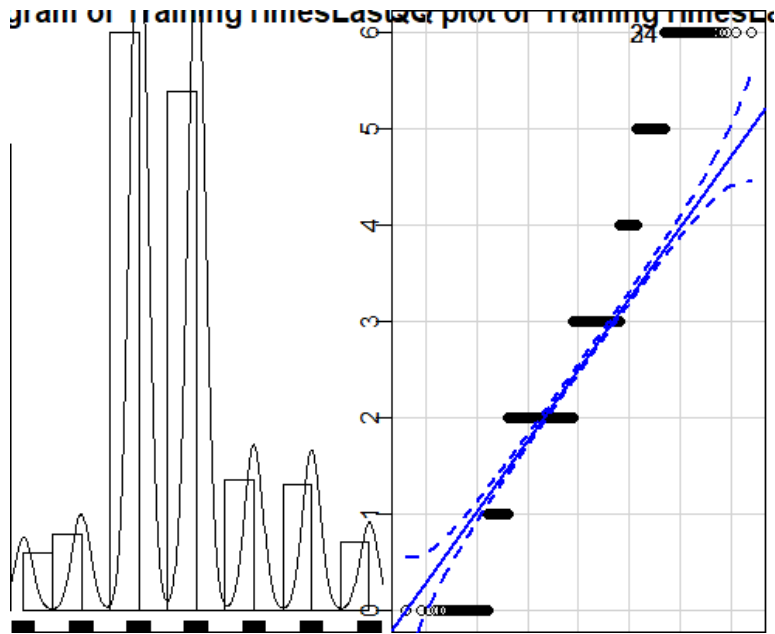
```
> par(mfrow=c(1,1))
```



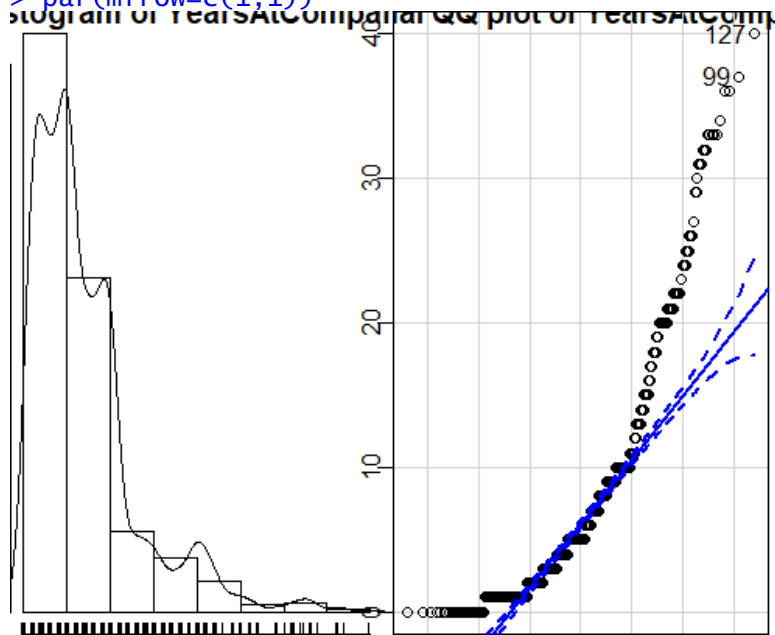
```
> par(mfrow = c(1,2))
> hist(attr$PercentSalaryHike,xlab='',main = 'Histogram of PercentSalaryHike',freq = FALSE)
> lines(density(attr$PercentSalaryHike,na.rm = T))
> rug(jitter(attr$PercentSalaryHike))
> qqPlot(attr$PercentSalaryHike,main='Normal QQ plot of PercentSalaryHike')
[1] 121 179
> par(mfrow=c(1,1))
```



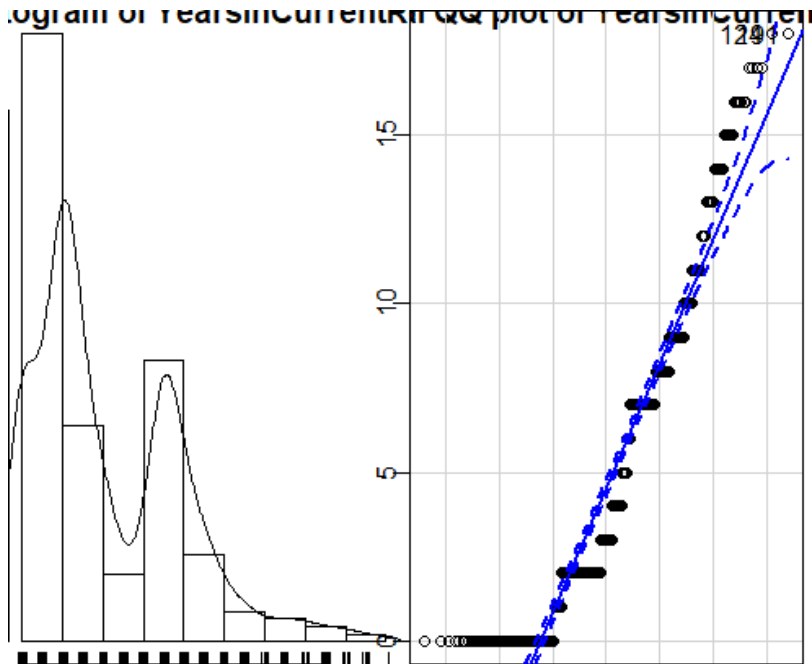
```
> par(mfrow = c(1,2))
> hist(attr$TrainingTimesLastYear,xlab='',main = 'Histogram of TrainingTimesLastYear',freq = FALSE)
> lines(density(attr$TrainingTimesLastYear,na.rm = T))
> rug(jitter(attr$TrainingTimesLastYear))
> qqPlot(attr$TrainingTimesLastYear,main='Normal QQ plot of TrainingTimesLastYear')
[1] 24 34
> par(mfrow=c(1,1))
```



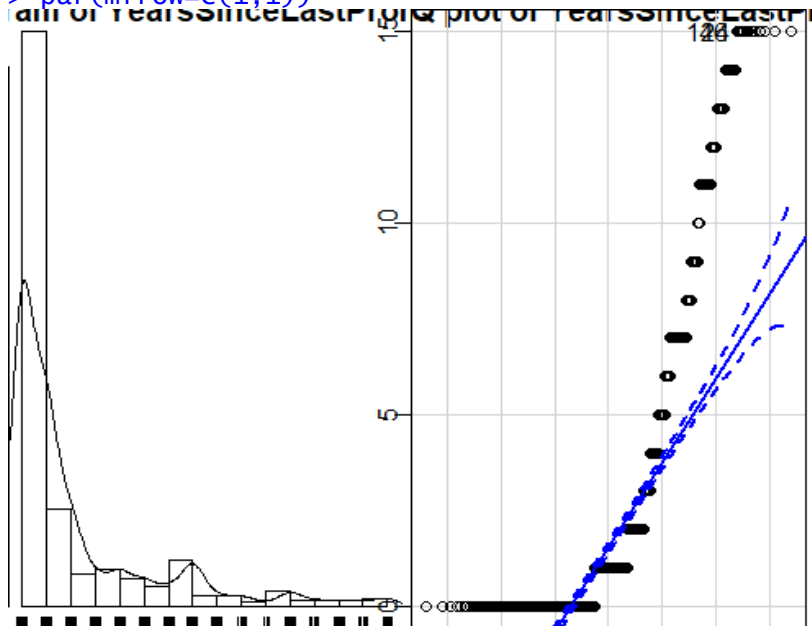
```
> par(mfrow = c(1,2))
> hist(attr$YearsAtCompany,xlab='',main = 'Histogram of YearsAtCompany',freq = FALSE)
> lines(density(attr$YearsAtCompany,na.rm = T))
> rug(jitter(attr$YearsAtCompany))
> qqPlot(attr$YearsAtCompany,main='Normal QQ plot of YearsAtCompany')
[1] 127 99
> par(mfrow=c(1,1))
```



```
> par(mfrow = c(1,2))
> hist(attr$YearsInCurrentRole,xlab='',main = 'Histogram of YearsInCurrentRole',freq = FALSE)
> lines(density(attr$YearsInCurrentRole,na.rm = T))
> rug(jitter(attr$YearsInCurrentRole))
> qqPlot(attr$YearsInCurrentRole,main='Normal QQ plot of YearsInCurrentRole')
[1] 124 191
> par(mfrow=c(1,1))
```

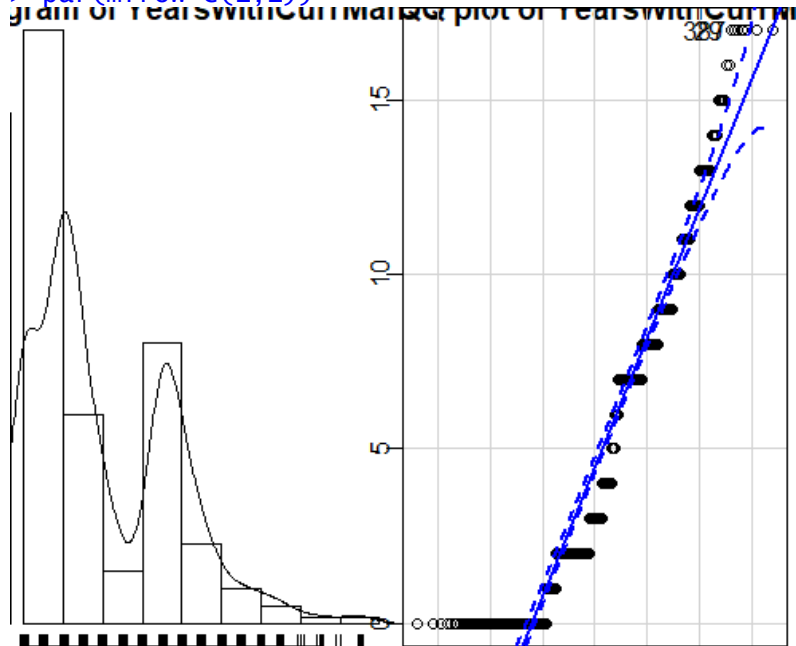


```
> par(mfrow = c(1,2))
> hist(attr$YearsSinceLastPromotion,xlab='',main = 'Histogram of YearsSinceLastPromotion',freq = FALSE)
> lines(density(attr$YearsSinceLastPromotion,na.rm = T))
> rug(jitter(attr$YearsSinceLastPromotion))
> qqPlot(attr$YearsSinceLastPromotion,main='Normal QQ plot of YearsSinceLastPromotion')
[1] 46 124
> par(mfrow=c(1,1))
```

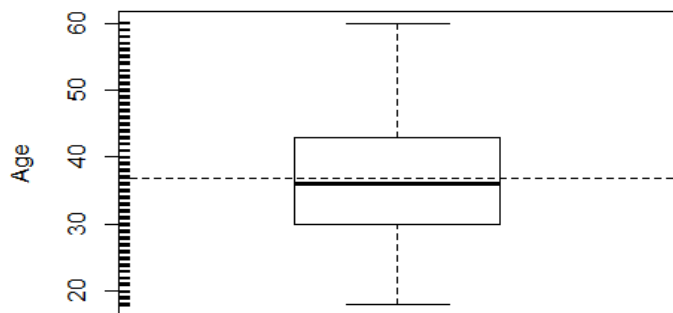


```
> par(mfrow = c(1,2))
> hist(attr$YearsWithCurrManager,xlab='',main = 'Histogram of YearsWithCurrManager',freq = FALSE)
> lines(density(attr$YearsWithCurrManager,na.rm = T))
> rug(jitter(attr$YearsWithCurrManager))
> qqPlot(attr$YearsWithCurrManager,main='Normal QQ plot of YearsWithCurrManager')
[1] 29 387
```

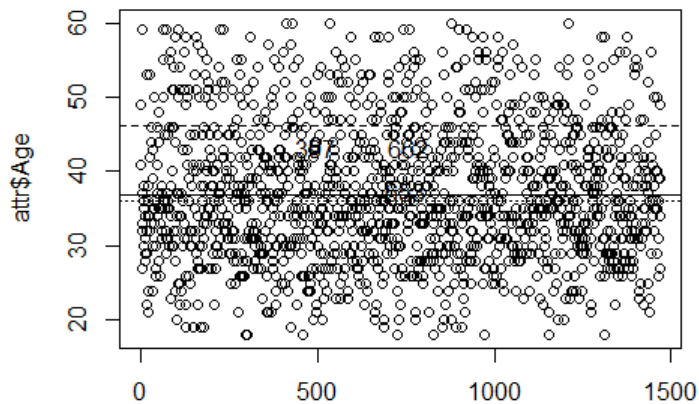
```
> par(mfrow=c(1,1))
```



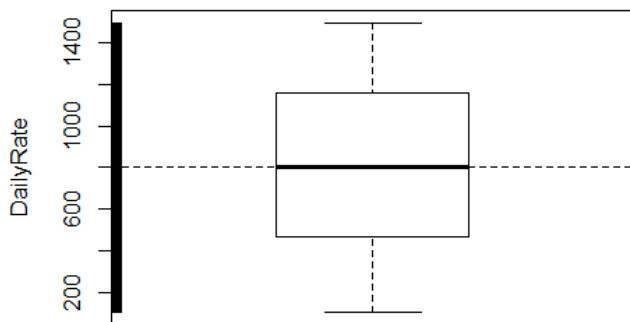
```
> #Boxplot distributions for our numeric columns
> #The dashed line shows the mean and the dark center line shows the median
> #Difference between these two lines depict the deviation from the central limit theorem
> #Boxplot distributions for Age
> boxplot(attr$Age, ylab = "Age")
> rug(jitter(attr$Age), side = 2)
> abline(h = mean(attr$Age, na.rm = T), lty = 2)
```



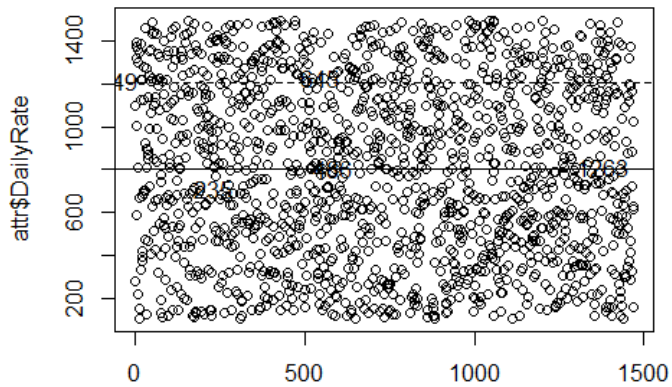
```
> #Plotting the Age with 3 lines for mean, median and mean+std
> plot(attr$Age, xlab = "")
> abline(h = mean(attr$Age, na.rm = T), lty = 1)
> abline(h = mean(attr$Age, na.rm = T) + sd(attr$Age, na.rm = T), lty = 2)
> abline(h = median(attr$Age, na.rm = T), lty = 3)
> identify(attr$Age)
[1] 286 696 709 720 1174 1323
```



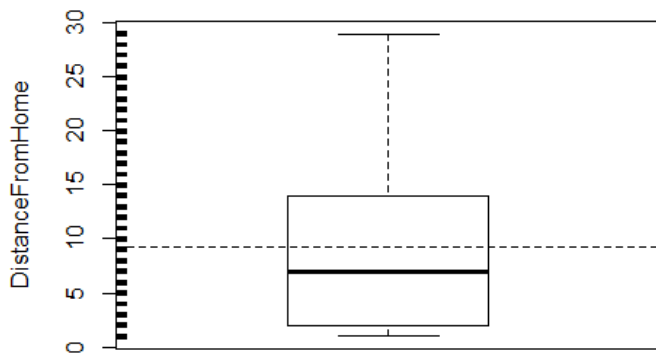
```
> #Boxplot distributions for Daily rate
> boxplot(attr$DailyRate, ylab = "DailyRate",outline = TRUE)
> rug(jitter(attr$DailyRate), side = 2)
> abline(h = mean(attr$DailyRate, na.rm = T), lty = 2)
```



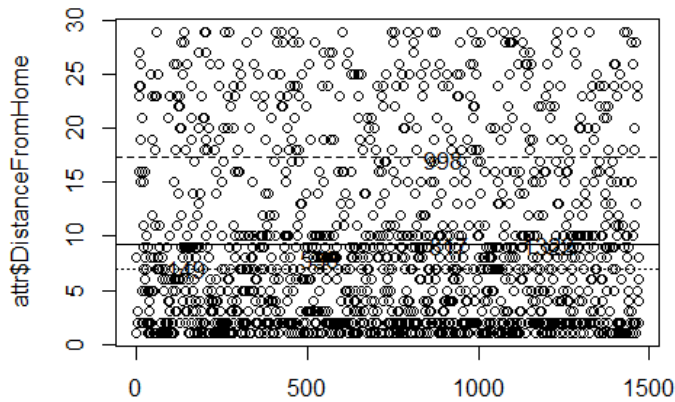
```
> #Plotting the DailyRate with 3 lines for mean, median and mean+std
> plot(attr$DailyRate, xlab = "")
> abline(h = mean(attr$DailyRate, na.rm = T), lty = 1)
> abline(h = mean(attr$DailyRate, na.rm = T) + sd(attr$DailyRate, na.rm = T), lty = 2)
> abline(h = median(attr$DailyRate, na.rm = T), lty = 3)
> identify(attr$DailyRate)
[1] 49 235 486 645 1263
```



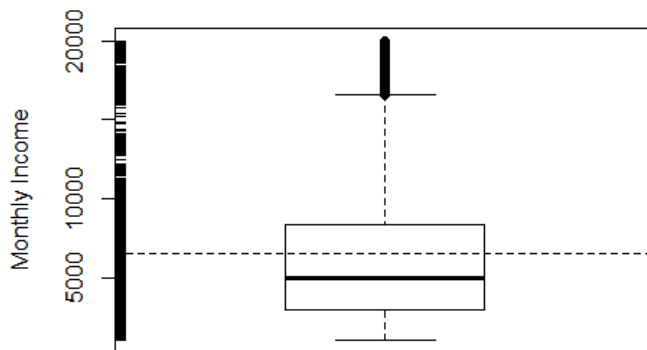
```
> #Boxplot distributions for Distance from home
> boxplot(attr$DistanceFromHome, ylab = "DistanceFromHome",outline = TRUE)
> rug(jitter(attr$DistanceFromHome), side = 2)
> abline(h = mean(attr$DistanceFromHome, na.rm = T), lty = 2)
```



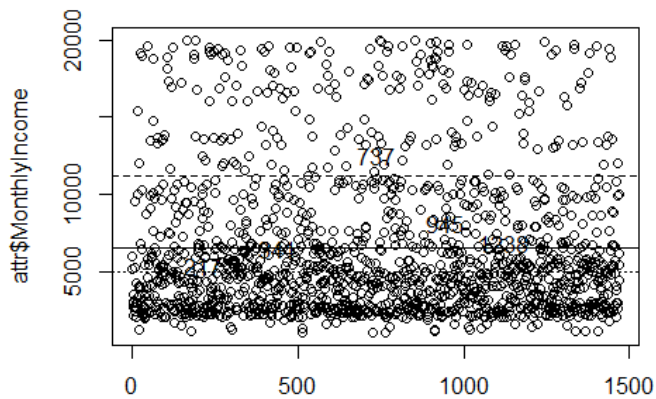
```
> plot(attr$DistanceFromHome, xlab = "")
> abline(h = mean(attr$DistanceFromHome, na.rm = T), lty = 1)
> abline(h = mean(attr$DistanceFromHome, na.rm = T) + sd(attr$DistanceFromHome, na.rm = T), lty = 2)
> abline(h = median(attr$DistanceFromHome, na.rm = T), lty = 3)
> identify(attr$DistanceFromHome)
[1] 149 538 817 998 1322
```



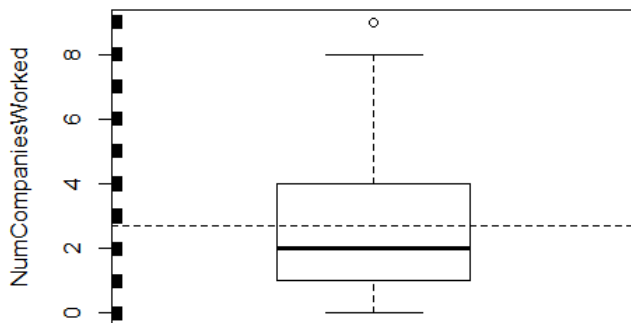
```
> #Boxplot distributions for Monthly Income
> boxplot(attr$MonthlyIncome, ylab = "Monthly Income")
> rug(jitter(attr$MonthlyIncome), side = 2)
> abline(h = mean(attr$MonthlyIncome, na.rm = T), lty = 2)
```



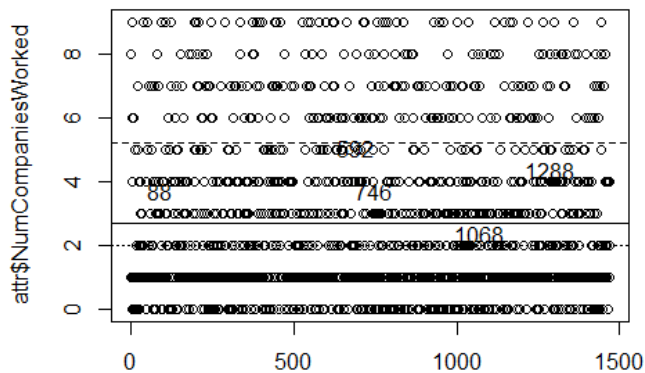
```
> #Plotting the Monthly Income and Age with 3 lines for mean, median and mean+std
> plot(attr$MonthlyIncome, xlab = "")
> abline(h = mean(attr$MonthlyIncome, na.rm = T), lty = 1)
> abline(h = mean(attr$MonthlyIncome, na.rm = T) + sd(attr$MonthlyIncome, na.rm = T), lty = 2)
> abline(h = median(attr$MonthlyIncome, na.rm = T), lty = 3)
> identify(attr$MonthlyIncome)
[1] 217 341 737 945 1238
```

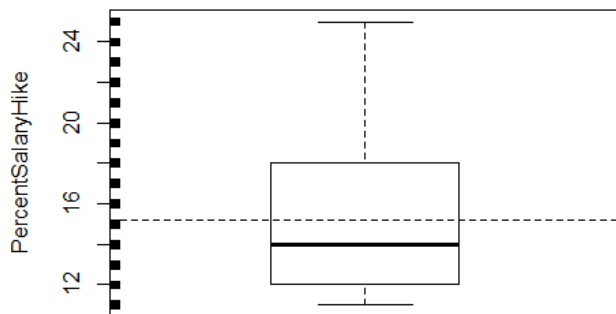
```
> #Boxplot distributions for NumCompaniesWorked
> boxplot(attr$NumCompaniesWorked, ylab = "NumCompaniesWorked")
> rug(jitter(attr$NumCompaniesWorked), side = 2)
> abline(h = mean(attr$NumCompaniesWorked, na.rm = T), lty = 2)
```



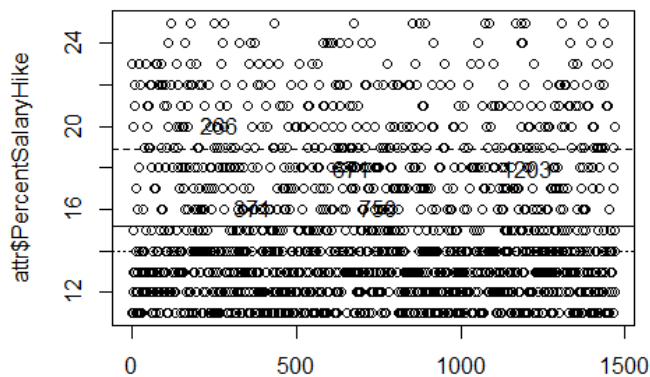
```
> #Plotting the NumCompaniesWorked with 3 lines for mean, median and mean+std
> plot(attr$NumCompaniesWorked, xlab = "")
> abline(h = mean(attr$NumCompaniesWorked, na.rm = T), lty = 1)
> abline(h = mean(attr$NumCompaniesWorked, na.rm = T) + sd(attr$NumCompaniesWorked, na.rm =
T), lty = 2)
> abline(h = median(attr$NumCompaniesWorked, na.rm = T), lty = 3)
> identify(attr$NumCompaniesWorked)
[1] 88 592 746 1068 1288
```



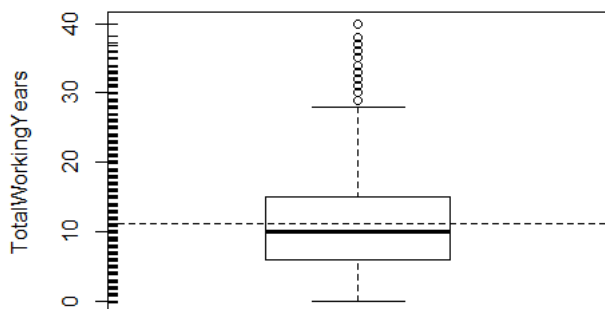
```
> #Boxplot distributions for PercentSalaryHike
> boxplot(attr$PercentSalaryHike, ylab = "PercentSalaryHike")
> rug(jitter(attr$PercentSalaryHike), side = 2)
> abline(h = mean(attr$PercentSalaryHike, na.rm = T), lty = 2)
```



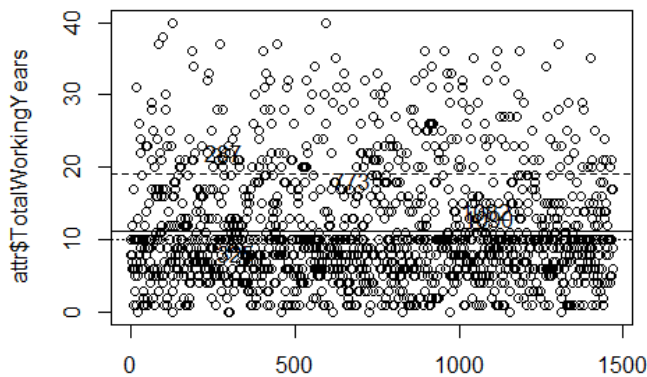
```
> #Plotting the PercentSalaryHike with 3 lines for mean, median and mean+std
> plot(attr$PercentSalaryHike, xlab = "")
> abline(h = mean(attr$PercentSalaryHike, na.rm = T), lty = 1)
> abline(h = mean(attr$PercentSalaryHike, na.rm = T) + sd(attr$PercentSalaryHike, na.rm = T), lty = 2)
> abline(h = median(attr$PercentSalaryHike, na.rm = T), lty = 3)
> identify(attr$PercentSalaryHike)
[1] 266 371 671 750 1203
```



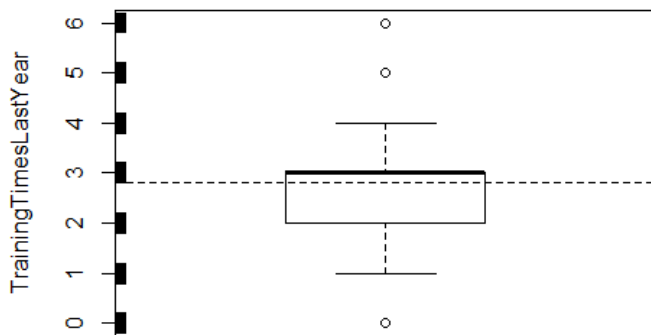
```
> #Boxplot distributions for TotalWorkingYears
> boxplot(attr$TotalWorkingYears, ylab = "TotalWorkingYears")
> rug(jitter(attr$TotalWorkingYears), side = 2)
> abline(h = mean(attr$TotalWorkingYears, na.rm = T), lty = 2)
```



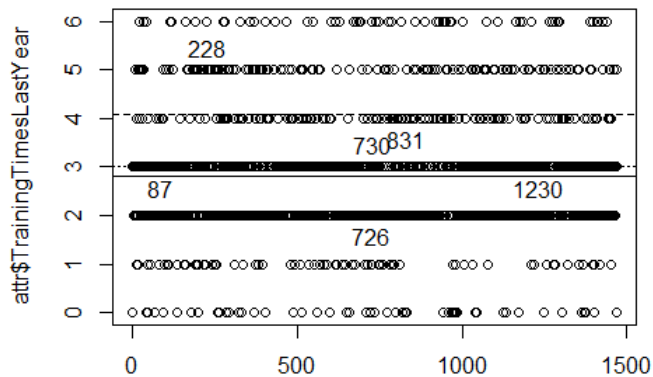
```
> #Plotting the TotalWorkingYears with 3 lines for mean, median and mean+std
> plot(attr$TotalWorkingYears, xlab = "")
> abline(h = mean(attr$TotalWorkingYears, na.rm = T), lty = 1)
> abline(h = mean(attr$TotalWorkingYears, na.rm = T) + sd(attr$TotalWorkingYears, na.rm = T),
+ lty = 2)
> abline(h = median(attr$TotalWorkingYears, na.rm = T), lty = 3)
> identify(attr$TotalWorkingYears)
[1] 287 325 773 1082 1090
```



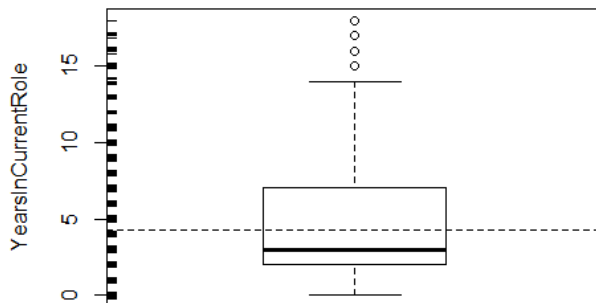
```
> #Boxplot distributions for TrainingTimesLastYear
> boxplot(attr$TrainingTimesLastYear, ylab = "TrainingTimesLastYear")
> rug(jitter(attr$TrainingTimesLastYear), side = 2)
> abline(h = mean(attr$TrainingTimesLastYear, na.rm = T), lty = 2)
```



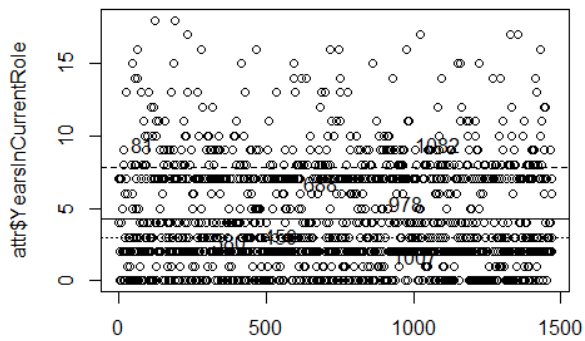
```
> #Plotting the TrainingTimesLastYear with 3 lines for mean, median and mean+std
> plot(attr$TrainingTimesLastYear, xlab = "")
> abline(h = mean(attr$TrainingTimesLastYear, na.rm = T), lty = 1)
> abline(h = mean(attr$TrainingTimesLastYear, na.rm = T) + sd(attr$TrainingTimesLastYear, na.rm = T), lty = 2)
> abline(h = median(attr$TrainingTimesLastYear, na.rm = T), lty = 3)
> identify(attr$TrainingTimesLastYear)
[1] 87 228 726 730 831 1230
```



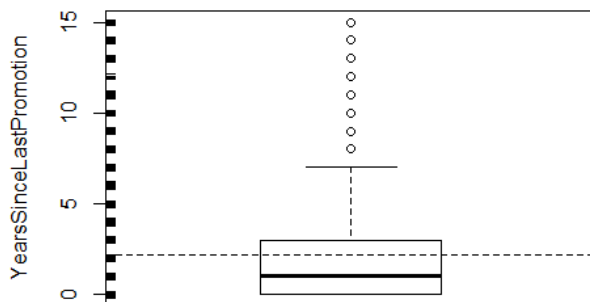
```
> #Boxplot distributions for YearsInCurrentRole
> boxplot(attr$YearsInCurrentRole, ylab = "YearsInCurrentRole")
> rug(jitter(attr$YearsInCurrentRole), side = 2)
> abline(h = mean(attr$YearsInCurrentRole, na.rm = T), lty = 2)
```



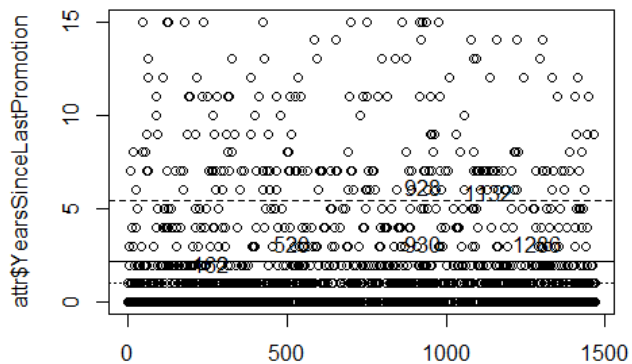
```
> #Plotting the YearsInCurrentRole with 3 lines for mean, median and mean+std
> plot(attr$YearsInCurrentRole, xlab = "")
> abline(h = mean(attr$YearsInCurrentRole, na.rm = T), lty = 1)
> abline(h = mean(attr$YearsInCurrentRole, na.rm = T) + sd(attr$YearsInCurrentRole, na.rm = T), lty = 2)
> abline(h = median(attr$YearsInCurrentRole, na.rm = T), lty = 3)
> identify(attr$YearsInCurrentRole)
[1] 81 380 450 688 978 1007 1082
```



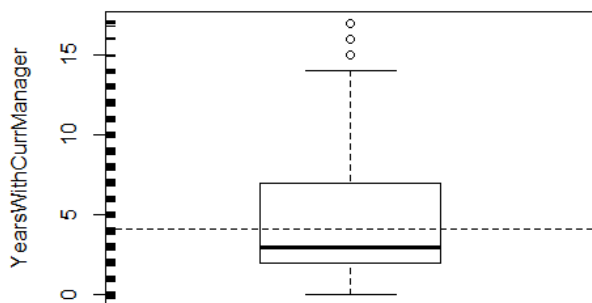
```
> #Boxplot distributions for YearsSinceLastPromotion
> boxplot(attr$YearsSinceLastPromotion, ylab = "YearsSinceLastPromotion")
> rug(jitter(attr$YearsSinceLastPromotion), side = 2)
> abline(h = mean(attr$YearsSinceLastPromotion, na.rm = T), lty = 2)
```



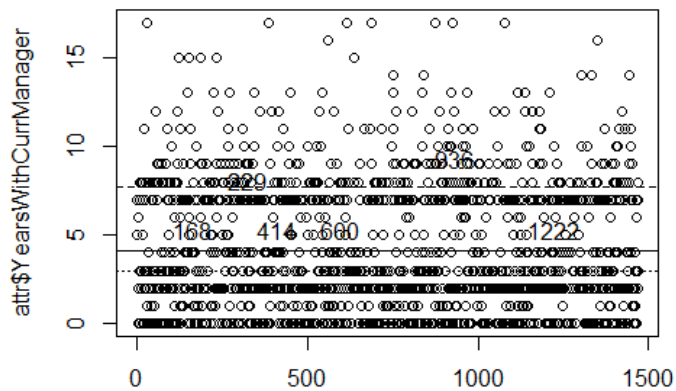
```
> #Plotting the YearsSinceLastPromotion with 3 lines for mean, median and mean+std
> plot(attr$YearsSinceLastPromotion, xlab = "")
> abline(h = mean(attr$YearsSinceLastPromotion, na.rm = T), lty = 1)
> abline(h = mean(attr$YearsSinceLastPromotion, na.rm = T) + sd(attr$YearsSinceLastPromotion
, na.rm = T), lty = 2)
> abline(h = median(attr$YearsSinceLastPromotion, na.rm = T), lty = 3)
> identify(attr$YearsSinceLastPromotion)
[1] 162 520 928 930 1132 1286
```



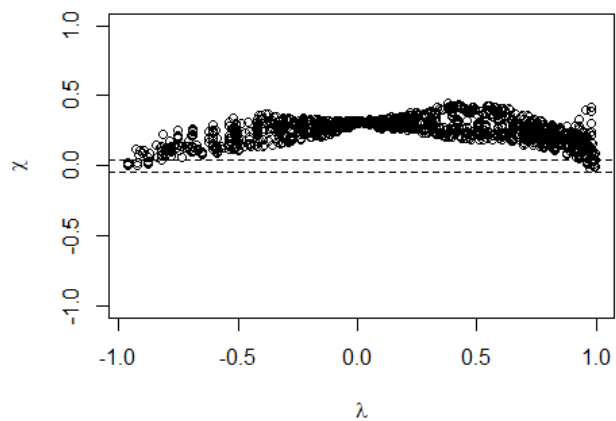
```
> #Boxplot distributions for YearsWithCurrManager
> boxplot(attr$YearsWithCurrManager, ylab = "YearsWithCurrManager")
> rug(jitter(attr$YearsWithCurrManager), side = 2)
> abline(h = mean(attr$YearsWithCurrManager, na.rm = T), lty = 2)
```



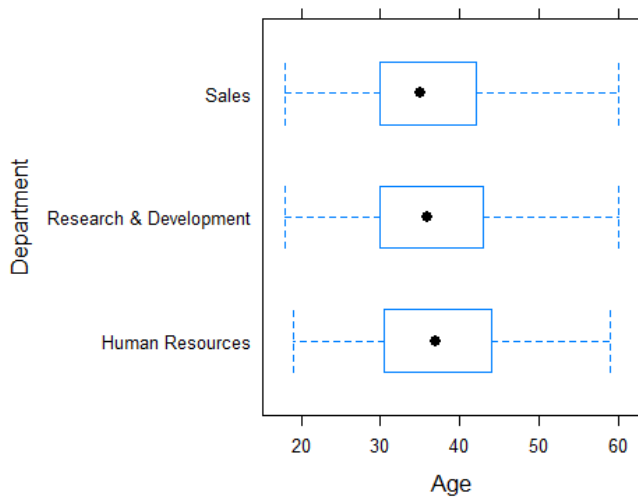
```
> #Boxplot distributions for YearsWithCurrManager
> plot(attr$YearsWithCurrManager, xlab = "")
> abline(h = mean(attr$YearsWithCurrManager, na.rm = T), lty = 1)
> abline(h = mean(attr$YearsWithCurrManager, na.rm = T) + sd(attr$YearsWithCurrManager, na.r
m = T), lty = 2)
> abline(h = median(attr$YearsWithCurrManager, na.rm = T), lty = 3)
> identify(attr$YearsWithCurrManager)
[1] 168 229 414 600 936 1222
```



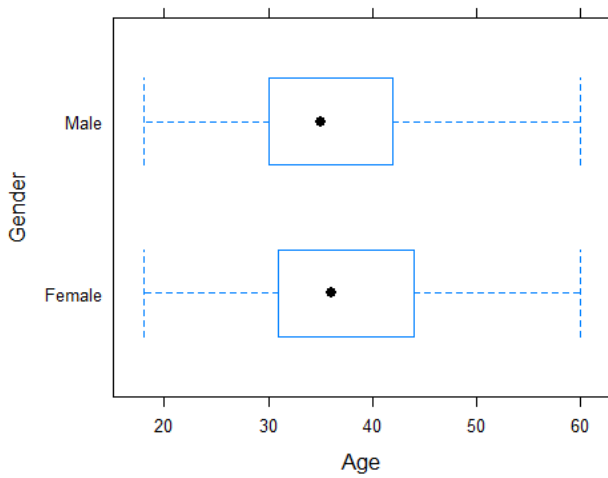
```
> #Chi plot for inspecting the independence
> chi.plot(attr$MonthlyIncome,attr$Age)
```



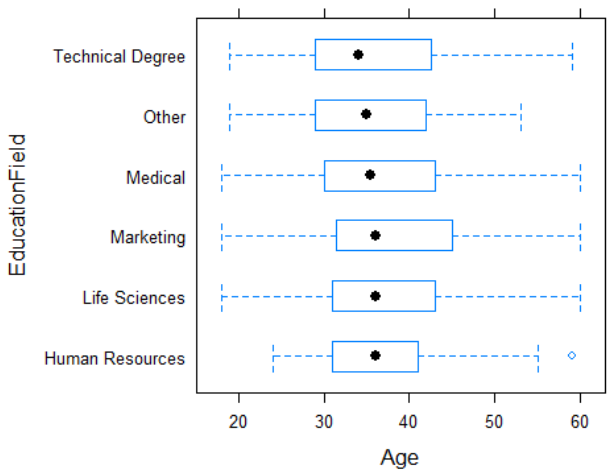
```
> #Plotting joint boxplots for various categories wrt Age
> bwplot(attr$Department ~ attr$Age, data=attr, ylab='Department',xlab='Age')
```

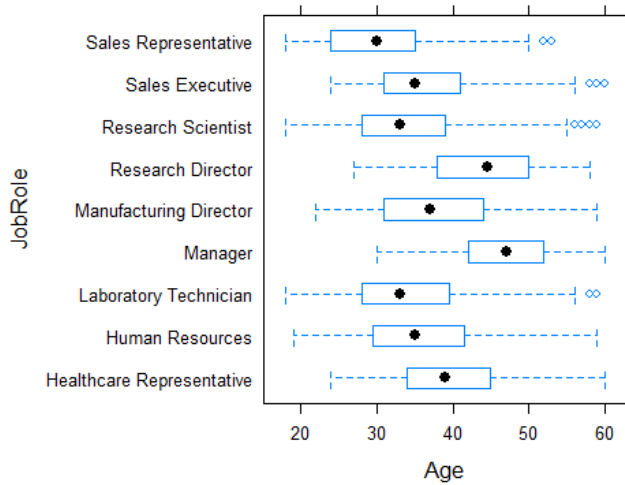
```
> bwplot(attr$Gender ~ attr$Age, data=attr, ylab='Gender',xlab='Age')
```



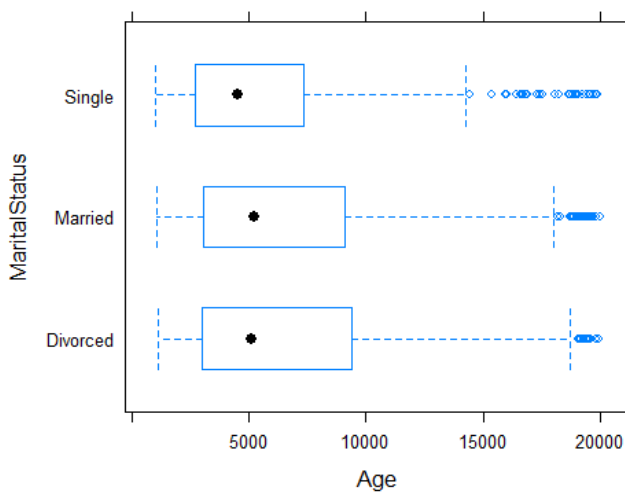
```
> bwplot(attr$EducationField ~ attr$Age, data=attr, ylab='EducationField',xlab='Age')
```



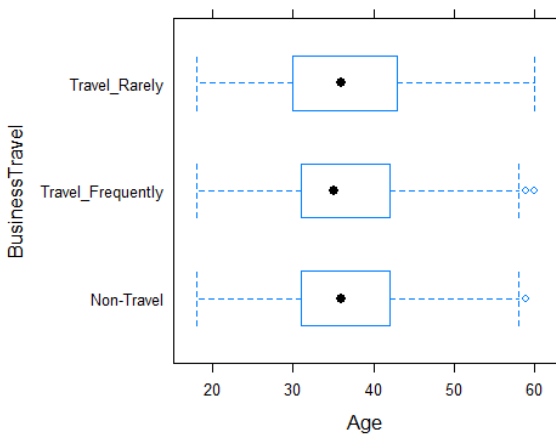
```
> bwplot(attr$JobRole ~ attr$Age, data=attr, ylab='JobRole',xlab='Age')
```



```
> bwplot(attr$MaritalStatus ~ attr$MonthlyIncome, data=attr, ylab='MaritalStatus',xlab='Age')
)
```

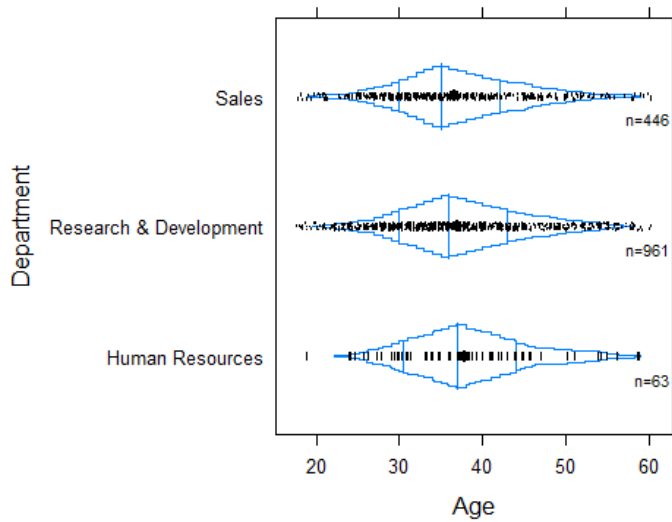


```
> bwplot(attr$BusinessTravel ~ attr$Age, data=attr, ylab='BusinessTravel',xlab='Age')
```

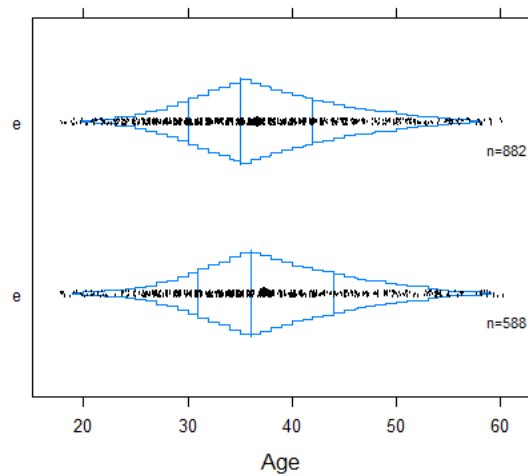


#Plotting stripplots for various categories wrt numerical column TotalCharges

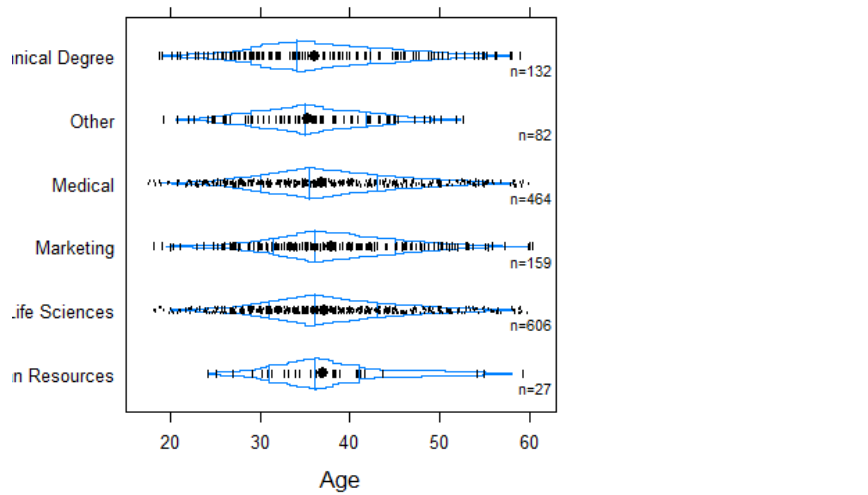
```
> bwplot(attr$Department ~ attr$Age, data=attr, panel=panel.bpplot,
+         probs=seq(.01,.49,by=.01), datadensity=TRUE, ylab='Department',xlab='Age')
```



```
ot(attr$Gender ~ attr$Age, data=attr, panel=panel.bpplot,
    probs=seq(.01,.49,by=.01), datadensity=TRUE, ylab='Gender',xlab='Age')
```



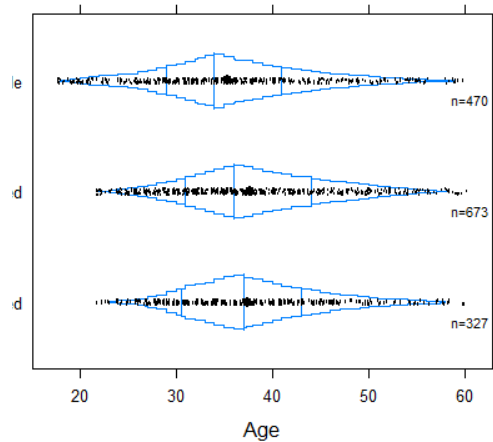
```
ot(attr$EducationField ~ attr$Age, data=attr, panel=panel.bpplot,
    probs=seq(.01,.49,by=.01), datadensity=TRUE, ylab='EducationField',xlab='Age')
```



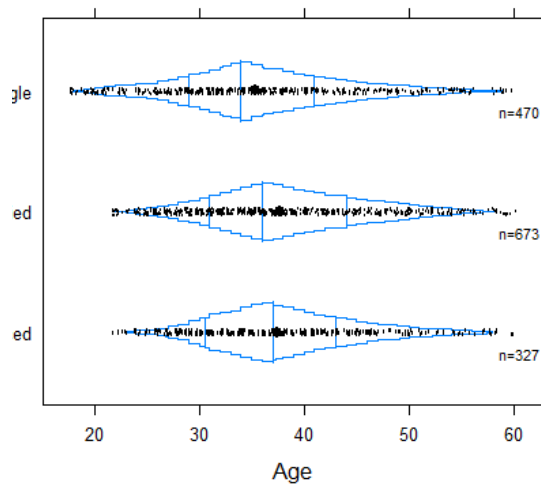
```
plot(attr$JobRole ~ attr$Age, data=attr, panel=panel.bplot,
      probs=seq(.01,.49,by=.01), datadensity=TRUE, ylab='JobRole', xlab='Age')
```



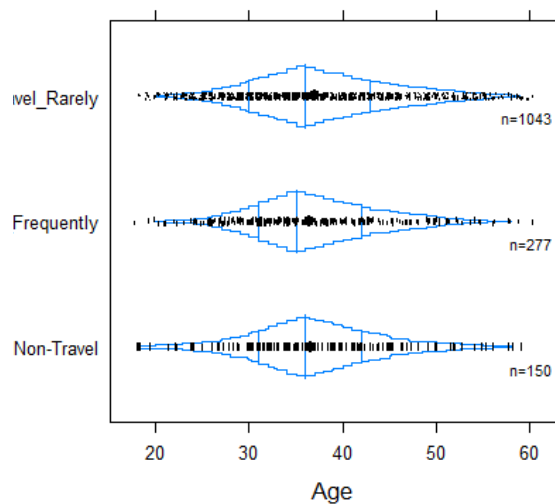
```
plot(attr$MaritalStatus ~ attr$Age, data=attr, panel=panel.bplot,
      probs=seq(.01,.49,by=.01), datadensity=TRUE, ylab='MaritalStatus', xlab='Age')
```



```
ot(attr$MaritalStatus ~ attr$Age, data=attr,panel=panel.bppplot,
  probs=seq(.01,.49,by=.01), datadensity=TRUE, ylab='MaritalStatus',xlab='Age')
```

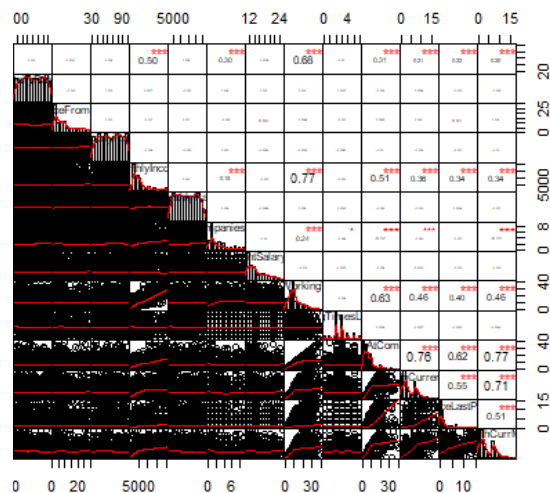


```
ot(attr$BusinessTravel ~ attr$Age, data=attr,panel=panel.bppplot,
  probs=seq(.01,.49,by=.01), datadensity=TRUE, ylab='BusinessTravel',xlab='Age')
```



```
:-attr[,c('Age','DailyRate','DistanceFromHome','HourlyRate',
  'MonthlyIncome','MonthlyRate','NumCompaniesWorked','PercentsSalaryHike','TotalWor
  'TrainingTimesLastYear','YearsAtCompany',
  'YearsInCurrentRole','YearsSinceLastPromotion','YearsWithCurrManager')]
```

```
:.Correlation(data,histogram = TRUE,pch=19)
```



Creating Temporary Variables

```

# Converting double/int columns to numeric
numeric_col <- c("Age", "DailyRate", "DistanceFromHome", "HourlyRate",
                 "MonthlyIncome", "MonthlyRate", "NumCompaniesWorked", "PercentSalaryHike", "TotalCompensation",
                 "TrainingTimesLastYear", "YearsAtCompany",
                 "YearsInCurrentRole", "YearsSinceLastPromotion", "YearsWithCurrManager")
attr[numeric_col] <- sapply(attr[numeric_col], as.numeric)

# Extract the numeric columns from categorical columns and storing them as a separate dataframe
attr_i <- attr[,c("Age", "DailyRate", "DistanceFromHome", "HourlyRate",
                 "MonthlyIncome", "MonthlyRate", "NumCompaniesWorked", "PercentSalaryHike", "TotalCompensation",
                 "TrainingTimesLastYear", "YearsAtCompany",
                 "YearsInCurrentRole", "YearsSinceLastPromotion", "YearsWithCurrManager")]
attr_i <- data.frame(scale(attr_i))

# Creating temporary variables for the categorical data
attr_c <- attr[, -c(2, 3, 5, 8, 10, 11, 12, 13, 14, 15, 19, 21, 22, 23)]
attr_c <- data.frame(sapply(attr_c, function(x) data.frame(model.matrix(~x-1, data = attr_c))[, 2:nrow(model.matrix(~x-1, data = attr_c))]))
attr_c <- data.frame(sapply(attr_c, function(x) data.frame(model.matrix(~x-1, data = attr_c))[, 2:nrow(model.matrix(~x-1, data = attr_c))]))

# EnvironmentSatisfaction.x2 Education.x3 Education.x4 Education.x5 EnvironmentSatisfaction.x2 EnvironmentSatisfaction.x3
1 0 0 0 0 1
0 0 0 0 0 0
1 0 0 0 0 0
0 0 1 0 0 0
0 0 0 0 0 0
1 0 0 0 0 0

# EnvironmentSatisfaction.x4 MaritalStatus.xMarried MaritalStatus.xSingle overTime StockOptionLevel.x2
0 0 0 1 1
0 1 1 0 0
1 0 1 1 1
1 1 0 0 0
0 1 0 0 0
1 0 1 0 0

# StockOptionLevel.x2 StockOptionLevel.x3 workLifeBalance.x2 workLifeBalance.x3 workLifeBalance.x4
0 0 0 0 0
0 0 0 0 1
0 0 0 0 1
0 0 0 0 1
0 0 0 0 1
0 0 1 1 0

```

attr)

Joining the temporary and the numeric columns and create the final dataset
final <- cbind(attr_i,temporary)

attr_final)

HourlyRate	DistanceFromHome	HourlyRate	MonthlyIncome	MonthlyRate	NumCompaniesWorked	
0.619856	0.7422739	-1.0105654	1.3826677	-0.1083127	0.7257730	2.124413
1.191535	-1.2973331	-0.1470997	-0.2405949	-0.2916193	1.4883696	-0.677818
0.0834016	1.4138821	-0.8872132	1.2842882	-0.9373347	-1.6742711	1.323775
0.951824	1.4609690	-0.7638609	-0.4865438	-0.7633739	1.2427877	-0.677818
0.630583	-0.5241163	-0.8872132	-1.2735802	-0.6446387	0.3257890	2.524731
0.898284	0.5018828	-0.8872132	0.6448211	-0.7296013	-0.3440822	-1.078137
SalaryHike	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole		
-1.15016269	-0.4214990	-2.1712429	-0.164557109	-0.06327437		
2.12858163	-0.1644554	0.1556541	0.488341541	0.76473737		
-0.05724792	-0.5500208	0.1556541	-1.143905083	-1.16729002		
-1.15016269	-0.4214990	0.1556541	0.161892216	0.76473737		
-0.87693400	-0.6785426	0.1556541	-0.817455758	-0.61528219		
-0.60370530	-0.4214990	-0.6199782	-0.001332446	0.76473737		
SinceLastPromotion	YearsWithCurrManager	Education.x2	Education.x3	Education.x4	Education.x5	
-0.67891464	0.2457504	1	0	0		
-0.36858985	0.8062671	0	0	0		
-0.67891464	-1.1555415	1	0	0		
0.25205973	-1.1555415	0	0	1		
-0.05826506	-0.5950247	0	0	0		
0.25205973	0.5260087	1	0	0		
EnvironmentSatisfaction.x2	EnvironmentSatisfaction.x3	EnvironmentSatisfaction.x4	MaritalStatus.x2			
1	0	0	0			
0	1	1	0			
0	0	0	1			
0	0	0	1			
0	0	0	0			
0	0	0	1			
Status.xSingle	OverTime	StockOptionLevel.x1	StockOptionLevel.x2	StockOptionLevel.x3		
1	1	0	0	0		
0	0	1	0	0		
1	1	0	0	0		
0	1	0	0	0		
0	0	1	0	0		
1	0	0	0	0		
LifeBalance.x2	WorkLifeBalance.x3	WorkLifeBalance.x4				
0	0	0	0			
0	1	0	0			
0	1	0	0			
0	1	0	0			
0	1	0	0			
1	0	0	0			

use(attr_final)

Dimensions: 1,470

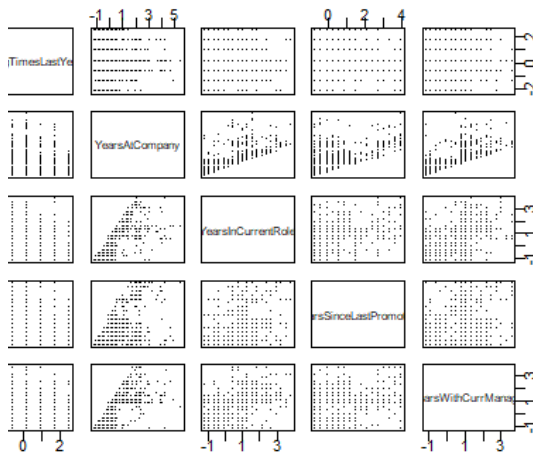
Rows: 30

HourlyRate	<dbl> 0.44619856, 1.32191535, 0.00834016, -0.42951824, -1.08630583, 0.74227393, -1.29733311, 1.41388208, 1.46096900, -0.52411634, -1.01056544, -0.14709966, -0.88721318, -0.76386093, -0.88721318, 1.38266773, -0.24059489, 1.28428818, -0.48654378, -1.27358020, -0.108312654, -0.291619349, -0.937334707, -0.763373892, -0.6446387, 0.7257730, 1.4883696, -1.6742711, 1.2427877, 0.3257890, -0.3440822, 2.1244130, -0.6778187, 1.3237753, -0.6778187, 2.5247318, -1.078137, -1.15016269, 2.12858163, -0.05724792, -1.15016269, -0.87693400, -0.42149902, -0.16445544, -0.55002081, -0.42149902, -0.6785426, -2.1712429, 0.1556541, 0.1556541, 0.1556541, 0.1556541, -0.6199782, -0.164557109, 0.488341541, -1.143905083, 0.161892216, -0.817455758, -0.06327437, 0.76473737, -1.16729002, 0.76473737, -0.61528219, -0.67891464, -0.36858985, -0.67891464, 0.25205973, -0.05826506, 0.25205973, 0.2457504, 0.8062671, -1.1555415, -1.1555415, -0.5950247, 0.5260087
DistanceFromHome	<dbl>
HourlyRate	<dbl>
MonthlyIncome	<dbl>
MonthlyRate	<dbl>
NumCompaniesWorked	<dbl>
SalaryHike	<dbl>
TotalWorkingYears	<dbl>
TrainingTimesLastYear	<dbl>
YearsAtCompany	<dbl>
YearsInCurrentRole	<dbl>
SinceLastPromotion	<dbl>
YearsWithCurrManager	<dbl>

```

x Plots, Covariance and Correlations Plots
rPlot matrix
attr_final[,10:14],pch=".",cex=1.5)

```



```
.
Hypothesis - The two means are equal
Alternative Hypothesis - Difference in the two means is not zero
alpha = 0.05, accept null hypothesis
```

ivariate mean comparison using t test
Monthly Income and Attrition

```
attr$MonthlyIncome[attr$Attrition == "Yes"] and attr$MonthlyIncome[attr$Attrition == "No"]
2039, df = 1468, p-value = 7.147e-10
t-test results:
Null hypothesis: true difference in means is equal to 0
Alternative hypothesis: true difference in means is not equal to 0
95% confidence interval:
-1398.847
```



```
estimates:
: x mean of y
:3 6832.740
```

HourlyRate and Attrition

```
data=attr,t.test(attr$HourlyRate[attr$Attrition=="Yes"],attr$HourlyRate[attr$Attrition=="No"],var.equal=FALSE)
```

single sample t-test

```
attr$HourlyRate[attr$Attrition == "Yes"] and attr$HourlyRate[attr$Attrition == "No"]
t = 26229, df = 1468, p-value = 0.7931
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-65 2.450946
estimates:
: x mean of y
:4 65.95215
```

DailyRate and Attrition

```
data=attr,t.test(attr$DailyRate[attr$Attrition=="Yes"],attr$DailyRate[attr$Attrition=="No"],var.equal=FALSE)
```

single sample t-test

```
attr$DailyRate[attr$Attrition == "Yes"] and attr$DailyRate[attr$Attrition == "No"]
t = 1741, df = 1468, p-value = 0.02986
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-9251 -6.073932
estimates:
: x mean of y
:9 812.5045
```

Age and Attrition

```
data=attr,t.test(attr$Age[attr$Attrition=="Yes"],attr$Age[attr$Attrition=="No"],var.equal=FALSE)
```

single sample t-test

```
attr$Age[attr$Attrition == "Yes"] and attr$Age[attr$Attrition == "No"]
t = 1787, df = 1468, p-value = 8.356e-10
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-125 -2.698450
estimates:
: x mean of y
:9 37.56123
```

DistanceFromHome and Attrition

```
data = attr,t.test(attr$DistanceFromHome[attr$Attrition=="Yes"],attr$Age[attr$Attrition=="No"],var.equal=FALSE)
```

single sample t-test

```
attr$DistanceFromHome[attr$Attrition == "Yes"] and attr$Age[attr$Attrition == "No"]
t = 1.048, df = 1468, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-138 -25.70126
estimates:
: x mean of y
:1 37.56123
```

Monthly Income and Gender

```
data = attr,t.test(attr$MonthlyIncome[attr$Gender=="Male"],attr$MonthlyIncome[attr$Gender=="Female"],var.equal=FALSE)
```

single sample t-test

```

attr$MonthlyIncome[attr$Gender == "Male"] and attr$MonthlyIncome[attr$Gender == "Female"]
2213, df = 1468, p-value = 0.2222
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-170 185.5303
estimates:
sample x mean of y
18 6686.566

```

```

DistanceFromHome and Gender
data = attr,t.test(attr$DistanceFromHome[attr$Gender=="Male"],attr$DistanceFromHome[attr$Gender=="Female"],data=data)

```

sample t-test

```

attr$DistanceFromHome[attr$Gender == "Male"] and attr$DistanceFromHome[attr$Gender == "Female"]
1070902, df = 1468, p-value = 0.9435
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-1316 0.8163071
estimates:
sample x mean of y
12 9.210884

```

```

Monthly Income and gender
t2gender <- hotelling.test(attr$MonthlyIncome + attr$DistanceFromHome ~ attr$Gender, data=attr)
T2 statistic =",t2testgender$stat[[1]],"\n")
T2 statistic = 1.499903
p-value:(t2testgender)
p-value: 0.74944
degrees of freedom: 2
number of variables: 2
p-value: 0.4728

```

```

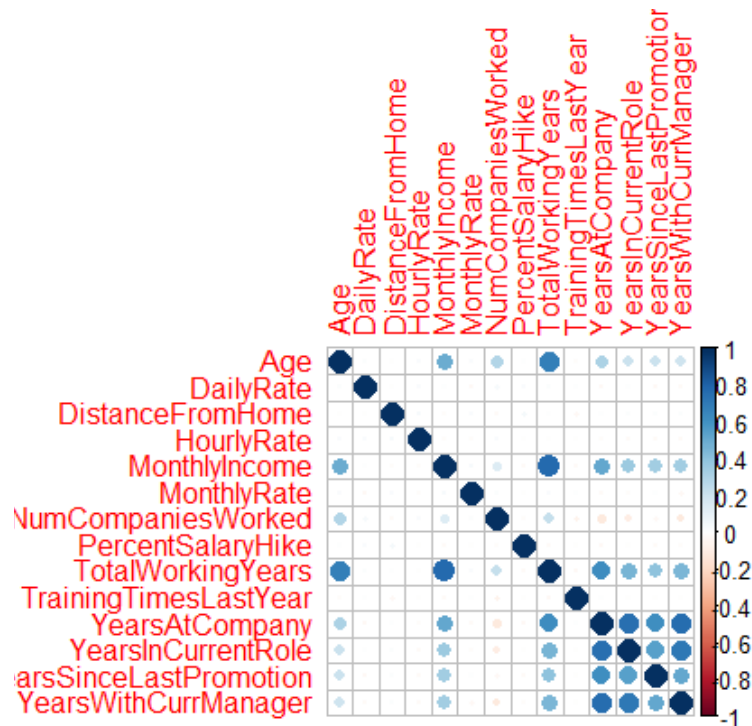
Monthly Income and Attrition
t2attr <- hotelling.test(attr$MonthlyIncome + attr$DistanceFromHome ~ attr$Attrition, data=attr)
T2 statistic =",t2testattr$stat[[1]],"\n")
T2 statistic = 47.28597
p-value:(t2testattr)
p-value: 23.627
degrees of freedom: 2
number of variables: 2
p-value: 7.957e-11

```

```

library(ggplot2); dev.off()
Considering the numeric columns that will help to get variance in data
pca <- attr[,numvar]
Creating correlation plot to understand the how feature are related to each other
plot<-cor(attr_pca)
plot(correplot,method="circle")

```



```

# finding the principal components of data
.pca <- prcomp(attr_pca,scale=TRUE)
.pca

```

```

# standard deviations (1, ..., p=14):

```

```

1.041891 1.2846031 1.0336848 1.0257290 1.0046944 0.9962218 0.9763963 0.9578606 0.8499797 0.8184527 0.5321872 0.4397545 0.3742537

```

```

# load (n x k) = (14 x 14):

```

	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12
Age	0.280157344	-0.472170158	0.003362193	0.004488409	-0.039563410	-0.058711111	-0.098196914	-0.05927715	-0.183114693	0.005033984	-0.74367068
DailyRate	-0.006815197	-0.077962430	-0.207301367	-0.609569867	-0.211568990	-0.130611111	0.715405171	-0.02770642	-0.028707475	0.040304455	-0.01980752
DistanceFromHome	0.004812032	0.041564987	-0.664884791	0.306131593	0.048941659	-0.176811111	0.031447533	-0.65217193	0.037737577	0.002338630	0.02927699
HourlyRate	-0.011288550	-0.062668026	-0.352147686	-0.255816205	0.602292088	-0.481611111	-0.221010405	0.40142111	-0.004675476	0.018009772	0.03725997
MonthlyIncome	0.360622909	-0.290395305	0.052415102	0.025332267	-0.034941693	-0.033211111	-0.012272736	-0.03685912	-0.377381332	0.104651321	0.61775910
MonthlyRate	0.001123298	-0.086158010	0.020312197	0.664085954	-0.101166486	-0.371211111	0.482943083	0.40448871	0.056690883	-0.044889268	-0.01681584
NumCompaniesWorked	0.030991906	-0.560133264	0.005628265	-0.041875610	0.017785645	0.101211111	-0.032989593	-0.03355765	0.775796629	-0.129586743	0.19687866
PercentSalaryHike	-0.015351368	0.004618486	-0.465841883	-0.055689609	-0.698726672	-0.008211111	-0.376210309	0.38335261	0.012190972	0.019568502	0.04082482
TotalWorkingYears	0.415285665	-0.318115831	0.009368263	0.007027664	-0.024159198	-0.025211111	-0.029511945	-0.04398227	-0.196663458	-0.038585533	0.08301594
TrainingTimesLastYear	-0.010993402	0.092457674	0.409028173	-0.138279489	-0.293982017	-0.751611111	-0.217564575	-0.29622601	0.130785998	-0.017811234	0.02954240
YearsAtCompany	0.443443529	0.213079968	0.002115638	-0.010571214	0.024921329	-0.001911111	0.005335572	0.01862614	-0.001551392	-0.104225054	0.03762072
YearsInCurrentRole	0.391353065	0.279423881	-0.048111956	-0.038785223	-0.004927194	0.014511111	0.062086964	0.05420752	0.201595025	-0.271683842	-0.04458982
YearsSinceLastPromotion	0.344322397	0.198658357	0.003993040	0.027659809	0.019935007	0.018611111	0.022129234	0.03850513	0.306725567	0.845951303	-0.08053456
YearsWithCurrManager	0.386171187	0.295138965	-0.031745944	-0.034459502	0.021898300	0.028611111					

thCurrManager	0.011525930	0.04176204	0.161413516	-0.407140185	-0.06576770	0.625185
PC14						
	0.1893016403	0.237072230				
ite	-0.0099081253	0.018837870				
ieFromHome	0.0057709912	0.011991386				
ate	0.0049037331	-0.003314012				
'Income	0.4041044054	0.279006032				
'Rate	-0.0083381972	0.009367738				
aniesWorked	-0.0369554196	0.107234673				
:SalaryHike	-0.0183445446	0.010585240				
rkingYears	-0.4158888971	-0.705989494				
igTimesLastYear	0.0008431661	-0.012085362				
:Company	-0.6494086309	0.562584645				
iCurrentRole	0.1948014145	-0.130643692				
nceLastPromotion	0.0977011821	-0.083447864				
thCurrManager	0.3959144832	-0.121010943				
(attr_pca)						
lev" "rotation" "center" "scale" "x"						
(attr_pca)						

0041891 1.2846031 1.0336848 1.0257290 1.0046944 0.9962218 0.9763963 0.9578606 0.8499797 0.6854527 0.5321872 0.4397545 0.3742537

on	PC2	PC3	PC4	PC5	PC6		
	0.280157344	-0.472170158	0.003362193	0.004488409	-0.039563410	-0.0587	
ite	-0.006815197	-0.077962430	-0.207301367	-0.609569867	-0.211568990	-0.1306	
ieFromHome	0.004812032	0.041564987	-0.664884791	0.306131593	0.048941659	-0.1768	
ate	-0.011288550	-0.062668026	-0.352147686	-0.255816205	0.602292088	-0.4816	
'Income	0.360622909	-0.290395305	0.052415102	0.025332267	-0.034941693	-0.0332	
'Rate	0.001123298	-0.086158010	0.020312197	0.664085954	-0.101166486	-0.3712	
aniesWorked	0.030991906	-0.560133264	0.005628265	-0.041875610	0.017785645	0.1012	
:SalaryHike	-0.015351368	0.004618486	-0.465841883	-0.055689609	-0.698726672	-0.0082	
rkingYears	0.415285665	-0.318115831	0.009368263	0.007027664	-0.024159198	-0.0252	
igTimesLastYear	-0.010993402	0.092457674	0.409028173	-0.138279489	-0.293982017	-0.7516	
:Company	0.443443529	0.213079968	0.002115638	-0.010571214	0.024921329	-0.0019	
iCurrentRole	0.391353065	0.279423881	-0.048111956	-0.038785223	-0.004927194	0.0145	
nceLastPromotion	0.344322397	0.198658357	0.003993040	0.027659809	0.019935007	0.0186	
thCurrManager	0.386171187	0.295138965	-0.031745944	-0.034459502	0.021898300	0.0286	
PC8	PC9	PC10	PC11	PC12			
	-0.098196914	-0.05927715	-0.183114693	0.005033984	-0.74367068	-0.041550	
ite	0.715405171	-0.02770642	-0.028707475	0.040304455	-0.01980752	0.040445	
ieFromHome	0.031447533	-0.65217193	0.037737577	0.002338630	0.02927699	0.003420	
ate	-0.221010405	0.40142111	-0.004675476	0.018009772	0.03725997	-0.004074	
'Income	-0.012272736	-0.03685912	-0.377381332	0.104651321	0.61775910	-0.047499	
'Rate	0.482943083	0.40448871	0.056690883	-0.044889268	-0.01681584	0.023709	
aniesWorked	-0.032989593	-0.03355765	0.775796629	-0.129586743	0.19687866	0.021028	
:SalaryHike	-0.376210309	0.38335261	0.012190972	0.019568502	0.04082482	0.014317	
rkingYears	-0.029511945	-0.04398227	-0.196663458	-0.038585533	0.08301594	0.061109	
igTimesLastYear	-0.217564575	-0.29622601	0.130785998	-0.017811234	0.02954240	-0.000289	
:Company	0.005335572	0.01862614	-0.001551392	-0.104225054	0.03762072	0.079527	
iCurrentRole	0.062086964	0.05420752	0.201595025	-0.271683842	-0.04458982	-0.765806	
nceLastPromotion	0.022129234	0.03850513	0.306725567	0.845951303	-0.08053456	0.075946	
thCurrManager	0.011525930	0.04176204	0.161413516	-0.407140185	-0.06576770	0.625185	
PC14							
	0.1893016403	0.237072230					
ite	-0.0099081253	0.018837870					
ieFromHome	0.0057709912	0.011991386					
ate	0.0049037331	-0.003314012					
'Income	0.4041044054	0.279006032					
'Rate	-0.0083381972	0.009367738					
aniesWorked	-0.0369554196	0.107234673					
:SalaryHike	-0.0183445446	0.010585240					
rkingYears	-0.4158888971	-0.705989494					

igTimesLastYear 0.0008431661 -0.012085362
Company -0.6494086309 0.562584645
CurrentRole 0.1948014145 -0.130643692
nceLastPromotion 0.0977011821 -0.083447864
thCurrManager 0.3959144832 -0.121010943

DailyRate DistanceFromHome HourlyRate
10 802.485714 9.192517 65.891156
Income MonthlyRate NumCompaniesWorked PercentSalaryHike
1293 14313.103401 2.693197 15.209524
orkingYears TrainingTimesLastYear YearsAtCompany YearsInCurrentRole
92 2.799320 7.008163 4.229252
nceLastPromotion YearsWithCurrManager
5 4.123129

DailyRate DistanceFromHome HourlyRate
3 403.509100 8.106864 20.329428
Income MonthlyRate NumCompaniesWorked PercentSalaryHike
6783 7117.786044 2.498009 3.659938
orkingYears TrainingTimesLastYear YearsAtCompany YearsInCurrentRole
2 1.289271 6.126525 3.623137
nceLastPromotion YearsWithCurrManager
0 3.568136

	PC2	PC3	PC4	PC5	PC6	PC7
1.243044079	-1.805296680	-0.3104169553	-0.384994275	2.0169575215	0.984793983	1.33213032
1.854288163	0.381073595	-0.5252390003	1.608645799	-1.5927436292	-0.481865695	-1.04322462
1.198275394	-1.413301606	-0.0582282745	-2.596801032	0.6022422032	-0.023230640	-0.24482174
1.570845554	0.682294015	0.9530781591	-0.112517223	0.0144209522	-0.415235118	2.25467789
1.567685771	-0.965438549	1.6427717726	0.537047071	-0.0703157168	0.940560119	0.33261104
1.033228256	1.476192828	0.1768758528	-0.871158691	0.9282306482	0.367849216	0.55347104
1.176981984	-2.344142438	-0.5229233979	-1.666338771	-0.8793271137	-0.417767837	-0.43837159
1.668563284	0.310022541	-2.6128166708	-0.330963952	-1.2486460778	-0.052250851	0.44046595
1.910894519	1.213005861	-1.5039201417	1.144947290	-1.1238829367	1.049881443	-1.50898530
1.339778839	-0.208584655	-1.9076328247	-0.281672326	1.0866328829	-1.252674274	1.0283294
1.227202504	0.961999888	0.0613545738	0.034499533	0.4709461858	-2.043427871	-0.0936310
1.073116546	1.760186112	0.5344916830	1.247906142	0.5189044912	0.442256861	-0.6159184
1.087474516	1.023377864	-1.5147071841	1.573775407	-0.7475549471	1.511464717	0.4754397
1.814073316	0.601874393	-1.3014136722	-1.101977678	1.6522331947	-0.334506872	0.9484714
1.659410211	0.292702788	-0.0672556843	1.527211158	0.0369416431	-0.176183833	-1.1432601
1.744251934	1.686663324	-1.1177364895	-0.381693162	0.6609099755	1.223658522	1.9446011
1.118546968	1.132058901	1.4189672811	0.273681898	0.7687430566	-1.460717606	-0.9296940
2.875446285	0.684977918	-1.2101773533	-1.069482747	1.5219403902	-0.105065952	0.2801528
4.306398521	-1.060188116	0.2102166478	-0.374474127	-0.3205736368	-1.006842601	0.8202298
1.274793286	-0.518252552	1.7607337154	-0.263605442	0.4775025923	1.296215086	-0.9179788
1.707674413	1.416074395	-0.2866612249	-0.911443288	0.0740619531	-1.694982203	-1.4684993
1.0973935456	-1.013413533	-1.1120212000	-1.850388185	-1.3640205357	-0.666890243	-1.0152267
1.686994016	1.312303531	1.5096245660	1.224455487	0.2429059015	-0.652215366	0.2571833
3.186960204	1.127496005	0.4028852195	0.661084708	0.6427677466	-2.782189999	-0.9699291
1.236420346	0.070998887	0.2998566707	0.248336464	1.5088956715	0.030328006	0.3846099
4.335210193	-1.187855044	0.8439064948	-1.135518002	0.1502712115	0.089980426	0.9783843
0.202667449	1.487707345	-1.0496066009	-1.510499974	-1.5194444667	-1.172856717	-1.1043543
0.522611662	0.517960123	0.7496484428	1.189509235	0.3725504816	0.467749272	1.0650694
4.167497779	1.068632778	1.1917707595	-0.655936499	-0.3603395503	0.680646739	-1.2670175
0.855668649	-2.594944348	0.7337329455	0.725830150	0.9881939586	-0.389610046	0.4267363
2.101453288	-0.598109160	0.9218830885	-1.261397525	1.1285699242	0.185406411	-0.1011647
0.628686779	-0.506577343	1.0557480273	-0.359363863	-1.2767722294	-1.259019980	1.5089119
0.585760317	1.290594877	1.0175278792	0.759970743	0.8434796204	-1.537202603	-1.3624105
1.453000790	-0.878346751	1.6553451372	-1.466979255	-0.7652620288	-1.050427892	-1.0555470
2.295426038	0.497391245	0.3961407175	-1.173667681	0.0495687553	1.396660954	-0.5849422
0.832994065	0.042990012	0.7006144001	-0.308495224	0.3417332881	-0.722274641	1.5080310

1.354693336	-0.382172652	-0.0113330121	-1.423881781	1.0314915947	0.517495020	-0.7185384
1.788459375	0.520002398	0.3186189447	-1.168483914	1.3010327250	-0.499080505	-0.2923377
1.940888185	-1.947119717	0.3014065269	-0.616302576	0.6580712905	-0.112112477	-0.2315559
0.826827035	0.269317986	0.4683770185	-1.617065750	-1.5424619460	1.078602496	-0.3253457
2.540242339	0.231335668	0.9249250633	-0.019213294	1.0357898965	0.023182442	-0.6662971
2.775064596	0.699871648	2.2688244419	-0.255818018	-1.5958498425	-1.351223462	1.2317170
2.660977369	0.709039810	-1.1151323620	-0.173311857	0.1700305471	0.580484544	1.5358935
0.494241988	1.355663630	-0.4558314906	-0.773576913	-0.0893201999	2.889936395	0.5730119
0.755465347	1.607572626	-0.5109637132	-0.506888091	-1.4233075836	1.057147451	-0.8116413
5.804951893	1.078091201	-0.6975281151	0.051444706	0.4337848886	1.614106696	2.3169509
0.806658069	1.653442819	-2.3068106160	-0.295882847	-0.4722918379	0.134169049	-0.0542540
1.995881882	-0.926896408	-1.9960316143	0.633599363	-0.1729888148	1.021151201	-1.4100772
0.844245935	-0.616849916	-0.8194206960	-0.921810229	-0.7717068286	-1.818536061	-0.1164837
2.418330657	0.297326189	-0.3513459999	-1.101751982	-1.5156578641	1.499053343	0.1728086
0.617002088	-3.634989196	0.3562096372	0.118216390	1.4389894618	-0.220229442	-0.3437186
1.874898008	0.830881805	0.6248015543	-1.142134976	-0.3600199657	0.329946720	1.3675038
0.595964470	-1.218466650	-0.8408839570	-2.447215614	-0.9399446833	0.774272087	-0.2054942
0.697653611	-0.440311397	-0.1001609790	-1.002941201	0.6741005136	-0.305412825	0.1179247
2.079810230	-0.955185144	-1.8161177942	0.441813227	-1.3960822450	0.253432093	1.6426596
3.708466615	1.814109184	-0.0097541922	-0.036909451	2.1090226075	0.552998695	0.0715580
0.809848967	1.103897503	-1.7108414088	-0.291327045	-1.1137226784	-0.318923581	-0.7706595
1.465681948	0.058005177	-0.5799431432	0.624721643	-1.1676958094	0.275086845	1.1479757
0.172118882	0.857390902	-0.3222266947	-0.286150650	-1.6974104391	0.722818482	-1.0174069
0.134488687	0.774824505	0.0742047436	-1.668328387	-0.8320217703	1.458220908	-0.2098923
1.154466224	1.922306493	0.5340354541	0.208456672	-2.0449281318	1.172737829	-1.1081902
1.015549604	1.685679343	-1.0836803069	0.522264077	0.9425346951	0.960676995	0.0215977
5.230825960	-1.151655660	0.8119758029	0.364485427	-0.0405314789	0.826552609	1.0108396
5.030282900	-0.755218265	-1.7678975054	-2.044562287	1.6478909242	-0.737221001	0.3123514
3.788984539	1.946298043	-0.0945560272	-1.067010987	0.3184679516	0.860439229	1.0204812
0.660742882	-2.427444222	0.7464731633	1.051907583	-0.8666771968	0.700339962	0.6994842
0.689313482	0.194433528	-0.4992692899	-0.091816631	0.9077818943	-1.467101142	1.1917945
0.360119052	-2.235551626	-0.3033093916	-0.208683127	-0.8858009134	0.057772762	1.0278813
1.590660053	-0.244778958	0.5118655703	-0.944308747	1.1711060680	0.909011154	-0.6490526
2.349000231	-0.024496709	-1.0212757577	1.625278907	0.8108621115	0.977055716	-0.2246999
0.537061435	-3.049510452	0.9612799574	0.240109595	0.1951466351	0.179765350	1.7241143

	PC9	PC10	PC11	PC12	PC13	PC14
..5917738507	1.1863471823	-0.8721216003	-0.0964053395	0.1652689774	2.697995e-01	5.6169
..4396138690	-0.2915207036	-0.9133153760	-1.2704956060	-0.1223848585	3.003787e-01	3.9264
..1645450520	0.7037177946	0.2334286037	-0.2063109991	0.0757180104	-2.034191e-01	-3.0270
..3788485663	-0.0232142896	0.4483748666	-0.4255970757	-1.1905425766	-5.888785e-01	3.7605
..2110090034	2.3132854086	-0.0092829889	0.7911383832	0.0932147601	-1.001822e-01	-1.4650
..8232618244	-0.2219554949	-0.0872069258	-0.4352547853	-0.2311142456	2.074828e-01	-3.4016
..6783978017	-0.4439152914	0.2850426885	-1.9955214056	0.0476998780	-7.608564e-02	1.5272
..3684730529	-0.4875080936	0.4800518063	0.0543954145	0.1020736714	-4.659415e-02	3.2533
..9351740522	-0.8467583073	-0.7791175369	0.1173708729	-0.0207647030	7.178969e-01	2.0342
..0.9887551265	1.8168832792	0.5496258442	0.0893646974	0.1719743118	1.482873e-01	-7.592
..0.7428933771	-0.3487121205	-0.3578297611	-0.5029560805	-0.2422407358	-3.914638e-02	-2.624
..1.0813690872	-0.3767620037	-1.1058405989	0.0965394361	0.4399899746	-2.594555e-02	-2.940
..1.2884619372	-0.0363538480	0.8308304610	-0.2190499489	0.3017206595	-5.138678e-02	6.517
..0.8195524226	-0.7310455341	0.3812739185	-0.4949317648	-0.0110627441	2.587105e-01	7.880
..1.9271549894	1.2343495139	-0.5198251249	0.4250203594	0.1772497877	-2.805626e-01	-4.452
..1.2962378063	0.1672283742	0.9190505173	0.6052322133	-0.1396419825	7.886224e-01	-8.889
..0.0866130578	-0.4359922773	-0.4908235512	-0.1712840455	0.4964863948	-6.197885e-02	-8.960
..0.3703968876	-0.4515944960	0.4707221281	0.6870011577	0.0480464742	-1.323742e-01	7.059
..1.1419762947	-1.3201148540	-0.5553725566	-0.0202145544	0.0106513546	-1.330532e+00	5.419
..0.9326540622	0.6299363640	-0.0098247146	-0.2880597580	-0.0739027515	1.175321e-01	2.148
..0.0042898132	-0.3112305780	0.1801517860	0.6691640181	0.1912063602	-6.152712e-02	-1.847
..0.3446067836	1.3648622584	-0.4792426584	0.2130812121	0.0911878469	-3.605121e-01	6.632
..0.2496196395	-0.6875524464	-0.9335162824	0.6027692112	0.8094891808	7.005028e-01	1.107
..0.3520700093	0.2822430507	0.2555611279	0.6350192662	0.0179911182	-1.389628e-01	-1.118
..0.5077089246	-0.1612550579	-0.0186130089	-0.3041024579	0.2026623054	-1.190615e-01	-1.583
..0.6259760526	-0.5375940379	-0.5583140528	0.3347066400	-1.0951792994	8.320370e-01	2.989
..0.6537874675	0.3570074959	0.9290619928	-0.0189461399	1.1560600116	-2.554831e-01	-6.819
..0.0648482848	-0.7354981588	0.5503138531	-0.7380133792	-0.9496643546	8.389053e-03	2.596

```

1.2648397307 0.3155536872 -1.1110140575 -0.1549320265 2.1008653026 -1.743973e-01 2.246
0.9457428880 -1.6915126800 0.7155359778 1.0274567321 -0.2257845320 7.444228e-01 -2.638
0.1895100955 0.2414887412 0.1464112473 -0.0495438258 -0.1690167656 -2.514129e-01 -1.647
1.1586344712 -0.3666531671 0.0562237019 -0.6611355034 0.2298295473 2.991824e-01 2.466
0.1491699406 0.0895757307 -0.5992509197 -0.0332054293 1.5600371817 -5.381913e-01 -1.237
1.5329294741 -0.2065832996 0.1820633909 -0.4482305144 0.1077454163 -8.542825e-01 -1.146
0.2134201607 -0.1299260602 0.8657952064 0.4687972163 0.1202434785 -4.949487e-01 -3.141
0.7203396398 -0.3895527430 -0.1574012260 -1.2429413892 0.1954059923 1.912162e-01 2.394
0.2688390818 -0.9067448813 0.0479551510 -1.6866316116 -0.1441330064 4.304295e-01 6.133
0.6935995880 -0.2003120841 0.5271573093 -0.6067308937 -0.0279386513 2.824748e-01 1.247
0.2429085978 1.7646246196 -0.1129573297 0.2507919469 -0.1314289782 -1.482093e-01 2.907
0.1179524881 -0.3580190226 0.0556865761 0.1396045303 0.0353093528 -1.389953e-01 -1.514
0.0181823818 -0.5107722810 0.3263458397 -0.5465772678 -0.0602546854 5.658773e-02 2.970
0.7388494377 -0.0587506994 0.2787045616 0.0926434197 0.0901210156 -1.196858e-01 1.389
1.9884712967 -0.3763602810 0.3022550599 0.1729522027 0.2552767122 -3.327794e-03 1.358
0.3462124514 -0.6086221030 -0.7113741266 0.7779144715 -0.3180020334 4.068577e-01 1.109
1.5058488466 0.0966839023 -0.4001732785 0.0586933619 -0.1521141805 -3.945470e-01 -2.508
0.0542470485 -0.2605203348 2.2309102556 0.7861699813 -1.1179707031 4.072934e-01 3.200
0.3676769926 0.0803763634 1.3065788470 -0.3439303856 0.5396748825 1.926447e-01 -2.356
0.0379981462 0.0139823408 0.2379323987 -0.1482978143 0.0345722067 -2.626249e-01 -3.020
1.5880220441 0.4128727770 -1.2321509722 -0.6278155609 0.3533099316 1.678164e-01 6.690
0.4960323101 -0.6439180110 0.3515209761 -0.5484838822 0.2054958400 1.408071e-01 3.516
1.1704670085 0.8200564211 -0.1123759892 -0.2977384011 0.1285674151 -6.899389e-01 -7.924
0.3941110717 -0.1764307635 0.5591763859 0.0448168714 0.0596852002 2.356005e-01 6.709
0.8857772453 0.2519075061 0.0130817786 -0.4850733698 0.0278447233 1.985134e-01 2.933
0.6111756017 -0.7690695559 0.6284517406 0.6011938058 0.6113545988 3.056229e-01 1.541
0.5984018598 1.3970676765 -0.0643320469 0.9721652618 -0.1949743264 -3.069309e-01 2.303
1.7422401316 0.1408058227 -0.0199461188 0.7410413537 -0.5297862525 1.093202e+00 -1.580
0.0108146406 -0.3106679951 -0.8493487541 0.3863867848 -0.1458192162 6.892529e-01 2.105
1.8215348214 0.3621471351 0.4006851921 -0.2172714122 0.0608335537 2.928318e-01 2.154
0.3335120551 0.4740138563 -0.8411057977 0.4163000283 -0.0858083206 2.931242e-01 -2.225
0.2284006406 -0.6348604010 -0.7475512841 -0.2920548376 0.2496513450 4.888034e-01 2.230
0.7408606053 0.5122781140 0.5793496320 -0.0105572994 -0.0042066309 5.488545e-01 -2.340
2.4733087118 0.5540510535 1.2979592812 -0.9935329529 1.2766076994 1.734229e-01 -1.856
0.4001018830 0.0656254162 2.1963468297 0.5895255433 1.4470277217 -1.086096e+00 1.034
1.7992385929 1.6436332545 -0.5355851584 -1.3269684512 -1.2755865234 -5.269145e-01 -1.040
0.1566109309 0.5395449026 1.4430413025 0.0325762440 -1.0121301749 2.073019e-01 -2.110
0.5389467786 -2.0662901268 0.1446763110 -0.3168046990 0.3722514197 2.468134e-01 1.594
0.6267828319 -0.5362398552 -0.3750836045 -0.0545365082 -0.4224485744 2.452230e-01 3.754
0.3270971145 -1.6969908177 0.3987065997 -0.0530068030 0.1509487886 -4.247686e-01 -1.035
0.3792991801 0.4293974391 0.0802128266 -0.3229283966 -0.0234897322 -3.881229e-02 1.049
1.5255487349 -1.1502222404 0.3958031962 -0.5136583440 -0.0367616655 1.303524e-01 3.312
0.4884620531 0.4469007175 -0.3625035208 -1.6091056814 0.0695982865 -7.853735e-02 -2.395
ed getOption("max.print") -- omitted 1399 rows ]

```

```

ry(attr_pca)
nce of components:
PC2    PC3    PC4    PC5    PC6    PC7    PC8    PC9    PC10   PC11
d deviation    2.0042 1.2846 1.03368 1.02573 1.0047 0.99622 0.9764 0.95786 0.8500 0.7284
ion of Variance 0.2869 0.1179 0.07632 0.07515 0.0721 0.07089 0.0681 0.06554 0.0516 0.0379
ive Proportion 0.2869 0.4048 0.48111 0.55626 0.6284 0.69925 0.7673 0.83288 0.8845 0.9223
PC13   PC14
d deviation    0.53219 0.43975 0.3743
ion of Variance 0.02023 0.01381 0.0100
ive Proportion 0.97618 0.99000 1.0000
act variance against features
values<-attr_pca$sdev^2
values
167738 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.9174969 0.7224654 0.
4698454 0.2832233 0.1933840 0.1400658
igenvalues)

```

```

(eigenvalues) <- paste("PC",1:14,sep="")
values

```

```

      PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10
38 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.9174969 0.7224654 0.5306
      PC13      PC14
33 0.1933840 0.1400658
lambdas <- sum(eigenvalues)
lambdas

```

```

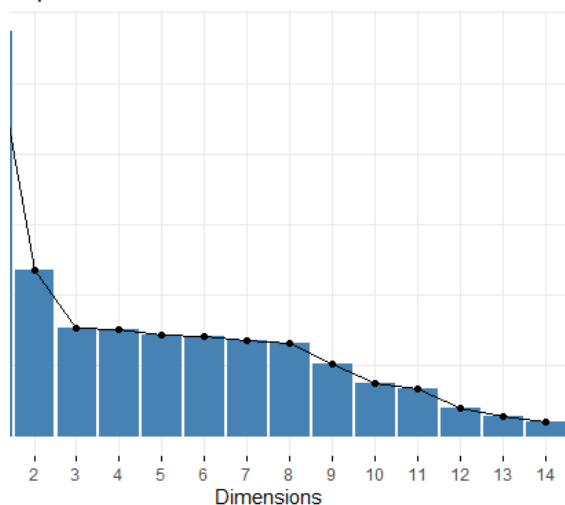
ance %
r<- (eigenvalues/sumoflambdas)*100
r
      PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10
41 11.787180  7.632173  7.515143  7.210077  7.088985  6.809641  6.553550  5.160467  3.790
      PC13      PC14
3  1.381314  1.000470
ulate cumulative of variance
r <- cumsum(pctvar)
r
      PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10
4  40.47842  48.11059  55.62574  62.83581  69.92480  76.73444  83.28799  88.44846  92.239
      PC13      PC14
2  98.99953 100.00000

```

```

alize PCA using Scree plot
screeplot(attr_pca, ncp=14)
ee plot

```



```

ry(attr_pca)
nce of components:
      PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10      PC11
d deviation      2.0042  1.2846  1.03368  1.02573  1.0047  0.99622  0.9764  0.95786  0.8500  0.7284
ion of Variance  0.2869  0.1179  0.07632  0.07515  0.0721  0.07089  0.0681  0.06554  0.0516  0.0379
ive Proportion  0.2869  0.4048  0.48111  0.55626  0.6284  0.69925  0.7673  0.83288  0.8845  0.9223
      PC13      PC14
d deviation      0.53219  0.43975  0.3743
ion of Variance  0.02023  0.01381  0.0100
ive Proportion  0.97618  0.99000  1.0000

```

```

.new(); dev.off()
sidering the numeric columns that will help to get variance in data
pca <- attr[,numvar]
ve the error "Figure margins too large"
"mar")
. 4.1 4.1 2.1

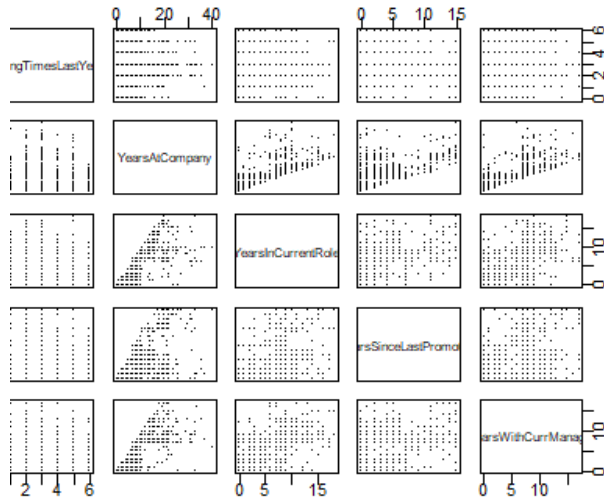
```



```

var=c(1,1,1,1))
shims.off()
off()
Matrix Plots, Covariance and Correlations Plots
interPlot matrix
plot(attr_pca[,10:14],pch=".",cex=1.5)

```

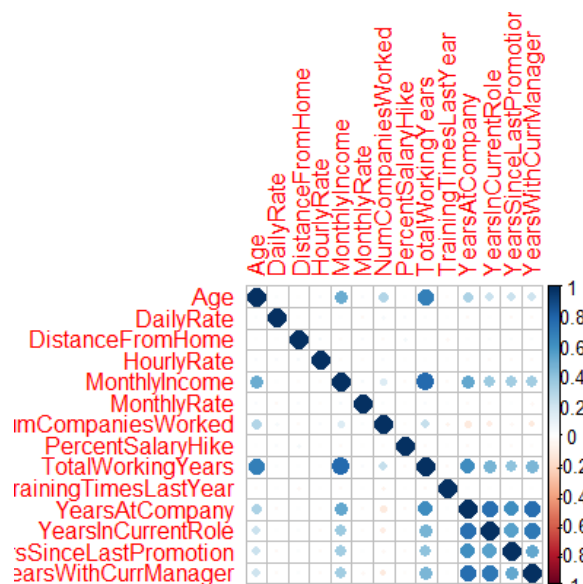


Using correlation plot to understand the how feature are related to each other

```

plot<-cor(attr_pca)
plot(correplot,method="circle")

```



Using the principal components of data

```

pca_done <- prcomp(attr_pca,scale=TRUE)
pca_done

```

Standard deviations (1, ..., p=14):

```

1.041891 1.284603 1.033684 1.025729 1.004694 0.996221 0.976396 0.957860 0.849979 0.814527
0.685452 0.532187 0.439754 0.374253

```

Matrix (n x k) = (14 x 14):

	PC2	PC3	PC4	PC5	PC6		
		0.280157344	-0.472170158	0.003362193	0.004488409	-0.039563410	-0.0587
ite		-0.006815197	-0.077962430	-0.207301367	-0.609569867	-0.211568990	-0.1306
ieFromHome		0.004812032	0.041564987	-0.664884791	0.306131593	0.048941659	-0.1768
ate		-0.011288550	-0.062668026	-0.352147686	-0.255816205	0.602292088	-0.4816
'Income		0.360622909	-0.290395305	0.052415102	0.025332267	-0.034941693	-0.0332
'Rate		0.001123298	-0.086158010	0.020312197	0.664085954	-0.101166486	-0.3712
aniesWorked		0.030991906	-0.560133264	0.005628265	-0.041875610	0.017785645	0.1012
:SalaryHike		-0.015351368	0.004618486	-0.465841883	-0.055689609	-0.698726672	-0.0082
orkingYears		0.415285665	-0.318115831	0.009368263	0.007027664	-0.024159198	-0.0252
igTimesLastYear		-0.010993402	0.092457674	0.409028173	-0.138279489	-0.293982017	-0.7516
:Company		0.443443529	0.213079968	0.002115638	-0.010571214	0.024921329	-0.0019
iCurrentRole		0.391353065	0.279423881	-0.048111956	-0.038785223	-0.004927194	0.0145
nceLastPromotion		0.344322397	0.198658357	0.003993040	0.027659809	0.019935007	0.0186
thCurrManager		0.386171187	0.295138965	-0.031745944	-0.034459502	0.021898300	0.0286

	PC8	PC9	PC10	PC11	PC12		
		-0.098196914	-0.05927715	-0.183114693	0.005033984	-0.74367068	-0.041550
ite		0.715405171	-0.02770642	-0.028707475	0.040304455	-0.01980752	0.040445
ieFromHome		0.031447533	-0.65217193	0.037737577	0.002338630	0.02927699	0.003420
ate		-0.221010405	0.40142111	-0.004675476	0.018009772	0.03725997	-0.004074
'Income		-0.012272736	-0.03685912	-0.377381332	0.104651321	0.61775910	-0.047499
'Rate		0.482943083	0.40448871	0.056690883	-0.044889268	-0.01681584	0.023709
aniesWorked		-0.032989593	-0.03355765	0.775796629	-0.129586743	0.19687866	0.021028
:SalaryHike		-0.376210309	0.38335261	0.012190972	0.019568502	0.04082482	0.014317
orkingYears		-0.029511945	-0.04398227	-0.196663458	-0.038585533	0.08301594	0.061109
igTimesLastYear		-0.217564575	-0.29622601	0.130785998	-0.017811234	0.02954240	-0.000289
:Company		0.005335572	0.01862614	-0.001551392	-0.104225054	0.03762072	0.079527
iCurrentRole		0.062086964	0.05420752	0.201595025	-0.271683842	-0.04458982	-0.765806
nceLastPromotion		0.022129234	0.03850513	0.306725567	0.845951303	-0.08053456	0.075946
thCurrManager		0.011525930	0.04176204	0.161413516	-0.407140185	-0.06576770	0.625185

	PC14		
	0.1893016403	0.237072230	
ite	-0.0099081253	0.018837870	
ieFromHome	0.0057709912	0.011991386	
ate	0.0049037331	-0.003314012	
'Income	0.4041044054	0.279006032	
'Rate	-0.0083381972	0.009367738	
aniesWorked	-0.0369554196	0.107234673	
:SalaryHike	-0.0183445446	0.010585240	
orkingYears	-0.4158888971	-0.705989494	
igTimesLastYear	0.0008431661	-0.012085362	
:Company	-0.6494086309	0.562584645	
iCurrentRole	0.1948014145	-0.130643692	
nceLastPromotion	0.0977011821	-0.083447864	
thCurrManager	0.3959144832	-0.121010943	

(attr_pca_done)
 lev" "rotation" "center" "scale" "x"
 (attr_pca_done)

0.041891 1.2846031 1.0336848 1.0257290 1.0046944 0.9962218 0.9763963 0.9578606 0.8499797 0.6854527 0.5321872 0.4397545 0.3742537

on	PC2	PC3	PC4	PC5	PC6		
		0.280157344	-0.472170158	0.003362193	0.004488409	-0.039563410	-0.0587
ite		-0.006815197	-0.077962430	-0.207301367	-0.609569867	-0.211568990	-0.1306
ieFromHome		0.004812032	0.041564987	-0.664884791	0.306131593	0.048941659	-0.1768
ate		-0.011288550	-0.062668026	-0.352147686	-0.255816205	0.602292088	-0.4816
'Income		0.360622909	-0.290395305	0.052415102	0.025332267	-0.034941693	-0.0332
'Rate		0.001123298	-0.086158010	0.020312197	0.664085954	-0.101166486	-0.3712
aniesWorked		0.030991906	-0.560133264	0.005628265	-0.041875610	0.017785645	0.1012
:SalaryHike		-0.015351368	0.004618486	-0.465841883	-0.055689609	-0.698726672	-0.0082
orkingYears		0.415285665	-0.318115831	0.009368263	0.007027664	-0.024159198	-0.0252
igTimesLastYear		-0.010993402	0.092457674	0.409028173	-0.138279489	-0.293982017	-0.7516

Company	0.443443529	0.213079968	0.002115638	-0.010571214	0.024921329	-0.0019
CurrentRole	0.391353065	0.279423881	-0.048111956	-0.038785223	-0.004927194	0.0145
nceLastPromotion	0.344322397	0.198658357	0.003993040	0.027659809	0.019935007	0.0186
thCurrManager	0.386171187	0.295138965	-0.031745944	-0.034459502	0.021898300	0.0286
PC8	PC9	PC10	PC11	PC12		
	-0.098196914	-0.05927715	-0.183114693	0.005033984	-0.74367068	-0.041550
ite	0.715405171	-0.02770642	-0.028707475	0.040304455	-0.01980752	0.040445
FromHome	0.031447533	-0.65217193	0.037737577	0.002338630	0.02927699	0.003420
ate	-0.221010405	0.40142111	-0.004675476	0.018009772	0.03725997	-0.004074
Income	-0.012272736	-0.03685912	-0.377381332	0.104651321	0.61775910	-0.047499
Rate	0.482943083	0.40448871	0.056690883	-0.044889268	-0.01681584	0.023709
paniesWorked	-0.032989593	-0.03355765	0.775796629	-0.129586743	0.19687866	0.021028
SalaryHike	-0.376210309	0.38335261	0.012190972	0.019568502	0.04082482	0.014317
orkingYears	-0.029511945	-0.04398227	-0.196663458	-0.038585533	0.08301594	0.061109
gTimesLastYear	-0.217564575	-0.29622601	0.130785998	-0.017811234	0.02954240	-0.000289
Company	0.005335572	0.01862614	-0.001551392	-0.104225054	0.03762072	0.079527
CurrentRole	0.062086964	0.05420752	0.201595025	-0.271683842	-0.04458982	-0.765806
nceLastPromotion	0.022129234	0.03850513	0.306725567	0.845951303	-0.08053456	0.075946
thCurrManager	0.011525930	0.04176204	0.161413516	-0.407140185	-0.06576770	0.625185
PC14						

	0.1893016403	0.237072230
ite	-0.0099081253	0.018837870
FromHome	0.0057709912	0.011991386
ate	0.0049037331	-0.003314012
Income	0.4041044054	0.279006032
Rate	-0.0083381972	0.009367738
paniesWorked	-0.0369554196	0.107234673
SalaryHike	-0.0183445446	0.010585240
orkingYears	-0.4158888971	-0.705989494
gTimesLastYear	0.0008431661	-0.012085362
Company	-0.6494086309	0.562584645
CurrentRole	0.1948014145	-0.130643692
nceLastPromotion	0.0977011821	-0.083447864
thCurrManager	0.3959144832	-0.121010943

	DailyRate	DistanceFromHome	HourlyRate
10	802.485714	9.192517	65.891156
Income	MonthlyRate	NumCompaniesWorked	PercentSalaryHike
1293	14313.103401	2.693197	15.209524
orkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole
92	2.799320	7.008163	4.229252
nceLastPromotion	YearsWithCurrManager		
5	4.123129		

	DailyRate	DistanceFromHome	HourlyRate
3	403.509100	8.106864	20.329428
Income	MonthlyRate	NumCompaniesWorked	PercentSalaryHike
6783	7117.786044	2.498009	3.659938
orkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole
2	1.289271	6.126525	3.623137
nceLastPromotion	YearsWithCurrManager		
0	3.568136		

	PC2	PC3	PC4	PC5	PC6	PC7
	0.243044079	-1.805296680	-0.3104169553	-0.384994275	2.0169575215	0.984793983
	0.854288163	0.381073595	-0.5252390003	1.608645799	-1.5927436292	-0.481865695
	0.198275394	-1.413301606	-0.0582282745	-2.596801032	0.6022422032	-0.023230640
	0.570845554	0.682294015	0.9530781591	-0.112517223	0.0144209522	-0.415235118
	0.567685771	-0.965438549	1.6427717726	0.537047071	-0.0703157168	0.940560119
	0.033228256	1.476192828	0.1768758528	-0.871158691	0.9282306482	0.367849216
	0.176981984	-2.344142438	-0.5229233979	-1.666338771	-0.8793271137	-0.417767837

1.668563284	0.310022541	-2.6128166708	-0.330963952	-1.2486460778	-0.052250851	0.44046595
1.910894519	1.213005861	-1.5039201417	1.144947290	-1.1238829367	1.049881443	-1.50898530
1.339778839	-0.208584655	-1.9076328247	-0.281672326	1.0866328829	-1.252674274	1.0283294
1.227202504	0.961999888	0.0613545738	0.034499533	0.4709461858	-2.043427871	-0.0936310
0.073116546	1.760186112	0.5344916830	1.247906142	0.5189044912	0.442256861	-0.6159184
1.087474516	1.023377864	-1.5147071841	1.573775407	-0.7475549471	1.511464717	0.4754397
1.814073316	0.601874393	-1.3014136722	-1.101977678	1.6522331947	-0.334506872	0.9484714
1.659410211	0.292702788	-0.0672556843	1.527211158	0.0369416431	-0.176183833	-1.1432601
1.744251934	1.686663324	-1.1177364895	-0.381693162	0.6609099755	1.223658522	1.9446011
1.118546968	1.132058901	1.4189672811	0.273681898	0.7687430566	-1.460717606	-0.9296940
2.875446285	0.684977918	-1.2101773533	-1.069482747	1.5219403902	-0.105065952	0.2801528
4.306398521	-1.060188116	0.2102166478	-0.374474127	-0.3205736368	-1.006842601	0.8202298
1.274793286	-0.518252552	1.7607337154	-0.263605442	0.4775025923	1.296215086	-0.9179788
1.707674413	1.416074395	-0.2866612249	-0.911443288	0.0740619531	-1.694982203	-1.4684993
0.973935456	-1.013413533	-1.1120212000	-1.850388185	-1.3640205357	-0.666890243	-1.0152267
1.686994016	1.312303531	1.5096245660	1.224455487	0.2429059015	-0.652215366	0.2571833
3.186960204	1.127496005	0.4028852195	0.661084708	0.6427677466	-2.782189999	-0.9699291
1.236420346	0.070998887	0.2998566707	0.248336464	1.5088956715	0.030328006	0.3846099
4.335210193	-1.187855044	0.8439064948	-1.135518002	0.1502712115	0.089980426	0.9783843
0.202667449	1.487707345	-1.0496066009	-1.510499974	-1.5194444667	-1.172856717	-1.1043543
0.522611662	0.517960123	0.7496484428	1.189509235	0.3725504816	0.467749272	1.0650694
4.167497779	1.068632778	1.1917707595	-0.655936499	-0.3603395503	0.680646739	-1.2670175
0.855668649	-2.594944348	0.7337329455	0.725830150	0.9881939586	-0.389610046	0.4267363
2.101453288	-0.598109160	0.9218830885	-1.261397525	1.1285699242	0.185406411	-0.1011647
0.628686779	-0.506577343	1.0557480273	-0.359363863	-1.2767722294	-1.259019980	1.5089119
0.585760317	1.290594877	1.0175278792	0.759970743	0.8434796204	-1.537202603	-1.3624105
1.453000790	-0.878346751	1.6553451372	-1.466979255	-0.7652620288	-1.050427892	-1.0555470
2.295426038	0.497391245	0.3961407175	-1.173667681	0.0495687553	1.396660954	-0.5849422
0.832994065	0.042990012	0.7006144001	-0.308495224	0.3417332881	-0.722274641	1.5080310
1.354693336	-0.382172652	-0.0113330121	-1.423881781	1.0314915947	0.517495020	-0.7185384
1.788459375	0.520002398	0.3186189447	-1.168483914	1.3010327250	-0.499080505	-0.2923377
1.940888185	-1.947119717	0.3014065269	-0.616302576	0.6580712905	-0.112112477	-0.2315559
0.826827035	0.269317986	0.4683770185	-1.617065750	-1.5424619460	1.078602496	-0.3253457
2.540242339	0.231335668	0.9249250633	-0.019213294	1.0357898965	0.023182442	-0.6662971
2.775064596	0.699871648	2.2688244419	-0.255818018	-1.5958498425	-1.351223462	1.2317170
2.660977369	0.709039810	-1.1151323620	-0.173311857	0.1700305471	0.580484544	1.5358935
0.494241988	1.355663630	-0.4558314906	-0.773576913	-0.0893201999	2.889936395	0.5730119
0.755465347	1.607572626	-0.5109637132	-0.506888091	-1.4233075836	1.057147451	-0.8116413
5.804951893	1.078091201	-0.6975281151	0.051444706	0.4337848886	1.614106696	2.3169509
0.806658069	1.653442819	-2.3068106160	-0.295882847	-0.4722918379	0.134169049	-0.0542540
1.995881882	-0.926896408	-1.9960316143	0.633599363	-0.1729888148	1.021151201	-1.4100772
0.844245935	-0.616849916	-0.8194206960	-0.921810229	-0.7717068286	-1.818536061	-0.1164837
2.418330657	0.297326189	-0.3513459999	-1.101751982	-1.5156578641	1.499053343	0.1728086
0.617002088	-3.634989196	0.3562096372	0.118216390	1.4389894618	-0.220229442	-0.3437186
1.874898008	0.830881805	0.6248015543	-1.142134976	-0.3600199657	0.329946720	1.3675038
0.595964470	-1.218466650	-0.8408839570	-2.447215614	-0.9399446833	0.774272087	-0.2054942
0.697653611	-0.440311397	-0.1001609790	-1.002941201	0.6741005136	-0.305412825	0.1179247
2.079810230	-0.955185144	-1.8161177942	0.441813227	-1.3960822450	0.253432093	1.6426596
3.708466615	1.814109184	-0.0097541922	-0.036909451	2.1090226075	0.552998695	0.0715580
0.809848967	1.103897503	-1.7108414088	-0.291327045	-1.1137226784	-0.318923581	-0.7706595
1.465681948	0.058005177	-0.5799431432	0.624721643	-1.1676958094	0.275086845	1.1479757
0.172118882	0.857390902	-0.3222266947	-0.286150650	-1.6974104391	0.722818482	-1.0174069
0.134488687	0.774824505	0.0742047436	-1.668328387	-0.8320217703	1.458220908	-0.2098923
1.154466224	1.922306493	0.5340354541	0.208456672	-2.0449281318	1.172737829	-1.1081902
1.015549604	1.685679343	-1.0836803069	0.522264077	0.9425346951	0.960676995	0.0215977
5.230825960	-1.151655660	0.8119758029	0.364485427	-0.0405314789	0.826552609	1.0108396
5.030282900	-0.755218265	-1.7678975054	-2.044562287	1.6478909242	-0.737221001	0.3123514
3.788984539	1.946298043	-0.0945560272	-1.067010987	0.3184679516	0.860439229	1.0204812
0.660742882	-2.427444222	0.7464731633	1.051907583	-0.8666771968	0.700339962	0.6994842
0.689313482	0.194433528	-0.4992692899	-0.091816631	0.9077818943	-1.467101142	1.1917945
0.360119052	-2.235551626	-0.3033093916	-0.208683127	-0.8858009134	0.057772762	1.0278813
1.590660053	-0.244778958	0.5118655703	-0.944308747	1.1711060680	0.909011154	-0.6490526
2.349000231	-0.024496709	-1.0212757577	1.625278907	0.8108621115	0.977055716	-0.2246999
0.537061435	-3.049510452	0.9612799574	0.240109595	0.1951466351	0.179765350	1.7241143

	PC9	PC10	PC11	PC12	PC13	PC14
..5917738507	1.1863471823	-0.8721216003	-0.0964053395	0.1652689774	2.697995e-01	5.6169
..4396138690	-0.2915207036	-0.9133153760	-1.2704956060	-0.1223848585	3.003787e-01	3.9264
..1645450520	0.7037177946	0.2334286037	-0.2063109991	0.0757180104	-2.034191e-01	-3.0270
..3788485663	-0.0232142896	0.4483748666	-0.4255970757	-1.1905425766	-5.888785e-01	3.7605
..2110090034	2.3132854086	-0.0092829889	0.7911383832	0.0932147601	-1.001822e-01	-1.4650
..8232618244	-0.2219554949	-0.0872069258	-0.4352547853	-0.2311142456	2.074828e-01	-3.4016
..6783978017	-0.4439152914	0.2850426885	-1.9955214056	0.0476998780	-7.608564e-02	1.5272
..3684730529	-0.4875080936	0.4800518063	0.0543954145	0.1020736714	-4.659415e-02	3.2533
..9351740522	-0.8467583073	-0.7791175369	0.1173708729	-0.0207647030	7.178969e-01	2.0342
..0.9887551265	1.8168832792	0.5496258442	0.0893646974	0.1719743118	1.482873e-01	-7.592
..0.7428933771	-0.3487121205	-0.3578297611	-0.5029560805	-0.2422407358	-3.914638e-02	-2.624
..1.0813690872	-0.3767620037	-1.1058405989	0.0965394361	0.4399899746	-2.594555e-02	-2.940
..1.2884619372	-0.0363538480	0.8308304610	-0.2190499489	0.3017206595	-5.138678e-02	6.517
..0.8195524226	-0.7310455341	0.3812739185	-0.4949317648	-0.0110627441	2.587105e-01	7.880
..1.9271549894	1.2343495139	-0.5198251249	0.4250203594	0.1772497877	-2.805626e-01	-4.452
..1.2962378063	0.1672283742	0.9190505173	0.6052322133	-0.1396419825	7.886224e-01	-8.889
..0.0866130578	-0.4359922773	-0.4908235512	-0.1712840455	0.4964863948	-6.197885e-02	-8.960
..0.3703968876	-0.4515944960	0.4707221281	0.6870011577	0.0480464742	-1.323742e-01	7.059
..1.1419762947	-1.3201148540	-0.5553725566	-0.0202145544	0.0106513546	-1.330532e+00	5.419
..0.9326540622	0.6299363640	-0.0098247146	-0.2880597580	-0.0739027515	1.175321e-01	2.148
..0.0042898132	-0.3112305780	0.1801517860	0.6691640181	0.1912063602	-6.152712e-02	-1.847
..0.3446067836	1.3648622584	-0.4792426584	0.2130812121	0.0911878469	-3.605121e-01	6.632
..0.2496196395	-0.6875524464	-0.9335162824	0.6027692112	0.8094891808	7.005028e-01	1.107
..0.3520700093	0.2822430507	0.2555611279	0.6350192662	0.0179911182	-1.389628e-01	-1.118
..0.5077089246	-0.1612550579	-0.0186130089	-0.3041024579	0.2026623054	-1.190615e-01	-1.583
..0.6259760526	-0.5375940379	-0.5583140528	0.3347066400	-1.0951792994	8.320370e-01	2.989
..0.6537874675	0.3570074959	0.9290619928	-0.0189461399	1.1560600116	-2.554831e-01	-6.819
..0.0648482848	-0.7354981588	0.5503138531	-0.7380133792	-0.9496643546	8.389053e-03	2.596
..1.2648397307	0.3155536872	-1.1110140575	-0.1549320265	2.1008653026	-1.743973e-01	2.246
..0.9457428880	-1.6915126800	0.7155359778	1.0274567321	-0.2257845320	7.444228e-01	-2.638
..0.1895100955	0.2414887412	0.1464112473	-0.0495438258	-0.1690167656	-2.514129e-01	-1.647
..1.1586344712	-0.3666531671	0.0562237019	-0.6611355034	0.2298295473	2.991824e-01	2.466
..0.1491699406	0.0895757307	-0.5992509197	-0.0332054293	1.5600371817	-5.381913e-01	-1.237
..1.5329294741	-0.2065832996	0.1820633909	-0.4482305144	0.1077454163	-8.542825e-01	-1.146
..0.2134201607	-0.1299260602	0.8657952064	0.4687972163	0.1202434785	-4.949487e-01	-3.141
..0.7203396398	-0.3895527430	-0.1574012260	-1.2429413892	0.1954059923	1.912162e-01	2.394
..0.2688390818	-0.9067448813	0.0479551510	-1.6866316116	-0.1441330064	4.304295e-01	6.133
..0.6935995880	-0.2003120841	0.5271573093	-0.6067308937	-0.0279386513	2.824748e-01	1.247
..0.2429085978	1.7646246196	-0.1129573297	0.2507919469	-0.1314289782	-1.482093e-01	2.907
..0.1179524881	-0.3580190226	0.0556865761	0.1396045303	0.0353093528	-1.389953e-01	-1.514
..0.0181823818	-0.5107722810	0.3263458397	-0.5465772678	-0.0602546854	5.658773e-02	2.970
..0.7388494377	-0.0587506994	0.2787045616	0.0926434197	0.0901210156	-1.196858e-01	1.389
..1.9884712967	-0.3763602810	0.3022550599	0.1729522027	0.2552767122	-3.327794e-03	1.358
..0.3462124514	-0.6086221030	-0.7113741266	0.7779144715	-0.3180020334	4.068577e-01	1.109
..1.5058488466	0.0966839023	-0.4001732785	0.0586933619	-0.1521141805	-3.945470e-01	-2.508
..0.0542470485	-0.2605203348	2.2309102556	0.7861699813	-1.1179707031	4.072934e-01	3.200
..0.3676769926	0.0803763634	1.3065788470	-0.3439303856	0.5396748825	1.926447e-01	-2.356
..0.0379981462	0.0139823408	0.2379323987	-0.1482978143	0.0345722067	-2.626249e-01	-3.020
..1.5880220441	0.4128727770	-1.2321509722	-0.6278155609	0.3533099316	1.678164e-01	6.690
..0.4960323101	-0.6439180110	0.3515209761	-0.5484838822	0.2054958400	1.408071e-01	3.516
..1.1704670085	0.8200564211	-0.1123759892	-0.2977384011	0.1285674151	-6.899389e-01	-7.924
..0.3941110717	-0.1764307635	0.5591763859	0.0448168714	0.0596852002	2.356005e-01	6.709
..0.8857772453	0.2519075061	0.0130817786	-0.4850733698	0.0278447233	1.985134e-01	2.933
..0.6111756017	-0.7690695559	0.6284517406	0.6011938058	0.6113545988	3.056229e-01	1.541
..0.5984018598	1.3970676765	-0.0643320469	0.9721652618	-0.1949743264	-3.069309e-01	2.303
..1.7422401316	0.1408058227	-0.0199461188	0.7410413537	-0.5297862525	1.093202e+00	-1.580
..0.0108146406	-0.3106679951	-0.8493487541	0.3863867848	-0.1458192162	6.892529e-01	2.105
..1.8215348214	0.3621471351	0.4006851921	-0.2172714122	0.0608335537	2.928318e-01	2.154
..0.3335120551	0.4740138563	-0.8411057977	0.4163000283	-0.0858083206	2.931242e-01	-2.225
..0.2284006406	-0.6348604010	-0.7475512841	-0.2920548376	0.2496513450	4.888034e-01	2.230
..0.7408606053	0.5122781140	0.5793496320	-0.0105572994	-0.0042066309	5.488545e-01	-2.340
..2.4733087118	0.5540510535	1.2979592812	-0.9935329529	1.2766076994	1.734229e-01	-1.856
..0.4001018830	0.0656254162	2.1963468297	0.5895255433	1.4470277217	-1.086096e+00	1.034

```

1.7992385929 1.6436332545 -0.5355851584 -1.3269684512 -1.2755865234 -5.269145e-01 -1.040
0.1566109309 0.5395449026 1.4430413025 0.0325762440 -1.0121301749 2.073019e-01 -2.110
0.5389467786 -2.0662901268 0.1446763110 -0.3168046990 0.3722514197 2.468134e-01 1.594
0.6267828319 -0.5362398552 -0.3750836045 -0.0545365082 -0.4224485744 2.452230e-01 3.754
0.3270971145 -1.6969908177 0.3987065997 -0.0530068030 0.1509487886 -4.247686e-01 -1.035
0.3792991801 0.4293974391 0.0802128266 -0.3229283966 -0.0234897322 -3.881229e-02 1.049
1.5255487349 -1.1502222404 0.3958031962 -0.5136583440 -0.0367616655 1.303524e-01 3.312
0.4884620531 0.4469007175 -0.3625035208 -1.6091056814 0.0695982865 -7.853735e-02 -2.395
ed getOption("max.print") -- omitted 1399 rows ]

```

```

try(attr_pca_done)
nce of components:
PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10     PC11
d deviation      2.0042 1.2846 1.03368 1.02573 1.0047 0.99622 0.9764 0.95786 0.8500 0.7284
ion of Variance 0.2869 0.1179 0.07632 0.07515 0.0721 0.07089 0.0681 0.06554 0.0516 0.0379
ive Proportion 0.2869 0.4048 0.48111 0.55626 0.6284 0.69925 0.7673 0.83288 0.8845 0.9223
PC13      PC14
d deviation      0.53219 0.43975 0.3743
ion of Variance 0.02023 0.01381 0.0100
ive Proportion 0.97618 0.99000 1.0000
'act variance against features
values<-attr_pca_done$sdev^2
values
167738 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.9174969 0.7224654 0.5306
4698454 0.2832233 0.1933840 0.1400658
igenvalues)

```

```

(eigenvalues) <- paste("PC",1:14,sep="")
values
PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10
38 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.9174969 0.7224654 0.5306
PC13      PC14
33 0.1933840 0.1400658
lambdas <- sum(eigenvalues)
lambdas

```

```

ance %
r<- (eigenvalues/sumoflambdas)*100
r
PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10
41 11.787180 7.632173 7.515143 7.210077 7.088985 6.809641 6.553550 5.160467 3.790
PC13      PC14
3 1.381314 1.000470
ulate cumulative of variance
r <- cumsum(pctvar)
r
PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10
4 40.47842 48.11059 55.62574 62.83581 69.92480 76.73444 83.28799 88.44846 92.239
PC13      PC14
2 98.99953 100.00000
mbdas <- rbind(eigenvalues,pctvar,cumvar)
mbdas

```

```

PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9
lues 4.016774 1.650205 1.068504 1.052120 1.009411 0.9924579 0.9533497 0.9174969
28.691241 11.787180 7.632173 7.515143 7.210077 7.0889848 6.8096407 6.5535496
28.691241 40.478422 48.110594 55.625738 62.835815 69.9247997 76.7344404 83.2879900 8
PC11      PC12      PC13      PC14
lues 0.5306975 0.4698454 0.2832233 0.193384 0.1400658
3.7906965 3.3560388 2.0230233 1.381314 1.0004700
92.2391537 95.5951925 97.6182158 98.999530 100.0000000
mes(matlambdas) <- c("Eigenvalues","Prop. variance","Cum. prop. variance")
l(matlambdas,4)
PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10      PC11
lues 4.0168 1.6502 1.0685 1.0521 1.0094 0.9925 0.9533 0.9175 0.7225 0.5306

```

```

variance      28.6912 11.7872  7.6322  7.5151  7.2101  7.0890  6.8096  6.5535  5.1605  3.7
op. variance  28.6912 40.4784 48.1106 55.6257 62.8358 69.9248 76.7344 83.2880 88.4485 92.2
PC13      PC14
values      0.2832  0.1934  0.1401
variance      2.0230  1.3813  1.0005
op. variance  97.6182 98.9995 100.0000

```

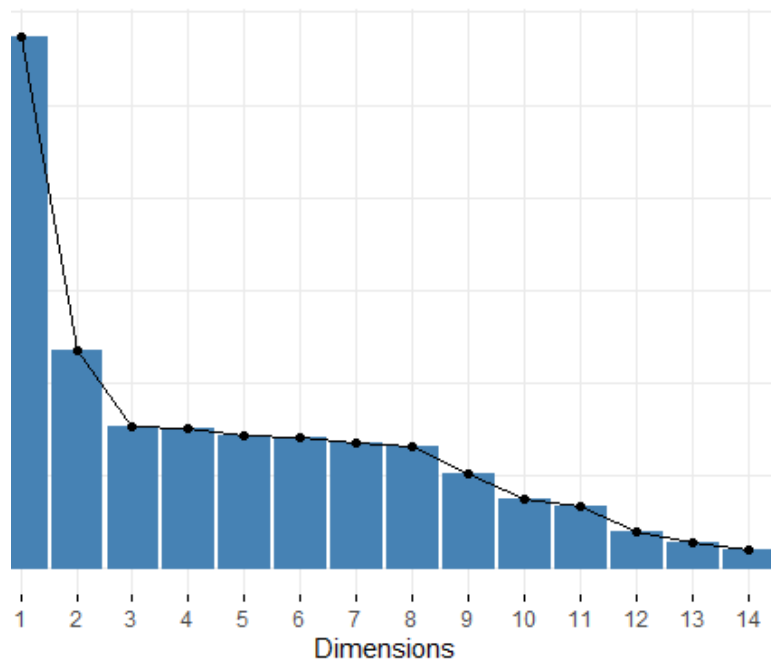
```
pca_done$rotation
```

	PC2	PC3	PC4	PC5	PC6		
ate	0.280157344	-0.472170158	0.003362193	0.004488409	-0.039563410	-0.0587	
FromHome	-0.006815197	-0.077962430	-0.207301367	-0.609569867	-0.211568990	-0.1306	
ate	0.004812032	0.041564987	-0.664884791	0.306131593	0.048941659	-0.1768	
ate	-0.011288550	-0.062668026	-0.352147686	-0.255816205	0.602292088	-0.4816	
Income	0.360622909	-0.290395305	0.052415102	0.025332267	-0.034941693	-0.0332	
Rate	0.001123298	-0.086158010	0.020312197	0.664085954	-0.101166486	-0.3712	
paniesWorked	0.030991906	-0.560133264	0.005628265	-0.041875610	0.017785645	0.1012	
SalaryHike	-0.015351368	0.004618486	-0.465841883	-0.055689609	-0.698726672	-0.0082	
orkingYears	0.415285665	-0.318115831	0.009368263	0.007027664	-0.024159198	-0.0252	
igTimesLastYear	-0.010993402	0.092457674	0.409028173	-0.138279489	-0.293982017	-0.7516	
Company	0.443443529	0.213079968	0.002115638	-0.010571214	0.024921329	-0.0019	
CurrentRole	0.391353065	0.279423881	-0.048111956	-0.038785223	-0.004927194	0.0145	
nceLastPromotion	0.344322397	0.198658357	0.003993040	0.027659809	0.019935007	0.0186	
thCurrManager	0.386171187	0.295138965	-0.031745944	-0.034459502	0.021898300	0.0286	
	PC8	PC9	PC10	PC11	PC12		
ate	-0.098196914	-0.05927715	-0.183114693	0.005033984	-0.74367068	-0.041550	
FromHome	0.715405171	-0.02770642	-0.028707475	0.040304455	-0.01980752	0.040445	
ate	0.031447533	-0.65217193	0.037737577	0.002338630	0.02927699	0.003420	
ate	-0.221010405	0.40142111	-0.004675476	0.018009772	0.03725997	-0.004074	
Income	-0.012272736	-0.03685912	-0.377381332	0.104651321	0.61775910	-0.047499	
Rate	0.482943083	0.40448871	0.056690883	-0.044889268	-0.01681584	0.023709	
paniesWorked	-0.032989593	-0.03355765	0.775796629	-0.129586743	0.19687866	0.021028	
SalaryHike	-0.376210309	0.38335261	0.012190972	0.019568502	0.04082482	0.014317	
orkingYears	-0.029511945	-0.04398227	-0.196663458	-0.038585533	0.08301594	0.061109	
igTimesLastYear	-0.217564575	-0.29622601	0.130785998	-0.017811234	0.02954240	-0.000289	
Company	0.005335572	0.01862614	-0.001551392	-0.104225054	0.03762072	0.079527	
CurrentRole	0.062086964	0.05420752	0.201595025	-0.271683842	-0.04458982	-0.765806	
nceLastPromotion	0.022129234	0.03850513	0.306725567	0.845951303	-0.08053456	0.075946	
thCurrManager	0.011525930	0.04176204	0.161413516	-0.407140185	-0.06576770	0.625185	
	PC14						
	0.1893016403	0.237072230					
ate	-0.0099081253	0.018837870					
FromHome	0.0057709912	0.011991386					
ate	0.0049037331	-0.003314012					
Income	0.4041044054	0.279006032					
Rate	-0.0083381972	0.009367738					
paniesWorked	-0.0369554196	0.107234673					
SalaryHike	-0.0183445446	0.010585240					
orkingYears	-0.4158888971	-0.705989494					
igTimesLastYear	0.0008431661	-0.012085362					
Company	-0.6494086309	0.562584645					
CurrentRole	0.1948014145	-0.130643692					
nceLastPromotion	0.0977011821	-0.083447864					
thCurrManager	0.3959144832	-0.121010943					

```
malize PCA using scree plot
```

```
screeplot(attr_pca_done, ncp=14)
```

cree plot



summary(attr_pca_done)

variance of components:

	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11
standard deviation	2.0042	1.2846	1.03368	1.02573	1.0047	0.99622	0.9764	0.95786	0.8500	0.7284
proportion of Variance	0.2869	0.1179	0.07632	0.07515	0.0721	0.07089	0.0681	0.06554	0.0516	0.0379
cumulative Proportion	0.2869	0.4048	0.48111	0.55626	0.6284	0.69925	0.7673	0.83288	0.8845	0.9223
PC13	PC14									
standard deviation	0.53219	0.43975	0.3743							
proportion of Variance	0.02023	0.01381	0.0100							
cumulative Proportion	0.97618	0.99000	1.0000							

sample scores stored in attr_pca\$x

need to calculate the scores on each of these components for each individual in our sample

attr_pca_done\$x

	PC2	PC3	PC4	PC5	PC6	PC7
0.243044079	-1.805296680	-0.3104169553	-0.384994275	2.0169575215	0.984793983	1.33213032
0.854288163	0.381073595	-0.5252390003	1.608645799	-1.5927436292	-0.481865695	-1.04322462
0.198275394	-1.413301606	-0.0582282745	-2.596801032	0.6022422032	-0.023230640	-0.24482174
0.570845554	0.682294015	0.9530781591	-0.112517223	0.0144209522	-0.415235118	2.25467789
0.567685771	-0.965438549	1.6427717726	0.537047071	-0.0703157168	0.940560119	0.33261104
0.033228256	1.476192828	0.1768758528	-0.871158691	0.9282306482	0.367849216	0.55347104
0.176981984	-2.344142438	-0.5229233979	-1.666338771	-0.8793271137	-0.417767837	-0.43837159
0.668563284	0.310022541	-2.6128166708	-0.330963952	-1.2486460778	-0.052250851	0.44046595
0.910894519	1.213005861	-1.5039201417	1.144947290	-1.1238829367	1.049881443	-1.50898530
1.339778839	-0.208584655	-1.9076328247	-0.281672326	1.0866328829	-1.252674274	1.0283294
1.227202504	0.961999888	0.0613545738	0.034499533	0.4709461858	-2.043427871	-0.0936310
0.073116546	1.760186112	0.5344916830	1.247906142	0.5189044912	0.442256861	-0.6159184
1.087474516	1.023377864	-1.5147071841	1.573775407	-0.7475549471	1.511464717	0.4754397
1.814073316	0.601874393	-1.3014136722	-1.101977678	1.6522331947	-0.334506872	0.9484714
1.659410211	0.292702788	-0.0672556843	1.527211158	0.0369416431	-0.176183833	-1.1432601
1.744251934	1.686663324	-1.1177364895	-0.381693162	0.6609099755	1.223658522	1.9446011
1.118546968	1.132058901	1.4189672811	0.273681898	0.7687430566	-1.460717606	-0.9296940
2.875446285	0.684977918	-1.2101773533	-1.069482747	1.5219403902	-0.105065952	0.2801528
4.306398521	-1.060188116	0.2102166478	-0.374474127	-0.3205736368	-1.006842601	0.8202298
1.274793286	-0.518252552	1.7607337154	-0.263605442	0.4775025923	1.296215086	-0.9179788
1.707674413	1.416074395	-0.2866612249	-0.911443288	0.0740619531	-1.694982203	-1.4684993

0.973935456	-1.013413533	-1.1120212000	-1.850388185	-1.3640205357	-0.666890243	-1.0152267
1.686994016	1.312303531	1.5096245660	1.224455487	0.2429059015	-0.652215366	0.2571833
3.186960204	1.127496005	0.4028852195	0.661084708	0.6427677466	-2.782189999	-0.9699291
1.236420346	0.070998887	0.2998566707	0.248336464	1.5088956715	0.030328006	0.3846099
4.335210193	-1.187855044	0.8439064948	-1.135518002	0.1502712115	0.089980426	0.9783843
0.202667449	1.487707345	-1.0496066009	-1.510499974	-1.5194444667	-1.172856717	-1.1043543
0.522611662	0.517960123	0.7496484428	1.189509235	0.3725504816	0.467749272	1.0650694
4.167497779	1.068632778	1.1917707595	-0.655936499	-0.3603395503	0.680646739	-1.2670175
0.855668649	-2.594944348	0.7337329455	0.725830150	0.9881939586	-0.389610046	0.4267363
2.101453288	-0.598109160	0.9218830885	-1.261397525	1.1285699242	0.185406411	-0.1011647
0.628686779	-0.506577343	1.0557480273	-0.359363863	-1.2767722294	-1.259019980	1.5089119
0.585760317	1.290594877	1.0175278792	0.759970743	0.8434796204	-1.537202603	-1.3624105
1.453000790	-0.878346751	1.6553451372	-1.466979255	-0.7652620288	-1.050427892	-1.0555470
2.295426038	0.497391245	0.3961407175	-1.173667681	0.0495687553	1.396660954	-0.5849422
0.832994065	0.042990012	0.7006144001	-0.308495224	0.3417332881	-0.722274641	1.5080310
1.354693336	-0.381272652	-0.0113330121	-1.423881781	1.0314915947	0.517495020	-0.7185384
1.788459375	0.520002398	0.3186189447	-1.168483914	1.3010327250	-0.499080505	-0.2923377
1.940888185	-1.947119717	0.3014065269	-0.616302576	0.6580712905	-0.112112477	-0.2315559
0.826827035	0.269317986	0.4683770185	-1.617065750	-1.5424619460	1.078602496	-0.3253457
2.540242339	0.231335668	0.9249250633	-0.019213294	1.0357898965	0.023182442	-0.6662971
2.775064596	0.699871648	2.2688244419	-0.255818018	-1.5958498425	-1.351223462	1.2317170
2.660977369	0.709039810	-1.1151323620	-0.173311857	0.1700305471	0.580484544	1.5358935
0.494241988	1.355663630	-0.4558314906	-0.773576913	-0.0893201999	2.889936395	0.5730119
0.755465347	1.607572626	-0.5109637132	-0.506888091	-1.4233075836	1.057147451	-0.8116413
5.804951893	1.078091201	-0.6975281151	0.051444706	0.4337848886	1.614106696	2.3169509
0.806658069	1.653442819	-2.3068106160	-0.295882847	-0.4722918379	0.134169049	-0.0542540
1.995881882	-0.926896408	-1.9960316143	0.633599363	-0.1729888148	1.021151201	-1.4100772
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	PC10	PC11	PC12	PC13	PC14		

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9152070	-0.913315376	-1.27049561	-0.122384858	0.300378690	0.39264772
0371779	0.233428604	-0.20631100	0.075718010	-0.203419065	-0.03027029
2321429	0.448374867	-0.42559708	-1.190542577	-0.588878508	0.03760515
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2195549	-0.087206926	-0.43525479	-0.231114246	0.207482785	-0.34016769
4391529	0.285042689	-1.99552141	0.047699878	-0.076085636	0.15272680
8750809	0.480051806	0.05439541	0.102073671	-0.046594152	0.32533830
4675831	-0.779117537	0.11737087	-0.020764703	0.717896928	0.20342651
1688328	0.549625844	0.08936470	0.171974312	0.148287350	-0.75927968
4871212	-0.357829761	-0.50295608	-0.242240736	-0.039146384	-0.02624589
7676200	-1.105840599	0.09653944	0.439989975	-0.025945549	-0.29403497
3635385	0.830830461	-0.21904995	0.301720660	-0.051386781	0.06517152
3104553	0.381273918	-0.49493176	-0.011062744	0.258710503	0.07880223
3434951	-0.519825125	0.42502036	0.177249788	-0.280562634	-0.04452694
6722837	0.919050517	0.60523221	-0.139641983	0.788622438	-0.08889241
3599228	-0.490823551	-0.17128405	0.496486395	-0.061978852	-0.08960470
5159450	0.470722128	0.68700116	0.048046474	-0.132374244	0.07059914
2011485	-0.555372557	-0.02021455	0.010651355	-1.330532123	0.54193113
2993636	-0.009824715	-0.28805976	-0.073902751	0.117532074	0.21483103
1123058	0.180151786	0.66916402	0.191206360	-0.061527117	-0.18474214
6486226	-0.479242658	0.21308121	0.091187847	-0.360512122	0.06632427
8755245	-0.933516282	0.60276921	0.809489181	0.700502805	0.11071287
8224305	0.255561128	0.63501927	0.017991118	-0.138962804	-0.11188786
6125506	-0.018613009	-0.30410246	0.202662305	-0.119061534	-0.15837894
3759404	-0.558314053	0.33470664	-1.095179299	0.832036960	0.02989736
5700750	0.929061993	-0.01894614	1.156060012	-0.255483067	-0.06819902
3549816	0.550313853	-0.73801338	-0.949664355	0.008389053	0.25967553
1555369	-1.111014058	-0.15493203	2.100865303	-0.174397307	0.02246194
9151268	0.715535978	1.02745673	-0.225784532	0.744422810	-0.26383596
4148874	0.146411247	-0.04954383	-0.169016766	-0.251412918	-0.16472346
6665317	0.056223702	-0.66113550	0.229829547	0.299182395	0.24667601
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0658330	0.182063391	-0.44823051	0.107745416	-0.854282470	-1.14616941
2992606	0.865795206	0.46879722	0.120243478	-0.494948660	-0.31419900
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7643076	0.559176386	0.04481687	0.059685200	0.235600513	0.06709468
5190751	0.013081779	-0.48507337	0.027844723	0.198513442	0.29335630
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pca

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Yes	-2.19827539	-1.41330161	-0.058228274	-2.59680103	0.60224220	-0.02323064	-0.2448217
No	-0.57084555	0.68229402	0.953078159	-0.11251722	0.01442095	-0.41523512	2.2546778
No	-1.56768577	-0.96543855	1.642771773	0.53704707	-0.07031572	0.94056012	0.3326110
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No	-2.66856328	0.31002254	-2.612816671	-0.33096395	-1.24864608	-0.05225085	0.4404659
No	0.91089452	1.21300586	-1.503920142	1.14494729	-1.12388294	1.04988144	-1.5089853
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No	-0.07311655	1.76018611	0.534491683	1.24790614	0.51890449	0.44225686	-0.6159184
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No	4.30639852	-1.06018812	0.210216648	-0.37447413	-0.32057364	-1.00684260	0.8202298
No	-1.27479329	-0.51825255	1.760733715	-0.26360544	0.47750259	1.29621509	-0.9179788
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Yes	-0.61700209	-3.63498920	0.356209637	0.11821639	1.43898946	-0.22022944	-0.3437186
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.02321429	0.448374867	-0.42559708	-1.190542577	-0.588878508	0.03760515		
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.4391529	0.285042689	-1.99552141	0.047699878	-0.076085636	0.15272680		
.8750809	0.480051806	0.05439541	0.102073671	-0.046594152	0.32533830		
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.1688328	0.549625844	0.08936470	0.171974312	0.148287350	-0.75927968		
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.3104553	0.381273918	-0.49493176	-0.011062744	0.258710503	0.07880223		
.3434951	-0.519825125	0.42502036	0.177249788	-0.280562634	-0.04452694		
.6722837	0.919050517	0.60523221	-0.139641983	0.788622438	-0.08889241		
.3599228	-0.490823551	-0.17128405	0.496486395	-0.061978852	-0.08960470		
.5159450	0.470722128	0.68700116	0.048046474	-0.132374244	0.07059914		
.2011485	-0.555372557	-0.02021455	0.010651355	-1.330532123	0.54193113		
.2993636	-0.009824715	-0.28805976	-0.073902751	0.117532074	0.21483103		
.1123058	0.180151786	0.66916402	0.191206360	-0.061527117	-0.18474214		
.6486226	-0.479242658	0.21308121	0.091187847	-0.360512122	0.06632427		
.8755245	-0.933516282	0.60276921	0.809489181	0.700502805	0.11071287		
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.0658330	0.182063391	-0.44823051	0.107745416	-0.854282470	-1.14616941		
.2992606	0.865795206	0.46879722	0.120243478	-0.494948660	-0.31419900		
.8955274	-0.157401226	-1.24294139	0.195405992	0.191216222	0.23944677		
.0674488	0.047955151	-1.68663161	-0.144133006	0.430429526	0.61334413		
.0031208	0.527157309	-0.60673089	-0.027938651	0.282474819	0.12472443		

```

6462462 -0.112957330 0.25079195 -0.131428978 -0.148209341 0.29073071
5801902 0.055686576 0.13960453 0.035309353 -0.138995276 -0.15147123
1077228 0.326345840 -0.54657727 -0.060254685 0.056587730 0.29700932
5875070 0.278704562 0.09264342 0.090121016 -0.119685794 0.13898868
7636028 0.302255060 0.17295220 0.255276712 -0.003327794 0.13586788
0862210 -0.711374127 0.77791447 -0.318002033 0.406857687 0.01109437
9668390 -0.400173278 0.05869336 -0.152114181 -0.394547025 -0.25084901
6052033 2.230910256 0.78616998 -1.117970703 0.407293367 0.32005748
8037636 1.306578847 -0.34393039 0.539674882 0.192644669 -0.23562251
1398234 0.237932399 -0.14829781 0.034572207 -0.262624929 -0.03020186
1287278 -1.232150972 -0.62781556 0.353309932 0.167816354 0.06690825
4391801 0.351520976 -0.54848388 0.205495840 0.140807097 0.35162772
2005642 -0.112375989 -0.29773840 0.128567415 -0.689938913 -0.79242652
7643076 0.559176386 0.04481687 0.059685200 0.235600513 0.06709468
5190751 0.013081779 -0.48507337 0.027844723 0.198513442 0.29335630
6906956 0.628451741 0.60119381 0.611354599 0.305622885 0.15411449
9706768 -0.064332047 0.97216526 -0.194974326 -0.306930947 0.23036887
4080582 -0.019946119 0.74104135 -0.529786253 1.093201883 -0.15809731
1066800 -0.849348754 0.38638678 -0.145819216 0.689252882 0.21050825
6214714 0.400685192 -0.21727141 0.060833554 0.292831786 0.21548050
7401386 -0.841105798 0.41630003 -0.085808321 0.293124207 -0.22251524
3486040 -0.747551284 -0.29205484 0.249651345 0.488803355 0.22308994
1227811 0.579349632 -0.01055730 -0.004206631 0.548854514 -0.23403874
5405105 1.297959281 -0.99353295 1.276607699 0.173422905 -0.18562460
6562542 2.196346830 0.58952554 1.447027722 -1.086096447 1.03490915
4363325 -0.535585158 -1.32696845 -1.275586523 -0.526914507 -0.10402533
3954490 1.443041303 0.03257624 -1.012130175 0.207301917 -0.21108226
6629013 0.144676311 -0.31680470 0.372251420 0.246813433 0.15949383
ed 'max' / getOption("max.print") -- omitted 1404 rows ]

```

`yp_pca)`

'frame': 1470 obs. of 15 variables:

tion: Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 1 1 1 1 ...

```

: num -0.243 0.854 -2.198 -0.571 -1.568 ...
: num -1.805 0.381 -1.413 0.682 -0.965 ...
: num -0.3104 -0.5252 -0.0582 0.9531 1.6428 ...
: num -0.385 1.609 -2.597 -0.113 0.537 ...
: num 2.017 -1.5927 0.6022 0.0144 -0.0703 ...
: num 0.9848 -0.4819 -0.0232 -0.4152 0.9406 ...
: num 1.332 -1.043 -0.245 2.255 0.333 ...
: num 1.592 1.44 0.165 0.379 -0.211 ...
: num 1.1863 -0.2915 0.7037 -0.0232 2.3133 ...
: num -0.87212 -0.91332 0.23343 0.44837 -0.00928 ...
: num -0.0964 -1.2705 -0.2063 -0.4256 0.7911 ...
: num 0.1653 -0.1224 0.0757 -1.1905 0.0932 ...
: num 0.27 0.3 -0.203 -0.589 -0.1 ...
: num 0.5617 0.3926 -0.0303 0.0376 -0.0147 ...

```

`pca`

st-- We see that true difference in all the means is different from zero.

`it(PC1~attr$Attrition,data=typ_pca)`

Two Sample t-test

PC1 by attr\$Attrition

668, df = 332.39, p-value = 9.363e-12

alternative hypothesis: true difference in means is not equal to 0

95 percent confidence interval:

-0.74 1.2660970

estimates:

group No mean in group Yes

79 -0.8307293

`it(PC2~attr$Attrition,data=typ_pca)`

Two Sample t-test


```
PC2 by attr$Attrition
85944, df = 359.22, p-value = 0.3907
ative hypothesis: true difference in means is not equal to 0
ent confidence interval:
i9831 0.09351411
estimates:
l group No mean in group Yes
'0362 0.06088848
```

```
it(PC3~attr$Attrition,data=typ_pca)
```

```
wo Sample t-test
```

```
PC3 by attr$Attrition
1682, df = 330.99, p-value = 0.04988
ative hypothesis: true difference in means is not equal to 0
ent confidence interval:
'54401 0.2902563607
estimates:
l group No mean in group Yes
143 -0.1217616
```

```
it(PC4~attr$Attrition,data=typ_pca)
```

```
wo Sample t-test
```

```
PC4 by attr$Attrition
9421, df = 316.05, p-value = 0.003501
ative hypothesis: true difference in means is not equal to 0
ent confidence interval:
i6461 -0.07520897
estimates:
l group No mean in group Yes
i0389 0.19043290
```

```
it(PC5~attr$Attrition,data=typ_pca)
```

```
wo Sample t-test
```

```
PC5 by attr$Attrition
8185, df = 335.9, p-value = 0.06988
ative hypothesis: true difference in means is not equal to 0
ent confidence interval:
i8955 0.01048367
estimates:
l group No mean in group Yes
i8558 0.10761736
```

```
it(PC6~attr$Attrition,data=typ_pca)
```

```
wo Sample t-test
```

```
PC6 by attr$Attrition
1045, df = 337.68, p-value = 0.04163
ative hypothesis: true difference in means is not equal to 0
ent confidence interval:
i2161 -0.00542244
estimates:
l group No mean in group Yes
i2967 0.11929235
```

```
it(PC7~attr$Attrition,data=typ_pca)
```


Two Sample t-test

```
PC7 by attr$Attrition
t = 0.2903, df = 338.09, p-value = 0.8974
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.946 0.1428859
estimates:
1 group No mean in group Yes
-0.8073 -0.007377570
```

```
plot(PC8~attr$Attrition,data=typ_pca)
```

Two Sample t-test

```
PC8 by attr$Attrition
t = 0.417, df = 333.18, p-value = 0.2152
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.5478 0.21789000
estimates:
1 group No mean in group Yes
-0.4406 -0.07072355
```

```
plot(PC9~attr$Attrition,data=typ_pca)
```

Two Sample t-test

```
PC9 by attr$Attrition
t = 0.4487, df = 341.99, p-value = 6.374e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.967 -0.1214329
estimates:
1 group No mean in group Yes
-0.7555 0.19808925
```

```
plot(PC10~attr$Attrition,data=typ_pca)
```

Two Sample t-test

```
PC10 by attr$Attrition
t = 0.7135, df = 407.32, p-value = 3.348e-06
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.4191 -0.1182375
estimates:
1 group No mean in group Yes
-0.70088 0.17012739
```

```
plot(PC11~attr$Attrition,data=typ_pca)
```

Two Sample t-test

```
PC11 by attr$Attrition
t = 0.716, df = 344.09, p-value = 0.08705
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.10429 0.01177642
estimates:
1 group No mean in group Yes
-0.68888 0.06757505
```

```
plot(PC12~attr$Attrition,data=typ_pca)
```

Two Sample t-test

```
PC12 by attr$Attrition
t = 3.139, df = 419.64, p-value = 0.001896
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.5603 0.02016025
estimates:
1 group No mean in group Yes
-0.53436 0.034094458
```

```
test(PC13~attr$Attrition,data=typ_pca)
```

Two Sample t-test

```
PC13 by attr$Attrition
t = 5.529, df = 328.06, p-value = 0.0004608
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.803 0.15253970
estimates:
1 group No mean in group Yes
-0.5597 -0.07572789
```

```
test(PC14~attr$Attrition,data=typ_pca)
```

Two Sample t-test

```
PC14 by attr$Attrition
t = 1.951, df = 362.54, p-value = 0.02328
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-0.3631 0.01882051
estimates:
1 group No mean in group Yes
-0.00967 0.024456932
```

test #Testing Variation

Variance Test- Test for variance

```
test(PC1~attr$Attrition,data=typ_pca)
```

to compare two variances

```
PC1 by attr$Attrition
F = 99326, num df = 1232, denom df = 236, p-value = 0.9282
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
0.491 1.2018726
estimates:
of variances
578
```

```
test(PC2~attr$Attrition,data=typ_pca)
```

to compare two variances

```
PC2 by attr$Attrition
F = 2515, num df = 1232, denom df = 236, p-value = 0.03136
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
0.37 1.514360
```

```
estimates:  
of variances  
06
```

```
test(PC3~attr$Attrition,data=typ_pca)
```

```
to compare two variances
```

```
PC3 by attr$Attrition  
97956, num df = 1232, denom df = 236, p-value = 0.8191  
ative hypothesis: true ratio of variances is not equal to 1  
cent confidence interval:  
755 1.1852922  
estimates:  
of variances  
553
```

```
test(PC4~attr$Attrition,data=typ_pca)
```

```
to compare two variances
```

```
PC4 by attr$Attrition  
8328, num df = 1232, denom df = 236, p-value = 0.06007  
ative hypothesis: true ratio of variances is not equal to 1  
cent confidence interval:  
035 1.0077126  
estimates:  
of variances  
99
```

```
test(PC5~attr$Attrition,data=typ_pca)
```

```
to compare two variances
```

```
PC5 by attr$Attrition  
0274, num df = 1232, denom df = 236, p-value = 0.8065  
ative hypothesis: true ratio of variances is not equal to 1  
cent confidence interval:  
538 1.2431317  
estimates:  
of variances  
55
```

```
test(PC6~attr$Attrition,data=typ_pca)
```

```
to compare two variances
```

```
PC6 by attr$Attrition  
0446, num df = 1232, denom df = 236, p-value = 0.6821  
ative hypothesis: true ratio of variances is not equal to 1  
cent confidence interval:  
521 1.2640519  
estimates:  
of variances  
44
```

```
test(PC7~attr$Attrition,data=typ_pca)
```

```
to compare two variances
```

```
PC7 by attr$Attrition  
0486, num df = 1232, denom df = 236, p-value = 0.6552  
ative hypothesis: true ratio of variances is not equal to 1
```

cent confidence interval:
597 1.2688116
estimates:
of variances
78

`test(PC8~attr$Attrition,data=typ_pca)`

to compare two variances

PC8 by attr\$Attrition
0009, num df = 1232, denom df = 236, p-value = 0.9893
ative hypothesis: true ratio of variances is not equal to 1
cent confidence interval:
071 1.2111588
estimates:
of variances
32

`test(PC9~attr$Attrition,data=typ_pca)`

to compare two variances

PC9 by attr\$Attrition
0863, num df = 1232, denom df = 236, p-value = 0.4278
ative hypothesis: true ratio of variances is not equal to 1
cent confidence interval:
151 1.3144492
estimates:
of variances
94

`test(PC10~attr$Attrition,data=typ_pca)`

to compare two variances

PC10 by attr\$Attrition
702, num df = 1232, denom df = 236, p-value = 7.271e-07
ative hypothesis: true ratio of variances is not equal to 1
cent confidence interval:
16 2.059510
estimates:
of variances
31

`test(PC11~attr$Attrition,data=typ_pca)`

to compare two variances

PC11 by attr\$Attrition
1066, num df = 1232, denom df = 236, p-value = 0.3303
ative hypothesis: true ratio of variances is not equal to 1
cent confidence interval:
918 1.3390472
estimates:
of variances
22

`test(PC12~attr$Attrition,data=typ_pca)`

to compare two variances

PC12 by attr\$Attrition

```

8153, num df = 1232, denom df = 236, p-value = 3.477e-08
ative hypothesis: true ratio of variances is not equal to 1
cent confidence interval:
90 2.196582
  estimates:
of variances
11

```

```
test(PC13~attr$Attrition,data=typ_pca)
```

to compare two variances

```

PC13 by attr$Attrition
95092, num df = 1232, denom df = 236, p-value = 0.5988
ative hypothesis: true ratio of variances is not equal to 1
cent confidence interval:
288 1.1506484
  estimates:
of variances
248

```

```
test(PC14~attr$Attrition,data=typ_pca)
```

to compare two variances

```

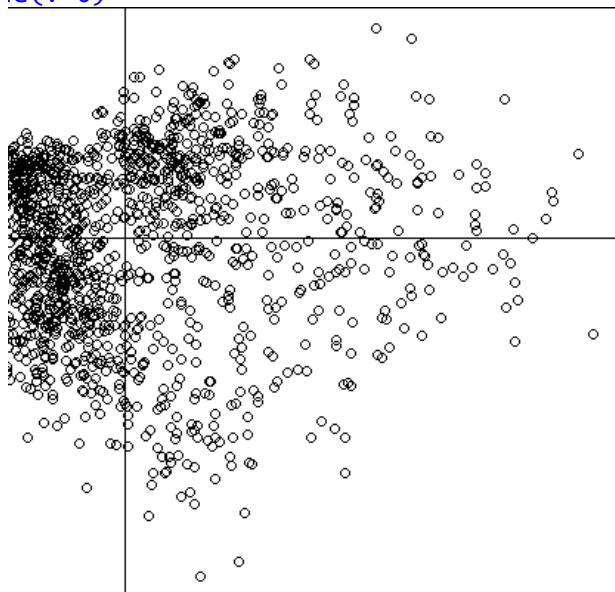
PC14 by attr$Attrition
2831, num df = 1232, denom df = 236, p-value = 0.01698
ative hypothesis: true ratio of variances is not equal to 1
cent confidence interval:
75 1.552554
  estimates:
of variances
7

```

```

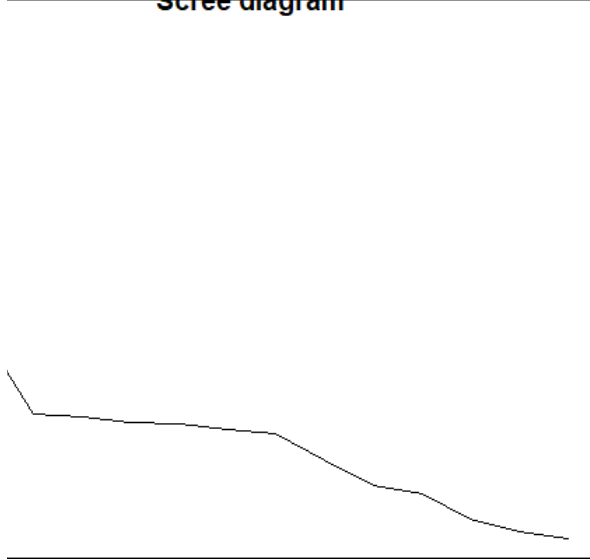
tting the scores of Pricipal Component 1 and Principal component 2
typ_pca$PC1, typ_pca$PC2,xlab="PC1:", ylab="PC2")
ie(h=0)
ie(v=0)

```

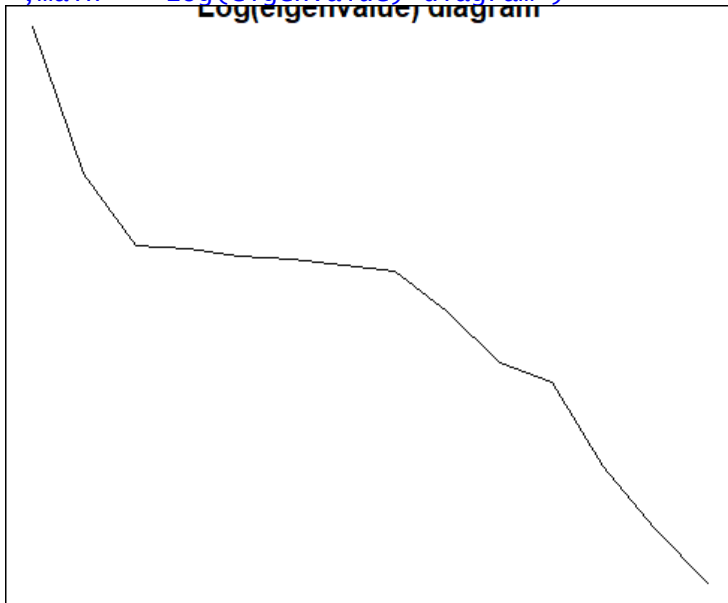


tting the Variance of Principal Components

```
(eigenvalues, xlab= "Component number", ylab = "Component variance", type = "l", main = "Scree diagram")
```



```
> #Plotting the Log variance of Components
> plot(log(eigenvalues), xlab = "Component number", ylab = "log(Component variance)", type="l", main = "Log(eigenvalue) diagram")
```



```
> #Variance of the principal components
```

```
>
```

```
> #View(attr_pca_done)
```

```
> diag(cov(attr_pca_done$x))
```

```
PC1      PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9      PC10
0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
PC11
4.0167738 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.9174969 0.7224654 0.5306975
PC12      PC13      PC14
0.2832233 0.1933840 0.1400658
```

```
> #x_pca$x[,1]
```

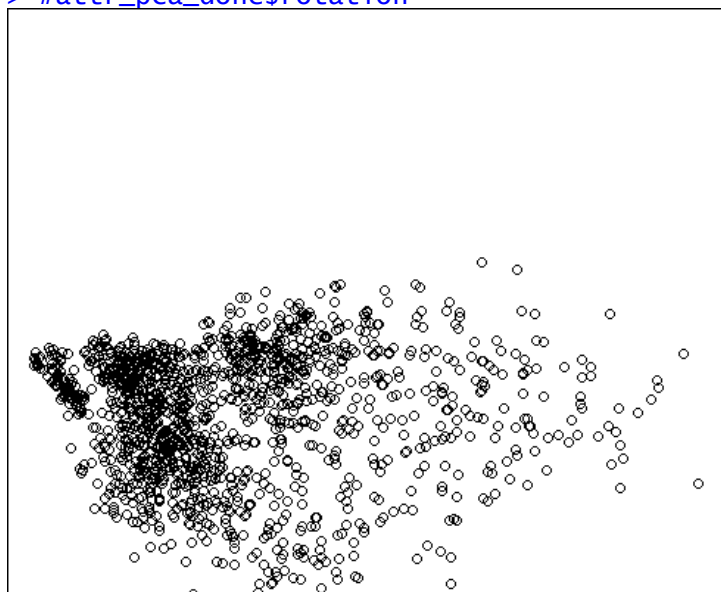
```
> #x_pca$x
```

```
> #Plotting the scores
```

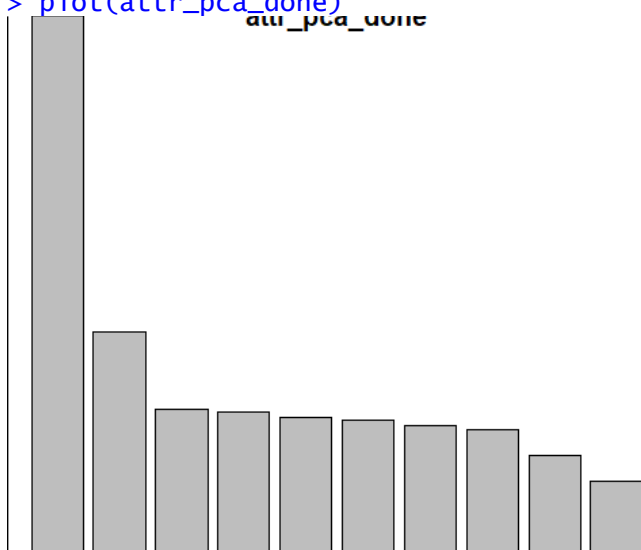
```
>
```

```
> xlim <- range(attr_pca_done$x[,1])
```

```
> plot(attr_pca_done$x,xlim=xlim,ylim=xlim)
> #attr_pca_done$rotation[,1]
> #attr_pca_done$rotation
```



```
> #Variance plot for each component. We can see that all components play a dominant role.
> plot(attr_pca_done)
```



```
> #get the original value of the data based on PCA
> center <- attr_pca_done$center
> scale <- attr_pca_done$scale
> new_attrition <- as.matrix(attr[, -2])
> new_attrition
```

	Age	BusinessTravel	DailyRate	Department	DistanceFromHome	Education
[1,]	"41"	"Travel_Rarely"	"1102"	"Sales"	"1"	"2"
[2,]	"49"	"Travel_Frequently"	"279"	"Research & Development"	"8"	"1"
[3,]	"37"	"Travel_Rarely"	"1373"	"Research & Development"	"2"	"2"
[4,]	"33"	"Travel_Frequently"	"1392"	"Research & Development"	"3"	"4"
[5,]	"27"	"Travel_Rarely"	"591"	"Research & Development"	"2"	"1"
[6,]	"32"	"Travel_Frequently"	"1005"	"Research & Development"	"2"	"2"
[7,]	"59"	"Travel_Rarely"	"1324"	"Research & Development"	"3"	"3"
[8,]	"30"	"Travel_Rarely"	"1358"	"Research & Development"	"24"	"1"
[9,]	"38"	"Travel_Frequently"	"216"	"Research & Development"	"23"	"3"
[10,]	"36"	"Travel_Rarely"	"1299"	"Research & Development"	"27"	"3"

[11,]	"35"	"Travel_Rarely"	" 809"	"Research & Development"	"16"	"3"
[12,]	"29"	"Travel_Rarely"	" 153"	"Research & Development"	"15"	"2"
[13,]	"31"	"Travel_Rarely"	" 670"	"Research & Development"	"26"	"1"
[14,]	"34"	"Travel_Rarely"	"1346"	"Research & Development"	"19"	"2"
[15,]	"28"	"Travel_Rarely"	" 103"	"Research & Development"	"24"	"3"
[16,]	"29"	"Travel_Rarely"	"1389"	"Research & Development"	"21"	"4"
[17,]	"32"	"Travel_Rarely"	" 334"	"Research & Development"	" 5"	"2"
[18,]	"22"	"Non-Travel"	"1123"	"Research & Development"	"16"	"2"
[19,]	"53"	"Travel_Rarely"	"1219"	"Sales"	" 2"	"4"
[20,]	"38"	"Travel_Rarely"	" 371"	"Research & Development"	" 2"	"3"
[21,]	"24"	"Non-Travel"	" 673"	"Research & Development"	"11"	"2"
[22,]	"36"	"Travel_Rarely"	"1218"	"Sales"	" 9"	"4"
[23,]	"34"	"Travel_Rarely"	" 419"	"Research & Development"	" 7"	"4"
[24,]	"21"	"Travel_Rarely"	" 391"	"Research & Development"	"15"	"2"
[25,]	"34"	"Travel_Rarely"	" 699"	"Research & Development"	" 6"	"1"
[26,]	"53"	"Travel_Rarely"	"1282"	"Research & Development"	" 5"	"3"
[27,]	"32"	"Travel_Frequently"	"1125"	"Research & Development"	"16"	"1"
[28,]	"42"	"Travel_Rarely"	" 691"	"Sales"	" 8"	"4"
[29,]	"44"	"Travel_Rarely"	" 477"	"Research & Development"	" 7"	"4"
[30,]	"46"	"Travel_Rarely"	" 705"	"Sales"	" 2"	"4"
[31,]	"33"	"Travel_Rarely"	" 924"	"Research & Development"	" 2"	"3"
[32,]	"44"	"Travel_Rarely"	"1459"	"Research & Development"	"10"	"4"
[33,]	"30"	"Travel_Rarely"	" 125"	"Research & Development"	" 9"	"2"
EducationField EnvironmentSatisfaction Gender HourlyRate JobInvolvement JobLevel						
[1,]	"Life Sciences"	"2"	"Female"	" 94"	"3"	"2"
[2,]	"Life Sciences"	"3"	"Male"	" 61"	"2"	"2"
[3,]	"Other"	"4"	"Male"	" 92"	"2"	"1"
[4,]	"Life Sciences"	"4"	"Female"	" 56"	"3"	"1"
[5,]	"Medical"	"1"	"Male"	" 40"	"3"	"1"
[6,]	"Life Sciences"	"4"	"Male"	" 79"	"3"	"1"
[7,]	"Medical"	"3"	"Female"	" 81"	"4"	"1"
[8,]	"Life Sciences"	"4"	"Male"	" 67"	"3"	"1"
[9,]	"Life Sciences"	"4"	"Male"	" 44"	"2"	"3"
[10,]	"Medical"	"3"	"Male"	" 94"	"3"	"2"
[11,]	"Medical"	"1"	"Male"	" 84"	"4"	"1"
[12,]	"Life Sciences"	"4"	"Female"	" 49"	"2"	"2"
[13,]	"Life Sciences"	"1"	"Male"	" 31"	"3"	"1"
[14,]	"Medical"	"2"	"Male"	" 93"	"3"	"1"
[15,]	"Life Sciences"	"3"	"Male"	" 50"	"2"	"1"
[16,]	"Life Sciences"	"2"	"Female"	" 51"	"4"	"3"
[17,]	"Life Sciences"	"1"	"Male"	" 80"	"4"	"1"
[18,]	"Medical"	"4"	"Male"	" 96"	"4"	"1"
[19,]	"Life Sciences"	"1"	"Female"	" 78"	"2"	"4"
[20,]	"Life Sciences"	"4"	"Male"	" 45"	"3"	"1"
[21,]	"Other"	"1"	"Female"	" 96"	"4"	"2"
[22,]	"Life Sciences"	"3"	"Male"	" 82"	"2"	"1"
[23,]	"Life Sciences"	"1"	"Female"	" 53"	"3"	"3"
[24,]	"Life Sciences"	"3"	"Male"	" 96"	"3"	"1"
[25,]	"Medical"	"2"	"Male"	" 83"	"3"	"1"
[26,]	"Other"	"3"	"Female"	" 58"	"3"	"5"
[27,]	"Life Sciences"	"2"	"Female"	" 72"	"1"	"1"
[28,]	"Marketing"	"3"	"Male"	" 48"	"3"	"2"
[29,]	"Medical"	"1"	"Female"	" 42"	"2"	"3"
[30,]	"Marketing"	"2"	"Female"	" 83"	"3"	"5"
[31,]	"Medical"	"3"	"Male"	" 78"	"3"	"1"
[32,]	"Other"	"4"	"Male"	" 41"	"3"	"2"
[33,]	"Medical"	"4"	"Male"	" 83"	"2"	"1"
JobRole Jobsatisfaction MaritalStatus MonthlyIncome MonthlyRate NumCompa						
niesworked						
[1,]	"Sales Executive"	"4"	"Single"	" 5993"	"19479"	"8"
[2,]	"Research Scientist"	"2"	"Married"	" 5130"	"24907"	"1"
[3,]	"Laboratory Technician"	"3"	"Single"	" 2090"	" 2396"	"6"
[4,]	"Research Scientist"	"3"	"Married"	" 2909"	"23159"	"1"
[5,]	"Laboratory Technician"	"2"	"Married"	" 3468"	"16632"	"9"

[6,]	"Laboratory Technician"	"4"	"Single"	" 3068"	"11864"	"0"
[7,]	"Laboratory Technician"	"1"	"Married"	" 2670"	" 9964"	"4"
[8,]	"Laboratory Technician"	"3"	"Divorced"	" 2693"	"13335"	"1"
[9,]	"Manufacturing Director"	"3"	"Single"	" 9526"	" 8787"	"0"
[10,]	"Healthcare Representative"	"3"	"Married"	" 5237"	"16577"	"6"
[11,]	"Laboratory Technician"	"2"	"Married"	" 2426"	"16479"	"0"
[12,]	"Laboratory Technician"	"3"	"Single"	" 4193"	"12682"	"0"
[13,]	"Research Scientist"	"3"	"Divorced"	" 2911"	"15170"	"1"
[14,]	"Laboratory Technician"	"4"	"Divorced"	" 2661"	" 8758"	"0"
[15,]	"Laboratory Technician"	"3"	"Single"	" 2028"	"12947"	"5"
[16,]	"Manufacturing Director"	"1"	"Divorced"	" 9980"	"10195"	"1"
[17,]	"Research Scientist"	"2"	"Divorced"	" 3298"	"15053"	"0"
[18,]	"Laboratory Technician"	"4"	"Divorced"	" 2935"	" 7324"	"1"
[19,]	"Manager"	"4"	"Married"	"15427"	"22021"	"2"
[20,]	"Research Scientist"	"4"	"Single"	" 3944"	" 4306"	"5"
[21,]	"Manufacturing Director"	"3"	"Divorced"	" 4011"	" 8232"	"0"
[22,]	"Sales Representative"	"1"	"Single"	" 3407"	" 6986"	"7"
[23,]	"Research Director"	"2"	"Single"	"11994"	"21293"	"0"
[24,]	"Research Scientist"	"4"	"Single"	" 1232"	"19281"	"1"
[25,]	"Research Scientist"	"1"	"Single"	" 2960"	"17102"	"2"
[26,]	"Manager"	"3"	"Divorced"	"19094"	"10735"	"4"
[27,]	"Research Scientist"	"1"	"Single"	" 3919"	" 4681"	"1"
[28,]	"Sales Executive"	"2"	"Married"	" 6825"	"21173"	"0"
[29,]	"Healthcare Representative"	"4"	"Married"	"10248"	" 2094"	"3"
[30,]	"Manager"	"1"	"Single"	"18947"	"22822"	"3"
[31,]	"Laboratory Technician"	"4"	"Single"	" 2496"	" 6670"	"4"
[32,]	"Healthcare Representative"	"4"	"Married"	" 6465"	"19121"	"2"
[33,]	"Laboratory Technician"	"3"	"Single"	" 2206"	"16117"	"1"

OverTime	PercentSalaryHike	PerformanceRating	RelationshipSatisfaction	StockOptionLevel	
[1,]	"Yes"	"11"	"3"	"1"	"0"
[2,]	"No"	"23"	"4"	"4"	"1"
[3,]	"Yes"	"15"	"3"	"2"	"0"
[4,]	"Yes"	"11"	"3"	"3"	"0"
[5,]	"No"	"12"	"3"	"4"	"1"
[6,]	"No"	"13"	"3"	"3"	"0"
[7,]	"Yes"	"20"	"4"	"1"	"3"
[8,]	"No"	"22"	"4"	"2"	"1"
[9,]	"No"	"21"	"4"	"2"	"0"
[10,]	"No"	"13"	"3"	"2"	"2"
[11,]	"No"	"13"	"3"	"3"	"1"

[12,]	"Yes"	"12"	"3"	"4"	"0"
[13,]	"No"	"17"	"3"	"4"	"1"
[14,]	"No"	"11"	"3"	"3"	"1"
[15,]	"Yes"	"14"	"3"	"2"	"0"
[16,]	"No"	"11"	"3"	"3"	"1"
[17,]	"Yes"	"12"	"3"	"4"	"2"
[18,]	"Yes"	"13"	"3"	"2"	"2"
[19,]	"No"	"16"	"3"	"3"	"0"
[20,]	"Yes"	"11"	"3"	"3"	"0"
[21,]	"No"	"18"	"3"	"4"	"1"
[22,]	"No"	"23"	"4"	"2"	"0"
[23,]	"No"	"11"	"3"	"3"	"0"
[24,]	"No"	"14"	"3"	"4"	"0"
[25,]	"No"	"11"	"3"	"3"	"0"
[26,]	"No"	"11"	"3"	"4"	"1"
[27,]	"Yes"	"22"	"4"	"2"	"0"
[28,]	"No"	"11"	"3"	"4"	"1"
[29,]	"No"	"14"	"3"	"4"	"1"
[30,]	"No"	"12"	"3"	"4"	"0"
[31,]	"No"	"11"	"3"	"4"	"0"
[32,]	"Yes"	"13"	"3"	"4"	"0"
[33,]	"No"	"13"	"3"	"1"	"0"

TotalWorkingYears TrainingTimesLastYear WorkLifeBalance YearsAtCompany YearsInCurrentRole

[1,]	"8"	"0"	"1"	"6"	"4"
[2,]	"10"	"3"	"3"	"10"	"7"
[3,]	"7"	"3"	"3"	"0"	"0"
[4,]	"8"	"3"	"3"	"8"	"7"
[5,]	"6"	"3"	"3"	"2"	"2"
[6,]	"8"	"2"	"2"	"7"	"7"
[7,]	"12"	"3"	"2"	"1"	"0"
[8,]	"1"	"2"	"3"	"1"	"0"
[9,]	"10"	"2"	"3"	"9"	"7"
[10,]	"17"	"3"	"2"	"7"	"7"
[11,]	"6"	"5"	"3"	"5"	"4"
[12,]	"10"	"3"	"3"	"9"	"5"
[13,]	"5"	"1"	"2"	"5"	"2"
[14,]	"3"	"2"	"3"	"2"	"2"
[15,]	"6"	"4"	"3"	"4"	"2"
[16,]	"10"	"1"	"3"	"10"	"9"
[17,]	"7"	"5"	"2"	"6"	"2"
[18,]	"1"	"2"	"2"	"1"	"0"
[19,]	"31"	"3"	"3"	"25"	"8"
[20,]	"6"	"3"	"3"	"3"	"2"
[21,]	"5"	"5"	"2"	"4"	"2"
[22,]	"10"	"4"	"3"	"5"	"3"
[23,]	"13"	"4"	"3"	"12"	"6"
[24,]	"0"	"6"	"3"	"0"	"0"
[25,]	"8"	"2"	"3"	"4"	"2"
[26,]	"26"	"3"	"2"	"14"	"13"
[27,]	"10"	"5"	"3"	"10"	"2"
[28,]	"10"	"2"	"3"	"9"	"7"
[29,]	"24"	"4"	"3"	"22"	"6"
[30,]	"22"	"2"	"2"	"2"	"2"
[31,]	"7"	"3"	"3"	"1"	"1"
[32,]	"9"	"5"	"4"	"4"	"2"
[33,]	"10"	"5"	"3"	"10"	"0"

YearsSinceLastPromotion YearsWithCurrManager

[1,]	"0"	"5"
[2,]	"1"	"7"
[3,]	"0"	"0"
[4,]	"3"	"0"
[5,]	"2"	"2"
[6,]	"3"	"6"
[7,]	"0"	"0"

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[8,] " 0" " 0"
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[10,] " 7" " 7"
[11,] " 0" " 3"
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[13,] " 4" " 3"
[14,] " 1" " 2"
[15,] " 0" " 3"
[16,] " 8" " 8"
[17,] " 0" " 5"
[18,] " 0" " 0"
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[20,] " 1" " 2"
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[26,] " 4" " 8"
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38 0.310022541
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[17] 1.132058901 0.684977918 -1.060188116 -0.518252552 1.416074395 -1.013413533 1.312303
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[25] 0.070998887 -1.187855044 1.487707345 0.517960123 1.068632778 -2.594944348 -0.598109
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7612	0.842682999						
[153]	-0.130298641	-0.105131907	1.179951656	1.186521001	-1.542771737	-2.150763323	-0.28184
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3050	-0.650092650						
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2098	1.167325207						
[193]	-0.706157496	-0.338535155	-1.601562460	1.171786028	-0.380339605	-0.232375365	-2.69053
9375	0.586173357						
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9640	0.855506760						
[209]	-1.740164487	-2.419827577	1.386354812	1.266122553	1.023754676	-1.025292143	-0.09174
8705	-1.969695384						
[217]	-0.328858475	0.920927227	-0.356579427	-1.158333264	-0.336179804	-0.574363551	0.59094
0088	2.077646912						
[225]	0.996531429	-1.393185423	0.946643526	1.313998196	0.820141343	0.716831172	-1.92064
7021	2.015699008						
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3467	0.790979516						
[241]	-1.594967526	0.704070565	-1.187363115	1.105805165	-0.759239466	-2.125592581	0.44283
1846	0.326168549						
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1244	1.135983263						
[257]	1.712019144	0.523153032	-1.160211079	1.292640892	0.236595751	0.182429198	0.09650
7056	-1.186671020						
[265]	0.134266014	-0.514082583	1.277490688	1.069225272	0.547145926	2.601335417	0.00809
2276	0.769896066						
[273]	0.993772287	-0.553756106	0.977359671	-1.083806073	-0.753986277	0.871988007	0.96392
4380	-2.091565779						
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3538	-2.036793449						
[289]	0.525600519	0.892866704	-3.711227520	0.104349489	1.031413296	1.520857872	0.47311
5865	-0.791143696						
[297]	1.009848060	1.710231468	-0.707554545	-2.050277481	-0.120838847	1.087088224	1.21364
5850	0.852701192						
[305]	1.254855369	-0.130287571	1.430153491	-0.960837004	-1.275995353	0.831525254	-0.48993
3412	1.149837686						
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2276	2.247438397						
[321]	0.987656073	0.342069059	-0.510910929	-0.314411292	1.498546319	1.823274743	0.42593
8296	-1.411326957						
[329]	0.631088025	-2.748517333	0.151196917	0.923918009	-1.444700203	-2.723449105	-0.38676
7126	-0.469344410						
[337]	1.800778713	1.116045123	1.218205478	1.506695120	-1.423296616	1.220046981	1.55421
9085	1.418490592						
[345]	1.422286260	0.884577024	-1.104769407	-1.506959695	-1.837521719	0.661610739	0.23930
9897	0.928176528						
[353]	-2.227861990	0.188797707	-0.642782258	1.841730098	-1.502857977	1.184556891	-0.85882
2239	0.616062127						
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8516	-2.451461096						
[369]	0.098990208	1.342061333	0.575022769	-1.028549141	-2.185260871	0.601978395	1.06410
7598	-3.420182356						
[377]	-1.064441925	-0.315474220	-1.191197774	-2.906444217	0.873531932	0.435598169	1.39057
0963	1.052637686						
[385]	1.131817389	-1.122396375	2.243123477	-1.108810210	-0.376939255	-1.094049070	0.67646
5003	-2.072444087						

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5067	0.783768941						
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7380	-0.580728506						
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0506	0.812458954						
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3863	1.962127218						
[425]	-3.271781082	0.741342234	1.982873795	0.357718898	-1.892575171	-3.162984341	1.12785
3389	-2.991612702						
[433]	0.477860732	-1.276710916	1.295048452	-0.900028552	-0.639744203	0.971176922	-0.57522
4933	-1.066429549						
[441]	-2.004491780	-0.945631187	1.074115541	-0.042114063	0.431105701	-1.747435280	-0.62965
9088	-0.392221803						
[449]	-0.489213167	0.703218734	-0.041305760	1.534024810	0.942095249	1.305404827	-0.07474
3009	-1.288912304						
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7359	0.660096978						
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0914	-1.780168899						
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1519	1.125474075						
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9609	0.592223933						
[489]	0.202230874	-2.449653448	-0.669277167	0.207261192	-3.187812330	-1.570551426	1.19361
2042	0.846565869						
[497]	0.997581144	-2.839341919	1.469610530	0.273807866	0.587776293	0.343800441	-0.68947
8142	2.048574287						
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6355	1.732972326						
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8084	1.120745269						
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[553]	-3.276158804	0.322549566	-0.536973345	0.687516163	-1.135138991	-0.912647683	1.46876
7498	-1.589209789						
[561]	-0.346714086	0.188580145	2.029806672	1.412630784	0.341711974	1.019488772	-0.86693
1380	0.892785071						
[569]	-3.323311627	0.711553285	-0.215143734	0.222354399	0.171714269	-0.242100920	0.12694
7395	-2.366260589						
[577]	0.733512097	0.842631663	0.096019534	0.859774673	0.293462481	-0.178604462	1.08844
4853	-0.974131320						
[585]	0.896449250	0.765114617	0.585712764	-2.206069723	-2.976740322	0.464113624	1.26223
1295	-0.623600008						
[593]	-0.046320896	0.913777612	1.345206146	-1.392450621	-0.322637564	-1.814111742	-0.50946
9707	-0.359358548						
[601]	1.834841532	-1.419360956	-1.254008747	-0.276287348	1.293970634	-0.127166641	0.61966
6687	0.798766978						
[609]	-0.636043357	-2.804028599	1.379612180	-0.308564996	1.700677241	0.518263924	1.50192
0474	0.887389313						
[617]	-0.103149805	-1.933067331	-0.527136480	1.504208198	0.623900019	1.960415008	0.40441
8761	-1.085359284						
[625]	-3.507392490	-1.817490014	-0.554828082	-2.238368802	-1.257404256	0.731357136	-0.22969
7559	-0.516114842						
[633]	-1.037509231	0.767057993	1.017088487	2.035863533	1.466797865	0.709647631	0.69289
2542	-0.780112077						
[641]	1.424217571	1.354487526	0.538840289	-1.049729876	0.188099574	-0.458596590	-3.17869
5989	0.727446360						

[649]	-0.869691363	-2.108792812	-1.025070774	1.083894103	0.526972971	0.106547585	-1.57912
8575	0.065329357						
[657]	0.362530777	-0.177879268	0.598067693	0.418378237	-2.902964529	-1.230015642	1.24378
8376	0.859241204						
[665]	1.654441086	-0.292713246	1.368412168	-0.659675458	-0.190981199	-1.239029629	0.52009
3303	0.382524528						
[673]	-1.080826985	-0.268560449	-2.160340763	0.800037634	0.966701327	-0.500732388	-1.69627
0774	0.499792694						
[681]	0.084230184	1.154382836	-0.731843360	0.679340328	-1.310150122	1.456904777	2.06659
9285	0.848466379						
[689]	1.273738663	0.892292380	1.743700198	-1.989868837	1.036180508	1.210608773	0.53311
8397	-0.249391121						
[697]	0.697966169	0.690692543	0.213663152	-1.056586184	-1.909022558	-0.954658182	0.50357
2421	0.132231545						
[705]	-0.192053690	1.036734221	-2.563733572	0.719381064	-0.144036597	0.912270536	0.25293
1707	-0.684606751						
[713]	0.136546310	-0.737521649	-3.995057539	0.403012092	0.545256731	-0.881191625	0.97565
9441	-0.295213590						
[721]	0.094592538	-0.919723252	0.106698207	-1.299295889	1.182820530	0.466544476	0.46064
1236	1.117911893						
[729]	-2.379598710	1.276309417	1.302119593	0.652201964	0.960109684	1.312218520	1.29204
3938	-1.326227574						
[737]	-1.479578319	-1.111836490	1.106182705	1.091951949	0.635498360	-3.041335367	-1.49648
1562	-2.603776947						
[745]	-1.677375775	-0.293546413	1.074951565	-2.617511762	-0.581796000	0.119321105	0.46249
2662	0.694623823						
[753]	3.049980309	0.577345739	0.610029980	-2.089980114	-0.161876417	0.665944831	-2.04060
9880	0.428826248						
[761]	-0.118533283	-1.631148320	-0.237885343	0.015757724	0.556103411	-0.254237024	-1.90794
9301	-0.169166448						
[769]	0.896046442	1.104786805	-3.880338858	-1.806915487	-1.160531838	1.488108118	-2.90644
1123	-2.002030974						
[777]	1.255015121	1.172039821	-0.903007564	-2.204968495	1.314794885	1.065786785	0.26439
6426	0.913158107						
[785]	1.262887991	0.094824595	0.817248085	-2.336743504	1.208718320	-1.967371922	-0.63080
3993	1.037714783						
[793]	1.750661157	1.060593112	0.345906410	-0.669580728	2.015411488	0.476849284	-0.09284
0055	0.874742084						
[801]	0.502614487	-1.494061418	0.712997018	-0.615738226	-2.092470529	1.202090305	-2.35576
8143	1.013557580						
[809]	0.278271263	1.442868021	-0.554104808	-1.967516548	-2.306238589	-0.494975233	0.09095
8740	1.323404706						
[817]	-1.694717488	0.443213958	0.987312263	0.886539334	0.209260156	-1.764583449	-0.08084
9348	1.050100682						
[825]	-1.294323856	0.871036310	0.852224049	0.634126880	0.918854147	0.417536233	-0.62455
1328	1.020767232						
[833]	-1.088651944	0.978270876	0.647594872	0.632415006	1.976245376	-1.048172325	2.02007
1014	-0.879779154						
[841]	-0.593110595	-0.337341915	0.391539946	1.326394378	0.845217248	-1.311688564	0.21815
6670	1.576609572						
[849]	0.435458968	-1.794870287	0.193258943	-3.299758216	1.544260981	1.287126204	-1.34536
1400	1.366509702						
[857]	1.112169475	0.063993033	-1.547828834	1.029721549	1.185256107	-0.636884579	-0.49871
7142	0.846163046						
[865]	-1.694006753	-0.930261463	-1.625781834	-2.565543396	1.143691500	-2.900696534	-0.18862
9805	0.774776820						
[873]	0.769710196	1.366970161	2.205826944	2.912812860	1.476151058	-0.531774967	-1.51254
7826	0.255021570						
[881]	0.863329108	0.493868424	0.566730435	2.571738400	-1.402021735	0.974544158	1.87949
6181	-1.817146074						
[889]	0.282595032	2.140026931	-3.186542503	1.011376168	1.101740089	0.821801343	-2.15479
9129	0.281011823						
[897]	1.284042243	-1.958870135	-1.667331648	-2.888220529	1.352165617	-1.729894773	0.94634
7812	0.119271676						

```

[905] -3.589861627  0.205507718  0.320568170 -1.157182430  1.218452381  1.081773710  0.93608
7694  1.052826050
[913]  1.265668267 -0.253877062 -0.117743653  1.278727250 -1.175011090  0.693400158 -0.24528
8304 -2.167305191
[921]  1.003050594  1.058588976  0.948234680  0.721555833  0.796882461 -1.996086917  1.45924
4489  0.474921323
[929]  0.213835796  0.913024261  0.825876322 -0.261549249  1.311149791  0.572968919  1.13587
1854  1.388433823
[937] -2.460102481 -0.446967250 -0.746971777  0.348847161  0.320911276  1.586772180  0.37714
9133 -0.525933102
[945]  1.896676090 -2.824252329 -0.462978817 -1.677706981  0.297657326  1.563448209  1.76152
6611  1.245765405
[953]  0.739778837 -0.962039268  0.435410396 -0.382159830 -2.897456049 -1.980587913  0.85970
5214  1.369469220
[961]  0.714977119  0.705616525 -0.250102356  0.223683709  1.776657658  0.656231086 -2.13590
7972 -0.207573580
[969]  1.608540593  0.274435098 -1.191804496 -2.807291532  0.971948342  0.443529382 -0.03399
5378 -1.567980309
[977] -0.371907292  0.397392501  0.364272767  0.728723037 -1.152437211  0.437515868  0.31479
0710  1.831260375
[985]  0.725716171  1.153724997 -0.126986304 -1.142008579 -0.445127086 -0.898134615 -1.14296
0124  0.796077351
[993] -0.619061781  0.326989090 -1.759930469  0.652537049  1.165257302  1.694508000  1.19578
6083  0.416643969
[ reached getOption("max.print") -- omitted 470 entries ]

```

```

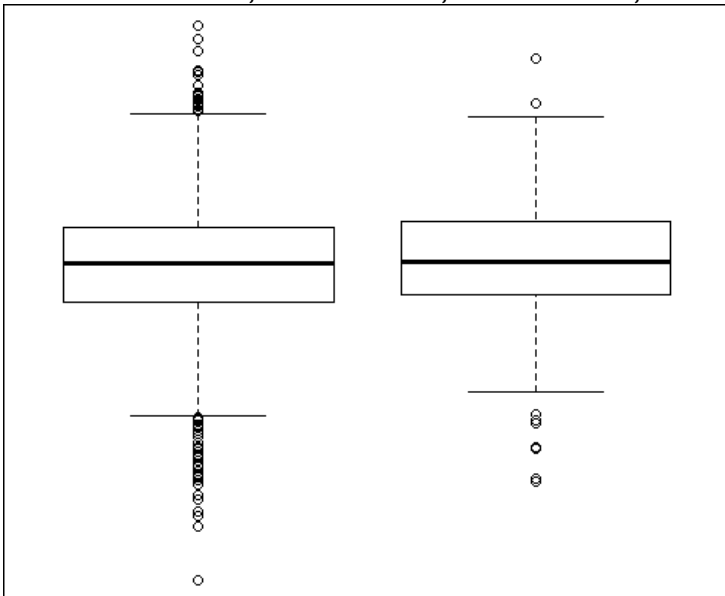
> #The aboved two gives us the same thing. predict is a good function to know.
> out <- sapply(10:14, function(i){plot(attr$Attrition,attr_pca_done$x[,i],xlab=paste("PC",i
,sep=""),ylab="Attrition")})
> out

```

```

[,1]      [,2]      [,3]      [,4]      [,5]
stats Numeric,10 Numeric,10 Numeric,10 Numeric,10 Numeric,10
n      Numeric,2 Numeric,2  Numeric,2  Numeric,2  Numeric,2
conf   Numeric,4 Numeric,4  Numeric,4  Numeric,4  Numeric,4
out    Numeric,59 Numeric,31 Numeric,233 Numeric,66 Numeric,68
group  Numeric,59 Numeric,31 Numeric,233 Numeric,66 Numeric,68
names  Character,2 Character,2 Character,2 Character,2 Character,2

```



```

> pairs(attr_pca_done$x[,10:14], ylim = c(-6,4),xlim = c(-6,4),panel=function(x,y,...){text(
x,y,attr$Attrition)})

```



```

[581] 2 2 2 2 1 2 2 2 1 2 1 2 1 2 2 1 2 2 2 1 2 2 1 1 2 1 1 2 2 2 2 1 2 2 2 2 1 2
2 1 2 2 1 2 2 2 2 2 2 2 1 2 2
[639] 2 2 2 1 2 2 2 2 2 1 2 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 1 2 2 2
1 2 2 2 2 1 1 2 2 1 2 2 1 2 1
[697] 1 2 2 1 2 1 1 2 1 2 2 1 2 2 1 2 2 2 1 2 1 2 2 2 2 1 1 1 2 2 2 2 2 1 2 1
2 2 2 2 1 2 1 1 2 2 1 1 1 1 1
[755] 2 1 1 1 1 2 1 2 2 2 2 2 1 2 1 2 1 1 2 2 2 1 2 1 2 2 2 1 1 2 2 2 1 2 1 1 2 2 2 2
2 2 1 2 2 2 2 1 1 1 1 2 2 1 2
[813] 1 1 1 2 2 1 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 1 1 1 2 2 2 2 2 2 2 1 1 2 2 2 1 2 2 2
1 2 2 1 2 2 1 2 2 2 2 2 2 1 2 1
[871] 1 2 2 2 1 1 2 2 2 1 2 2 1 1 2 2 1 2 1 1 1 1 2 2 1 2 1 2 1 2 2 2 2 1 2 1 1 2 2 2 2
1 1 2 1 2 1 1 1 2 1 1 2 2 1 1
[929] 1 2 2 2 1 2 2 2 2 1 2 2 2 2 2 1 1 1 2 1 2 2 1 1 2 2 1 1 1 2 2 1 2 2 1 1 1 2 1 2 1 1 2
1 2 2 2 1 1 2 1 1 2 2 2 1 2 2
[987] 2 2 2 2 2 2 2 2 1 1 2 2 2 1
[ reached getOption("max.print") -- omitted 470 entries ]

```

within cluster sum of squares by cluster:

```

[1] 7087.951 9563.508
(between_SS / total_SS = 19.0 %)

```

Available components:

```

[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss" "betweenss"
"size"         "iter"
[9] "ifault"
> # K-means, k=2, 3, 4, 5, 6
>
> # Centers (k's) are numbers thus, 10 random sets are chosen
>
>
> (kmeans2_attr_std <- kmeans(attr_std,2,nstart = 10))
K-means clustering with 2 clusters of sizes 988, 482

```

Cluster means:

	Age	DailyRate	DistanceFromHome	HourlyRate	MonthlyIncome	MonthlyRate	NumCompaniesworked
1	-0.2736309	-0.003308239	-0.003147081	0.02800718	-0.4005389	-0.000543936	0.0
04100873		0.0171433					
2	0.5608866	0.006781204	0.006450863	-0.05740890	0.8210216	0.001114956	-0.0
08405938		-0.0351402					
	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager	
1	-0.4455643	-0.0005714331	-0.4814244	-0.4920861			-0.
4116207		-0.4699297					
2	0.9133144	0.0011713194	0.9868202	1.0086744			0.
8437371		0.9632583					

Clustering vector:

```

[1] 1 2 1 1 1 1 1 1 2 2 1 1 1 1 1 2 1 1 1 2 1 1 2 1 1 2 2 1 1 1 1 1 1 1 1 1 1 1 1 2
2 2 2 1 2 1 1 1 1 1 1 1 2 2 1
[59] 1 1 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 2 1 2 1 1 2 2 2 1 2 2 2 1 1 1 2 1 1 1
1 2 1 2 2 1 1 1 2 1 2 1 1 1
[117] 2 2 1 2 1 1 1 2 2 1 2 1 1 2 1 1 1 2 1 2 1 1 1 1 1 1 1 2 1 1 2 1 2 2 2 1 1 1 2
1 1 1 1 1 1 2 2 2 1 1 1 1 1 2
[175] 1 1 1 1 2 1 1 1 1 1 1 1 2 2 2 2 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 1 2 1 1 1
1 2 1 2 1 2 2 1 1 2 2 1 1 2
[233] 1 2 1 2 1 2 1 1 1 1 1 2 2 1 1 2 1 1 1 2 1 1 1 1 2 2 1 1 1 2 1 2 1 1 1 1 2 2 2 2 1 1 1
1 2 1 1 2 2 2 1 2 1 2 1 1 1 1
[291] 2 1 1 1 1 2 1 2 1 1 2 1 1 2 2 2 2 1 1 1 2 1 2 2 1 2 2 1 2 1 1 1 1 2 2 2 1 1 2 1 1 1
1 2 1 1 1 1 1 1 2 2 1 2 1 1 1
[349] 1 1 1 1 1 2 1 2 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 1 1 1 2 1 2 1 1 1 2
1 2 1 2 1 1 1 2 1 2 2 1 2 1 1

```

```

[407] 2 1 2 1 1 2 2 1 1 1 1 2 1 1 1 1 2 1 2 2 2 1 2 1 1 1 1 2 2 1 1 1 1 1 1 2 1 2 2 2 2 2
1 1 2 2 1 1 1 1 1 1 1 1 2 1
[465] 1 1 2 2 2 1 1 1 1 2 1 1 1 2 1 1 1 1 1 2 1 1 1 1 1 2 1 1 1 1 2 2 1 1 2
1 2 2 2 1 1 2 1 1 1 1 1 1
[523] 1 2 2 1 2 1 1 2 1 2 2 2 2 2 1 1 2 1 1 1 1 2 2 1 1 1 1 1 2 1 1 1 1 2 1 1 2 2 1 1
1 1 1 2 2 1 1 1 1 1 1 1 2 1
[581] 1 1 1 1 2 1 1 1 2 1 2 1 2 1 1 2 1 1 1 2 1 1 2 2 1 2 2 1 1 1 1 2 1 1 1 1 2 1
1 2 1 1 2 1 1 1 1 1 1 2 1 1
[639] 1 1 1 2 1 1 1 1 1 2 1 2 1 2 1 2 1 1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 2 1 1 1 1 1
2 1 1 1 1 2 2 1 1 2 1 1 2 1 2
[697] 2 1 1 2 1 2 2 1 2 1 1 2 1 1 2 1 1 2 1 2 1 1 2 1 2 1 1 1 1 2 2 2 1 1 1 1 1 2 1 2
1 1 1 1 2 1 2 2 1 1 2 2 2 2 2
[755] 1 2 2 2 2 1 2 1 1 1 1 1 2 1 2 1 2 2 1 1 1 2 1 2 1 1 1 2 2 1 1 1 2 1 2 2 1 1 1 1
1 1 2 1 1 1 1 2 2 2 2 1 1 2 1
[813] 2 2 2 1 1 2 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 2 2 2 1 1 1 1 1 1 2 2 1 1 1 2 1 1 1
2 1 1 2 1 1 2 1 1 1 1 2 1 2
[871] 2 1 1 1 2 2 1 1 1 2 1 1 2 2 1 1 2 1 2 2 2 1 1 2 1 2 1 2 1 1 1 1 2 1 2 2 1 1 1 1
2 2 1 2 1 2 2 2 1 2 2 1 1 2 2
[929] 2 1 1 1 2 1 1 1 1 2 1 1 1 1 1 2 2 2 1 2 1 1 2 2 1 1 2 2 2 1 1 2 1 1 2 2 2 1
2 1 1 1 2 2 1 2 2 1 1 1 2 1 1
[987] 1 1 1 1 1 1 1 1 2 2 1 1 1 2
[ reached getOption("max.print") -- omitted 470 entries ]

```

within cluster sum of squares by cluster:

```

[1] 9563.508 7087.951
(between_SS / total_SS = 19.0 %)

```

Available components:

```

[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss" "betweenss"
"size"         "iter"
[9] "ifault"
> # Computing the percentage of variation accounted for. Two clusters
>
> perc.var.2 <- round(100*(1 - kmeans2_attr_std$betweenss/kmeans2_attr_std$totss),1)
>
> names(perc.var.2) <- "Perc. 2 clus"
>
> perc.var.2
Perc. 2 clus
81
> # Computing the percentage of variation accounted for. Three clusters
>
> (kmeans3_attr_std <- kmeans(attr_std,3,nstart = 10))
K-means clustering with 3 clusters of sizes 367, 705, 398

```

Cluster means:

	Age	DailyRate	DistanceFromHome	HourlyRate	MonthlyIncome	MonthlyRate	NumCompaniesWorked	PercentsSalaryHike
1	0.5013783	-0.07679400	0.01893852	-0.02292678	0.7731900	-0.005035529	-0.	
0942477		-0.020767791						
2	-0.6413051	-0.06732578	-0.01639876	-0.02736942	-0.5304961	-0.074517134	-0.	
5051990		-0.001439503						
3	0.6736539	0.19007053	0.01158465	0.06962204	0.2267312	0.136639746	0.	
9817944		0.021700073						
	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager		
1	0.9127463	0.01828053	1.2848957	1.2422918		1.		
1686594		1.2140545						
2	-0.6577604	0.01483008	-0.3659833	-0.3459337		-0.		
3628676		-0.3143688						
3	0.3234753	-0.04312604	-0.5365289	-0.5327584		-0.		
4348652		-0.5626331						

clustering vector:

```
[1] 3 1 3 2 3 2 3 2 1 1 2 2 2 2 1 2 2 1 2 2 3 1 2 2 1 2 2 1 3 2 3 2 3 2 2 2 2 3 2 2 2 2 2
2 1 1 2 3 2 3 2 3 2 3 1 1 2
[59] 2 2 1 1 1 1 1 3 2 3 2 2 3 2 2 2 2 2 1 3 3 3 2 2 3 1 2 3 2 3 1 1 1 2 2 1 1 3 2 2 1 3 2 2
2 1 3 3 3 2 2 2 1 2 3 2 3 2
[117] 1 1 3 1 2 2 3 1 1 2 1 2 2 1 3 3 2 3 2 3 3 1 2 1 3 3 3 2 2 2 2 1 2 2 1 2 3 1 1 2 3 3 1
2 2 2 2 3 2 3 1 1 3 2 2 2 2 1
[175] 3 3 2 2 1 2 3 2 2 2 3 2 1 1 1 3 1 2 2 3 1 2 2 2 3 2 2 3 2 3 3 2 2 2 3 3 1 1 2 1 2 3 2
2 1 3 1 2 1 1 2 3 1 2 2 2 3 1
[233] 3 3 2 1 3 1 2 2 3 2 3 1 1 3 2 1 3 3 3 1 2 3 2 2 1 1 2 2 2 1 2 1 2 2 2 2 1 1 1 1 2 3 2
3 3 2 2 1 3 1 2 1 2 1 3 3 2 2
[291] 3 2 2 2 2 1 2 1 2 3 1 2 2 1 1 3 1 3 3 2 2 1 2 1 1 2 3 1 2 1 2 2 3 2 2 1 1 3 2 3 2 2 3
3 1 2 2 2 2 2 3 1 1 2 1 2 3 3
[349] 3 2 2 2 3 1 3 2 3 2 3 1 3 2 2 2 3 3 1 3 2 2 2 3 3 2 2 3 3 2 2 2 2 1 3 1 3 2 3 1
3 3 3 1 3 3 2 1 2 1 1 2 2 2 2
[407] 3 2 3 3 2 1 1 2 2 2 2 2 1 2 2 2 2 1 3 1 1 1 3 3 2 3 2 3 1 1 3 2 3 3 3 3 1 2 1 1 1 1 1
2 2 1 2 2 3 3 2 3 2 2 2 1 2
[465] 3 3 1 1 1 3 2 3 3 1 2 2 2 1 2 2 2 2 2 1 2 3 2 2 3 2 1 3 3 2 2 2 3 2 2 2 2 1 1 2 2 1
2 1 1 1 3 2 2 1 2 2 2 2 2 3 2
[523] 2 1 1 3 1 2 3 2 2 1 1 1 3 1 3 2 1 3 2 3 3 2 1 1 2 3 3 2 2 3 3 2 3 2 3 2 1 3 2 1 1 2 2
2 3 2 3 2 2 2 2 2 3 2 2 1 2
[581] 2 2 2 3 1 2 2 3 2 2 1 2 1 2 1 2 1 2 2 1 2 3 2 2 1 3 3 2 1 2 2 1 1 3 2 3 2 2 2 2 1 3 2 2 2 1 2
3 3 3 3 3 2 2 3 2 2 1 2 2
[639] 2 3 2 2 2 3 2 2 3 1 3 1 3 1 2 1 3 2 2 2 2 3 3 2 2 1 2 2 3 2 3 2 2 3 2 3 2 2 1 3 2 2
1 2 2 3 2 1 1 2 2 1 3 2 1 2 1
[697] 2 2 2 1 3 1 1 2 1 2 3 1 3 2 1 2 2 3 3 2 1 3 2 2 2 1 2 3 2 2 2 2 3 1 2 2 2 2 2 3 1 3 1
2 2 3 3 3 1 1 3 3 1 1 1 1 1
[755] 2 3 3 2 3 2 1 3 2 2 2 2 1 2 1 2 3 3 3 1 1 3 2 2 1 3 2 2 2 2 1 1 2 3 2 1 2 1 1 2 2 2 2
2 2 1 2 3 2 2 3 1 3 2 2 1 3
[813] 3 1 1 2 3 1 2 2 2 3 2 2 3 2 2 2 2 2 3 2 2 2 1 1 1 3 3 2 2 2 2 3 1 1 2 3 2 3 2 2 3
1 2 2 1 2 2 1 2 2 3 3 3 2 3
[871] 3 2 2 2 1 1 2 3 3 1 2 2 1 1 3 2 1 3 1 2 3 1 2 2 1 2 2 3 1 3 2 3 2 2 3 1 2 1 2 2 2 2 2
1 1 2 1 2 1 1 1 2 1 1 2 3 1 1
[929] 2 2 2 3 2 2 2 3 1 3 2 2 2 2 3 1 3 2 3 2 2 1 1 2 3 1 1 1 3 2 1 2 2 1 2 1 2 1 2 1 1 3
3 2 2 2 1 1 2 1 3 2 2 1 2 2
[987] 2 3 3 3 3 2 3 2 3 1 2 2 2 1
[ reached getOption("max.print") -- omitted 470 entries ]
```

within cluster sum of squares by cluster:

```
[1] 5205.277 6049.267 4071.095
(between_SS / total_SS = 25.5 %)
```

Available components:

```
[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss" "betweenss"
"size"         "iter"
[9] "ifault"
```

```
>
> perc.var.3 <- round(100*(1 - kmeans3_attr_std$betweenss/kmeans3_attr_std$totss),1)
>
> names(perc.var.3) <- "Perc. 3 clus"
>
> perc.var.3
Perc. 3 clus
74.5
```

```
> # Computing the percentage of variation accounted for. Four clusters
>
> (kmeans4_attr_std <- kmeans(attr_std,4,nstart = 10))
k-means clustering with 4 clusters of sizes 370, 560, 156, 384
```

Cluster means:

```
Age      DailyRate DistanceFromHome HourlyRate MonthlyIncome MonthlyRate NumCompaniesWorked Pe
rcentsSalaryHike
```

1	0.7707463	0.22961595	0.008257502	0.03633025	0.2669399	0.09802993	0.9
613245		0.009213117					
2	-0.7192085	-0.11199075	-0.020883872	0.03636112	-0.6095477	-0.03790853	-0.4
054590		-0.022606422					
3	1.0047487	-0.10884912	-0.068027703	0.03341739	1.7607150	-0.02802579	0.1
176866		-0.006455403					
4	-0.1019796	-0.01370473	0.050135454	-0.10160815	-0.0835745	-0.02778716	-0.3
827921		0.026712984					
TotalWorkingYears TrainingTimesLastYear YearsAtCompany YearsInCurrentRole YearsSinceLastPromotion YearsWithCurrManager							
1	0.39270390		-0.05607256	-0.5390915	-0.5548597		-0.
4306548		-0.5829055					
2	-0.78847463		0.01576328	-0.5723273	-0.6147893		-0.
4572541		-0.6265538					
3	1.78479174		-0.11283401	2.0923377	1.3928232		1.
6166931		1.4170866					
4	0.04640063		0.07687895	0.5040689	0.8653638		0.
4250011		0.8996866					

Clustering vector:

```
[1] 1 4 1 2 1 4 1 2 4 4 2 4 2 2 2 4 2 2 3 2 2 1 4 2 2 3 4 4 3 1 2 1 2 1 2 2 2 1 2 2 2 2 4
4 3 4 2 4 2 1 2 1 2 2 3 4 2
[59] 4 4 4 4 3 3 3 1 2 1 2 2 1 2 2 4 2 4 4 1 1 1 4 2 1 4 2 1 2 1 4 4 3 4 4 3 4 1 2 2 3 1 2 2
2 4 1 1 1 2 2 2 3 4 1 2 1 1
[117] 4 4 2 3 4 4 1 3 4 2 3 2 2 4 1 1 2 4 4 1 1 4 2 4 1 1 1 2 4 2 2 3 2 2 4 4 4 4 1 1 4
2 2 2 2 1 2 1 4 4 1 2 2 2 4 4
[175] 1 1 2 2 3 2 1 2 2 2 1 4 3 3 4 1 3 2 2 1 3 4 2 1 1 4 2 4 2 1 1 4 2 2 1 1 4 4 4 4 2 1 2
2 3 1 4 2 4 4 2 1 4 4 4 2 1 3
[233] 1 1 2 3 4 3 2 2 1 2 1 4 3 1 2 4 1 1 1 3 2 1 2 2 4 3 2 2 2 4 2 3 2 2 4 2 3 4 3 4 2 2 2
1 1 4 2 3 1 3 4 4 2 4 1 1 2 2
[291] 1 4 2 4 2 3 2 4 2 1 3 2 2 4 4 4 1 1 2 2 3 2 4 3 4 1 4 2 4 2 4 1 2 4 4 3 1 2 1 2 2 1
1 4 2 4 2 4 4 1 4 4 4 4 2 1 1
[349] 1 2 2 2 1 4 2 4 1 2 2 4 1 4 2 2 1 1 4 1 2 2 2 1 1 2 2 1 1 2 2 2 2 4 2 3 1 2 1 3
1 1 1 4 1 1 2 4 2 3 3 2 4 2 2
[407] 1 2 1 1 2 3 4 2 2 2 2 3 2 2 4 2 2 4 1 3 4 3 1 1 2 1 4 1 4 4 1 2 1 2 1 1 4 2 4 3 4 4 3
4 2 4 4 2 2 1 1 2 1 4 2 2 4 2
[465] 1 1 3 4 4 1 2 1 1 3 2 2 2 3 2 2 2 2 2 4 2 1 2 2 1 2 4 1 1 2 2 2 1 2 2 2 2 3 4 2 2 4
2 3 4 4 1 2 2 4 2 2 2 4 4 1 2
[523] 2 4 4 2 3 4 1 4 4 4 4 3 1 3 1 4 3 1 4 1 1 2 3 4 2 1 1 2 2 1 1 2 1 2 1 2 4 1 2 3 4 2 4
2 1 2 1 4 2 2 2 2 2 1 2 2 4 2
[581] 2 2 4 1 3 2 2 1 1 2 4 2 3 4 4 3 2 1 2 2 4 1 1 2 4 2 2 4 4 1 4 4 4 2 4 2 3 1 2 4 2 4 2
1 1 1 2 1 1 2 2 2 1 2 2 3 4 2
[639] 2 1 2 4 2 1 2 2 1 4 1 3 1 4 4 3 1 2 2 2 4 2 1 2 2 2 4 2 2 1 2 1 2 2 1 2 1 4 4 3 1 2 2
3 2 2 1 4 4 4 2 2 4 1 4 4 2 3
[697] 4 2 2 3 1 3 4 2 4 4 1 4 4 2 4 2 2 1 1 2 3 1 4 1 2 3 2 1 2 2 2 2 1 4 4 2 2 2 2 1 3 1 3
2 2 1 1 1 1 4 3 1 2 3 3 4 3 3
[755] 2 1 4 4 1 2 3 1 2 2 2 2 3 2 4 2 1 1 1 4 3 1 2 2 4 1 4 2 2 4 4 4 2 1 4 3 2 4 4 2 2 2 4
2 2 3 2 1 2 2 1 4 1 4 4 4 3 1
[813] 1 3 3 2 1 4 2 2 2 1 2 2 1 2 2 2 2 2 2 2 2 4 3 3 1 1 2 2 4 2 1 4 4 2 1 2 1 4 2 1
4 2 2 3 2 2 3 2 2 1 1 1 1 2 1
[871] 4 2 2 4 4 3 2 1 1 4 2 4 4 4 1 2 4 1 4 4 1 4 2 2 3 2 4 1 3 1 4 1 2 2 1 4 2 3 4 2 2 2 2
3 3 2 3 1 4 2 3 4 2 1 3 3
[929] 4 2 4 1 4 2 2 4 1 3 1 2 2 4 4 4 4 1 2 1 4 4 4 3 2 1 3 3 3 1 4 4 4 2 3 4 4 2 3 2 4 4 2
1 2 2 2 3 3 2 3 4 2 2 2 4 2 4
[987] 1 1 1 1 1 2 1 2 1 4 2 4 2 3
[ reached getOption("max.print") -- omitted 470 entries ]
```

within cluster sum of squares by cluster:

```
[1] 3753.165 4326.294 2322.362 3710.699
(between_SS / total_SS = 31.4 %)
```

Available components:

```
[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss" "betweenss"
"size"         "iter"
[9] "ifault"
```

```
>
> perc.var.4 <- round(100*(1 - kmeans4_attr_std$betweenss/kmeans4_attr_std$totss),1)
```

```
> names(perc.var.4) <- "Perc. 4 clus"
```

```
>
> perc.var.4
```

```
Perc. 4 clus
```

```
68.6
```

```
> # Computing the percentage of variation accounted for. Five clusters
```

```
>
> (kmeans5_attr_std <- kmeans(attr_std,5,nstart = 10))
```

```
K-means clustering with 5 clusters of sizes 362, 121, 464, 385, 138
```

```
Cluster means:
```

	Age	DailyRate	DistanceFromHome	HourlyRate	MonthlyIncome	MonthlyRate	NumCompaniesWorked	
1	0.29439958	0.12871318	-0.07860849	0.085796939	-0.34473854	-0.004242516	0	
2	1.42504729	0.15367721	0.01601076	0.005353989	1.72713466	0.218033124	0	
3	-0.80816195	-0.09282987	0.02676321	0.023482118	-0.61613188	-0.017337269	-0	
4	-0.09401635	-0.01885408	0.06916728	-0.103630113	-0.08568613	-0.031458713	-0	
5	0.95782658	-0.10766111	-0.09078668	-0.019597347	1.70062617	-0.033986375	0	
	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager		
1	-0.19463320	-0.06075160	-0.5888511	-0.6168071	-0.			
2	1.65396859	-0.06870235	-0.3331776	-0.2776906	-0.			
3	-0.84002580	0.03529737	-0.5578441	-0.6027906	-0.			
4	0.05219558	0.07708356	0.5108114	0.8629518	0.			
5	1.73915719	-0.11413105	2.2873612	1.4807475	1.			

```
Clustering vector:
```

```
[1] 1 4 1 3 1 4 1 3 4 4 3 4 3 3 3 4 3 3 5 1 3 1 4 3 3 5 4 4 5 2 1 1 3 1 3 3 1 3 1 3 3 3 3 4
4 5 4 1 4 3 1 3 1 3 1 5 4 3
[59] 4 4 4 4 5 5 5 2 3 2 1 3 2 3 3 4 3 4 4 2 2 1 3 3 2 4 3 2 3 1 4 4 5 4 4 5 4 2 3 3 5 1 1 3
3 4 1 2 2 3 3 3 5 4 2 3 1 1
[117] 4 4 1 5 4 4 1 5 4 3 5 3 3 4 1 2 3 4 4 1 2 4 3 4 1 1 1 3 4 1 3 2 1 3 4 4 4 4 4 1 1 4
1 3 1 3 2 3 2 4 4 1 3 3 3 4 4
[175] 1 1 3 3 5 3 1 3 3 1 1 4 5 5 4 2 5 3 3 1 5 4 1 1 1 4 1 4 3 1 1 4 3 3 1 1 4 4 4 2 1 2 1
3 5 1 4 1 4 4 3 1 4 4 4 3 1 5
[233] 1 2 1 5 4 5 3 3 1 3 1 4 5 1 3 4 1 1 1 5 3 1 3 3 4 5 1 3 3 4 3 5 3 3 4 3 5 4 5 4 3 1 3
2 1 4 3 2 2 5 4 4 3 4 1 1 3 3
[291] 2 4 3 4 3 5 3 4 1 1 5 3 3 4 4 4 4 2 1 3 3 5 3 4 5 4 2 4 3 4 3 4 1 1 4 4 5 1 3 2 3 3 2
1 4 1 4 3 4 4 1 4 4 4 4 3 1 1
[349] 2 3 3 3 2 4 1 4 1 3 1 4 1 4 3 3 1 1 4 2 3 3 3 1 1 3 3 2 4 1 1 2 3 3 3 3 4 1 5 1 1 1 5
1 2 1 4 1 1 3 4 3 5 2 3 4 3 3
[407] 2 1 2 1 3 5 4 3 3 3 3 5 3 1 4 1 3 4 2 5 4 5 1 2 3 1 4 1 4 4 1 3 1 3 1 1 4 3 4 5 4 4 5
4 1 4 4 3 3 1 1 3 2 4 3 3 4 3
[465] 1 2 5 4 4 1 3 1 1 5 3 3 3 5 3 3 3 3 1 4 3 1 3 3 2 1 4 2 1 3 3 3 2 3 3 3 3 5 4 3 3 4
3 5 4 2 1 3 3 4 3 3 3 4 4 1 3
[523] 1 4 4 1 5 4 2 4 4 4 4 5 2 5 1 4 5 1 4 1 1 3 5 4 3 1 1 1 3 1 2 3 1 3 1 1 4 1 3 5 4 3 4
3 1 3 2 4 3 3 3 1 3 1 3 3 4 3
```

```

[581] 3 3 4 1 5 3 3 1 2 3 4 1 5 4 4 5 1 1 1 1 4 1 1 3 4 3 3 4 4 2 4 4 4 3 4 3 5 1 1 4 3 4 3
1 2 2 1 2 1 3 1 1 1 3 3 5 4 3
[639] 3 1 3 4 3 1 3 1 2 4 1 5 1 4 4 5 1 3 3 1 4 3 1 1 3 3 4 1 3 1 1 1 3 3 1 3 2 4 4 5 1 3 3
5 1 3 1 4 4 4 3 3 4 1 4 4 3 5
[697] 4 3 3 5 1 5 4 3 4 4 2 4 4 3 4 1 3 1 2 3 5 1 4 1 3 2 3 2 3 3 3 2 4 4 3 3 3 3 1 5 1 5
3 3 2 1 2 1 4 5 1 1 5 5 4 5 4
[755] 3 2 4 4 2 3 5 1 1 3 3 1 2 3 4 3 2 2 1 4 2 1 3 3 4 1 4 3 3 4 4 4 3 2 4 5 1 4 4 3 3 3 4
3 1 5 3 1 3 3 2 4 2 4 4 4 5 1
[813] 2 5 5 3 1 4 3 3 3 2 3 3 1 3 3 3 3 3 3 1 3 3 3 4 5 5 1 1 1 3 4 3 1 4 4 3 1 3 2 4 3 1
4 3 3 2 3 3 5 3 3 1 1 1 2 3 2
[871] 4 3 3 4 4 5 3 1 1 4 3 4 4 4 1 3 4 2 4 4 2 4 3 3 2 3 4 1 2 2 4 1 3 3 2 4 3 5 4 3 3 3 3
5 5 3 2 3 5 2 4 3 5 4 3 1 5 5
[929] 4 3 4 1 4 3 3 4 2 5 1 3 3 4 4 4 4 2 3 1 4 4 4 5 3 1 5 5 2 1 4 4 4 3 5 4 4 3 5 1 4 4 1
2 3 3 3 5 5 3 5 4 1 3 3 4 3 4
[987] 1 2 1 1 1 3 1 3 2 4 3 4 3 5
[ reached getOption("max.print") -- omitted 470 entries ]

```

within cluster sum of squares by cluster:
[1] 3047.750 1186.244 3451.050 3732.063 2002.454
(between_ss / total_ss = 34.7 %)

Available components:

```

[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss" "betweenss"
"size"         "iter"
[9] "ifault"

```

```

>
> perc.var.5 <- round(100*(1 - kmeans5_attr_std$betweenss/kmeans5_attr_std$totss),1)
>
> names(perc.var.5) <- "Perc. 5 clus"
>
> perc.var.5
Perc. 5 clus
65.3
> # Computing the percentage of variation accounted for. Six clusters
> (kmeans6_attr_std <- kmeans(attr_std,6,nstart = 10))
K-means clustering with 6 clusters of sizes 315, 204, 117, 367, 133, 334

```

Cluster means:

	Age	DailyRate	DistanceFromHome	HourlyRate	MonthlyIncome	MonthlyRate	NumCompaniesworked	P
1	0.29572817	0.06720409	-0.37970677	0.083120684	-0.33509590	-0.05149656	1.	
2	-0.25566270	0.03786530	1.67053208	0.038629426	-0.32910387	0.24140707	-0.	
3	1.44167150	0.14005703	-0.03745321	-0.018189835	1.75468907	0.18300839	0.	
4	-0.86588529	-0.05984460	-0.36052931	0.076390996	-0.66450191	-0.05898106	-0.	
5	0.98035288	-0.09522849	-0.02745725	-0.003152513	1.75533922	-0.04414310	0.	
6	-0.06671192	-0.03189258	-0.24201442	-0.178297661	-0.06644952	-0.08060037	-0.	
	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager		
1	-0.21096808	-0.02409561	-0.5941230	-0.6284252	-0.			
2	-0.35912815	-0.27018326	-0.2701731	-0.2188648	-0.			
3	1.70405369	-0.05648465	-0.3375473	-0.2826621	-0.			
4	-0.88690899	0.09436436	-0.5835152	-0.6340835	-0.			
5	-0.21096808	-0.02409561	-0.5941230	-0.6284252	-0.			
6	-0.35912815	-0.27018326	-0.2701731	-0.2188648	-0.			

5	1.76916941	-0.11260971	2.3500845	1.4931387	1.
7313523	1.5416819				
6	0.09143376	0.14868735	0.5489399	0.9275301	0.
4973464	0.9296143				

Clustering vector:

```
[1] 1 6 1 4 1 6 1 2 2 2 4 6 2 2 2 6 4 4 5 1 4 1 6 4 4 5 6 6 5 3 1 1 4 1 4 4 1 4 1 4 4 4 2 6
6 5 2 2 6 4 1 4 1 4 2 5 6 2
[59] 6 6 6 2 5 5 5 3 4 3 1 4 3 4 4 6 4 6 6 3 3 1 6 4 3 6 4 3 4 1 6 6 5 2 6 6 6 3 4 4 5 2 1 4
4 6 1 3 3 4 4 4 5 6 3 4 1 1
[117] 6 6 1 5 2 2 1 5 6 4 5 2 4 6 2 3 2 6 2 1 3 6 2 6 1 2 1 2 6 1 4 3 1 4 6 6 6 6 6 6 1 1 6
1 4 1 2 2 4 3 6 6 1 4 4 4 6 6
[175] 1 1 4 4 5 4 1 2 2 1 2 6 5 5 6 3 5 4 2 1 5 2 1 2 1 2 1 2 4 1 2 2 4 2 1 1 6 6 2 6 1 3 2
4 5 1 6 1 6 6 4 1 6 6 6 4 1 5
[233] 1 3 2 5 6 5 4 4 1 2 2 2 5 1 4 6 1 1 1 5 2 2 2 4 6 5 1 2 4 6 4 3 4 4 2 4 5 6 5 6 4 1 4
1 2 6 4 3 3 5 6 6 4 6 2 1 4 4
[291] 3 6 4 6 4 5 4 6 1 1 5 4 2 6 6 2 6 2 1 4 4 5 4 6 5 6 3 6 4 6 4 6 1 1 2 6 5 1 4 3 4 4 3
1 6 1 6 4 6 6 1 6 6 6 6 2 1 1
[349] 3 4 4 4 2 6 2 6 1 4 1 6 1 6 4 4 1 1 6 3 2 4 4 1 1 4 4 3 6 1 1 3 4 4 4 4 6 1 5 1 1 1 5
1 3 1 6 1 1 4 6 4 5 3 4 6 2 4
[407] 3 1 3 2 4 5 6 2 4 4 4 5 2 1 6 2 4 6 3 5 6 5 1 3 2 1 6 1 6 6 1 4 2 2 1 1 6 4 6 5 6 6 5
6 1 6 6 2 2 1 4 2 6 2 4 6 2
[465] 1 3 5 6 6 1 2 1 1 5 2 2 4 5 2 4 4 4 4 2 6 4 1 4 4 3 1 6 3 1 4 4 2 3 4 4 4 4 5 6 2 4 6
4 6 6 3 1 4 4 6 4 4 4 6 6 1 4
[523] 1 6 6 1 5 6 3 6 6 6 6 5 3 5 1 6 5 1 6 1 1 2 5 2 4 1 1 1 4 1 3 4 1 4 1 1 2 1 4 5 6 2 6
4 2 4 3 6 2 4 2 1 4 1 4 4 6 4
[581] 4 4 6 1 5 4 4 1 3 4 6 2 5 6 2 5 1 1 1 2 6 1 1 4 2 1 4 6 6 3 6 6 6 4 6 4 5 1 1 6 2 6 4
1 3 3 1 3 2 4 1 1 1 4 4 5 2 4
[639] 4 1 4 6 4 1 4 1 3 6 2 5 1 6 2 5 1 4 2 1 6 4 1 1 4 4 6 1 4 1 1 1 4 4 1 4 3 6 2 5 1 2 4
5 1 4 1 6 6 6 4 4 6 1 6 6 4 6
[697] 6 4 2 5 1 5 6 4 6 6 3 6 6 4 6 1 4 1 3 4 5 1 2 1 2 3 4 3 4 2 4 4 3 6 6 4 4 4 4 1 5 1 5
4 4 3 1 3 1 6 5 1 2 5 5 6 5 5
[755] 4 3 2 6 3 2 5 1 1 4 4 1 3 1 2 4 3 3 1 6 3 3 4 4 6 1 2 4 2 6 6 6 4 3 6 5 1 6 2 4 4 4 6
2 2 5 4 1 4 4 3 6 3 6 2 6 5 1
[813] 3 5 5 4 1 6 2 4 4 3 4 4 2 4 4 4 4 4 1 4 2 4 4 4 6 5 5 1 1 2 4 6 4 2 6 6 4 1 4 3 6 4 1
6 4 4 3 2 4 5 4 4 1 2 1 3 2 3
[871] 2 4 2 6 6 5 4 1 1 6 4 6 6 6 1 4 6 3 6 6 3 6 4 4 3 4 2 1 3 3 6 1 4 4 3 6 4 5 6 2 4 4 4
5 5 4 3 4 5 3 6 4 5 6 4 1 5 6
[929] 6 4 6 1 6 4 4 6 3 5 2 4 2 6 6 6 6 3 2 1 2 6 6 6 4 1 5 5 3 1 6 6 6 4 5 6 6 4 5 1 6 6 1
3 4 4 4 5 5 2 6 2 1 2 4 6 2 2
[987] 2 3 2 1 1 4 2 2 3 6 4 2 4 5
[ reached getOption("max.print") -- omitted 470 entries ]
```

within cluster sum of squares by cluster:

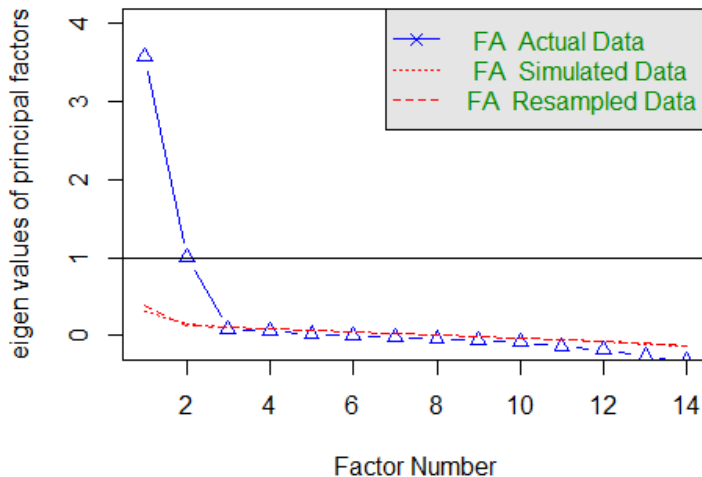
```
[1] 2496.832 1801.395 1137.594 2452.579 1929.518 3105.339
(between_SS / total_SS = 37.2 %)
```

Available components:

```
[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss" "betweenss"
"size"         "iter"
[9] "ifault"
>
> perc.var.6 <- round(100*(1 - kmeans6_attr_std$betweenss/kmeans6_attr_std$totss),1)
>
> names(perc.var.6) <- "Perc. 6 clus"
>
> perc.var.6
Perc. 6 clus
62.8
> #Factor Analysis
> #parallel analysis suggest factor recommendation
> parallel<-fa.parallel(attr_pca[,1:14],fm='minres',fa='fa')
```

Parallel analysis suggests that the number of factors = 2 and the number of components = NA

Parallel Analysis Scree Plots



```
> #The gap between simulated data and actual data tends to be between 3 and 4
> threefactor<-principal(attr_pca[,1:14],nfactors=3,rotate='varimax')
> print(threefactor)
```

```
Principal Components Analysis
Call: principal(r = attr_pca[, 1:14], nfactors = 3, rotate = "varimax")
Standardized loadings (pattern matrix) based upon correlation matrix
RC1  RC2  RC3  h2  u2 com
Age      0.31  0.76  0.07  0.683 0.32 1.3
DailyRate -0.04  0.06  0.23  0.056 0.94 1.2
DistanceFromHome 0.07 -0.12  0.68  0.475 0.52 1.1
HourlyRate -0.03  0.03  0.37  0.139 0.86 1.0
MonthlyIncome 0.54  0.61 -0.02  0.664 0.34 2.0
MonthlyRate -0.04  0.11 -0.01  0.013 0.99 1.3
NumCompaniesWorked -0.20  0.69  0.08  0.522 0.48 1.2
PercentsSalaryHike 0.00 -0.07  0.48  0.233 0.77 1.0
TotalWorkingYears 0.63  0.68  0.03  0.860 0.14 2.0
TrainingTimesLastYear 0.00 -0.07 -0.43  0.193 0.81 1.1
YearsAtCompany 0.93  0.07 -0.05  0.865 0.14 1.0
YearsInCurrentRole 0.86 -0.06  0.00  0.747 0.25 1.0
YearsSinceLastPromotion 0.73  0.01 -0.04  0.541 0.46 1.0
YearsWithCurrManager 0.86 -0.08 -0.02  0.744 0.26 1.0
```

```
RC1  RC2  RC3
SS loadings      3.71 1.95 1.08
Proportion Var   0.26 0.14 0.08
Cumulative Var   0.26 0.40 0.48
Proportion Explained 0.55 0.29 0.16
Cumulative Proportion 0.55 0.84 1.00
```

```
Mean item complexity = 1.2
Test of the hypothesis that 3 components are sufficient.
```

```
The root mean square of the residuals (RMSR) is 0.08
with the empirical chi square 1591.36 with prob < 6e-299
```

```
Fit based upon off diagonal values = 0.91> class(threefactor)
[1] "psych"      "principal"
> #Display factor values
```



```

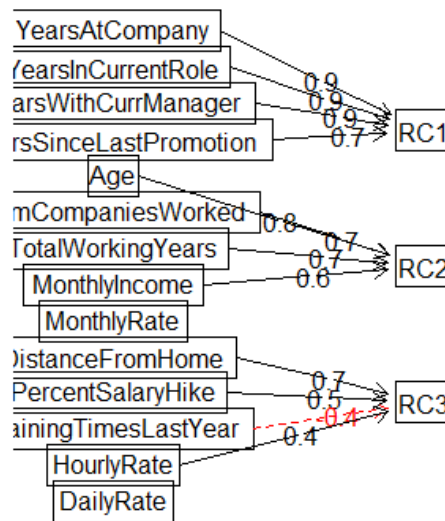
> threefactor$values
[1] 4.0167738 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.9174969 0.722465
4 0.5306975
[11] 0.4698454 0.2832233 0.1933840 0.1400658
> #Display factor loadings
> threefactor$loadings

Loadings:
RC1      RC2      RC3
Age              0.307  0.765
DailyRate              0.225
DistanceFromHome      -0.122  0.675
HourlyRate              0.371
MonthlyIncome          0.538  0.612
MonthlyRate              0.106
NumCompaniesWorked     -0.199  0.689
PercentSalaryHike              0.477
TotalWorkingYears       0.630  0.680
TrainingTimesLastYear              -0.434
YearsAtCompany          0.926
YearsInCurrentRole       0.862
YearsSinceLastPromotion  0.734
YearsWithCurrManager     0.859

RC1      RC2      RC3
SS loadings      3.707 1.951 1.078
Proportion Var  0.265 0.139 0.077
Cumulative Var  0.265 0.404 0.481
> #communalities
> threefactor$communality
Age              DailyRate      DistanceFromHome      HourlyRate
0.68318561          0.05613449          0.47529954          0.13949574
MonthlyIncome      MonthlyRate      NumCompaniesWorked      PercentSalaryHike
0.66447336          0.01269573          0.52164264          0.23285647
TotalWorkingYears  TrainingTimesLastYear      YearsAtCompany      YearsInCurrentRole
0.85983230          0.19335717          0.86479626          0.74651548
YearsSinceLastPromotion      YearssWithCurrManager
0.54136294          0.74383547
> #Rotated factor scores
> head(threefactor$scores)
RC1      RC2      RC3
[1,] -0.5982509  1.2242118  0.4724958
[2,]  0.5308061 -0.1775199  0.4632603
[3,] -1.4124116  0.6169246  0.2028231
[4,] -0.1259390 -0.4919472 -0.9774844
[5,] -1.0834488  0.5907171 -1.4763255
[6,]  0.3852668 -1.0510701 -0.3112959
> #round threefactor values

```

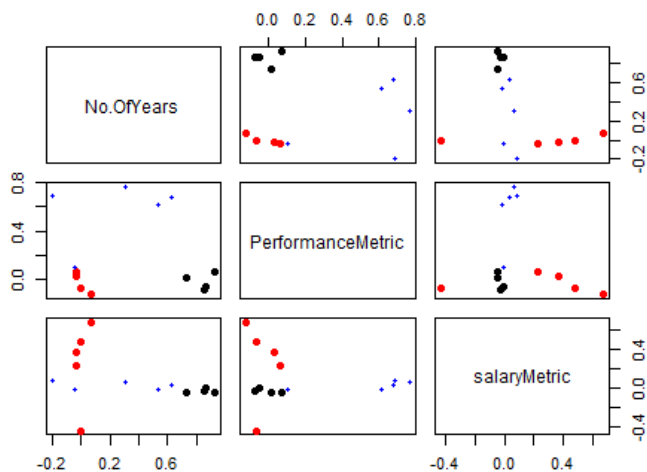
Components Analysis



```
> round(threefactor$values,3)
[1] 4.017 1.650 1.069 1.052 1.009 0.992 0.953 0.917 0.722 0.531 0.470 0.283 0.193 0.140
> #visualize the relationship and factor recommendations for simple structure
> fa.diagram(threefactor)
```

```
> colnames(threefactor$loadings)<- c("No.OfYears","PerformanceMetric","salaryMetric")
> colnames(threefactor$loadings)
[1] "No.OfYears" "PerformanceMetric" "salaryMetric"
> plot(threefactor)
```

Principal Component Analysis



```
> Multiple Regression
> #install.packages("GGally")
> #install.packages("FFally")
> attach(attr)
> attr[, c(2)] <- sapply(attr[, c(2)], as.numeric)
> fit_attr<- lm(Attrition~Age+DailyRate+DistanceFromHome+HourlyRate+MonthlyIncome
```

```
+ MonthlyRate+NumCompaniesWorked+PercentSalaryHike+TotalWorkingYears+Training
TimesLastYear
+ YearsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrMana
ger)
> fit_attr
```

```
Call:
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome +
HourlyRate + MonthlyIncome + MonthlyRate + NumCompaniesWorked +
PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear +
YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +
YearsWithCurrManager)
```

```
Coefficients:
(Intercept)                Age                DailyRate                DistanceFromHome
1.475e+00             -4.842e-03             -4.622e-05                3.607e-03
-1.762e-04
MonthlyIncome            MonthlyRate            NumCompaniesWorked            PercentSalaryHike
-6.435e-06                6.944e-07                1.400e-02                -1.302e-03
-2.215e-03
TrainingTimesLastYear    YearsAtCompany    YearsInCurrentRole    YearsSinceLastPromo
tion    YearsWithCurrManager
-1.642e-02                6.547e-03             -1.359e-02                1.211e-02
-1.202e-02
```

```
> summary(fit_attr)
```

```
Call:
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome +
HourlyRate + MonthlyIncome + MonthlyRate + NumCompaniesWorked +
PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear +
YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +
YearsWithCurrManager)
```

```
Residuals:
Min      1Q  Median      3Q      Max
-0.40687 -0.20911 -0.13209 -0.01769  1.12055
```

```
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.475e+00  7.393e-02  19.953 < 2e-16 ***
Age              -4.842e-03  1.429e-03  -3.388 0.000723 ***
DailyRate        -4.622e-05  2.305e-05  -2.005 0.045171 *
DistanceFromHome  3.607e-03  1.146e-03  3.148 0.001678 **
HourlyRate       -1.762e-04  4.563e-04  -0.386 0.699459
MonthlyIncome    -6.435e-06  3.126e-06  -2.058 0.039722 *
MonthlyRate      6.944e-07  1.305e-06  0.532 0.594875
NumCompaniesWorked 1.400e-02  4.131e-03  3.390 0.000718 ***
PercentSalaryHike -1.302e-03  2.537e-03  -0.513 0.607844
TotalWorkingYears -2.215e-03  2.564e-03  -0.864 0.387788
TrainingTimesLastYear -1.642e-02  7.205e-03  -2.279 0.022830 *
YearsAtCompany    6.547e-03  3.227e-03  2.029 0.042676 *
YearsInCurrentRole -1.359e-02  4.186e-03  -3.246 0.001198 **
YearsSinceLastPromotion 1.211e-02  3.711e-03  3.264 0.001123 **
YearsWithCurrManager -1.202e-02  4.300e-03  -2.794 0.005268 **
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.3547 on 1455 degrees of freedom
Multiple R-squared:  0.07892, Adjusted R-squared:  0.07006
F-statistic: 8.905 on 14 and 1455 DF, p-value: < 2.2e-16
```

```
icients(fit_attr)
```

cept)	Age	DailyRate	DistanceFromHome	
08e+00	-4.841883e-03	-4.621800e-05	3.607208e-03	-
yIncome	MonthlyRate	NumCompaniesWorked	PercentSalaryHike	Total
379e-06	6.943688e-07	1.400361e-02	-1.302020e-03	
ngTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	
803e-02	6.547309e-03	-1.358638e-02	1.211203e-02	

```

tall.packages("GGally")
tall.packages("FFally")
ary(GGally)
int(fit_attr, level=0.95)
97.5 %

```

cept)	1.330087e+00	1.620129e+00
	-7.645349e-03	-2.038416e-03
ate	-9.144038e-05	-9.956195e-07
ceFromHome	1.359397e-03	5.855019e-03
Rate	-1.071269e-03	7.188886e-04
yIncome	-1.256787e-05	-3.028915e-07
yRate	-1.866389e-06	3.255127e-06
paniesworked	5.900450e-03	2.210677e-02
tSalaryHike	-6.278083e-03	3.674043e-03
orkingYears	-7.244350e-03	2.814421e-03
ngTimesLastYear	-3.055144e-02	-2.284612e-03
tCompany	2.164117e-04	1.287821e-02
nCurrentRole	-2.179721e-02	-5.375559e-03
inceLastPromotion	4.833295e-03	1.939077e-02
ithCurrManager	-2.045105e-02	-3.581037e-03

```

dicted values
ed(fit_attr)

```

	2	3	4	5	6	7	8	9	10
071	1.0383735	1.2114521	1.1756231	1.3404380	1.1029924	1.0752183	1.2906399	1.0986213	1.2309
	14	15	16	17	18	19	20	21	22
093	1.2095810	1.3442734	1.1851934	1.1367118	1.3122560	0.9681044	1.2245651	1.1889457	1.1816
	26	27	28	29	30	31	32	33	34
329	0.8538387	1.1992116	1.1499223	1.0171349	1.0492551	1.2245549	1.0792900	1.2132042	1.1317
	38	39	40	41	42	43	44	45	46
304	1.1779045	1.2903062	1.1263251	1.2338891	1.1899926	1.3186586	1.1194586	1.1183320	1.1071
	50	51	52	53	54	55	56	57	58
015	1.2088953	1.2107472	1.1976104	1.1027696	1.1769008	1.3606416	1.0112144	1.0503242	1.2663
	62	63	64	65	66	67	68	69	70
843	1.3153139	1.2506461	1.0175200	1.1003593	1.0510820	1.1122561	1.0848700	1.2303231	1.2779
	74	75	76	77	78	79	80	81	82
773	1.0753403	1.2749839	1.1142876	1.0191567	1.1368875	1.1631061	1.1776661	1.2154409	1.1126
	86	87	88	89	90	91	92	93	94
122	0.9956106	1.2958829	1.1106158	1.1673794	1.0287419	1.1614188	1.1296730	1.0635080	1.0275
	98	99	100	101	102	103	104	105	106
700	1.1843033	1.0248456	1.2489043	1.2033316	1.2331328	1.2678573	1.0151671	1.2031133	0.9949
	110	111	112	113	114	115	116	117	118
059	1.2958267	1.0488521	1.0757890	1.0982503	1.2722436	1.2531769	1.1033592	0.9705148	0.9627
	122	123	124	125	126	127	128	129	130
320	1.1136118	1.2376346	0.9238711	1.2045781	1.2445552	1.2860723	1.3935309	1.2818995	1.0375
	134	135	136	137	138	139	140	141	142
736	1.0624707	1.2040892	1.2907501	1.0422071	1.0880367	1.2933060	1.0953369	1.2224581	1.2065
	146	147	148	149	150	151	152	153	154
776	1.2878876	1.1557796	1.0801260	1.1889117	1.2779218	1.0974692	1.0334471	1.0270869	1.0828
	158	159	160	161	162	163	164	165	166
851	1.1146537	1.0298291	1.2555301	1.2242867	1.3429739	1.3120264	1.1289271	1.2157031	0.9525
	170	171	172	173	174	175	176	177	178
251	1.2256223	1.2551233	1.2292413	1.2153224	1.1496661	1.0947804	1.0976988	1.2138019	1.3199
	182	183	184	185	186	187	188	189	190
143	1.2709999	1.1244172	1.1179438	1.1092612	1.0901779	1.0636192	0.8713907	0.9927435	0.9602
	194	195	196	197	198	199	200	201	202

680	1.1653183	1.1941978	1.1565519	1.2342299	1.1445573	1.2215024	1.1268367	1.3203772	1.0700
	206	207	208	209	210	211	212	213	214
391	1.2172490	1.2678543	1.2283262	1.2111871	1.1105075	1.1633427	1.0933400	1.1020469	0.9446
	218	219	220	221	222	223	224	225	226
679	1.1919425	1.2379731	0.9965779	1.1066303	1.2914905	1.0551588	0.9429311	1.1232812	1.0856
	230	231	232	233	234	235	236	237	238
769	1.2504511	1.1374029	0.8987928	1.1950058	0.9576079	1.2505982	0.9467761	1.1774490	1.1159
	242	243	244	245	246	247	248	249	250
940	1.2584024	1.2108354	1.1298656	1.1069697	1.2103574	1.1970361	1.1504932	1.1470058	1.1416
	254	255	256	257	258	259	260	261	262
208	1.2051040	1.2273537	1.1999189	1.1094561	0.9086445	1.1789862	1.2706130	1.1780597	1.1817
	266	267	268	269	270	271	272	273	274
443	1.1803276	1.2684178	1.2157573	1.0363435	1.0378193	0.9268986	1.1513654	1.1716387	1.1703
	278	279	280	281	282	283	284	285	286
757	1.2398192	1.0586538	0.9287098	0.9339764	1.0766204	1.0798757	1.0431391	1.2696837	1.0623
	290	291	292	293	294	295	296	297	298
179	1.1812315	1.1138797	1.3107934	1.1917659	1.2542990	1.1983138	1.2465311	1.3512552	1.0603
	302	303	304	305	306	307	308	309	310
514	1.3389128	1.1339686	1.2147086	0.9627429	1.1552994	1.1104839	1.1584355	1.0813643	1.1468
	314	315	316	317	318	319	320	321	322
444	1.2295554	1.1216704	1.0387382	1.0400082	1.1450574	1.2198362	1.1790678	1.1194127	1.1029
	326	327	328	329	330	331	332	333	334
977	1.1168309	1.2133564	1.1780946	1.1367316	1.0381902	1.1275023	1.2121315	1.0836258	1.2396
	338	339	340	341	342	343	344	345	346
736	1.2362541	1.1540241	1.0702784	1.2140869	1.0081543	1.0749396	1.1384309	0.9438025	1.3065
	350	351	352	353	354	355	356	357	358
029	1.1775770	1.1432945	1.1345310	1.1751491	1.1377581	1.3759847	1.1624170	1.0574483	1.2413
	362	363	364	365	366	367	368	369	370
785	1.0890640	1.2623572	1.2677748	1.1756622	1.1647613	1.0696806	1.0863400	1.1786251	1.1959
	374	375	376	377	378	379	380	381	382
162	1.1667711	1.1773788	1.1330966	1.0230550	1.2304282	1.2567775	0.9255460	1.2187198	1.2568
	386	387	388	389	390	391	392	393	394
444	1.3337785	1.1672134	1.1613907	1.1619905	1.1849491	1.0162353	1.2047646	0.9695657	1.2396
	398	399	400	401	402	403	404	405	406
370	1.1831933	1.2413566	1.2447004	0.9754143	1.0796019	1.1324159	1.0257759	1.2317715	1.2172
	410	411	412	413	414	415	416	417	418
221	1.1919258	1.1919812	1.0546437	0.9805107	1.0957466	1.1495476	1.2273134	1.1586543	0.8005
	422	423	424	425	426	427	428	429	430
685	1.3789072	1.3083234	1.1334770	1.1214503	1.1921906	1.1531708	1.0050958	1.1310012	1.0477
	434	435	436	437	438	439	440	441	442
259	1.0708892	0.9686952	1.2113812	1.2923338	1.2237561	1.1951869	1.2870484	1.3019248	1.1581
	446	447	448	449	450	451	452	453	454
539	0.9471428	1.1976471	1.2081851	1.1391498	1.1346599	1.1392005	1.0809259	1.0236429	1.2767
	458	459	460	461	462	463	464	465	466
585	1.2735037	1.1990748	1.0146221	1.3399165	1.1347081	1.2145517	1.3490997	1.1380722	1.1112
	470	471	472	473	474	475	476	477	478
789	1.3048391	1.3277534	1.1151561	1.2385068	0.9246576	1.2642710	1.2195045	1.3164141	1.1317
	482	483	484	485	486	487	488	489	490
220	1.1621957	1.2287011	1.2845124	1.1400185	1.1518415	1.1910039	1.3142532	1.1613482	1.0870
	494	495	496	497	498	499	500	501	502
823	1.1506412	1.2082224	1.1495127	1.3176227	1.0107385	1.2449191	1.1922290	1.1555537	1.2825
	506	507	508	509	510	511	512	513	514
690	1.2338037	1.1226305	1.1746320	1.1456398	1.0717804	1.1771915	1.1558438	1.2626387	1.2800
	518	519	520	521	522	523	524	525	526
258	1.1924800	1.0905692	1.0681102	1.0996098	1.1079008	1.2265049	1.1153442	1.1095088	1.3738
	530	531	532	533	534	535	536	537	538
719	0.9901329	1.0745776	1.0719286	1.0484143	0.9879893	0.9949154	1.2309626	1.1878624	1.1008
	542	543	544	545	546	547	548	549	550
663	1.1875771	1.1893019	1.1773599	1.2676281	1.3411036	1.1792184	1.2896782	1.1566669	1.2474
	554	555	556	557	558	559	560	561	562
300	1.1544259	1.2020102	1.2480807	1.0850329	1.1679790	1.2138948	1.3126131	1.2549605	0.9345
	566	567	568	569	570	571	572	573	574
420	1.2614175	1.2084379	1.0910550	0.9923958	1.0291753	1.1324027	1.2793466	1.3040784	1.2755
	578	579	580	581	582	583	584	585	586

931	1.2120176	1.1589207	1.1585421	1.2401673	1.2046724	1.0666742	1.2377412	1.1569966	1.2605
	590	591	592	593	594	595	596	597	598
443	1.2720688	1.0853881	1.2959548	1.0500073	1.0787991	1.1422661	1.0983104	1.2328617	1.1756
	602	603	604	605	606	607	608	609	610
518	1.2241069	1.2004933	1.1765445	1.1601972	1.1711529	1.2197281	1.0423343	1.1429898	1.1463
	614	615	616	617	618	619	620	621	622
508	1.1634152	1.1405327	1.2276154	0.9546701	1.2533879	1.3264586	1.0100015	1.2361409	0.9971
	626	627	628	629	630	631	632	633	634
757	1.0998187	1.2388367	1.0280247	1.2875816	1.1445049	1.2918918	1.1300055	1.2050992	1.1004
	638	639	640	641	642	643	644	645	646
397	1.2289121	1.2518347	1.0876910	1.2192868	1.1820848	1.1711699	1.1152275	1.2225404	1.2797
	650	651	652	653	654	655	656	657	658
795	1.0902088	1.2099553	1.1060140	1.1545760	1.1587187	1.1604917	1.1633879	1.3144919	1.2021
	662	663	664	665	666	667	668	669	670
837	1.2572880	1.2611837	1.2941247	1.0541363	1.0792416	1.2106028	1.1814049	1.2905476	1.2374
	674	675	676	677	678	679	680	681	682
423	1.1966685	0.9854140	1.2771849	1.1336471	1.1054934	1.1995226	1.2011961	1.1804164	0.9210
	686	687	688	689	690	691	692	693	694
028	1.0811266	0.9261751	1.0293094	1.3783921	1.3225984	1.2383124	1.2812433	1.1994419	1.0431
	698	699	700	701	702	703	704	705	706
164	1.2136676	1.2242791	0.9224425	1.1315447	1.1297196	1.2967050	1.2179523	1.0686229	0.9761
	710	711	712	713	714	715	716	717	718
595	1.2691621	1.2127017	1.2744285	1.2315961	1.1339860	1.0301211	1.1549758	0.8313966	1.3856
	722	723	724	725	726	727	728	729	730
660	0.9905761	1.1891155	1.0474839	1.2420517	1.2172599	1.1758969	1.3441063	1.0294554	1.2898
	734	735	736	737	738	739	740	741	742
552	1.1497888	1.2817432	1.1713817	0.9972396	1.2007947	1.1702764	1.1981114	1.1743315	1.1271
	746	747	748	749	750	751	752	753	754
743	1.1072099	0.9163875	1.2504574	1.3715234	0.9544018	1.0742032	0.9492152	1.1831468	1.1428
	758	759	760	761	762	763	764	765	766
614	1.1307162	0.9753709	1.1738874	1.0258760	1.3016361	1.3283153	1.2152907	1.2267642	1.1800
	770	771	772	773	774	775	776	777	778
438	1.1752119	1.1567184	1.1652848	0.9975937	1.1434312	1.0656858	1.1958359	1.2666574	1.2593
	782	783	784	785	786	787	788	789	790
679	1.2309278	1.2115318	1.0756121	1.0587235	1.1837050	1.1707204	0.9769951	1.1300778	1.1720
	794	795	796	797	798	799	800	801	802
558	1.2463063	1.1603520	1.1925018	1.1548612	1.3338456	1.3410180	1.1609715	1.2428148	1.1066
	806	807	808	809	810	811	812	813	814
701	1.0038097	1.1177864	1.0527469	1.2631796	1.0446659	0.9564943	1.2824496	1.2247256	1.2678
	818	819	820	821	822	823	824	825	826
355	1.1117286	1.2441724	1.1367614	1.1829363	1.0749356	1.1614374	1.2378602	1.2900768	1.1941
	830	831	832	833	834	835	836	837	838
398	1.1510333	1.2349417	1.2115421	1.3515596	1.3237391	1.1060211	1.1577752	1.1543778	1.0947
	842	843	844	845	846	847	848	849	850
488	1.4068671	1.2247783	1.0704668	1.1813324	1.2369392	1.1285805	1.0464173	1.2314564	1.2014
	854	855	856	857	858	859	860	861	862
039	1.2713359	1.1370281	1.0301604	1.2610618	1.1007703	0.8491503	1.2227491	1.1988460	1.1168
	866	867	868	869	870	871	872	873	874
703	1.3146662	1.2233028	0.9262897	1.2518084	1.0455051	1.0795463	1.2979310	1.1976162	1.0499
	878	879	880	881	882	883	884	885	886
949	1.1071337	1.1805078	0.9241001	1.2723826	1.0852852	1.0926014	1.0701423	1.2909868	1.1904
	890	891	892	893	894	895	896	897	898
541	1.1990508	1.0147912	1.0969522	1.3106446	1.1405072	0.8259763	1.1685137	1.1071475	1.1067
	902	903	904	905	906	907	908	909	910
164	1.1678747	1.1892084	1.2493214	1.0587066	1.0392474	1.2022250	0.9846344	1.0377966	1.4043
	914	915	916	917	918	919	920	921	922
337	0.8794542	1.2987341	1.3274624	0.9801234	1.1661797	1.0617573	1.0135885	1.2284814	1.2064
	926	927	928	929	930	931	932	933	934
230	1.2410613	1.1386079	1.1155666	1.0880255	1.2608845	1.0947677	1.2169368	1.2278323	1.2389
	938	939	940	941	942	943	944	945	946
430	1.3140864	1.1561976	1.1959936	1.2329389	1.1611044	1.1520524	1.1341008	1.0736252	1.1063
	950	951	952	953	954	955	956	957	958
500	1.0539495	1.1165734	1.2811618	1.2139351	1.1420947	0.9667058	0.9578507	1.0078892	1.3789
	962	963	964	965	966	967	968	969	970

```

450 1.1649852 0.9851448 1.0429769 1.1778842 1.2469435 1.0331016 1.1552392 1.1113417 0.9598
    974      975      976      977      978      979      980      981      982
422 1.1599830 1.2499978 1.0920848 1.0859389 1.2623101 1.1629916 1.3224421 1.3046488 1.2914
    986      987      988      989      990      991      992      993      994
939 1.2966364 1.1664008 1.0556268 1.2057096 1.2076243 1.2033321 1.1914743 1.1053278 1.2394
    998      999      1000
446 1.3652994 1.2222030 0.9336410
hed getOption("max.print") -- omitted 470 entries ]
duals(fit_attr)
      2      3      4      5      6      7      8
92851 -0.038373529 0.788547948 -0.175623067 -0.340438020 -0.102992410 -0.075218252 -0.290
    11      12      13      14      15      16      17
989385 -0.137033891 -0.162756672 -0.356509302 -0.209581007 0.655726602 -0.185193366 -0.13
    20      21      22      23      24      25      26
95635 -0.224565147 -0.188945740 0.818364356 -0.024938237 -0.295277807 0.783767139 0.146
    29      30      31      32      33      34      35
922285 -0.017134928 -0.049255109 -0.224554887 -0.079290028 -0.213204211 0.868292425 0.70
    38      39      40      41      42      43      44
69612 -0.177904530 -0.290306243 -0.126325119 -0.233889113 -0.189992609 0.681341439 -0.119
    47      48      49      50      51      52      53
55456 -0.231863929 -0.321511469 0.012498475 -0.208895286 0.789252772 0.802389594 -0.102
    56      57      58      59      60      61      62
641636 -0.011214444 -0.050324159 -0.266301157 -0.100769558 -0.038359927 -0.121184273 -0.31
    65      66      67      68      69      70      71
519991 -0.100359325 -0.051081964 -0.112256134 -0.084869951 -0.230323097 0.722050187 -0.07
    74      75      76      77      78      79      80
277285 -0.075340256 -0.274983876 -0.114287609 -0.019156745 -0.136887536 -0.163106090 -0.17
    83      84      85      86      87      88      89
600197 -0.065229286 -0.084101846 -0.160912205 0.004389403 -0.295882854 -0.110615840 -0.16
    92      93      94      95      96      97      98
418825 -0.129673013 -0.063507969 -0.027550930 -0.166967513 -0.025775094 -0.180769975 -0.18
    101      102      103      104      105      106      107
904289 0.796668358 -0.233132783 0.732142743 -0.015167090 -0.203113347 0.005014606 0.07
    110      111      112      113      114      115      116
505905 -0.295826692 -0.048852145 0.924210987 -0.098250324 -0.272243578 -0.253176914 -0.10
    119      120      121      122      123      124      125
31814 -0.245251358 -0.029326232 -0.122632003 -0.113611836 0.762365383 0.076128949 0.795
    128      129      130      131      132      133      134
27700 0.606469092 -0.281899488 -0.037597871 -0.239901398 -0.125828866 0.680426396 -0.062
    137      138      139      140      141      142      143
750071 0.957792867 -0.088036736 -0.293305959 -0.095336856 0.777541928 -0.206566878 -0.18
    146      147      148      149      150      151      152
677608 -0.287887588 -0.155779552 -0.080126004 -0.188911745 -0.277921842 -0.097469206 -0.03
    155      156      157      158      159      160      161
852648 -0.095138343 -0.073123907 -0.121085070 -0.114653674 -0.029829076 -0.255530128 -0.22
    164      165      166      167      168      169      170
026426 -0.128927114 -0.215703062 0.047492817 -0.128138768 -0.156637650 -0.100425114 -0.22
    173      174      175      176      177      178      179
58671 -0.215322350 -0.149666089 -0.094780365 -0.097698783 -0.213801880 0.680084180 -0.123
    182      183      184      185      186      187      188
214281 -0.270999875 0.875582793 -0.117943812 -0.109261195 -0.090177896 -0.063619169 0.12
    191      192      193      194      195      196      197
38468 0.120613067 -0.171103105 0.687731975 -0.165318271 -0.194197836 -0.156551864 -0.234
    200      201      202      203      204      205      206
502375 -0.126836680 -0.320377201 -0.070694943 -0.209319916 -0.281853264 0.696860908 0.78
    209      210      211      212      213      214      215
326220 -0.211187103 -0.110507525 0.836657343 -0.093340042 -0.102046927 0.055399848 0.81
    218      219      220      221      222      223      224
32078 0.808057516 -0.237973110 0.003422121 -0.106630279 -0.291490538 -0.055158849 0.057
    227      228      229      230      231      232      233
634745 -0.159124685 -0.081130470 0.002223059 0.749548933 -0.137402897 0.101207238 -0.19
    236      237      238      239      240      241      242
01806 0.053223934 0.822550982 -0.115965839 -0.141070779 0.807684522 -0.231594014 -0.258
    245      246      247      248      249      250      251

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865577	-0.106969747	-0.210357367	-0.197036114	-0.150493244	-0.147005754	-0.141604548	0.79
254	255	256	257	258	259	260	
120775	-0.205104010	-0.227353659	-0.199918866	-0.109456126	0.091355511	-0.178986231	0.72
263	264	265	266	267	268	269	
772990	-0.207477758	-0.008578763	0.783155684	-0.180327648	-0.268417850	-0.215757282	-0.03
272	273	274	275	276	277	278	
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90171	0.066023574	-0.076620427	-0.079875664	-0.043139074	-0.269683745	-0.062357147	0.730
290	291	292	293	294	295	296	
82080	-0.181231536	-0.113879732	-0.310793355	-0.191765892	0.745701001	-0.198313752	-0.246
299	300	301	302	303	304	305	
338751	-0.303940087	-0.105680320	-0.028651355	-0.338912777	-0.133968597	-0.214708587	0.03
308	309	310	311	312	313	314	
483891	-0.158435499	-0.081364322	-0.146858206	-0.275593006	-0.104491563	-0.228944392	-0.22
317	318	319	320	321	322	323	
738208	-0.040008235	0.854942597	-0.219836214	-0.179067842	-0.119412724	-0.102921254	-0.16
326	327	328	329	330	331	332	
397685	-0.116830940	-0.213356445	0.821905374	-0.136731584	-0.038190239	-0.127502268	-0.21
335	336	337	338	339	340	341	
667115	-0.218189700	-0.098910533	0.889926441	-0.236254073	-0.154024141	-0.070278435	-0.21
344	345	346	347	348	349	350	
939634	-0.138430905	0.056197498	-0.306562062	-0.191362894	-0.139698519	-0.165702939	-0.17
353	354	355	356	357	358	359	
530976	-0.175149097	-0.137758136	-0.375984744	-0.162416957	-0.057448288	0.758653671	-0.15
362	363	364	365	366	367	368	
578493	-0.089063961	-0.262357239	0.732225175	-0.175662197	-0.164761262	0.930319448	-0.08
371	372	373	374	375	376	377	
908261	0.607372939	-0.354085449	-0.247516221	-0.166771077	-0.177378768	-0.133096625	-0.02
380	381	382	383	384	385	386	
22481	0.074453972	-0.218719813	-0.256861168	0.834900041	-0.355343321	-0.237744401	0.666
389	390	391	392	393	394	395	
390725	-0.161990527	-0.184949141	-0.016235312	-0.204764620	0.030434339	-0.239679065	-0.02
398	399	400	401	402	403	404	
436972	-0.183193286	-0.241356563	-0.244700447	0.024585721	-0.079601889	-0.132415943	-0.02
407	408	409	410	411	412	413	
64011	0.012716388	-0.171473217	0.056577865	-0.191925819	-0.191981162	-0.054643679	0.019
416	417	418	419	420	421	422	
52371	0.772686621	-0.158654324	0.199452094	-0.235409547	-0.188074900	-0.111468515	0.621
425	426	427	428	429	430	431	
476990	-0.121450338	-0.192190603	-0.153170801	-0.005095783	-0.131001235	-0.047745784	-0.28
434	435	436	437	438	439	440	
225931	-0.070889230	0.031304814	0.788618776	0.707666214	-0.223756075	-0.195186882	0.71
443	444	445	446	447	448	449	
163799	-0.222278396	0.751300713	-0.121753855	0.052857178	-0.197647070	-0.208185062	-0.13
452	453	454	455	456	457	458	
200466	-0.080925863	-0.023642870	0.723208167	-0.345197075	-0.113016733	-0.247558494	0.72
461	462	463	464	465	466	467	
622081	-0.339916490	-0.134708055	-0.214551668	0.650900254	-0.138072187	-0.111286710	-0.03
470	471	472	473	474	475	476	
478928	0.695160859	-0.327753367	-0.115156062	-0.238506759	0.075342357	-0.264270961	-0.21
479	480	481	482	483	484	485	
791667	-0.257133363	0.792940568	0.701577969	-0.162195681	0.771298899	-0.284512363	-0.14
488	489	490	491	492	493	494	
003913	-0.314253178	-0.161348195	-0.087016886	-0.216575541	-0.092794140	-0.051882254	-0.15
497	498	499	500	501	502	503	
87282	-0.317622722	-0.010738530	-0.244919114	-0.192228959	-0.155553722	-0.282552725	-0.128
506	507	508	509	510	511	512	
31028	-0.233803678	-0.122630504	-0.174632018	-0.145639788	-0.071780355	-0.177191531	-0.155
515	516	517	518	519	520	521	
71193	0.845309566	-0.224775902	-0.230125820	-0.192479995	-0.090569241	-0.068110172	-0.099
524	525	526	527	528	529	530	
504914	-0.115344176	-0.109508842	0.626165790	-0.184426238	-0.101590994	0.920628094	0.00
533	534	535	536	537	538	539	

928597	-0.048414295	0.012010680	0.005084608	-0.230962555	-0.187862370	-0.100851067	0.00
542	543	544	545	546	547	548	
33678	-0.187577125	-0.189301854	-0.177359931	-0.267628087	-0.341103641	-0.179218424	0.710
551	552	553	554	555	556	557	
433271	-0.259839010	-0.261270192	-0.097729974	-0.154425950	-0.202010241	-0.248080727	-0.08
560	561	562	563	564	565	566	
894767	-0.312613115	-0.254960456	0.065420381	0.856250651	-0.201542451	-0.073642035	-0.26
569	570	571	572	573	574	575	
055002	1.007604234	-0.029175254	-0.132402714	-0.279346642	-0.304078418	0.724460282	-0.20
578	579	580	581	582	583	584	
893121	-0.212017614	-0.158920679	-0.158542052	-0.240167327	-0.204672358	-0.066674246	-0.23
587	588	589	590	591	592	593	
61954	-0.269766945	-0.168620928	0.028855723	0.727931201	-0.085388064	0.704045193	-0.050
596	597	598	599	600	601	602	
266053	0.901689560	-0.232861677	-0.175618634	0.719631189	-0.243204124	-0.060951781	-0.22
605	606	607	608	609	610	611	
544497	-0.160197200	-0.171152895	-0.219728083	0.957665694	0.857010165	-0.146314315	-0.04
614	615	616	617	618	619	620	
550768	-0.163415241	0.859467302	-0.227615389	0.045329901	-0.253387850	-0.326458603	-0.01
623	624	625	626	627	628	629	
93483	-0.243106679	-0.246692181	-0.048775663	-0.099818723	-0.238836703	-0.028024741	-0.287
632	633	634	635	636	637	638	
891790	-0.130005529	-0.205099206	-0.100405275	-0.210249849	0.035163132	0.683760263	-0.22
641	642	643	644	645	646	647	
691007	-0.219286842	-0.182084751	-0.171169926	-0.115227493	-0.222540353	0.720211697	-0.08
650	651	652	653	654	655	656	
379461	-0.090208765	-0.209955283	-0.106014038	-0.154575976	-0.158718707	-0.160491665	-0.16
659	660	661	662	663	664	665	
101956	-0.251376947	-0.200260290	0.792216285	-0.257288024	0.738816319	0.705875347	-0.05
668	669	670	671	672	673	674	
97179	0.818595089	-0.290547625	0.762514140	-0.261475892	-0.261528822	-0.151742254	-0.196
677	678	679	680	681	682	683	
184854	-0.133647081	-0.105493365	-0.199522552	-0.201196143	-0.180416416	0.078917462	-0.23
686	687	688	689	690	691	692	
902788	-0.081126551	0.073824862	-0.029309406	0.621607890	0.677401612	-0.238312438	-0.28
695	696	697	698	699	700	701	
63474	-0.141953171	0.682935831	0.024083552	-0.213667554	-0.224279095	0.077557474	0.868
704	705	706	707	708	709	710	
704962	-0.217952275	-0.068622912	0.023866663	0.830860599	-0.026687714	-0.073259482	0.73
713	714	715	716	717	718	719	
71469	-0.231596123	-0.133985973	-0.030121051	-0.154975840	0.168603402	-0.385686489	-0.103
722	723	724	725	726	727	728	
34046	0.009423860	-0.189115540	-0.047483885	-0.242051717	0.782740076	-0.175896945	-0.344
731	732	733	734	735	736	737	
811969	-0.061713126	0.688091130	0.765144812	-0.149788752	-0.281743162	-0.171381743	0.00
740	741	742	743	744	745	746	
276445	-0.198111371	-0.174331528	-0.127162779	-0.155044400	0.024385544	0.757625739	-0.10
749	750	751	752	753	754	755	
457408	0.628476592	1.045598187	-0.074203224	0.050784796	0.816853202	-0.142819873	-0.20
758	759	760	761	762	763	764	
561371	-0.130716221	0.024629139	-0.173887366	-0.025875951	0.698363859	0.671684723	-0.21
767	768	769	770	771	772	773	
034381	-0.002847480	-0.206988404	-0.213943814	-0.175211862	-0.156718441	-0.165284850	0.00
776	777	778	779	780	781	782	
685838	-0.195835888	0.733342553	0.740612802	-0.070042504	0.789911804	0.879532110	-0.23
785	786	787	788	789	790	791	
612064	-0.058723511	-0.183705024	-0.170720415	0.023004884	-0.130077754	0.827902875	-0.23
794	795	796	797	798	799	800	
44188	-0.246306274	-0.160351974	-0.192501807	0.845138792	0.666154442	0.658982009	-0.160
803	804	805	806	807	808	809	
85873	-0.160268028	-0.252231567	0.034729940	-0.003809684	-0.117786447	-0.052746880	-0.263
812	813	814	815	816	817	818	
05743	-0.282449560	-0.224725588	0.732183239	-0.042179442	-0.206345142	-0.244635465	-0.111
821	822	823	824	825	826	827	

761436	-0.182936313	-0.074935568	-0.161437420	-0.237860221	-0.290076850	-0.194128722	-0.22
830		831	832	833	834	835	836
60196	0.848966678	-0.234941718	0.788457855	-0.351559585	-0.323739141	-0.106021076	-0.157
839		840	841	842	843	844	845
791139	0.894528472	-0.165616399	-0.244248847	-0.406867113	0.775221654	-0.070466827	-0.18
848		849	850	851	852	853	854
580492	-0.046417285	-0.231456376	0.798574399	-0.219795166	-0.027767277	-0.033703931	-0.27
857		858	859	860	861	862	863
160374	-0.261061792	0.899229652	0.150849708	-0.222749116	0.801154043	-0.116860474	-0.24
866		867	868	869	870	871	872
29677	-0.314666242	-0.223302818	0.073710261	-0.251808358	-0.045505104	-0.079546295	0.702
875		876	877	878	879	880	881
942127	-0.160807100	-0.150525850	-0.356794908	-0.107133703	-0.180507793	0.075899869	-0.27
884		885	886	887	888	889	890
601368	-0.070142350	-0.290986784	-0.190434099	-0.077555281	-0.148689775	-0.077454129	-0.19
893		894	895	896	897	898	899
952186	0.689355375	-0.140507234	0.174023669	-0.168513706	-0.107147487	-0.106777344	0.08
902		903	904	905	906	907	908
516356	-0.167874722	-0.189208425	-0.249321406	-0.058706602	-0.039247389	-0.202224954	0.01
911		912	913	914	915	916	917
328936	-0.290535958	0.654977152	-0.237833738	1.120545842	-0.298734140	0.672537633	0.01
920		921	922	923	924	925	926
757334	-0.013588517	-0.228481388	-0.206471867	-0.020788788	-0.084384401	-0.179622973	-0.24
929		930	931	932	933	934	935
566553	0.911974484	-0.260884478	-0.094767663	-0.216936837	0.772167738	-0.238986207	-0.27
938		939	940	941	942	943	944
742950	-0.314086441	-0.156197631	0.804006421	0.767061116	-0.161104360	-0.152052409	-0.13
947		948	949	950	951	952	953
310251	0.748689900	0.852661309	-0.166949984	-0.053949494	-0.116573400	-0.281161756	0.78
956		957	958	959	960	961	962
94209	0.042149334	-0.007889177	-0.378986147	-0.100691898	-0.095278198	-0.067145028	-0.164
965		966	967	968	969	970	971
976943	-0.177884233	-0.246943481	0.966898384	-0.155239230	-0.111341656	0.040194106	-0.31
974		975	976	977	978	979	980
942222	-0.159983032	-0.249997849	0.907915193	-0.085938867	-0.262310117	-0.162991619	-0.32
983		984	985	986	987	988	989
42467	-0.189387222	-0.037325119	-0.309793949	0.703363645	-0.166400825	-0.055626769	-0.205
992		993	994	995	996	997	998
332063	-0.191474281	-0.105327831	-0.239442304	-0.099778858	-0.074379317	-0.271144608	0.63

58953

hed getOption("max.print") -- omitted 470 entries]

va table
a(fit_attr)

is of Variance Table

se: Attrition

m	Sq	Mean	Sq	F	value	Pr(>F)
1	5.039	5.0386	40.0387	3.307e-10	***	
ate	1	0.600	0.6004	4.7712	0.0290991	*
ceFromHome	1	1.190	1.1904	9.4593	0.0021399	**
Rate	1	0.003	0.0034	0.0270	0.8695254	
yIncome	1	1.665	1.6647	13.2284	0.0002854	***
yRate	1	0.064	0.0637	0.5066	0.4767412	
paniesworked	1	1.985	1.9850	15.7739	7.487e-05	***
tSalaryHike	1	0.055	0.0551	0.4381	0.5081493	
orkingYears	1	0.298	0.2978	2.3665	0.1241812	
ngTimesLastYear	1	0.619	0.6188	4.9174	0.0267408	*
tCompany	1	0.049	0.0487	0.3872	0.5338555	
nCurrentRole	1	1.860	1.8602	14.7818	0.0001259	***
inceLastPromotion	1	1.279	1.2795	10.1671	0.0014601	**
ithCurrManager	1	0.983	0.9826	7.8086	0.0052681	**
als	1455	183.101	0.1258			

. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(fit_attr)

```

cept)      Age      DailyRate DistanceFromHome      HourlyRate MonthlyIncome      MonthlyRa
cept)      -5.465664e-03 -5.401767e-05 -4.077725e-07 -1.001031e-05 -1.329590e-05
ate        -5.401767e-05 2.042546e-06 4.174337e-10 5.386738e-09 -1.899115e-08
ceFromHome -4.077725e-07 4.174337e-10 5.314811e-10 1.366512e-10 -2.360246e-10
Rate       -1.001031e-05 5.386738e-09 1.366512e-10 1.313108e-06 -1.691089e-08
yIncome    -1.329590e-05 -1.899115e-08 -2.360246e-10 -1.691089e-08 2.082110e-07
yRate      -2.253115e-08 2.173753e-10 -5.393647e-14 1.178725e-10 2.497798e-11
paniesWorked -2.527187e-08 -8.279939e-12 1.066478e-12 -4.359249e-11 9.431926e-12
tSalaryHike -2.109799e-05 -7.736385e-07 -1.773406e-09 1.538901e-07 -2.299436e-08
orkingYears 5.246665e-05 -1.885600e-06 -1.842474e-09 -7.478390e-08 1.832019e-09
ngTimesLastYear -1.500646e-04 -2.084194e-07 -1.130791e-09 3.131160e-07 2.197556e-08
tCompany    -1.717430e-05 3.245154e-07 3.611569e-09 3.716019e-08 -1.114817e-08
nCurrentRole -7.091218e-06 9.130808e-08 -5.957290e-09 -6.190303e-08 2.078902e-08
inceLastPromotion 7.009198e-06 -1.115776e-07 2.115227e-09 -2.165622e-08 2.835623e-08
ithCurrManager -2.480019e-05 2.263869e-07 1.708163e-09 -1.238252e-08 6.067393e-09
paniesWorked PercentsSalaryHike TotalWorkingYears TrainingTimesLastYear YearsAtCompany
cept)      -2.109799e-05 -9.596482e-05 5.246665e-05 -1.500646e-04
ate        -7.736385e-07 -8.172910e-08 -1.885600e-06 -2.084194e-07
ceFromHome -1.773406e-09 -1.172098e-09 -1.842474e-09 -1.130791e-09
Rate       1.538901e-07 -1.147267e-07 -7.478390e-08 3.131160e-07
yIncome    -2.299436e-08 1.368832e-08 1.832019e-09 2.197556e-08
yRate      4.319924e-10 9.467275e-11 -4.638835e-09 -8.043639e-10
paniesWorked 3.410154e-11 2.579984e-11 -6.255431e-11 -4.345587e-11
tSalaryHike 1.706435e-05 2.062118e-07 -2.260527e-06 1.607156e-06
orkingYears 2.062118e-07 6.435062e-06 -1.525629e-08 7.752798e-08
ngTimesLastYear -2.260527e-06 -1.525629e-08 6.573714e-06 5.188159e-07
tCompany    1.607156e-06 7.752798e-08 5.188159e-07 5.191289e-07
nCurrentRole 2.973260e-06 3.611138e-07 -2.523337e-06 -4.985615e-06
inceLastPromotion -2.199886e-07 -3.475784e-07 3.788685e-08 2.880460e-08
ithCurrManager -5.707867e-07 5.136124e-08 2.107781e-07 5.326433e-08
nCurrentRole YearsSinceLastPromotion YearsWithCurrManager
cept)      -7.091218e-06 7.009198e-06 -2.480019e-05
ate        9.130808e-08 -1.115776e-07 2.263869e-07
ceFromHome -5.957290e-09 2.115227e-09 1.708163e-09
Rate       -6.190303e-08 -2.165622e-08 -1.238252e-08
yIncome    2.078902e-08 2.835623e-08 6.067393e-09
yRate      1.864849e-10 -4.541142e-10 1.056369e-09
paniesWorked -1.007534e-10 -8.061954e-11 1.696906e-10
tSalaryHike -2.199886e-07 -5.707867e-07 2.757224e-07
orkingYears -3.475784e-07 5.136124e-08 -1.350262e-07
ngTimesLastYear 3.788685e-08 2.107781e-07 -4.741292e-07
tCompany    2.880460e-07 5.326433e-09 2.595454e-07
nCurrentRole -4.877024e-06 -3.256264e-06 -5.812570e-06
inceLastPromotion 1.752082e-05 -2.194322e-06 -5.468174e-06
ithCurrManager -2.194322e-06 1.376870e-05 -4.383185e-07

```

<-influence.measures(fit_attr)

nce measures of

mula = Attrition ~ Age + DailyRate + DistanceFromHome + HourlyRate + MonthlyIncome +
 ke + TotalWorkingYears + TrainingTimesLastYear + YearsAtCompany + YearsInCurrentRole
 :

```

dfb.Age dfb.DlyR dfb.DsFH dfb.HrIR dfb.MntI dfb.MntR dfb.NmCW dfb.PrSH dfb.TtWY
012824 0.049286 0.044617 -0.061209 0.079634 0.031221 0.051700 0.134764 -0.066599 -0.0
006144 -0.006300 0.003586 0.000856 0.000597 0.000392 -0.004363 0.001719 -0.005996 0.
007932 0.005024 0.075128 -0.048524 0.069570 -0.041534 -0.094111 0.063525 -0.003539 0.
007951 0.001107 -0.019468 0.010194 0.006185 0.012910 -0.016615 0.007261 0.015167 -0.
042692 0.033609 0.013695 0.018529 0.031669 0.005191 -0.007961 -0.073200 0.020158 0.
005141 0.001028 -0.003629 0.007419 -0.005203 0.004969 0.001943 0.008037 0.004920 -0.

```

012454	-0.016242	-0.006821	0.004573	-0.003321	0.006813	0.003282	0.002336	-0.006887	0.01292
019995	-0.004251	-0.030314	-0.037962	0.000695	-0.007840	0.002548	0.009822	-0.037682	0.01149
001215	-0.005125	0.010798	-0.012217	0.007819	-0.010304	0.006206	0.006164	-0.010835	0.00776
007357	0.019847	-0.019869	-0.037016	-0.022667	0.020210	-0.005007	-0.019014	0.012420	-0.00101
005548	-0.004550	-0.000191	-0.008571	-0.008704	0.005324	-0.003181	0.009408	0.006837	0.00466
020340	0.009146	0.018646	-0.008771	0.009730	0.006439	0.002659	0.008772	0.010837	-0.00101
027446	0.000244	0.004810	-0.053950	0.046694	0.007098	-0.001573	0.012013	-0.010524	0.00101
001878	-0.010605	-0.021237	-0.018608	-0.019091	-0.001185	0.011636	0.017614	0.019873	0.00101
052771	-0.045171	-0.084298	0.093910	-0.040170	-0.029502	-0.013099	0.069127	-0.017074	0.00101
017772	0.009096	-0.020847	-0.020515	0.009947	-0.018581	0.008214	0.005609	0.017464	0.00101
003794	0.001053	0.011073	0.004907	-0.007441	0.004270	-0.001534	0.008498	0.008382	-0.00101
020212	0.023752	-0.018201	-0.019461	-0.033241	-0.008525	0.021989	0.008870	0.014548	0.00101
003120	0.000830	0.002736	-0.002252	0.001423	-0.000879	0.002827	-0.000834	0.000988	0.00101
025282	-0.010709	0.018106	0.012024	0.017587	-0.000233	0.024029	-0.016204	0.018763	0.00101
003185	0.016470	0.005171	-0.002953	-0.021466	-0.001617	0.011539	0.009957	-0.011006	-0.00101
090815	-0.023978	0.053247	-0.001236	0.044516	-0.042211	-0.057273	0.116410	0.130150	0.00101
001066	0.000346	0.001486	0.000363	0.000985	-0.002983	-0.001885	0.001299	0.002041	0.00101
001114	0.026153	0.022245	-0.016472	-0.033573	0.001789	-0.014708	0.004106	0.006702	-0.00101
046807	-0.005346	-0.012603	-0.025191	0.048207	-0.040022	0.024563	-0.022006	-0.066024	0.00101
002734	0.009227	0.011076	-0.004418	-0.004091	0.021972	-0.006496	-0.000302	-0.013162	-0.00101
062927	-0.030610	0.053358	0.049792	0.017567	-0.040958	-0.074596	-0.016180	0.111981	0.00101
007322	-0.013342	0.002181	0.001789	0.009582	-0.001382	-0.009916	0.012970	0.013118	0.00101
000803	0.000104	0.000785	0.000202	0.001511	0.000788	0.001992	-0.000700	0.000266	-0.00101
000783	0.000491	0.001218	0.003198	-0.003356	-0.009151	-0.003615	0.003722	0.003065	-0.00101
018841	0.005785	-0.003678	0.013530	-0.009184	0.011396	0.017701	-0.006000	0.018898	-0.00101
004280	-0.008179	-0.010094	-0.001367	0.007604	-0.002220	-0.004010	0.002686	0.004014	0.00101
006643	0.012805	0.023776	0.000193	-0.013882	0.020054	-0.005864	0.002912	0.007549	-0.00101
070479	-0.072920	0.004633	-0.028294	-0.035629	-0.177100	-0.106131	-0.048733	-0.023515	0.00101
099020	-0.076502	-0.000240	-0.052213	-0.011202	-0.038428	-0.081657	-0.012731	0.014144	0.00101
004756	-0.011601	-0.008746	0.006235	-0.001778	0.003059	-0.008094	0.005478	0.006296	0.00101
053245	0.208312	0.011128	-0.051136	0.059579	0.011280	-0.095425	-0.063476	-0.026777	-0.00101
001649	-0.011133	-0.002855	0.011860	-0.020073	0.000519	0.007727	0.008776	0.008069	0.00101
002110	0.001066	-0.000605	0.009008	-0.015722	0.002438	0.003481	-0.056704	0.006040	0.00101
006578	0.004169	-0.007246	0.009086	0.010942	0.001926	0.014241	0.003006	-0.009634	-0.00101
011145	-0.016531	0.013738	0.010331	-0.007477	-0.000868	0.008349	0.010765	0.014962	0.00101
007386	0.003489	-0.016795	0.010257	0.022534	-0.000588	-0.011227	0.004745	0.008416	0.00101
061987	-0.016124	0.074170	0.102505	-0.050297	0.010073	-0.026794	-0.020880	-0.050859	-0.00101
018059	0.007442	-0.003738	0.001222	0.012389	-0.010071	0.013805	0.003095	0.001011	0.00101
001190	0.008335	0.002196	0.010227	0.002609	0.009038	0.003377	0.002897	-0.019051	-0.00101
052187	-0.014960	0.099810	0.021881	-0.048390	0.147709	0.012618	-0.039170	-0.057008	-0.00101
008841	0.001689	-0.012622	-0.027178	-0.004999	0.007632	0.009940	0.016802	-0.021053	-0.00101
001178	-0.002224	0.024924	-0.026556	-0.006631	0.013185	0.015511	-0.007186	-0.036694	-0.00101
002541	0.000907	0.000881	-0.000579	0.001446	-0.000415	0.000942	0.000434	0.001456	-0.00101
004668	-0.016053	-0.017039	0.001683	0.023858	-0.003421	0.019801	0.009562	-0.014826	0.00101
CR	dfb.YSLP	dfb.YWCM	dffit cov.r	cook.d	hat	inf			
001035	-0.052115	0.044194	0.26249	0.970	4.58e-03	0.01292			
001575	0.002920	-0.001613	-0.01173	1.022	9.17e-06	0.01149			
023205	0.010303	-0.020357	0.19760	0.967	2.60e-03	0.00776	*		
020545	-0.002355	0.032123	-0.05132	1.019	1.76e-04	0.01052			
002327	-0.011741	-0.000867	-0.09751	1.011	6.34e-04	0.01012			
007112	-0.001838	-0.002964	-0.01990	1.014	2.64e-05	0.00466			
002889	-0.000241	0.002327	-0.02397	1.023	3.83e-05	0.01247			
014195	-0.001972	0.010258	-0.07713	1.012	3.97e-04	0.00871			
004153	0.006889	-0.008391	-0.02960	1.021	5.84e-05	0.01109			
008257	-0.030125	-0.014777	-0.07575	1.019	3.83e-04	0.01319			
004518	0.005899	0.002187	-0.02892	1.014	5.58e-05	0.00554			
002714	0.013621	-0.015570	-0.03922	1.015	1.03e-04	0.00721			
020746	-0.028649	0.001020	-0.09576	1.009	6.11e-04	0.00892			
001047	-0.004329	-0.000552	-0.05196	1.014	1.80e-04	0.00762			
015056	-0.023455	0.006151	0.17520	0.984	2.04e-03	0.00881			
011431	-0.023603	-0.009648	-0.05895	1.020	2.32e-04	0.01244			
007765	0.006011	-0.008255	-0.03105	1.015	6.43e-05	0.00641			
011913	-0.002993	0.011865	-0.07377	1.009	3.63e-04	0.00693			
002335	-0.003987	-0.003996	0.01167	1.027	9.09e-06	0.01632			

```

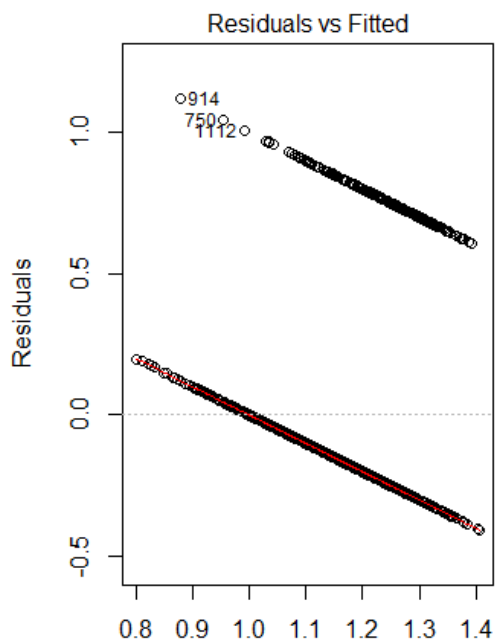
000545 -0.000181  0.001847 -0.05104  1.013  1.74e-04  0.00642
005551 -0.001140 -0.001831 -0.04537  1.015  1.37e-04  0.00715
009755 -0.034149 -0.006533  0.22448  0.965  3.35e-03  0.00927  *
001235  0.001505 -0.004351 -0.00716  1.021  3.42e-06  0.01017
006518 -0.003807  0.007977 -0.08634  1.014  4.97e-04  0.01054
021552  0.000599  0.010460  0.12753  0.964  1.08e-03  0.00330  *
027428 -0.007279 -0.001792  0.04737  1.022  1.50e-04  0.01289
125335  0.088043  0.061723  0.25234  0.970  4.23e-03  0.01216
013885 -0.004003  0.017910 -0.03649  1.016  8.88e-05  0.00735
003763  0.000749 -0.004440 -0.00705  1.031  3.31e-06  0.02045  *
000734 -0.001601  0.000412 -0.01611  1.024  1.73e-05  0.01312
000333 -0.000049  0.010727 -0.04299  1.011  1.23e-04  0.00457
002805  0.000318 -0.002145 -0.02009  1.018  2.69e-05  0.00796
042149  0.007534 -0.028784 -0.07027  1.020  3.29e-04  0.01331
026740  0.008724 -0.042084  0.33054  0.966  7.26e-03  0.01754  *
037184  0.043004 -0.040588  0.16593  0.977  1.83e-03  0.00696
001820  0.001116 -0.003219 -0.02124  1.016  3.01e-05  0.00653
001571 -0.019804 -0.003277  0.27143  0.955  4.89e-03  0.01112  *
000591 -0.008536 -0.000288 -0.03669  1.013  8.98e-05  0.00530
000708  0.002619  0.011716 -0.06964  1.011  3.23e-04  0.00714
001351  0.001153  0.001250 -0.02650  1.015  4.69e-05  0.00548
006445 -0.000692  0.008083 -0.04514  1.011  1.36e-04  0.00465
007596 -0.000798  0.005953 -0.05476  1.018  2.00e-04  0.01025
036698  0.003650 -0.001299  0.17670  0.980  2.08e-03  0.00831
009571  0.008090 -0.004413 -0.03530  1.020  8.31e-05  0.01076
004923  0.002839  0.000826 -0.02927  1.017  5.72e-05  0.00759
115176  0.195603 -0.119345  0.40341  0.968  1.08e-02  0.02436  *
012673 -0.037113 -0.013293 -0.06290  1.015  2.64e-04  0.00910
011515 -0.000302  0.012966 -0.07646  1.009  3.90e-04  0.00702
000039 -0.001118  0.001241  0.00348  1.020  8.09e-07  0.00959
011023 -0.000928  0.000388 -0.05180  1.014  1.79e-04  0.00762
hed 'max' / getOption("max.print") -- omitted 1420 rows ]

```

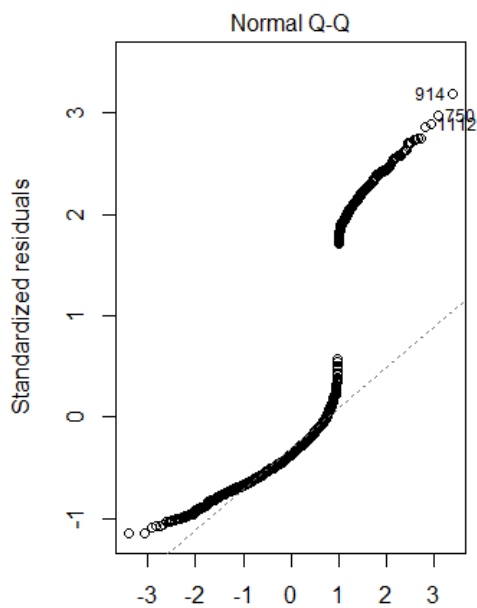
```

> View(temp)
> #Diagnostic Plot
> plot(fit_attr)
Hit <Return> to see next plot:

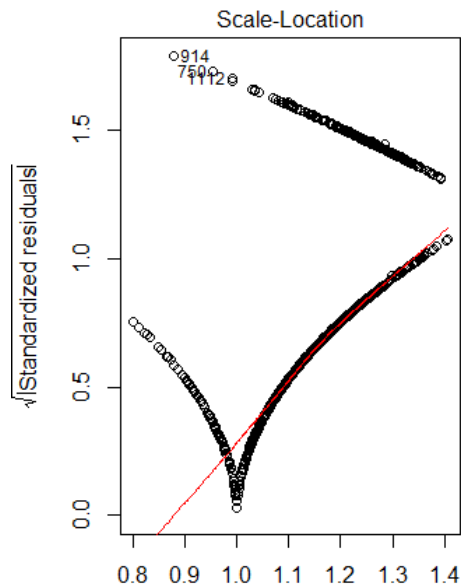
```



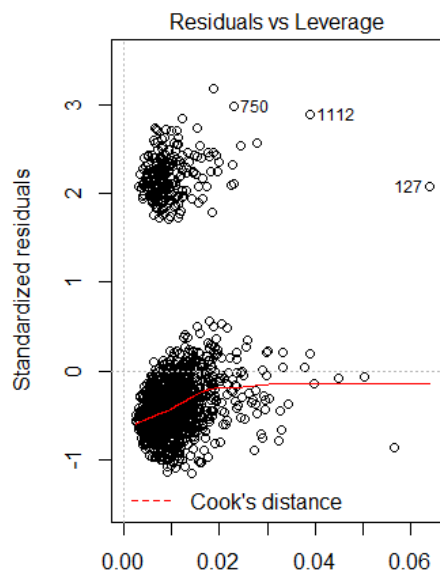
~ Age + DailyRate + DistanceFromHome + HourlyRa
 Hit <Return> to see next plot:



~ Age + DailyRate + DistanceFromHome + HourlyRa
 Hit <Return> to see next plot:

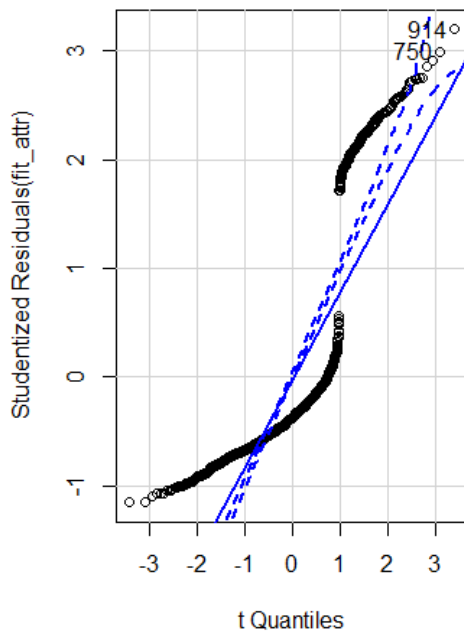


~ Age + DailyRate + DistanceFromHome + HourlyRa
 Hit <Return> to see next plot:



~ Age + DailyRate + DistanceFromHome + HourlyRa
 > #Assessing outliers
 > outlierTest(fit_attr)
 No Studentized residuals with Bonferroni $p < 0.05$
 Largest |rstudent|:
 rstudent unadjusted p-value Bonferroni p
 914 3.198679 0.0014104 NA
 > qqPlot(fit_attr, main="QQ Plot")
 [1] 750 914

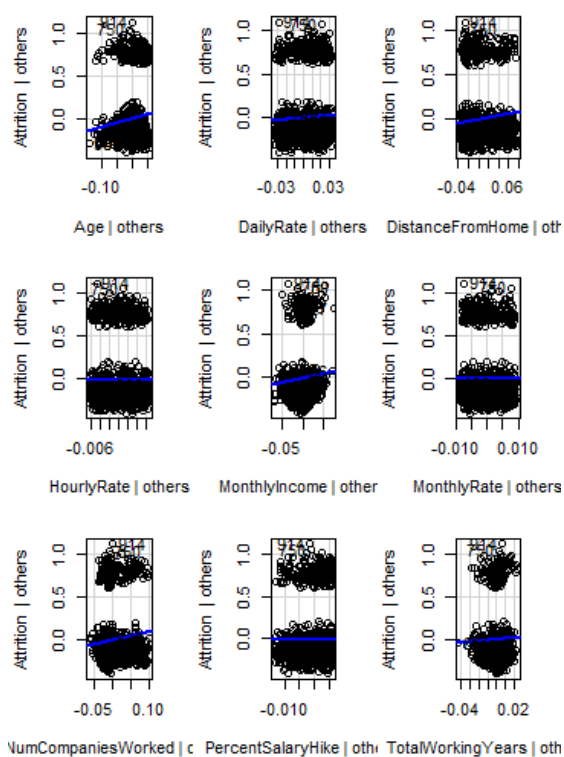
QQ Plot



```
aphics.off()
r(mfrow = c(1,2))
.new();
off()
evic
```

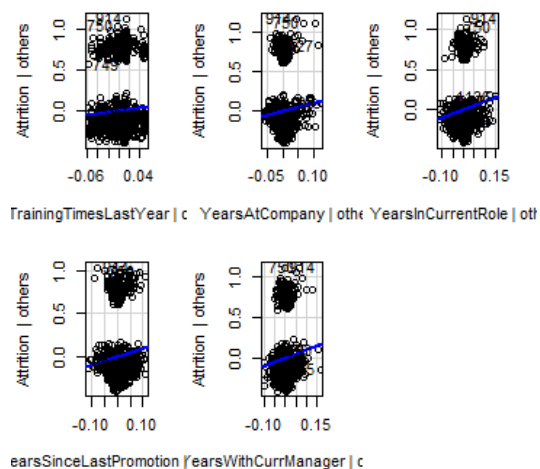
```
ragePlots(fit_attr)
```

return> to see next plot:



Hit <Return> to see next plot:

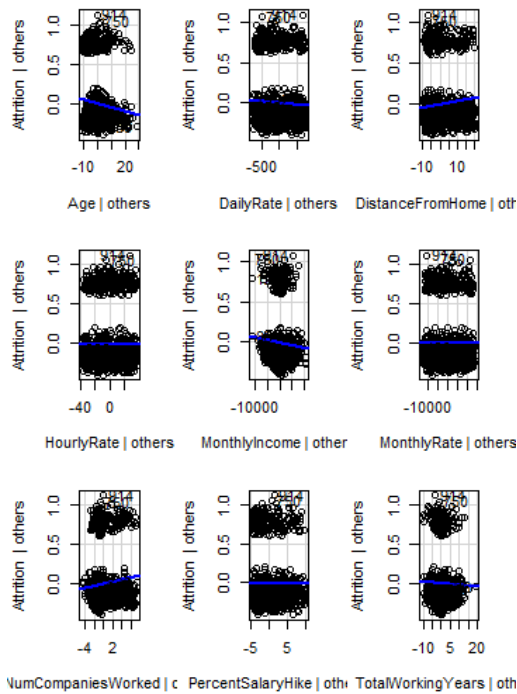
Leverage Plots



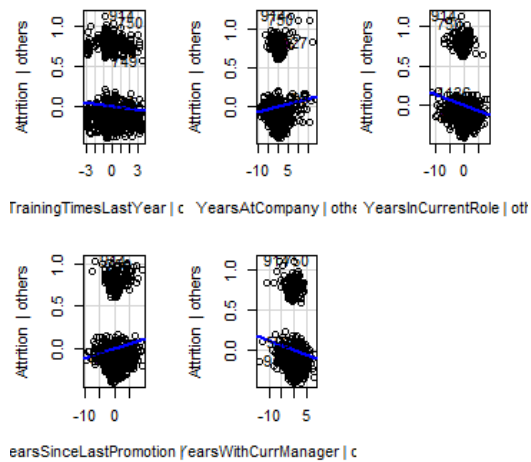
fluential observations
ded variable plots

```
ots(fit_attr)
```

```
\return> to see next plot:
```

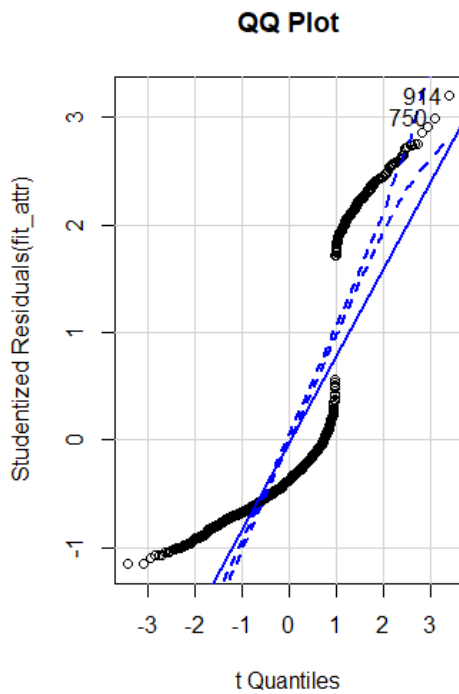


Hit <Return> to see next plot:
Added-Variable Plots



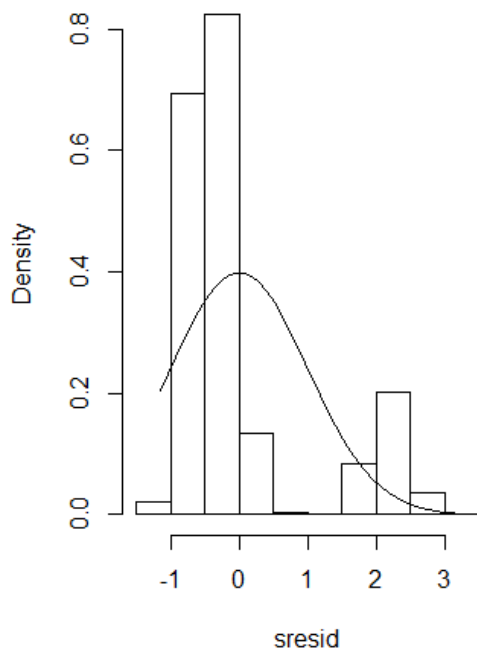
```
> # Normality of Residuals
```

```
> # qq plot for studentized resid
> qqPlot(fit_attr, main="QQ Plot")
[1] 750 914
```



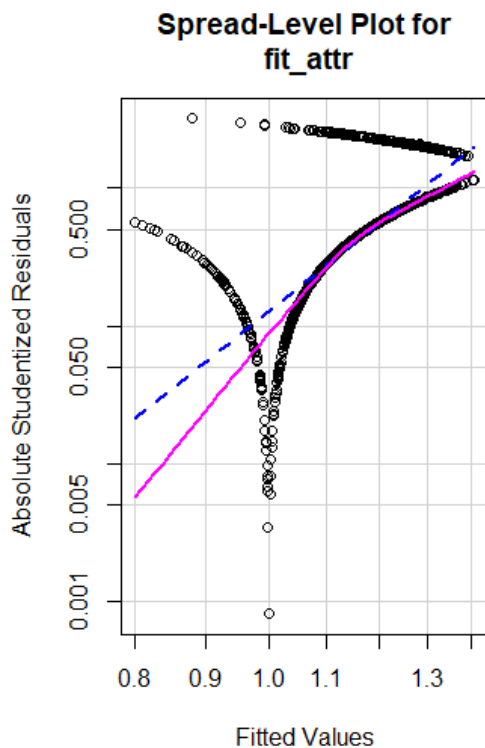
```
> # distribution of studentized residuals
> library(MASS)
> sresid <- studres(fit_attr)
> hist(sresid, freq=FALSE,
+      main="Distribution of Studentized Residuals")
> xfit<-seq(min(sresid),max(sresid),length=40)
> yfit<-dnorm(xfit)
> lines(xfit, yfit)
```

Distribution of Studentized Residuals



```
> #Non-constant Error Variance
> # Evaluate homoscedasticity
> # non-constant error variance test
> ncvTest(fit_attr)
Non-constant Variance Score Test
Variance formula: ~ fitted.values
Chisquare = 174.5721, Df = 1, p = < 2.22e-16
> # plot studentized residuals vs. fitted values
> spreadLevelPlot(fit_attr)
```

Suggested power transformation: -7.081486

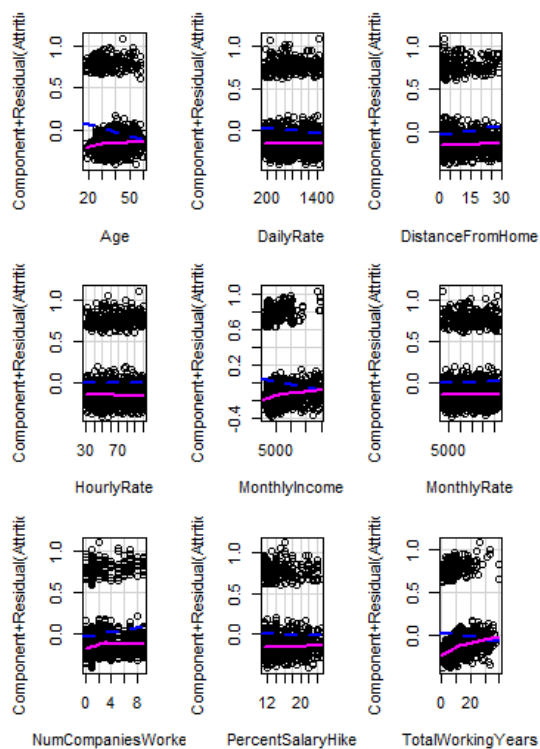


```

> #Multi-collinearity
> # Evaluate Collinearity
> vif(fit_attr) # variance inflation factors
Age          DailyRate      DistanceFromHome      HourlyRate      Monthl
yIncome
1.989844          1.010157          1.007398          1.004497
2.528796
MonthlyRate      NumCompaniesWorked      PercentSalaryHike      TotalWorkingYears      Traini
ngTimesLastYear
1.007865          1.243004          1.006224          4.645708
1.007298
YearsAtCompany      YearsInCurrentRole      YearsSinceLastPromotion      YearswithCurrManager
4.563884          2.684841          1.668993          2.748080
> sqrt(vif(fit_attr)) > 2 # problem?
Age          DailyRate      DistanceFromHome      HourlyRate      Monthl
yIncome
FALSE          FALSE          FALSE          FALSE
FALSE
MonthlyRate      NumCompaniesWorked      PercentSalaryHike      TotalWorkingYears      Traini
ngTimesLastYear
FALSE          FALSE          FALSE          TRUE
FALSE
YearsAtCompany      YearsInCurrentRole      YearsSinceLastPromotion      YearswithCurrManager
TRUE          FALSE          FALSE          FALSE
linearity
component + residual plot
ots(fit_attr)

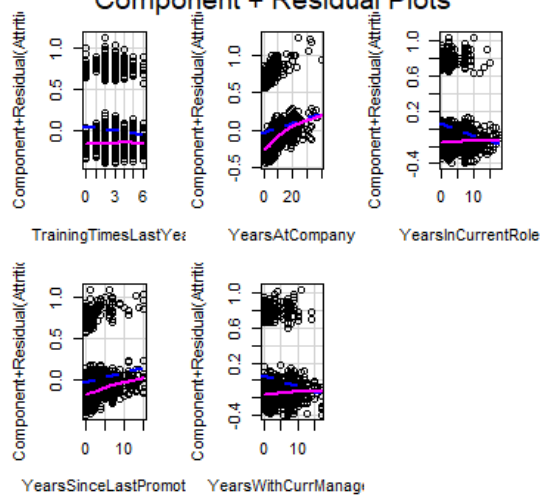
```

return> to see next plot:



Hit <Return> to see next plot:

Component + Residual Plots



```
> library(gvlma)
> gvmodel <- gvlma(fit_attr)
> summary(gvmodel)
```

```
Call:
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome +
    HourlyRate + MonthlyIncome + MonthlyRate + NumCompaniesWorked +
    PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear +
    YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +
    YearsWithCurrManager)
```

```
Residuals:
Min      1Q  Median      3Q      Max
-0.40687 -0.20911 -0.13209 -0.01769  1.12055
```

```
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.475e+00  7.393e-02  19.953 < 2e-16 ***
Age             -4.842e-03  1.429e-03  -3.388 0.000723 ***
DailyRate       -4.622e-05  2.305e-05  -2.005 0.045171 *
DistanceFromHome  3.607e-03  1.146e-03   3.148 0.001678 **
HourlyRate      -1.762e-04  4.563e-04  -0.386 0.699459
MonthlyIncome   -6.435e-06  3.126e-06  -2.058 0.039722 *
MonthlyRate     6.944e-07  1.305e-06   0.532 0.594875
NumCompaniesWorked 1.400e-02  4.131e-03   3.390 0.000718 ***
PercentSalaryHike -1.302e-03  2.537e-03  -0.513 0.607844
TotalWorkingYears -2.215e-03  2.564e-03  -0.864 0.387788
TrainingTimesLastYear -1.642e-02  7.205e-03  -2.279 0.022830 *
YearsAtCompany    6.547e-03  3.227e-03   2.029 0.042676 *
YearsInCurrentRole -1.359e-02  4.186e-03  -3.246 0.001198 **
YearsSinceLastPromotion 1.211e-02  3.711e-03   3.264 0.001123 **
YearsWithCurrManager -1.202e-02  4.300e-03  -2.794 0.005268 **
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.3547 on 1455 degrees of freedom
Multiple R-squared:  0.07892, Adjusted R-squared:  0.07006
F-statistic: 8.905 on 14 and 1455 DF,  p-value: < 2.2e-16
```

```
ASSESSMENT OF THE LINEAR MODEL ASSUMPTIONS
USING THE GLOBAL TEST ON 4 DEGREES-OF-FREEDOM:
Level of Significance = 0.05
```

```
Call:
gvlma(x = fit_attr)
```

```
Value    p-value      Decision
Global Stat    748.8633 0.000e+00 Assumptions NOT satisfied!
Skewness       641.8767 0.000e+00 Assumptions NOT satisfied!
Kurtosis        76.5709 0.000e+00 Assumptions NOT satisfied!
Link Function   30.1796 3.938e-08 Assumptions NOT satisfied!
Heteroscedasticity 0.2361 6.270e-01 Assumptions acceptable.
> fit_attr
```

```
Call:
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome +
    HourlyRate + MonthlyIncome + MonthlyRate + NumCompaniesWorked +
    PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear +
    YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +
    YearsWithCurrManager)
```

```
Coefficients:
(Intercept)              Age              DailyRate      DistanceFromHome
1.475e+00          -4.842e-03          -4.622e-05          3.607e-03
-1.762e-04
```

MonthlyIncome	MonthlyRate	NumCompaniesWorked	PercentSalaryHike
TotalWorkingYears			
-6.435e-06	6.944e-07	1.400e-02	-1.302e-03
-2.215e-03			
TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion
tion	YearsWithCurrManager		
-1.642e-02	6.547e-03	-1.359e-02	1.211e-02
-1.202e-02			

```
> summary(fit_attr)
```

```
Call:
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome +
HourlyRate + MonthlyIncome + MonthlyRate + NumCompaniesWorked +
PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear +
YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +
YearsWithCurrManager)
```

```
Residuals:
Min      1Q  Median      3Q      Max
-0.40687 -0.20911 -0.13209 -0.01769  1.12055
```

```
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.475e+00  7.393e-02  19.953 < 2e-16 ***
Age              -4.842e-03  1.429e-03  -3.388 0.000723 ***
DailyRate        -4.622e-05  2.305e-05  -2.005 0.045171 *
DistanceFromHome  3.607e-03  1.146e-03  3.148 0.001678 **
HourlyRate       -1.762e-04  4.563e-04  -0.386 0.699459
MonthlyIncome    -6.435e-06  3.126e-06  -2.058 0.039722 *
MonthlyRate      6.944e-07  1.305e-06  0.532 0.594875
NumCompaniesWorked 1.400e-02  4.131e-03  3.390 0.000718 ***
PercentSalaryHike -1.302e-03  2.537e-03  -0.513 0.607844
TotalWorkingYears -2.215e-03  2.564e-03  -0.864 0.387788
TrainingTimesLastYear -1.642e-02  7.205e-03  -2.279 0.022830 *
YearsAtCompany    6.547e-03  3.227e-03  2.029 0.042676 *
YearsInCurrentRole -1.359e-02  4.186e-03  -3.246 0.001198 **
YearsSinceLastPromotion 1.211e-02  3.711e-03  3.264 0.001123 **
YearsWithCurrManager -1.202e-02  4.300e-03  -2.794 0.005268 **
---
```

```
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.3547 on 1455 degrees of freedom
Multiple R-squared:  0.07892, Adjusted R-squared:  0.07006
F-statistic: 8.905 on 14 and 1455 DF, p-value: < 2.2e-16
```

```
> fit1<-fit_attr
> fit2<- lm(Attrition~Age+DailyRate+DistanceFromHome+MonthlyIncome+MonthlyRate+NumCompanies
Worked+PercentSalaryHike+TotalWorkingYears+TrainingTimesLastYear+YearsAtCompany+YearsInCurre
ntRole+YearsSinceLastPromotion+YearsWithCurrManager, data=attr)
> summary(fit2)
```

```
Call:
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome +
MonthlyIncome + MonthlyRate + NumCompaniesWorked + PercentSalaryHike +
TotalWorkingYears + TrainingTimesLastYear + YearsAtCompany +
YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager,
data = attr)
```

```
Residuals:
Min      1Q  Median      3Q      Max
-0.40375 -0.20961 -0.13121 -0.01759  1.11560
```

```
Coefficients:
```


Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.464e+00	6.793e-02	21.551 < 2e-16 ***
Age	-4.858e-03	1.428e-03	-3.402 0.000688 ***
DailyRate	-4.642e-05	2.304e-05	-2.015 0.044136 *
DistanceFromHome	3.593e-03	1.145e-03	3.138 0.001735 **
MonthlyIncome	-6.414e-06	3.125e-06	-2.053 0.040286 *
MonthlyRate	7.024e-07	1.305e-06	0.538 0.590493
NumCompaniesWorked	1.398e-02	4.129e-03	3.386 0.000727 ***
PercentSalaryHike	-1.290e-03	2.536e-03	-0.509 0.610912
TotalWorkingYears	-2.213e-03	2.563e-03	-0.864 0.387980
TrainingTimesLastYear	-1.640e-02	7.203e-03	-2.277 0.022942 *
YearsAtCompany	6.538e-03	3.226e-03	2.026 0.042908 *
YearsInCurrentRole	-1.357e-02	4.184e-03	-3.243 0.001211 **
YearsSinceLastPromotion	1.214e-02	3.709e-03	3.272 0.001093 **
YearsWithCurrManager	-1.201e-02	4.299e-03	-2.794 0.005274 **

 signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3546 on 1456 degrees of freedom
 Multiple R-squared: 0.07883, Adjusted R-squared: 0.0706
 F-statistic: 9.584 on 13 and 1456 DF, p-value: < 2.2e-16

```
> fit3<- lm(Attrition~Age+DailyRate+DistanceFromHome+MonthlyIncome+NumCompaniesWorked+PercentSalaryHike+TotalWorkingYears+TrainingTimesLastYear+YearsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrManager,data=attr)
> summary(fit3)
```

Call:
 lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome + MonthlyIncome + NumCompaniesWorked + PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear + YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager, data = attr)

Residuals:

Min	1Q	Median	3Q	Max
-0.40948	-0.20834	-0.13312	-0.01794	1.10809

Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.474e+00	6.523e-02	22.598 < 2e-16 ***
Age	-4.855e-03	1.428e-03	-3.400 0.000691 ***
DailyRate	-4.686e-05	2.302e-05	-2.036 0.041970 *
DistanceFromHome	3.611e-03	1.144e-03	3.155 0.001635 **
MonthlyIncome	-6.374e-06	3.123e-06	-2.041 0.041442 *
NumCompaniesWorked	1.397e-02	4.128e-03	3.384 0.000734 ***
PercentSalaryHike	-1.301e-03	2.535e-03	-0.513 0.607948
TotalWorkingYears	-2.188e-03	2.562e-03	-0.854 0.393341
TrainingTimesLastYear	-1.638e-02	7.201e-03	-2.275 0.023060 *
YearsAtCompany	6.480e-03	3.224e-03	2.010 0.044609 *
YearsInCurrentRole	-1.353e-02	4.183e-03	-3.234 0.001248 **
YearsSinceLastPromotion	1.217e-02	3.708e-03	3.282 0.001054 **
YearsWithCurrManager	-1.208e-02	4.296e-03	-2.812 0.004986 **

 signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3546 on 1457 degrees of freedom
 Multiple R-squared: 0.07864, Adjusted R-squared: 0.07106
 F-statistic: 10.36 on 12 and 1457 DF, p-value: < 2.2e-16

```
> fit4<- lm(Attrition~Age+DailyRate+DistanceFromHome+MonthlyIncome+NumCompaniesWorked+TotalWorkingYears+TrainingTimesLastYear+YearsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrManager,data=attr)
> summary(fit4)
```

```
Call:
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome +
MonthlyIncome + NumCompaniesWorked + TotalWorkingYears +
TrainingTimesLastYear + YearsAtCompany + YearsInCurrentRole +
YearsSinceLastPromotion + YearsWithCurrManager, data = attr)
```

```
Residuals:
Min      1Q  Median      3Q      Max
-0.41835 -0.20806 -0.13307 -0.01769  1.10641
```

```
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.455e+00  5.348e-02  27.204 < 2e-16 ***
Age             -4.871e-03  1.427e-03  -3.413 0.000659 ***
DailyRate       -4.710e-05  2.301e-05  -2.047 0.040853 *
DistanceFromHome  3.588e-03  1.143e-03   3.139 0.001731 **
MonthlyIncome   -6.355e-06  3.122e-06  -2.035 0.041988 *
NumCompaniesWorked  1.401e-02  4.126e-03   3.396 0.000703 ***
TotalWorkingYears -2.191e-03  2.561e-03  -0.855 0.392588
TrainingTimesLastYear -1.637e-02  7.199e-03  -2.273 0.023154 *
YearsAtCompany    6.553e-03  3.220e-03   2.035 0.042021 *
YearsInCurrentRole -1.360e-02  4.179e-03  -3.253 0.001166 **
YearsSinceLastPromotion 1.218e-02  3.707e-03   3.286 0.001040 **
YearsWithCurrManager -1.211e-02  4.294e-03  -2.820 0.004873 **
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.3545 on 1458 degrees of freedom
Multiple R-squared:  0.07848, Adjusted R-squared:  0.07153
F-statistic: 11.29 on 11 and 1458 DF, p-value: < 2.2e-16
```

```
> fit5<- lm(Attrition~Age+DailyRate+DistanceFromHome+MonthlyIncome+NumCompaniesWorked+Train
ingTimesLastYear+YearsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrMana
ger,data=attr)
> summary(fit5)
```

```
Call:
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome +
MonthlyIncome + NumCompaniesWorked + TrainingTimesLastYear +
YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +
YearsWithCurrManager, data = attr)
```

```
Residuals:
Min      1Q  Median      3Q      Max
-0.41785 -0.20700 -0.13205 -0.01959  1.11348
```

```
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.472e+00  4.957e-02  29.695 < 2e-16 ***
Age             -5.500e-03  1.223e-03  -4.497 7.45e-06 ***
DailyRate       -4.770e-05  2.300e-05  -2.074 0.03824 *
DistanceFromHome  3.562e-03  1.143e-03   3.118 0.00186 **
MonthlyIncome   -7.903e-06  2.544e-06  -3.106 0.00193 **
NumCompaniesWorked  1.326e-02  4.031e-03   3.289 0.00103 **
TrainingTimesLastYear -1.619e-02  7.196e-03  -2.250 0.02457 *
YearsAtCompany    5.714e-03  3.066e-03   1.863 0.06262 .
YearsInCurrentRole -1.359e-02  4.179e-03  -3.251 0.00118 **
YearsSinceLastPromotion 1.225e-02  3.705e-03   3.306 0.00097 ***
YearsWithCurrManager -1.226e-02  4.290e-03  -2.859 0.00431 **
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.3544 on 1459 degrees of freedom
Multiple R-squared:  0.07802, Adjusted R-squared:  0.0717
```

F-statistic: 12.35 on 10 and 1459 DF, p-value: < 2.2e-16

```
> fit6<- lm(Attrition~Age+DailyRate+DistanceFromHome+MonthlyIncome+NumCompaniesWorked+TrainingTimesLastYear+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrManager,data=attr)
> summary(fit6)
```

```
Call:
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome + MonthlyIncome + NumCompaniesWorked + TrainingTimesLastYear + YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager, data = attr)
```

```
Residuals:
Min      1Q  Median      3Q      Max
-0.40760 -0.20639 -0.13235 -0.02203  1.15117
```

```
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.466e+00  4.952e-02  29.611 < 2e-16 ***
Age             -5.261e-03  1.217e-03  -4.322 1.65e-05 ***
DailyRate       -4.945e-05  2.300e-05  -2.150  0.03170 *
DistanceFromHome  3.552e-03  1.144e-03   3.106  0.00193 **
MonthlyIncome   -6.431e-06  2.420e-06  -2.657  0.00797 **
NumCompaniesWorked  1.199e-02  3.976e-03   3.015  0.00261 **
TrainingTimesLastYear -1.601e-02  7.201e-03  -2.223  0.02634 *
YearsInCurrentRole -1.065e-02  3.874e-03  -2.750  0.00604 **
YearsSinceLastPromotion  1.417e-02  3.562e-03   3.979 7.25e-05 ***
YearsWithCurrManager -8.627e-03  3.823e-03  -2.256  0.02420 *
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.3547 on 1460 degrees of freedom
Multiple R-squared:  0.07582, Adjusted R-squared:  0.07013
F-statistic: 13.31 on 9 and 1460 DF, p-value: < 2.2e-16
```

```
> fit7<- lm(Attrition~Age+DistanceFromHome+MonthlyIncome+NumCompaniesWorked+TrainingTimesLastYear+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrManager,data=attr)
> summary(fit7)
```

```
Call:
lm(formula = Attrition ~ Age + DistanceFromHome + MonthlyIncome + NumCompaniesWorked + TrainingTimesLastYear + YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager, data = attr)
```

```
Residuals:
Min      1Q  Median      3Q      Max
-0.38983 -0.20696 -0.13423 -0.02457  1.14670
```

```
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept)      1.428e+00  4.621e-02  30.901 < 2e-16 ***
Age             -5.262e-03  1.219e-03  -4.317 1.69e-05 ***
DistanceFromHome  3.561e-03  1.145e-03   3.110  0.00190 **
MonthlyIncome   -6.476e-06  2.423e-06  -2.672  0.00762 **
NumCompaniesWorked  1.170e-02  3.979e-03   2.942  0.00332 **
TrainingTimesLastYear -1.609e-02  7.210e-03  -2.232  0.02580 *
YearsInCurrentRole -1.107e-02  3.874e-03  -2.857  0.00434 **
YearsSinceLastPromotion  1.448e-02  3.563e-03   4.062 5.12e-05 ***
YearsWithCurrManager -8.319e-03  3.825e-03  -2.175  0.02981 *
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.3552 on 1461 degrees of freedom
Multiple R-squared:  0.0729, Adjusted R-squared:  0.06782
```

F-statistic: 14.36 on 8 and 1461 DF, p-value: < 2.2e-16

```
> fit8<- lm(Attrition~Age+DistanceFromHome+MonthlyIncome+NumCompaniesWorked+YearsInCurrentR
ole+YearsSinceLastPromotion+YearsWithCurrManager,data=attr)
> summary(fit8)
```

Call:
lm(formula = Attrition ~ Age + DistanceFromHome + MonthlyIncome +
NumCompaniesWorked + YearsInCurrentRole + YearsSinceLastPromotion +
YearsWithCurrManager, data = attr)

Residuals:
Min 1Q Median 3Q Max
-0.38369 -0.20480 -0.13618 -0.03085 1.14424

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.381e+00 4.111e-02 33.584 < 2e-16 ***
Age -5.284e-03 1.220e-03 -4.329 1.60e-05 ***
DistanceFromHome 3.661e-03 1.146e-03 3.196 0.00142 **
MonthlyIncome -6.413e-06 2.427e-06 -2.643 0.00830 **
NumCompaniesWorked 1.228e-02 3.976e-03 3.088 0.00205 **
YearsInCurrentRole -1.103e-02 3.880e-03 -2.843 0.00453 **
YearsSinceLastPromotion 1.444e-02 3.568e-03 4.047 5.46e-05 ***
YearsWithCurrManager -8.283e-03 3.830e-03 -2.162 0.03075 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3557 on 1462 degrees of freedom
Multiple R-squared: 0.06974, Adjusted R-squared: 0.06528
F-statistic: 15.66 on 7 and 1462 DF, p-value: < 2.2e-16

```
> fit9<- lm(Attrition~Age+DistanceFromHome+MonthlyIncome+NumCompaniesWorked+YearsInCurrentR
ole+YearsSinceLastPromotion,data=attr)
> summary(fit9)
```

Call:
lm(formula = Attrition ~ Age + DistanceFromHome + MonthlyIncome +
NumCompaniesWorked + YearsInCurrentRole + YearsSinceLastPromotion,
data = attr)

Residuals:
Min 1Q Median 3Q Max
-0.39822 -0.20509 -0.13451 -0.03268 1.16520

Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 1.374e+00 4.105e-02 33.474 < 2e-16 ***
Age -5.374e-03 1.221e-03 -4.400 1.16e-05 ***
DistanceFromHome 3.658e-03 1.147e-03 3.189 0.001460 **
MonthlyIncome -6.871e-06 2.420e-06 -2.839 0.004592 **
NumCompaniesWorked 1.311e-02 3.963e-03 3.308 0.000962 ***
YearsInCurrentRole -1.586e-02 3.175e-03 -4.995 6.59e-07 ***
YearsSinceLastPromotion 1.305e-02 3.514e-03 3.713 0.000212 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.3561 on 1463 degrees of freedom
Multiple R-squared: 0.06676, Adjusted R-squared: 0.06293
F-statistic: 17.44 on 6 and 1463 DF, p-value: < 2.2e-16

```
> #Comparing model
> anova(fit1,fit9)
Analysis of Variance Table
```

Model 1: Attrition ~ Age + DailyRate + DistanceFromHome + HourlyRate + MonthlyIncome + MonthlyRate + NumCompaniesWorked + PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear + YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager
 Model 2: Attrition ~ Age + DistanceFromHome + MonthlyIncome + NumCompaniesWorked + YearsInCurrentRole + YearsSinceLastPromotion

	Res.Df	RSS	Df	Sum of Sq	F	Pr(>F)
1	1455	183.10				
2	1463	185.52	-8	-2.4177	2.4015	0.0142 *

 signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
>
> step <- stepAIC(fit1, direction="both")
Start: AIC=-3031.98
Attrition ~ Age + DailyRate + DistanceFromHome + HourlyRate + MonthlyIncome + MonthlyRate + NumCompaniesWorked + PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear + YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager
```

	Df	Sum of Sq	RSS	AIC
- HourlyRate	1	0.01876	183.12	-3033.8
- PercentSalaryHike	1	0.03315	183.13	-3033.7
- MonthlyRate	1	0.03560	183.14	-3033.7
- TotalWorkingYears	1	0.09392	183.19	-3033.2
<none>			183.10	-3032.0
- DailyRate	1	0.50578	183.61	-3029.9
- YearsAtCompany	1	0.51789	183.62	-3029.8
- MonthlyIncome	1	0.53324	183.63	-3029.7
- TrainingTimesLastYear	1	0.65342	183.75	-3028.8
- YearsWithCurrManager	1	0.98265	184.08	-3026.1
- DistanceFromHome	1	1.24701	184.35	-3024.0
- YearsInCurrentRole	1	1.32581	184.43	-3023.4
- YearsSinceLastPromotion	1	1.34081	184.44	-3023.3
- Age	1	1.44439	184.54	-3022.4
- NumCompaniesWorked	1	1.44616	184.55	-3022.4

Step: AIC=-3033.83
 Attrition ~ Age + DailyRate + DistanceFromHome + MonthlyIncome + MonthlyRate + NumCompaniesWorked + PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear + YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager

	Df	Sum of Sq	RSS	AIC
- PercentSalaryHike	1	0.03257	183.15	-3035.6
- MonthlyRate	1	0.03644	183.16	-3035.5
- TotalWorkingYears	1	0.09379	183.21	-3035.1
<none>			183.12	-3033.8
+ HourlyRate	1	0.01876	183.10	-3032.0
- DailyRate	1	0.51042	183.63	-3031.7
- YearsAtCompany	1	0.51643	183.64	-3031.7
- MonthlyIncome	1	0.52990	183.65	-3031.6
- TrainingTimesLastYear	1	0.65197	183.77	-3030.6
- YearsWithCurrManager	1	0.98182	184.10	-3028.0
- DistanceFromHome	1	1.23843	184.36	-3025.9
- YearsInCurrentRole	1	1.32253	184.44	-3025.2
- YearsSinceLastPromotion	1	1.34651	184.47	-3025.1
- NumCompaniesWorked	1	1.44236	184.56	-3024.3
- Age	1	1.45523	184.57	-3024.2

Step: AIC=-3035.57
 Attrition ~ Age + DailyRate + DistanceFromHome + MonthlyIncome + MonthlyRate + NumCompaniesWorked + TotalWorkingYears + TrainingTimesLastYear + YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager

Df	Sum of Sq	RSS	AIC
- MonthlyRate	1	0.03696	183.19 -3037.3
- TotalWorkingYears	1	0.09405	183.25 -3036.8
<none>			183.15 -3035.6
+ PercentSalaryHike	1	0.03257	183.12 -3033.8
+ HourlyRate	1	0.01818	183.13 -3033.7
- DailyRate	1	0.51573	183.67 -3033.4
- MonthlyIncome	1	0.52690	183.68 -3033.3
- YearsAtCompany	1	0.52900	183.68 -3033.3
- TrainingTimesLastYear	1	0.65077	183.80 -3032.4
- YearsWithCurrManager	1	0.98642	184.14 -3029.7
- DistanceFromHome	1	1.22464	184.38 -3027.8
- YearsInCurrentRole	1	1.33766	184.49 -3026.9
- YearsSinceLastPromotion	1	1.34875	184.50 -3026.8
- NumCompaniesWorked	1	1.45154	184.60 -3026.0
- Age	1	1.46564	184.62 -3025.8

Step: AIC=-3037.27

Attrition ~ Age + DailyRate + DistanceFromHome + MonthlyIncome +
NumCompaniesWorked + TotalWorkingYears + TrainingTimesLastYear +
YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion +
YearsWithCurrManager

Df	Sum of Sq	RSS	AIC
- TotalWorkingYears	1	0.09189	183.28 -3038.5
<none>			183.19 -3037.3
+ MonthlyRate	1	0.03696	183.15 -3035.6
+ PercentSalaryHike	1	0.03310	183.16 -3035.5
+ HourlyRate	1	0.01900	183.17 -3035.4
- YearsAtCompany	1	0.52037	183.71 -3035.1
- MonthlyIncome	1	0.52054	183.71 -3035.1
- DailyRate	1	0.52639	183.72 -3035.1
- TrainingTimesLastYear	1	0.64931	183.84 -3034.1
- YearsWithCurrManager	1	0.99893	184.19 -3031.3
- DistanceFromHome	1	1.23774	184.43 -3029.4
- YearsInCurrentRole	1	1.32995	184.52 -3028.6
- YearsSinceLastPromotion	1	1.35672	184.55 -3028.4
- NumCompaniesWorked	1	1.44865	184.64 -3027.7
- Age	1	1.46388	184.65 -3027.6

Step: AIC=-3038.54

Attrition ~ Age + DailyRate + DistanceFromHome + MonthlyIncome +
NumCompaniesWorked + TrainingTimesLastYear + YearsAtCompany +
YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager

Df	Sum of Sq	RSS	AIC
<none>			183.28 -3038.5
+ TotalWorkingYears	1	0.09189	183.19 -3037.3
- YearsAtCompany	1	0.43614	183.72 -3037.0
+ MonthlyRate	1	0.03480	183.25 -3036.8
+ PercentSalaryHike	1	0.03334	183.25 -3036.8
+ HourlyRate	1	0.01884	183.26 -3036.7
- DailyRate	1	0.54042	183.82 -3036.2
- TrainingTimesLastYear	1	0.63620	183.92 -3035.4
- YearsWithCurrManager	1	1.02671	184.31 -3032.3
- MonthlyIncome	1	1.21206	184.49 -3030.8
- DistanceFromHome	1	1.22105	184.50 -3030.8
- YearsInCurrentRole	1	1.32780	184.61 -3029.9
- NumCompaniesWorked	1	1.35901	184.64 -3029.7
- YearsSinceLastPromotion	1	1.37284	184.65 -3029.6
- Age	1	2.54008	185.82 -3020.3

> step\$anova

Stepwise Model Path

Analysis of Deviance Table

Initial Model:

Attrition ~ Age + DailyRate + DistanceFromHome + HourlyRate +
MonthlyIncome + MonthlyRate + NumCompaniesWorked + PercentSalaryHike +
TotalWorkingYears + TrainingTimesLastYear + YearsAtCompany +
YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager

Final Model:

Attrition ~ Age + DailyRate + DistanceFromHome + MonthlyIncome +
NumCompaniesWorked + TrainingTimesLastYear + YearsAtCompany +
YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager

```
Step Df   Deviance Resid. Df Resid. Dev      AIC
1              1455      183.1008 -3031.982
2 - HourlyRate 1 0.01876239      1456      183.1195 -3033.831
3 - PercentSalaryHike 1 0.03256930      1457      183.1521 -3035.570
4 - MonthlyRate 1 0.03696356      1458      183.1891 -3037.273
5 - TotalWorkingYears 1 0.09188909      1459      183.2810 -3038.536
> attach(attr)
> predict.lm(fit9, data.frame(Age=27, DistanceFromHome=10, MonthlyIncome=2000, NumCompanieswor
ked=1, YearsInCurrentRole=3, YearsSinceLastPromotion=1))
1
1.230249
```

```
> ##Logistic Regression
> library(ggplot2)
> library(cowplot)
> attr <- as.data.frame(attr)
> summary(attr)
Age          Attrition      BusinessTravel  DailyRate          Department
DistanceFromHome Education
Min.   :18.00  No :1233  Non-Travel      : 150  Min.   : 102.0  Human Resources      :
63  Min.   : 1.000  1:170
1st Qu.:30.00  Yes: 237  Travel_Frequently: 277  1st Qu.: 465.0  Research & Development:
961 1st Qu.: 2.000  2:282
Median :36.00          Travel_Rarely  :1043  Median : 802.0  Sales                :
446 Median : 7.000  3:572
Mean   :36.92
Mean   : 9.193  4:398
3rd Qu.:43.00
3rd Qu.:14.000  5: 48
Max.    :60.00
Max.    :29.000
```

```
EducationField EnvironmentsSatisfaction  Gender      HourlyRate      JobInvolvement JobLevel
Human Resources : 27      1:284      Female:588  Min.      : 30.00  1: 83
1:543
Life Sciences   :606      2:287      Male  :882  1st Qu.: 48.00  2:375
2:534
Marketing       :159      3:453              Median : 66.00  3:868
3:218
Medical         :464      4:446              Mean   : 65.89  4:144
4:106
Other           : 82              3rd Qu.: 83.75
5: 69
Technical Degree:132              Max.    :100.00
```

```
JobRole      JobSatisfaction  MaritalStatus  MonthlyIncome      MonthlyRate      NumCompaniesWorked
OverTime
Sales Executive :326      1:289      Divorced:327  Min.      : 1009  Min.      : 2094
Min.      :0.000  No :1054
```


Research Scientist	:292	2:280	Married	:673	1st Qu.: 2911	1st Qu.: 8047
1st Qu.:1.000	Yes: 416					
Laboratory Technician	:259	3:442	Single	:470	Median : 4919	Median :14236
Median :2.000						
Manufacturing Director	:145	4:459			Mean : 6503	Mean :14313
Mean :2.693						
Healthcare Representative	:131				3rd Qu.: 8379	3rd Qu.:20462
3rd Qu.:4.000						
Manager	:102				Max. :19999	Max. :26999
Max. :9.000						
(Other)	:215					

PercentSalaryHike	PerformanceRating	RelationshipSatisfaction	StockOptionLevel	TotalWorkingYears
TrainingTimesLastYear				
Min. :11.00	3:1244	1:276	0:631	Min. : 0.00
Min. :0.000				
1st Qu.:12.00	4: 226	2:303	1:596	1st Qu.: 6.00
1st Qu.:2.000				
Median :14.00		3:459	2:158	Median :10.00
Median :3.000				
Mean :15.21		4:432	3: 85	Mean :11.28
Mean :2.799				
3rd Qu.:18.00				3rd Qu.:15.00
3rd Qu.:3.000				
Max. :25.00				Max. :40.00
Max. :6.000				

workLifeBalance	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager
1: 80	Min. : 0.000	Min. : 0.000	Min. : 0.000	Min. : 0.000
2:344	1st Qu.: 3.000	1st Qu.: 2.000	1st Qu.: 0.000	1st Qu.: 2.000
3:893	Median : 5.000	Median : 3.000	Median : 1.000	Median : 3.000
4:153	Mean : 7.008	Mean : 4.229	Mean : 2.188	Mean : 4.123
3rd Qu.: 9.000	3rd Qu.: 7.000	3rd Qu.: 3.000	3rd Qu.: 7.000	
Max. :40.000	Max. :18.000	Max. :15.000	Max. :17.000	

```

> glimpse(attr)
Observations: 1,470
Variables: 31
 $ Age                <dbl> 41, 49, 37, 33, 27, 32, 59, 30, 38, 36, 35, 29, 31, 34, 28,
29, 32, 22, 53, 38, 24, 36, 3...
 $ Attrition          <fct> Yes, No, Yes, No, No, No, No, No, No, No, No, No, No, No, No, Y
es, No, No, No, No, No, No, Ye...
 $ BusinessTravel     <fct> Travel_Rarely, Travel_Frequently, Travel_Rarely, Travel_Fre
quently, Travel_Rarely, Travel...
 $ DailyRate          <dbl> 1102, 279, 1373, 1392, 591, 1005, 1324, 1358, 216, 1299, 80
9, 153, 670, 1346, 103, 1389, ...
 $ Department         <fct> Sales, Research & Development, Research & Development, Rese
arch & Development, Research &...
 $ DistanceFromHome   <dbl> 1, 8, 2, 3, 2, 2, 3, 24, 23, 27, 16, 15, 26, 19, 24, 21, 5,
16, 2, 2, 11, 9, 7, 15, 6, 5,...
 $ Education          <fct> 2, 1, 2, 4, 1, 2, 3, 1, 3, 3, 3, 2, 1, 2, 3, 4, 2, 2, 4, 3,
2, 4, 4, 2, 1, 3, 1, 4, 4, 4,...
 $ EducationField     <fct> Life Sciences, Life Sciences, Other, Life Sciences, Medical
, Life Sciences, Medical, Life...
 $ EnvironmentsSatisfaction <fct> 2, 3, 4, 4, 1, 4, 3, 4, 4, 3, 1, 4, 1, 2, 3, 2, 1, 4, 1, 4,
1, 3, 1, 3, 2, 3, 2, 3, 1, 2,...
 $ Gender             <fct> Female, Male, Male, Female, Male, Male, Female, Male, Male,
Male, Male, Female, Male, Mal...
 $ HourlyRate         <dbl> 94, 61, 92, 56, 40, 79, 81, 67, 44, 94, 84, 49, 31, 93, 50,
51, 80, 96, 78, 45, 96, 82, 5...
 $ JobInvolvement     <fct> 3, 2, 2, 3, 3, 3, 4, 3, 2, 3, 4, 2, 3, 3, 2, 4, 4, 4, 2, 3,
4, 2, 3, 3, 3, 3, 1, 3, 2, 3,...
 $ JobLevel           <fct> 2, 2, 1, 1, 1, 1, 1, 1, 3, 2, 1, 2, 1, 1, 1, 3, 1, 1, 4, 1,
2, 1, 3, 1, 1, 5, 1, 2, 3, 5,...

```



```

$ JobRole <fct> Sales Executive, Research Scientist, Laboratory Technician,
Research Scientist, Laborator...
$ JobSatisfaction <fct> 4, 2, 3, 3, 2, 4, 1, 3, 3, 3, 2, 3, 3, 4, 3, 1, 2, 4, 4, 4,
3, 1, 2, 4, 1, 3, 1, 2, 4, 1,...
$ MaritalStatus <fct> Single, Married, Single, Married, Married, Single, Married,
Divorced, Single, Married, Ma...
$ MonthlyIncome <dbl> 5993, 5130, 2090, 2909, 3468, 3068, 2670, 2693, 9526, 5237,
2426, 4193, 2911, 2661, 2028,...
$ MonthlyRate <dbl> 19479, 24907, 2396, 23159, 16632, 11864, 9964, 13335, 8787,
16577, 16479, 12682, 15170, 8...
$ NumCompaniesWorked <dbl> 8, 1, 6, 1, 9, 0, 4, 1, 0, 6, 0, 0, 1, 0, 5, 1, 0, 1, 2, 5,
0, 7, 0, 1, 2, 4, 1, 0, 3, 3,...
$ OverTime <fct> Yes, No, Yes, Yes, No, No, Yes, No, No, No, No, Yes, No, No
, Yes, No, Yes, Yes, No, Yes, ...
$ PercentSalaryHike <dbl> 11, 23, 15, 11, 12, 13, 20, 22, 21, 13, 13, 12, 17, 11, 14,
11, 12, 13, 16, 11, 18, 23, 1...
$ PerformanceRating <fct> 3, 4, 3, 3, 3, 3, 4, 4, 4, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
3, 4, 3, 3, 3, 3, 4, 3, 3, 3,...
$ RelationshipSatisfaction <fct> 1, 4, 2, 3, 4, 3, 1, 2, 2, 2, 3, 4, 4, 3, 2, 3, 4, 2, 3, 3,
4, 2, 3, 4, 3, 4, 2, 4, 4, 4,...
$ StockOptionLevel <fct> 0, 1, 0, 0, 1, 0, 3, 1, 0, 2, 1, 0, 1, 1, 0, 1, 2, 2, 0, 0,
1, 0, 0, 0, 0, 1, 0, 1, 1, 0,...
$ TotalWorkingYears <dbl> 8, 10, 7, 8, 6, 8, 12, 1, 10, 17, 6, 10, 5, 3, 6, 10, 7, 1,
31, 6, 5, 10, 13, 0, 8, 26, 1...
$ TrainingTimesLastYear <dbl> 0, 3, 3, 3, 3, 2, 3, 2, 2, 3, 5, 3, 1, 2, 4, 1, 5, 2, 3, 3,
5, 4, 4, 6, 2, 3, 5, 2, 4, 2,...
$ WorkLifeBalance <fct> 1, 3, 3, 3, 3, 2, 2, 3, 3, 2, 3, 3, 2, 3, 3, 3, 2, 2, 3, 3,
2, 3, 3, 3, 3, 2, 3, 3, 3, 2,...
$ YearsAtCompany <dbl> 6, 10, 0, 8, 2, 7, 1, 1, 9, 7, 5, 9, 5, 2, 4, 10, 6, 1, 25,
3, 4, 5, 12, 0, 4, 14, 10, 9,...
$ YearsInCurrentRole <dbl> 4, 7, 0, 7, 2, 7, 0, 0, 7, 7, 4, 5, 2, 2, 2, 9, 2, 0, 8, 2,
2, 3, 6, 0, 2, 13, 2, 7, 6, 2...
$ YearsSinceLastPromotion <dbl> 0, 1, 0, 3, 2, 3, 0, 0, 1, 7, 0, 0, 4, 1, 0, 8, 0, 0, 3, 1,
1, 0, 2, 0, 1, 4, 6, 4, 5, 2,...
$ YearsWithCurrManager <dbl> 5, 7, 0, 0, 2, 6, 0, 0, 8, 7, 3, 8, 3, 2, 3, 8, 5, 0, 7, 2,
3, 3, 11, 0, 3, 8, 7, 2, 17, ...

```

> ##Checking relationships between our dependent variable and each of our independent categorical variable.

```
> xtabs(~Attrition+BusinessTravel,data=attr)
```

```

BusinessTravel
Attrition Non-Travel Travel_Frequently Travel_Rarely
No          138          208          887
Yes          12           69          156

```

```
> xtabs(~Attrition+Department,data=attr)
```

```

Department
Attrition Human Resources Research & Development Sales
No          51          828          354
Yes          12          133           92

```

```
> xtabs(~Attrition+Education,data=attr)
```

```

Education
Attrition 1 2 3 4 5
No 139 238 473 340 43
Yes 31 44 99 58 5

```

```
> xtabs(~Attrition+EducationField,data=attr)
```

```

EducationField
Attrition Human Resources Life Sciences Marketing Medical Other Technical Degree
No          20          517          124          401          71          100
Yes          7           89           35           63          11           32

```

```
> xtabs(~Attrition+EnvironmentSatisfaction,data=attr)
```

```

EnvironmentSatisfaction
Attrition 1 2 3 4
No 212 244 391 386
Yes 72 43 62 60

```

```

> xtabs(~Attrition+Gender,data=attr)
Gender
Attrition Female Male
No      501  732
Yes      87  150
> xtabs(~Attrition+JobInvolvement,data=attr)
JobInvolvement
Attrition  1    2    3    4
No      55 304 743 131
Yes     28  71 125  13
> xtabs(~Attrition+JobLevel,data=attr)
JobLevel
Attrition  1    2    3    4    5
No     400 482 186 101  64
Yes    143  52  32   5   5
> xtabs(~Attrition+JobRole,data=attr)
JobRole
Attrition Healthcare Representative Human Resources Laboratory Technician Manager Manufactur
ing Director Research Director
No      135          78          122          40          197          97
Yes      10          2           9          12           62           5
JobRole
Attrition Research Scientist Sales Executive Sales Representative
No      245          269          50
Yes      47          57          33
> xtabs(~Attrition+JobSatisfaction,data=attr)
JobSatisfaction
Attrition  1    2    3    4
No     223 234 369 407
Yes     66  46  73  52
> xtabs(~Attrition+MaritalStatus,data=attr)
MaritalStatus
Attrition Divorced Married Single
No      294          589          350
Yes      33          84          120
> xtabs(~Attrition+OverTime,data=attr)
OverTime
Attrition No Yes
No     944 289
Yes    110 127
> xtabs(~Attrition+PerformanceRating,data=attr)
PerformanceRating
Attrition  3    4
No     1044 189
Yes     200  37
> xtabs(~Attrition+RelationshipSatisfaction,data=attr)
RelationshipSatisfaction
Attrition  1    2    3    4
No     219 258 388 368
Yes     57  45  71  64
> xtabs(~Attrition+StockOptionLevel,data=attr)
StockOptionLevel
Attrition  0    1    2    3
No     477 540 146  70
Yes    154  56  12  15
> xtabs(~Attrition+WorkLifeBalance,data=attr)
WorkLifeBalance
Attrition  1    2    3    4
No      55 286 766 126
Yes     25  58 127  27
> #By the above we can see that the independent variables Education and EducationFe
ild do not have much impact on the dependent variable-Attrition.

```

```
> #Hence, we will create 2 logistic models. One simple model, which will not include the independent variables Education and EducationFeild and
> #The other model, which will include all independent variables
> attach(attr)
> logistic_simple <- glm(Attrition~BusinessTravel+Department+
+                           Environmentsatisfaction+Gender+JobInvolvement+JobLevel+
+                           JobRole+JobSatisfaction+MaritalStatus+
+                           OverTime+PerformanceRating+RelationshipSatisfaction+
+                           StockOptionLevel+WorkLifeBalance, data=attr, family="binomial")
> summary(logistic_simple)
```

Call:

```
glm(formula = Attrition ~ BusinessTravel + Department + Environmentsatisfaction +
Gender + JobInvolvement + JobLevel + JobRole + JobSatisfaction +
MaritalStatus + OverTime + PerformanceRating + RelationshipSatisfaction +
StockOptionLevel + WorkLifeBalance, family = "binomial",
data = attr)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.1014	-0.4930	-0.2656	-0.1076	3.2836

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)	
(Intercept)	-10.6984	397.0064	-0.027	0.978502	
BusinessTravelTravel_Frequently	1.6497	0.3948	4.179	2.93e-05	***
BusinessTravelTravel_Rarely	0.7738	0.3678	2.104	0.035378	*
DepartmentResearch & Development	12.2972	397.0053	0.031	0.975290	
DepartmentSales	11.6580	397.0059	0.029	0.976574	
Environmentsatisfaction2	-0.9318	0.2685	-3.471	0.000519	***
Environmentsatisfaction3	-0.9684	0.2396	-4.041	5.32e-05	***
Environmentsatisfaction4	-1.1982	0.2459	-4.872	1.11e-06	***
GenderMale	0.3506	0.1807	1.940	0.052373	.
JobInvolvement2	-1.1582	0.3447	-3.360	0.000779	***
JobInvolvement3	-1.4869	0.3254	-4.569	4.89e-06	***
JobInvolvement4	-2.0729	0.4504	-4.602	4.18e-06	***
JobLevel2	-2.0201	0.4099	-4.928	8.29e-07	***
JobLevel3	-1.1303	0.4701	-2.404	0.016215	*
JobLevel4	-1.9089	0.7421	-2.572	0.010100	*
JobLevel5	-0.2788	1.0700	-0.261	0.794441	
JobRoleHuman Resources	12.8911	397.0058	0.032	0.974097	
JobRoleLaboratory Technician	0.3766	0.5603	0.672	0.501570	
JobRoleManager	-0.6163	1.0178	-0.605	0.544856	
JobRoleManufacturing Director	0.1570	0.5215	0.301	0.763427	
JobRoleResearch Director	-2.1764	1.0339	-2.105	0.035294	*
JobRoleResearch Scientist	-0.5025	0.5743	-0.875	0.381580	
JobRoleSales Executive	1.9903	1.2204	1.631	0.102902	
JobRoleSales Representative	1.6867	1.2980	1.300	0.193768	
JobSatisfaction2	-0.4570	0.2652	-1.723	0.084826	.
JobSatisfaction3	-0.5219	0.2331	-2.239	0.025149	*
JobSatisfaction4	-1.2128	0.2512	-4.829	1.38e-06	***
MaritalStatusMarried	0.2391	0.2672	0.895	0.371029	
MaritalStatusSingle	0.5110	0.3754	1.361	0.173488	
OverTimeYes	1.9291	0.1891	10.202	< 2e-16	***
PerformanceRating4	-0.1585	0.2505	-0.633	0.526765	
RelationshipSatisfaction2	-0.6384	0.2740	-2.330	0.019815	*
RelationshipSatisfaction3	-0.7283	0.2437	-2.989	0.002799	**
RelationshipSatisfaction4	-0.7281	0.2453	-2.968	0.002999	**
StockOptionLevel1	-1.0244	0.2957	-3.464	0.000532	***
StockOptionLevel2	-0.9339	0.4241	-2.202	0.027679	*
StockOptionLevel3	-0.3573	0.4320	-0.827	0.408240	
workLifeBalance2	-1.0319	0.3558	-2.900	0.003731	**
workLifeBalance3	-1.3843	0.3315	-4.176	2.97e-05	***
workLifeBalance4	-0.9251	0.4052	-2.283	0.022422	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 1298.6 on 1469 degrees of freedom
Residual deviance: 890.3 on 1430 degrees of freedom
AIC: 970.3

Number of Fisher Scoring iterations: 14

```
>  
> logistic <- glm(Attrition~BusinessTravel+Department+Education+EducationField+  
+ EnvironmentSatisfaction+Gender+JobInvolvement+JobLevel+  
+ JobRole+JobSatisfaction+MaritalStatus+  
+ OverTime+PerformanceRating+RelationshipSatisfaction+  
+ StockOptionLevel+WorkLifeBalance, data=attr, family="binomial")  
> summary(logistic)
```

Call:

```
glm(formula = Attrition ~ BusinessTravel + Department + Education +  
EducationField + EnvironmentSatisfaction + Gender + JobInvolvement +  
JobLevel + JobRole + JobSatisfaction + MaritalStatus + OverTime +  
PerformanceRating + RelationshipSatisfaction + StockOptionLevel +  
WorkLifeBalance, family = "binomial", data = attr)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.0543	-0.4857	-0.2643	-0.1006	3.3248

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)	
(Intercept)	-10.18051	396.43314	-0.026	0.979512	
BusinessTravelTravel_Frequently	1.68023	0.40059	4.194	2.74e-05	***
BusinessTravelTravel_Rarely	0.79631	0.37253	2.138	0.032553	*
DepartmentResearch & Development	13.01387	396.43231	0.033	0.973812	
DepartmentSales	12.09486	396.43291	0.031	0.975661	
Education2	0.23495	0.32119	0.731	0.464480	
Education3	0.24902	0.28611	0.870	0.384107	
Education4	0.17917	0.30845	0.581	0.561317	
Education5	0.02805	0.60790	0.046	0.963197	
EducationFieldLife Sciences	-1.38073	0.81317	-1.698	0.089515	.
EducationFieldMarketing	-0.93860	0.85554	-1.097	0.272601	.
EducationFieldMedical	-1.42088	0.81631	-1.741	0.081749	.
EducationFieldOther	-1.44764	0.88090	-1.643	0.100306	.
EducationFieldTechnical Degree	-0.48734	0.82724	-0.589	0.555781	.
EnvironmentSatisfaction2	-0.89578	0.27248	-3.287	0.001011	**
EnvironmentSatisfaction3	-1.02358	0.24634	-4.155	3.25e-05	***
EnvironmentSatisfaction4	-1.20090	0.25132	-4.778	1.77e-06	***
GenderMale	0.35123	0.18329	1.916	0.055333	.
JobInvolvement2	-1.18453	0.34828	-3.401	0.000671	***
JobInvolvement3	-1.52167	0.32887	-4.627	3.71e-06	***
JobInvolvement4	-2.12428	0.45688	-4.650	3.33e-06	***
JobLevel2	-2.10261	0.42564	-4.940	7.82e-07	***
JobLevel3	-1.24154	0.48889	-2.540	0.011101	*
JobLevel4	-2.03631	0.74788	-2.723	0.006474	**
JobLevel5	-0.37731	1.07673	-0.350	0.726025	.
JobRoleHuman Resources	12.92989	396.43242	0.033	0.973981	
JobRoleLaboratory Technician	0.34152	0.57103	0.598	0.549785	
JobRoleManager	-0.53701	1.01974	-0.527	0.598461	
JobRoleManufacturing Director	0.16390	0.52217	0.314	0.753604	
JobRoleResearch Director	-2.10097	1.03707	-2.026	0.042779	*
JobRoleResearch Scientist	-0.61304	0.58677	-1.045	0.296133	.
JobRoleSales Executive	2.13192	1.22890	1.735	0.082772	.

JobRoleSales Representative	1.71998	1.31031	1.313	0.189302	
JobSatisfaction2	-0.49575	0.26833	-1.848	0.064666	.
JobSatisfaction3	-0.51239	0.23642	-2.167	0.030211	*
JobSatisfaction4	-1.18826	0.25387	-4.681	2.86e-06	***
MaritalStatusMarried	0.24536	0.27093	0.906	0.365129	
MaritalStatusSingle	0.49710	0.38298	1.298	0.194299	
OverTimeYes	1.95894	0.19152	10.228	< 2e-16	***
PerformanceRating4	-0.15678	0.25507	-0.615	0.538778	
RelationshipSatisfaction2	-0.67013	0.27822	-2.409	0.016010	*
RelationshipSatisfaction3	-0.77295	0.24948	-3.098	0.001947	**
RelationshipSatisfaction4	-0.75381	0.24903	-3.027	0.002470	**
StockOptionLevel1	-1.09215	0.30122	-3.626	0.000288	***
StockOptionLevel2	-0.97594	0.43405	-2.248	0.024546	*
StockOptionLevel3	-0.36374	0.43968	-0.827	0.408075	
workLifeBalance2	-0.98196	0.36058	-2.723	0.006464	**
workLifeBalance3	-1.38617	0.33593	-4.126	3.69e-05	***
workLifeBalance4	-0.88866	0.41005	-2.167	0.030217	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

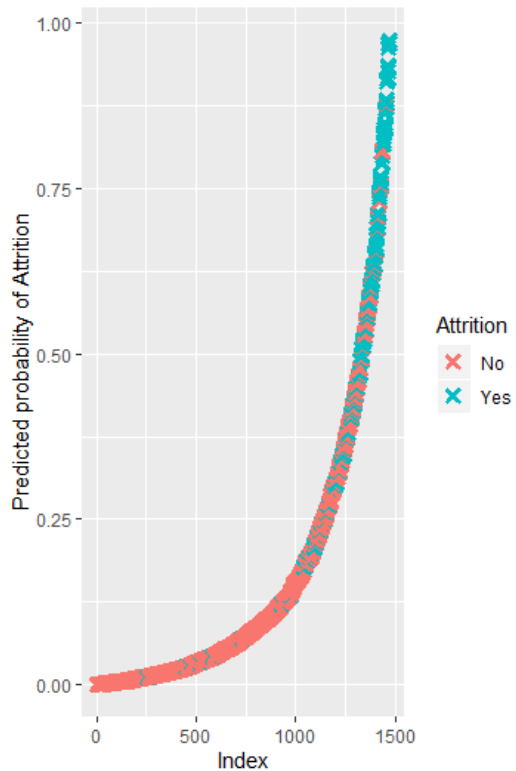
Null deviance: 1298.58 on 1469 degrees of freedom
 Residual deviance: 876.06 on 1421 degrees of freedom
 AIC: 974.06

Number of Fisher Scoring iterations: 14

```

> ll.null <- logistic$null.deviance/-2
> ll.proposed <- logistic$deviance/-2
> ## McFadden's Pseudo R^2 = [ LL(Null) - LL(Proposed) ] / LL(Null)
> (ll.null - ll.proposed) / ll.null
[1] 0.3253749
>
> ## The p-value for the R^2
> 1 - pchisq(2*(ll.proposed - ll.null), df=(length(logistic$coefficients)-1))
[1] 0
>
> ## Now we can plot the data
> predicted.data <- data.frame(probability.of.Attrition=logistic$fitted.values,
  Attrition=attr$Attrition)
> predicted.data <- predicted.data[order(predicted.data$probability.of.Attrition,
  decreasing=FALSE),]
> predicted.data$rank <- 1:nrow(predicted.data)
> ## Lastly, we can plot the predicted probabilities for each sample having
> ## Attrition and color by whether or not they would actually leave the company
> ggplot(data=predicted.data, aes(x=rank, y=probability.of.Attrition)) +
+   geom_point(aes(color=Attrition), alpha=1, shape=4, stroke=2) +
+   xlab("Index") +
+   ylab("Predicted probability of Attrition")

```



```
> library(caret)
> #confusion_matrix(logistic)
> pdata <- predict(logistic,newdata=attr,type="response")
> pdata
```

1	2	3	4	5	6
7	8	9	10		
6.093371e-01	6.187840e-03	6.483152e-01	3.797128e-01	1.088395e-01	2.482315e-01
5.874153e-01	2.663594e-02	1.236479e-01	8.715651e-03		
11	12	13	14	15	16
17	18	19	20		
7.760259e-02	1.348244e-01	5.341145e-02	2.364924e-02	7.047355e-01	7.240100e-03
2.403588e-01	5.507793e-02	4.722175e-03	2.013710e-01		
21	22	23	24	25	26
27	28	29	30		
3.071161e-03	4.148912e-01	1.001272e-02	4.092206e-02	1.059791e-01	1.250769e-02
8.661113e-01	2.422153e-02	1.458380e-02	6.791285e-02		
31	32	33	34	35	36
37	38	39	40		
9.745486e-02	6.070071e-02	3.428977e-01	1.837377e-02	2.176326e-01	8.848827e-03
9.188245e-01	2.123906e-01	3.109753e-01	5.883338e-02		
41	42	43	44	45	46
47	48	49	50		
2.033138e-02	3.973168e-02	8.054200e-01	2.362506e-01	1.858577e-02	1.962023e-02
3.867311e-02	1.203943e-01	6.560891e-01	3.028478e-02		
51	52	53	54	55	56
57	58	59	60		
6.351179e-01	8.399355e-01	1.634296e-01	7.600045e-02	1.203903e-01	8.411529e-02
1.579885e-01	2.967677e-01	2.794591e-03	2.633814e-02		
61	62	63	64	65	66
67	68	69	70		
5.018607e-02	1.546064e-02	2.941980e-02	4.277578e-01	3.462714e-02	1.956250e-02
7.990286e-02	9.247568e-03	1.278524e-01	3.608604e-01		
71	72	73	74	75	76
77	78	79	80		

3.334955e-01	1.892078e-02	7.769743e-02	3.809154e-03	3.993414e-02	6.408119e-03
1.922365e-01	6.255293e-02	4.613513e-02	2.332118e-02		
81	82	83	84	85	86
87	88	89	90		
3.692815e-02	2.165692e-01	5.263990e-02	2.453131e-02	4.415401e-02	2.492779e-01
1.821296e-01	2.334785e-02	1.545366e-02	9.339057e-02		
91	92	93	94	95	96
97	98	99	100		
2.153632e-02	5.358663e-01	2.302821e-01	4.014432e-01	1.224521e-01	5.206159e-02
7.639936e-02	4.228020e-02	7.063548e-02	5.652662e-03		
101	102	103	104	105	106
107	108	109	110		
7.672815e-01	8.484155e-02	6.340088e-01	1.711529e-02	2.035865e-03	2.625059e-08
5.271089e-01	4.992952e-01	1.081001e-02	7.810344e-02		
111	112	113	114	115	116
117	118	119	120		
3.615165e-01	8.346467e-01	5.470463e-08	4.769548e-02	1.940892e-03	1.416063e-01
4.024296e-02	8.478464e-02	7.449432e-02	1.943800e-02		
121	122	123	124	125	126
127	128	129	130		
5.823107e-01	3.972605e-02	3.444041e-01	3.471833e-02	7.376315e-01	8.352423e-02
4.739950e-03	7.906060e-01	5.193972e-02	2.645392e-02		
131	132	133	134	135	136
137	138	139	140		
7.968522e-02	1.706529e-01	3.000906e-01	1.444982e-01	1.735742e-02	4.822425e-03
4.389289e-01	2.047615e-02	1.635516e-01	4.403645e-01		
141	142	143	144	145	146
147	148	149	150		
6.746541e-01	6.341734e-02	7.328639e-02	1.967176e-01	1.671196e-01	4.006399e-02
1.181656e-01	1.852611e-02	7.123096e-02	1.185980e-01		
151	152	153	154	155	156
157	158	159	160		
8.447234e-03	1.075482e-01	3.202394e-01	2.435904e-02	1.895084e-01	8.929993e-03
2.398676e-02	1.934071e-01	1.158546e-01	1.840311e-01		
161	162	163	164	165	166
167	168	169	170		
1.695553e-02	2.497491e-02	4.080664e-02	7.270330e-02	1.006709e-01	4.668361e-02
9.311185e-02	1.563812e-02	1.038027e-01	1.102391e-01		
171	172	173	174	175	176
177	178	179	180		
3.693339e-01	9.628630e-01	3.880026e-01	4.369772e-03	2.742973e-01	1.242646e-01
1.313682e-01	1.835546e-01	9.977686e-02	7.108679e-02		
181	182	183	184	185	186
187	188	189	190		
3.417430e-02	4.606665e-02	7.985528e-01	1.040975e-01	2.585598e-03	1.261317e-02
7.817208e-03	6.524961e-03	5.406576e-02	1.144333e-02		
191	192	193	194	195	196
197	198	199	200		
4.358700e-02	6.835600e-02	2.935610e-01	5.940755e-03	2.258022e-03	3.421545e-01
4.854808e-02	1.505128e-03	1.469774e-02	4.955983e-02		
201	202	203	204	205	206
207	208	209	210		
5.867678e-02	1.379354e-02	2.688299e-01	3.735949e-02	1.403918e-01	6.266820e-02
1.544731e-01	2.572052e-01	4.299318e-03	1.124864e-02		
211	212	213	214	215	216
217	218	219	220		
2.335904e-01	2.160308e-02	8.427420e-02	9.721687e-03	5.872636e-01	2.159418e-02
3.540111e-01	2.374404e-01	2.702205e-02	2.511275e-02		
221	222	223	224	225	226
227	228	229	230		
3.592762e-02	4.832176e-02	2.091947e-02	1.251718e-01	1.078704e-02	3.250945e-02
2.582989e-01	2.851493e-02	5.856905e-01	3.211999e-01		
231	232	233	234	235	236
237	238	239	240		

1.529198e-01	5.657592e-02	1.532599e-01	2.018764e-03	4.393627e-01	3.446955e-03
6.233191e-01	3.243966e-01	1.203526e-01	8.802838e-01		
241	242	243	244	245	246
247	248	249	250		
5.462882e-02	3.426231e-02	1.232563e-02	1.697028e-02	4.176654e-03	5.896062e-03
1.502362e-02	1.156790e-02	9.919790e-02	1.986235e-02		
251	252	253	254	255	256
257	258	259	260		
7.936695e-02	1.308550e-01	8.421420e-02	3.696887e-02	8.531617e-03	1.280089e-02
2.935018e-01	7.037103e-03	5.195233e-02	5.633690e-01		
261	262	263	264	265	266
267	268	269	270		
4.686576e-01	4.445783e-03	9.146785e-02	1.033777e-01	6.923143e-01	7.257281e-02
3.604287e-03	2.025777e-03	5.589040e-02	2.352195e-02		
271	272	273	274	275	276
277	278	279	280		
3.703013e-01	8.042737e-02	1.149627e-02	1.352495e-02	2.483443e-01	7.660688e-03
3.908665e-03	1.171864e-01	5.484955e-02	2.076671e-02		
281	282	283	284	285	286
287	288	289	290		
1.273064e-02	3.591959e-02	2.207652e-01	6.500260e-02	2.704475e-01	2.698536e-02
6.890924e-01	1.687962e-03	4.477169e-01	2.104882e-02		
291	292	293	294	295	296
297	298	299	300		
1.985435e-01	2.516181e-02	1.914843e-01	3.010754e-01	3.917106e-01	7.380588e-02
1.781492e-01	9.416571e-02	3.909491e-02	1.698237e-02		
301	302	303	304	305	306
307	308	309	310		
4.108846e-03	3.709566e-01	1.816868e-02	2.074855e-02	1.607437e-02	2.356106e-03
2.819478e-02	3.892454e-03	4.285833e-02	1.517706e-01		
311	312	313	314	315	316
317	318	319	320		
2.619580e-01	2.374176e-01	2.025318e-01	1.129856e-02	7.626405e-02	2.750768e-01
2.566459e-01	3.177091e-02	4.128671e-01	4.620829e-01		
321	322	323	324	325	326
327	328	329	330		
4.487842e-01	1.775936e-02	7.405997e-03	8.032015e-01	8.638037e-04	5.624920e-02
5.392342e-02	3.873244e-01	2.242911e-01	2.502151e-03		
331	332	333	334	335	336
337	338	339	340		
2.144681e-02	6.223782e-02	2.028795e-02	4.238790e-02	2.397827e-03	4.378486e-01
9.325606e-01	1.163187e-01	3.323704e-02	4.048040e-02		
341	342	343	344	345	346
347	348	349	350		
3.062617e-03	6.100414e-03	1.516058e-01	1.849769e-01	1.101911e-01	1.123725e-02
1.551465e-01	1.575463e-01	2.173127e-03	1.983036e-02		
351	352	353	354	355	356
357	358	359	360		
2.808224e-01	3.741396e-02	1.482452e-02	3.054197e-02	1.202218e-01	1.796455e-02
2.991694e-02	9.690476e-01	7.252007e-03	2.667316e-01		
361	362	363	364	365	366
367	368	369	370		
1.085590e-02	1.076574e-01	2.100061e-01	7.121479e-01	5.701177e-02	7.994748e-03
4.027821e-01	6.206253e-02	3.797142e-01	4.448511e-01		
371	372	373	374	375	376
377	378	379	380		
1.205161e-01	3.497400e-02	2.438390e-02	3.804172e-02	3.360378e-02	5.361756e-02
8.654292e-03	1.402040e-02	2.883786e-01	2.897446e-02		
381	382	383	384	385	386
387	388	389	390		
1.160786e-01	2.730056e-01	3.544350e-01	4.072172e-02	6.829033e-02	6.035075e-01
6.121798e-02	1.316346e-02	5.752626e-02	1.854141e-01		
391	392	393	394	395	396
397	398	399	400		

1.986023e-03	6.992789e-03	2.173887e-02	1.620081e-02	3.139079e-02	9.397105e-02
4.833375e-02	2.184640e-01	1.258276e-02	9.843827e-02		
401	402	403	404	405	406
407	408	409	410		
1.607875e-01	7.991461e-02	1.205338e-01	5.934114e-02	8.632923e-03	2.014887e-01
2.457810e-01	4.265684e-02	1.089277e-02	1.066213e-02		
411	412	413	414	415	416
417	418	419	420		
3.013756e-02	3.902007e-01	4.561214e-03	3.798886e-02	9.109767e-01	5.174180e-01
2.584563e-01	1.264888e-02	6.736678e-02	4.932041e-02		
421	422	423	424	425	426
427	428	429	430		
6.001162e-03	1.884732e-01	5.267792e-01	5.104069e-02	4.403887e-03	5.017639e-03
4.795739e-02	5.473955e-01	8.768722e-03	2.084202e-02		
431	432	433	434	435	436
437	438	439	440		
4.539829e-01	1.707989e-02	1.829285e-02	1.777179e-01	1.201067e-02	1.698701e-01
4.908433e-01	4.343512e-01	1.704953e-01	3.355283e-01		
441	442	443	444	445	446
447	448	449	450		
6.119995e-01	1.275326e-01	5.068412e-02	5.833365e-01	1.782363e-02	6.480807e-03
1.207359e-02	8.002802e-02	1.859131e-02	1.398898e-01		
451	452	453	454	455	456
457	458	459	460		
2.495898e-01	1.453465e-01	2.340044e-02	3.805817e-01	9.549286e-03	4.143546e-04
1.929471e-03	9.152178e-01	8.968318e-02	2.378017e-01		
461	462	463	464	465	466
467	468	469	470		
7.649887e-02	1.082421e-01	1.383443e-02	9.748681e-01	8.036644e-02	1.579850e-01
1.448368e-03	3.437984e-02	5.824917e-02	8.962059e-03		
471	472	473	474	475	476
477	478	479	480		
9.057861e-02	3.307179e-03	7.227043e-03	2.005379e-02	5.518702e-02	1.034277e-01
5.141653e-02	2.362096e-07	1.850347e-01	6.596031e-01		
481	482	483	484	485	486
487	488	489	490		
4.689215e-01	1.116181e-01	2.073617e-01	4.704094e-02	1.422761e-02	6.581342e-02
1.860188e-01	1.051154e-01	2.035685e-03	3.752634e-03		
491	492	493	494	495	496
497	498	499	500		
1.045170e-01	6.217764e-02	3.300836e-02	7.466844e-02	4.944259e-01	1.358220e-01
3.952915e-01	1.313325e-01	1.054131e-01	5.386831e-02		
501	502	503	504	505	506
507	508	509	510		
2.605675e-02	2.327118e-02	6.264157e-02	1.517102e-02	1.224017e-01	1.255392e-01
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517	518	519	520		
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521	522	523	524	525	526
527	528	529	530		
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7.122633e-02	6.020683e-02	6.268868e-01	5.819996e-03		
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537	538	539	540		
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3.030591e-01	4.885570e-02	1.856917e-07	1.013196e-01		
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547	548	549	550		
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557	558	559	560		

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567	568	569	570		
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577	578	579	580		
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597	598	599	600		
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607	608	609	610		
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617	618	619	620		
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627	628	629	630		
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647	648	649	650		
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697	698	699	700		
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707	708	709	710		
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727	728	729	730		
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747	748	749	750		
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> attr$Attrition
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[ reached getOption("max.print") -- omitted 470 entries ]
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```
Levels: No Yes
```

```
> pdataF <- as.factor(ifelse(test=as.numeric(pdata>0.5) == 0, yes="Employee will Leave", no="Employee will not Leave"))
```

```
> roc(attr$Attrition, logistic$fitted.values, plot=TRUE)
```

```
Setting levels: control = No, case = Yes
```

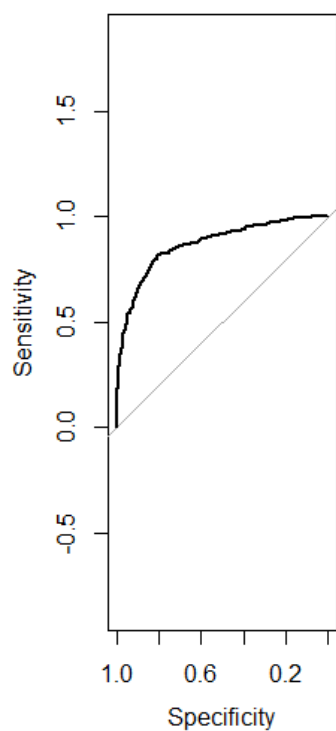
```
Setting direction: controls < cases
```

```
Call:
```

```
roc.default(response = attr$Attrition, predictor = logistic$fitted.values, plot = TRUE)
```

```
Data: logistic$fitted.values in 1233 controls (attr$Attrition No) < 237 cases (attr$Attrition Yes).
```

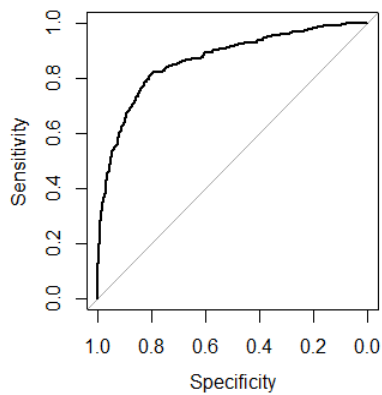
```
Area under the curve: 0.867
```



```
> par(pty='s')
> roc(attr$Attrition,logistic$fitted.values,plot=TRUE)
Setting levels: control = No, case = Yes
Setting direction: controls < cases
```

```
Call:
roc.default(response = attr$Attrition, predictor = logistic$fitted.values,
plot = TRUE)
```

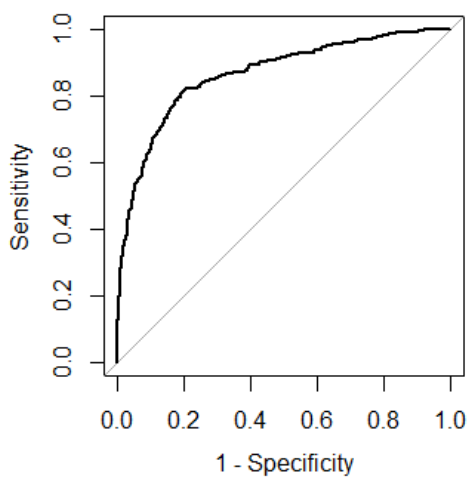
```
Data: logistic$fitted.values in 1233 controls (attr$Attrition No) < 237 cases
(attr$Attrition Yes).
Area under the curve: 0.867
```



```
> roc(attr$Attrition,logistic$fitted.values,plot=TRUE, legacy.axes=TRUE)
Setting levels: control = No, case = Yes
Setting direction: controls < cases
```

```
Call:
roc.default(response = attr$Attrition, predictor = logistic$fitted.values,
plot = TRUE, legacy.axes = TRUE)
```

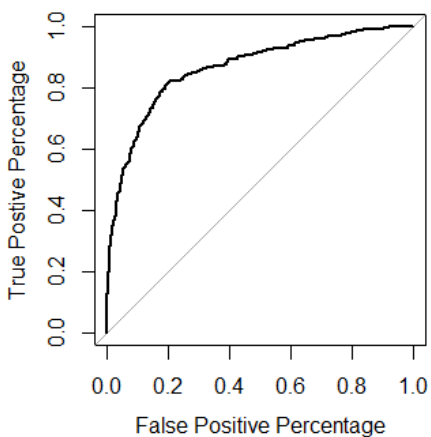
```
Data: logistic$fitted.values in 1233 controls (attr$Attrition No) < 237 cases
(attr$Attrition Yes).
Area under the curve: 0.867
```



```
> roc(attr$Attrition,logistic$fitted.values,plot=TRUE, legacy.axes=TRUE, xlab
="False Positive Percentage", ylab="True Postive Percentage")
Setting levels: control = No, case = Yes
Setting direction: controls < cases
```

```
Call:
roc.default(response = attr$Attrition, predictor = logistic$fitted.values,
plot = TRUE, legacy.axes = TRUE, xlab = "False Positive Percentage", ylab
= "True Postive Percentage")
```

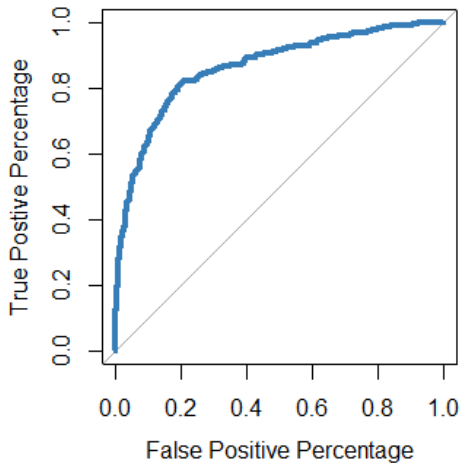
Data: logistic\$fitted.values in 1233 controls (attr\$Attrition No) < 237 cases (attr\$Attrition Yes).
Area under the curve: 0.867



```
> roc(attr$Attrition,logistic$fitted.values,plot=TRUE, legacy.axes=TRUE, xlab
="False Positive Percentage", ylab="True Postive Percentage", col="#377eb8",
lwd=4)
Setting levels: control = No, case = Yes
Setting direction: controls < cases
```

```
Call:
roc.default(response = attr$Attrition, predictor = logistic$fitted.values,
plot = TRUE, legacy.axes = TRUE, xlab = "False Positive Percentage", ylab
= "True Postive Percentage", col = "#377eb8", lwd = 4)
```

Data: logistic\$fitted.values in 1233 controls (attr\$Attrition No) < 237 cases (attr\$Attrition Yes).
Area under the curve: 0.867



```
> ## If we want to find out the optimal threshold we can store the
> ## data used to make the ROC graph in a variable...
> roc.info <- roc(attr$Attrition, logistic$fitted.values, legacy.axes=TRUE)
Setting levels: control = No, case = Yes
Setting direction: controls < cases
> str(roc.info)
List of 15
 $ percent          : logi FALSE
 $ sensitivities     : num [1:1469] 1 1 1 1 1 1 1 1 1 1 ...
 $ specificities     : num [1:1469] 0 0.000811 0.001622 0.002433 0.003244 ...
 $ thresholds       : num [1:1469] -Inf 2.30e-08 2.91e-08 3.73e-08 4.87e-08 .
 ..
 $ direction        : chr "<"
 $ cases            : Named num [1:237] 0.609 0.648 0.705 0.415 0.106 ...
 ..- attr(*, "names")= chr [1:237] "1" "3" "15" "22" ...
 $ controls         : Named num [1:1233] 0.00619 0.37971 0.10884 0.24823 0.58
 742 ...
 ..- attr(*, "names")= chr [1:1233] "2" "4" "5" "6" ...
 $ fun.sesp         :function (thresholds, controls, cases, direction)
 $ auc              : 'auc' num 0.867
 ..- attr(*, "partial.auc")= logi FALSE
 ..- attr(*, "percent")= logi FALSE
 ..- attr(*, "roc")=List of 15
 .. ..$ percent          : logi FALSE
 .. ..$ sensitivities     : num [1:1469] 1 1 1 1 1 1 1 1 1 1 ...
 .. ..$ specificities     : num [1:1469] 0 0.000811 0.001622 0.002433 0.003244
 .. ..
 .. ..$ thresholds       : num [1:1469] -Inf 2.30e-08 2.91e-08 3.73e-08 4.87e
 -08 ...
 .. ..$ direction        : chr "<"
 .. ..$ cases            : Named num [1:237] 0.609 0.648 0.705 0.415 0.106 ..
 ..
 .. ..- attr(*, "names")= chr [1:237] "1" "3" "15" "22" ...
 .. ..$ controls         : Named num [1:1233] 0.00619 0.37971 0.10884 0.24823
 0.58742 ...
```

```

.. ..- attr(*, "names")= chr [1:1233] "2" "4" "5" "6" ...
.. ..$ fun.sesp      :function (thresholds, controls, cases, direction)
.. ..$ auc           : 'auc' num 0.867
.. ..- attr(*, "partial.auc")= logi FALSE
.. ..- attr(*, "percent")= logi FALSE
.. ..- attr(*, "roc")=List of 8
.. .. ..$ percent      : logi FALSE
.. .. ..$ sensitivities: num [1:1469] 1 1 1 1 1 1 1 1 1 1 ...
.. .. ..$ specificities: num [1:1469] 0 0.000811 0.001622 0.002433 0.00324
4 ...
.. .. ..$ thresholds   : num [1:1469] -Inf 2.30e-08 2.91e-08 3.73e-08 4.87
e-08 ...
.. .. ..$ direction     : chr "<"
.. .. ..$ cases         : Named num [1:237] 0.609 0.648 0.705 0.415 0.106 .
..
.. .. ..- attr(*, "names")= chr [1:237] "1" "3" "15" "22" ...
.. .. ..$ controls      : Named num [1:1233] 0.00619 0.37971 0.10884 0.2482
3 0.58742 ...
.. .. ..- attr(*, "names")= chr [1:1233] "2" "4" "5" "6" ...
.. .. ..$ fun.sesp      :function (thresholds, controls, cases, direction)
.. .. ..- attr(*, "class")= chr "roc"
.. .. ..$ call          : language roc.default(response = attr$Attrition, pr
edictor = logistic$fitted.values, legacy.axes = TRUE)
.. .. ..$ original.predictor: Named num [1:1470] 0.60934 0.00619 0.64832 0.37971
0.10884 ...
.. .. ..- attr(*, "names")= chr [1:1470] "1" "2" "3" "4" ...
.. .. ..$ original.response : Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 1 1 1 1
...
.. .. ..$ predictor      : Named num [1:1470] 0.60934 0.00619 0.64832 0.37971
0.10884 ...
.. .. ..- attr(*, "names")= chr [1:1470] "1" "2" "3" "4" ...
.. .. ..$ response       : Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 1 1 1 1
...
.. .. ..$ levels         : chr [1:2] "No" "Yes"
.. .. ..- attr(*, "class")= chr "roc"
$ call              : language roc.default(response = attr$Attrition, predict
or = logistic$fitted.values, legacy.axes = TRUE)
$ original.predictor: Named num [1:1470] 0.60934 0.00619 0.64832 0.37971 0.10
884 ...
.. ..- attr(*, "names")= chr [1:1470] "1" "2" "3" "4" ...
$ original.response : Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 1 1 1 1 ...
$ predictor         : Named num [1:1470] 0.60934 0.00619 0.64832 0.37971 0.10
884 ...
.. ..- attr(*, "names")= chr [1:1470] "1" "2" "3" "4" ...
$ response          : Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 1 1 1 1 ...
$ levels            : chr [1:2] "No" "Yes"
- attr(*, "class")= chr "roc"
> roc.df <- data.frame(tpp=roc.info$sensitivities*100, ## tpp = true positive
percentage
+                               fpp=(1 - roc.info$specificities)*100, ## fpp = false p
ositive precentage
+                               thresholds=roc.info$thresholds)
> roc.df
  tpp    fpp  thresholds
1 100.00000 100.00000      -Inf
2 100.00000 99.91890 2.299219e-08
3 100.00000 99.83779 2.909140e-08
4 100.00000 99.75669 3.732817e-08
5 100.00000 99.67559 4.871439e-08
6 100.00000 99.59448 6.635647e-08
7 100.00000 99.51338 1.318500e-07
8 100.00000 99.43228 2.109507e-07
9 100.00000 99.35118 2.364839e-07
10 100.00000 99.27007 2.635048e-07

```

11	100.00000	99.18897	7.144099e-07
12	100.00000	99.10787	1.302563e-04
13	100.00000	99.02676	2.636112e-04
14	100.00000	98.94566	3.304767e-04
15	100.00000	98.86456	4.037298e-04
16	100.00000	98.78345	4.309555e-04
17	100.00000	98.70235	5.280483e-04
18	100.00000	98.62125	6.118780e-04
19	100.00000	98.54015	6.199957e-04
20	100.00000	98.45904	6.416514e-04
21	100.00000	98.37794	6.729294e-04
22	100.00000	98.29684	7.546975e-04
23	100.00000	98.21573	8.429336e-04
24	100.00000	98.13463	9.442720e-04
25	100.00000	98.05353	1.035191e-03
26	100.00000	97.97242	1.063223e-03
27	100.00000	97.89132	1.098326e-03
28	100.00000	97.81022	1.133502e-03
29	100.00000	97.72912	1.167740e-03
30	100.00000	97.64801	1.214727e-03
31	100.00000	97.56691	1.315267e-03
32	100.00000	97.48581	1.392421e-03
33	100.00000	97.40470	1.423903e-03
34	100.00000	97.32360	1.449826e-03
35	100.00000	97.24250	1.458005e-03
36	100.00000	97.16139	1.468810e-03
37	100.00000	97.08029	1.475726e-03
38	100.00000	96.99919	1.483335e-03
39	100.00000	96.91809	1.496620e-03
40	100.00000	96.83698	1.558289e-03
41	100.00000	96.75588	1.624923e-03
42	100.00000	96.67478	1.663180e-03
43	100.00000	96.59367	1.724831e-03
44	100.00000	96.51257	1.766663e-03
45	100.00000	96.43147	1.786619e-03
46	100.00000	96.35036	1.813480e-03
47	100.00000	96.26926	1.837536e-03
48	100.00000	96.18816	1.859354e-03
49	100.00000	96.10706	1.899226e-03
50	100.00000	96.02595	1.935181e-03
51	100.00000	95.94485	1.948333e-03
52	100.00000	95.86375	1.970899e-03
53	100.00000	95.78264	2.002394e-03
54	100.00000	95.70154	2.018952e-03
55	100.00000	95.62044	2.022458e-03
56	100.00000	95.53933	2.030731e-03
57	100.00000	95.45823	2.035775e-03
58	100.00000	95.37713	2.040433e-03
59	100.00000	95.29603	2.084830e-03
60	100.00000	95.21492	2.129029e-03
61	100.00000	95.13382	2.153262e-03
62	100.00000	95.05272	2.215574e-03
63	100.00000	94.97161	2.278770e-03
64	100.00000	94.89051	2.327812e-03
65	100.00000	94.80941	2.364950e-03
66	100.00000	94.72830	2.385811e-03
67	100.00000	94.64720	2.431415e-03
68	100.00000	94.56610	2.471167e-03
69	100.00000	94.48500	2.489741e-03
70	100.00000	94.40389	2.520105e-03
71	100.00000	94.32279	2.561828e-03
72	100.00000	94.24169	2.632383e-03
73	100.00000	94.16058	2.736880e-03
74	100.00000	94.07948	2.824864e-03

75	100.00000	93.99838	2.958877e-03
76	100.00000	93.91727	3.066889e-03
77	100.00000	93.83617	3.075079e-03
78	100.00000	93.75507	3.193088e-03
79	100.00000	93.67397	3.318304e-03
80	100.00000	93.59286	3.333109e-03
81	100.00000	93.51176	3.391872e-03
82	100.00000	93.43066	3.458713e-03
83	100.00000	93.34955	3.472295e-03
84	100.00000	93.26845	3.524882e-03
85	100.00000	93.18735	3.579613e-03
86	100.00000	93.10624	3.592470e-03
87	100.00000	93.02514	3.602823e-03
88	100.00000	92.94404	3.623337e-03
89	100.00000	92.86294	3.697510e-03
90	100.00000	92.78183	3.761461e-03
91	100.00000	92.70073	3.776597e-03
92	100.00000	92.61963	3.796031e-03
93	100.00000	92.53852	3.817561e-03
94	100.00000	92.45742	3.834634e-03
95	100.00000	92.37632	3.861826e-03
96	100.00000	92.29521	3.886404e-03
97	100.00000	92.21411	3.897444e-03
98	100.00000	92.13301	3.905550e-03
99	100.00000	92.05191	3.909613e-03
100	100.00000	91.97080	3.943777e-03
101	99.57806	91.97080	3.996750e-03
102	99.57806	91.88970	4.062677e-03
103	99.57806	91.80860	4.114593e-03
104	99.57806	91.72749	4.127280e-03
105	99.57806	91.64639	4.155437e-03
106	99.57806	91.56529	4.183343e-03
107	99.57806	91.48418	4.195738e-03
108	99.57806	91.40308	4.223695e-03
109	99.57806	91.32198	4.250332e-03
110	99.57806	91.24088	4.277019e-03
111	99.57806	91.15977	4.334545e-03
112	99.57806	91.07867	4.372897e-03
113	99.57806	90.99757	4.382588e-03
114	99.57806	90.91646	4.396521e-03
115	99.57806	90.83536	4.424835e-03
116	99.57806	90.75426	4.452974e-03
117	99.57806	90.67315	4.481581e-03
118	99.57806	90.59205	4.525238e-03
119	99.57806	90.51095	4.554346e-03
120	99.57806	90.42985	4.625747e-03
121	99.57806	90.34874	4.706227e-03
122	99.57806	90.26764	4.731063e-03
123	99.15612	90.26764	4.742495e-03
124	99.15612	90.18654	4.749347e-03
125	99.15612	90.10543	4.785470e-03
126	99.15612	90.02433	4.817970e-03
127	99.15612	89.94323	4.819471e-03
128	99.15612	89.86212	4.821357e-03
129	99.15612	89.78102	4.840750e-03
130	99.15612	89.69992	4.863414e-03
131	99.15612	89.61882	4.909374e-03
132	99.15612	89.53771	4.965311e-03
133	99.15612	89.45661	4.998634e-03
134	99.15612	89.37551	5.076623e-03
135	99.15612	89.29440	5.146958e-03
136	99.15612	89.21330	5.168950e-03
137	99.15612	89.13220	5.258227e-03
138	99.15612	89.05109	5.364157e-03

139	99.15612	88.96999	5.392043e-03
140	99.15612	88.88889	5.449325e-03
141	99.15612	88.80779	5.524292e-03
142	99.15612	88.72668	5.585758e-03
143	99.15612	88.64558	5.639154e-03
144	99.15612	88.56448	5.651011e-03
145	99.15612	88.48337	5.660565e-03
146	99.15612	88.40227	5.692574e-03
147	99.15612	88.32117	5.768338e-03
148	99.15612	88.24006	5.847665e-03
149	99.15612	88.15896	5.877291e-03
150	99.15612	88.07786	5.887656e-03
151	99.15612	87.99676	5.907654e-03
152	99.15612	87.91565	5.930000e-03
153	99.15612	87.83455	5.949974e-03
154	99.15612	87.75345	5.980177e-03
155	99.15612	87.67234	6.047302e-03
156	99.15612	87.59124	6.096929e-03
157	99.15612	87.51014	6.110769e-03
158	99.15612	87.42903	6.154482e-03
159	99.15612	87.34793	6.244587e-03
160	99.15612	87.26683	6.354726e-03
161	99.15612	87.18573	6.413042e-03
162	99.15612	87.10462	6.449386e-03
163	99.15612	87.02352	6.502884e-03
164	99.15612	86.94242	6.529692e-03
165	99.15612	86.86131	6.535250e-03
166	99.15612	86.78021	6.607509e-03
167	99.15612	86.69911	6.684544e-03
168	99.15612	86.61800	6.730865e-03
169	99.15612	86.53690	6.882186e-03
170	99.15612	86.45580	7.014946e-03
171	99.15612	86.37470	7.116125e-03
172	99.15612	86.29359	7.211096e-03
173	99.15612	86.21249	7.233572e-03
174	99.15612	86.13139	7.246053e-03
175	99.15612	86.05028	7.253599e-03
176	99.15612	85.96918	7.284369e-03
177	99.15612	85.88808	7.359772e-03
178	99.15612	85.80697	7.407860e-03
179	99.15612	85.72587	7.535206e-03
180	99.15612	85.64477	7.698769e-03
181	99.15612	85.56367	7.777029e-03
182	99.15612	85.48256	7.841403e-03
183	99.15612	85.40146	7.897936e-03
184	99.15612	85.32036	7.962511e-03
185	99.15612	85.23925	8.022600e-03
186	99.15612	85.15815	8.070374e-03
187	99.15612	85.07705	8.130010e-03
188	99.15612	84.99594	8.188882e-03
189	99.15612	84.91484	8.260403e-03
190	99.15612	84.83374	8.318137e-03
191	99.15612	84.75264	8.364269e-03
192	99.15612	84.67153	8.426133e-03
193	99.15612	84.59043	8.449375e-03
194	99.15612	84.50933	8.465100e-03
195	99.15612	84.42822	8.496831e-03
196	99.15612	84.34712	8.523298e-03
197	99.15612	84.26602	8.549036e-03
198	99.15612	84.18491	8.597508e-03
199	99.15612	84.10381	8.630742e-03
200	99.15612	84.02271	8.634641e-03
201	99.15612	83.94161	8.645326e-03
202	99.15612	83.86050	8.684972e-03

203	99.15612	83.77940	8.742186e-03
204	99.15612	83.69830	8.808775e-03
205	99.15612	83.61719	8.889410e-03
206	99.15612	83.53609	8.946026e-03
207	98.73418	83.53609	8.967792e-03
208	98.73418	83.45499	9.110547e-03
209	98.73418	83.37388	9.284431e-03
210	98.73418	83.29278	9.326911e-03
211	98.73418	83.21168	9.339344e-03
212	98.73418	83.13058	9.380757e-03
213	98.73418	83.04947	9.457968e-03
214	98.73418	82.96837	9.524934e-03
215	98.73418	82.88727	9.631630e-03
216	98.73418	82.80616	9.717830e-03
217	98.73418	82.72506	9.815111e-03
218	98.73418	82.64396	9.925986e-03
219	98.73418	82.56285	9.978079e-03
220	98.73418	82.48175	1.005536e-02
221	98.73418	82.40065	1.013695e-02
222	98.73418	82.31955	1.024889e-02
223	98.73418	82.23844	1.037105e-02
224	98.73418	82.15734	1.050322e-02
225	98.73418	82.07624	1.059732e-02
226	98.73418	81.99513	1.062332e-02
227	98.73418	81.91403	1.065018e-02
228	98.73418	81.83293	1.068592e-02
229	98.73418	81.75182	1.074838e-02
230	98.73418	81.67072	1.079853e-02
231	98.73418	81.58962	1.083296e-02
232	98.73418	81.50852	1.087434e-02
233	98.73418	81.42741	1.096623e-02
234	98.73418	81.34631	1.104329e-02
235	98.73418	81.26521	1.108464e-02
236	98.73418	81.18410	1.116198e-02
237	98.31224	81.18410	1.121941e-02
238	98.31224	81.10300	1.124295e-02
239	98.31224	81.02190	1.127360e-02
240	98.31224	80.94079	1.130636e-02
241	98.31224	80.85969	1.134063e-02
242	98.31224	80.77859	1.136769e-02
243	98.31224	80.69749	1.139298e-02
244	98.31224	80.61638	1.143051e-02
245	98.31224	80.53528	1.146980e-02
246	98.31224	80.45418	1.151423e-02
247	98.31224	80.37307	1.154346e-02
248	98.31224	80.29197	1.156131e-02
249	98.31224	80.21087	1.164294e-02
250	98.31224	80.12976	1.176372e-02
251	98.31224	80.04866	1.185897e-02
252	98.31224	79.96756	1.195958e-02
253	98.31224	79.88646	1.204038e-02
254	98.31224	79.80535	1.207184e-02
255	98.31224	79.72425	1.208075e-02
256	98.31224	79.64315	1.213777e-02
257	98.31224	79.56204	1.219482e-02
258	97.89030	79.56204	1.225925e-02
259	97.89030	79.48094	1.232107e-02
260	97.89030	79.39984	1.240536e-02
261	97.89030	79.31873	1.249639e-02
262	97.89030	79.23763	1.250842e-02
263	97.89030	79.15653	1.251792e-02
264	97.89030	79.07543	1.255473e-02
265	97.89030	78.99432	1.259173e-02
266	97.89030	78.91322	1.260693e-02

267	97.89030	78.83212	1.262198e-02
268	97.89030	78.75101	1.263983e-02
269	97.89030	78.66991	1.265178e-02
270	97.89030	78.58881	1.269266e-02
271	97.89030	78.50770	1.276576e-02
272	97.89030	78.42660	1.288665e-02
273	97.89030	78.34550	1.297387e-02
274	97.89030	78.26440	1.305001e-02
275	97.89030	78.18329	1.314408e-02
276	97.89030	78.10219	1.321885e-02
277	97.89030	78.02109	1.330836e-02
278	97.89030	77.93998	1.337687e-02
279	97.89030	77.85888	1.341714e-02
280	97.89030	77.77778	1.347397e-02
281	97.89030	77.69667	1.352808e-02
282	97.89030	77.61557	1.354268e-02
283	97.46835	77.61557	1.355517e-02
284	97.46835	77.53447	1.357314e-02
285	97.46835	77.45337	1.369181e-02
286	97.46835	77.37226	1.381398e-02
287	97.46835	77.29116	1.389188e-02
288	97.46835	77.21006	1.398486e-02
289	97.46835	77.12895	1.412400e-02
290	97.46835	77.04785	1.427438e-02
291	97.46835	76.96675	1.444434e-02
292	97.46835	76.88564	1.457045e-02
293	97.46835	76.80454	1.457858e-02
294	97.46835	76.72344	1.459794e-02
295	97.46835	76.64234	1.462603e-02
296	97.46835	76.56123	1.465817e-02
297	97.04641	76.56123	1.468705e-02
298	97.04641	76.48013	1.476113e-02
299	97.04641	76.39903	1.492407e-02
300	97.04641	76.31792	1.508450e-02
301	97.04641	76.23682	1.515821e-02
302	97.04641	76.15572	1.519407e-02
303	97.04641	76.07461	1.531952e-02
304	97.04641	75.99351	1.543779e-02
305	97.04641	75.91241	1.545715e-02
306	97.04641	75.83131	1.546506e-02
307	97.04641	75.75020	1.555380e-02
308	97.04641	75.66910	1.566202e-02
309	97.04641	75.58800	1.571254e-02
310	97.04641	75.50689	1.575047e-02
311	97.04641	75.42579	1.583504e-02
312	97.04641	75.34469	1.592919e-02
313	97.04641	75.26358	1.595461e-02
314	97.04641	75.18248	1.596744e-02
315	97.04641	75.10138	1.600036e-02
316	97.04641	75.02028	1.604967e-02
317	97.04641	74.93917	1.613759e-02
318	97.04641	74.85807	1.626843e-02
319	97.04641	74.77697	1.648593e-02
320	97.04641	74.69586	1.672754e-02
321	97.04641	74.61476	1.682619e-02
322	97.04641	74.53366	1.685814e-02
323	97.04641	74.45255	1.689436e-02
324	97.04641	74.37145	1.691472e-02
325	97.04641	74.29035	1.693833e-02
326	97.04641	74.20925	1.695415e-02
327	97.04641	74.12814	1.696291e-02
328	97.04641	74.04704	1.697633e-02
329	97.04641	73.96594	1.700002e-02
330	97.04641	73.88483	1.702567e-02

```

331  97.04641  73.80373 1.703472e-02
332  97.04641  73.72263 1.705783e-02
333  97.04641  73.64152 1.708487e-02
[ reached 'max' / getOption("max.print") -- omitted 1136 rows ]
> roc(attr$Attrition,logistic$fitted.values,plot=TRUE, legacy.axes=TRUE, xlab
="False Positive Percentage", ylab="True Postive Percentage", col="#377eb8",
lwd=4, percent=TRUE)
Setting levels: control = No, case = Yes
Setting direction: controls < cases

```

```

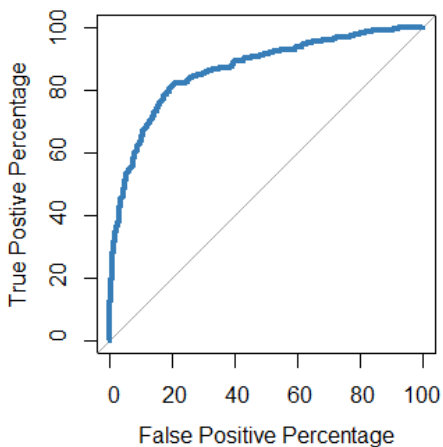
Call:
roc.default(response = attr$Attrition, predictor = logistic$fitted.values,
percent = TRUE, plot = TRUE, legacy.axes = TRUE, xlab = "False Positive Perce
ntage", ylab = "True Postive Percentage", col = "#377eb8", lwd = 4)

```

```

Data: logistic$fitted.values in 1233 controls (attr$Attrition No) < 237 cases
(attr$Attrition Yes).
Area under the curve: 86.7%

```



```

> roc(attr$Attrition,logistic$fitted.values,plot=TRUE, legacy.axes=TRUE, xlab="False Posi
centage", col="#377eb8", lwd=4, percent=TRUE, print.auc=TRUE)
Setting levels: control = No, case = Yes
Setting direction: controls < cases

```

```

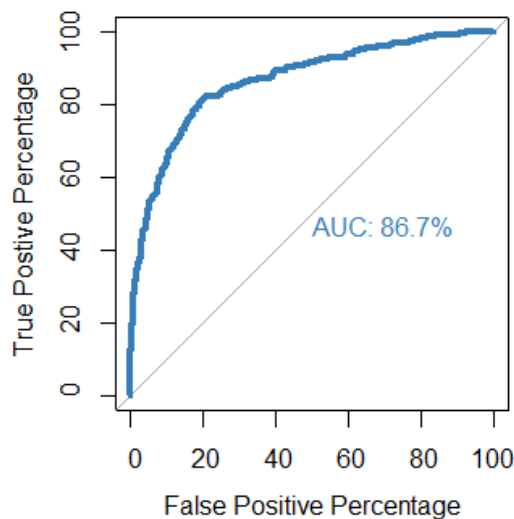
Call:
roc.default(response = attr$Attrition, predictor = logistic$fitted.values, percent =
ab = "False Positive Percentage", ylab = "True Postive Percentage", col = "#377eb8",

```

```

Data: logistic$fitted.values in 1233 controls (attr$Attrition No) < 237 cases (attr$Attri
Area under the curve: 86.7%

```

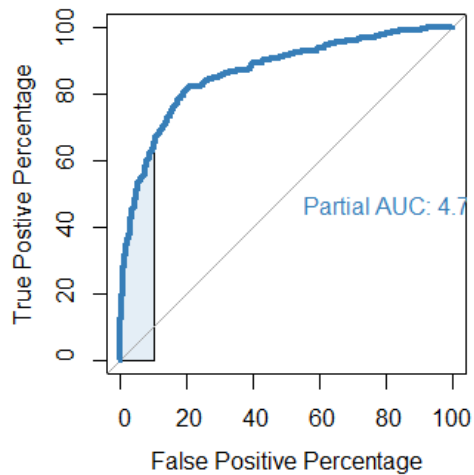
```
> roc(attr$Attrition,logistic$fitted.values,plot=TRUE, legacy.axes=TRUE, xlab="False Positive Percentage", col="#377eb8", lwd=4, percent=TRUE, print.auc=TRUE, partial.auc=c(100, 90), auc.col="#377eb822", print.auc.x=45)
```

```
Setting levels: control = No, case = Yes
Setting direction: controls < cases
```

```
Call:
```

```
roc.default(response = attr$Attrition, predictor = logistic$fitted.values, percent = TRUE,
  ab = "False Positive Percentage", ylab = "True Postive Percentage", col = "#377eb8",
  c = c(100, 90), auc.polygon = TRUE, auc.polygon.col = "#377eb822", print.auc.x = 45)
```

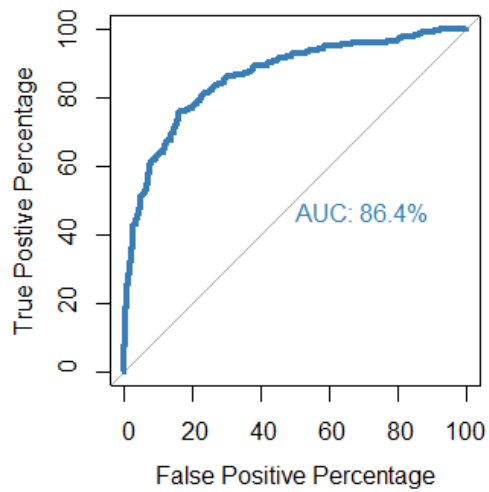
```
Data: logistic$fitted.values in 1233 controls (attr$Attrition No) < 237 cases (attr$Attrition Yes)
Partial area under the curve (specificity 100%-90%): 4.737%
```



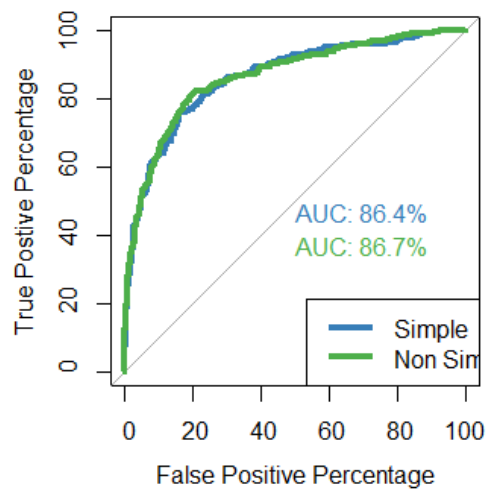
```
> # Lets do two roc plots to understand which model is better
> roc(attr$Attrition, logistic_simple$fitted.values, plot=TRUE, legacy.axes=TRUE, percent
ylab="True Postive Percentage", col="#377eb8", lwd=4, print.auc=TRUE)
Setting levels: control = No, case = Yes
Setting direction: controls < cases
```

```
Call:
roc.default(response = attr$Attrition, predictor = logistic_simple$fitted.values, percent
RUE, xlab = "False Positive Percentage", ylab = "True Postive Percentage", col = "#377eb8", lwd=4, print.auc=TRUE)
```

```
Data: logistic_simple$fitted.values in 1233 controls (attr$Attrition No) < 237 cases (attr$Attrition Yes)
Area under the curve: 86.4%
```



```
> # Lets add the other graph
> plot.roc(attr$Attrition, logistic$fitted.values, percent=TRUE, col="#4daf4a", lwd=4, pr
Setting levels: control = No, case = Yes
Setting direction: controls < cases
> legend("bottomright", legend=c("Simple", "Non Simple"), col=c("#377eb8", "#4daf4a"), lw
```



```
> # reset the par area back to the default setting  
> par(pty='m')
```