

```

> ##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, Yes, No, No, No...
$ BusinessTravel <fct> Travel_Rarely, Travel_Frequently, Travel_Rar
ely, Travel_Frequently, Trave...
$ DailyRate <int> 1102, 279, 1373, 1392, 591, 1005, 1324, 1358
, 216, 1299, 809, 153, 670, 1...
$ Department <fct> Sales, Research & Development, Research & De
velopment, Research & 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 Sc
iences, 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, 21, 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, Fema
le, 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, Laborat
ory 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, S
ingle, Married, Divorced, Sin...
$ MonthlyIncome <int> 5993, 5130, 2090, 2909, 3468, 3068, 2670, 26
93, 9526, 5237, 2426, 4193, 2...
$ MonthlyRate <int> 19479, 24907, 2396, 23159, 16632, 11864, 996
4, 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, Y, Y, Y, Y, Y, Y, Y, Y, Y,
Y, Y, Y, 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...

```

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$ 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,
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	EducationField
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	3	Male	61			
2	2	1	4	Male	92			
3	1	1	5	Female	56			
4	1	1	7	Male	40			
5	1	1	8	Male	79			
6	1							
3	1							
	JobRole	Jobsatisfaction	MaritalStatus	MonthlyIncome	MonthlyRate	NumCompaniesWorked	Over18	
1	Sales Executive	4	Single	5993	194			
79	8	Y						
2	Research Scientist	2	Married	5130	249			
07	1	Y						
3	Laboratory Technician	3	Single	2090	23			
96	6	Y						
4	Research Scientist	3	Married	2909	231			
59	1	Y						
5	Laboratory Technician	2	Married	3468	166			
32	9	Y						
6	Laboratory Technician	4	Single	3068	118			
64	0	Y						

	OverTime	PercentSalaryHike	PerformanceRating	RelationshipSatisfaction	StandardHours
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	
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					

	YearsSinceLastPromotion	YearsWithCurrManager
1	0	5
2	1	7
3	0	0
4	3	0
5	2	2
6	3	6

> 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.	
1st Qu.: 2.000	1st Qu.:2.000	Life Sciences :606	1st Qu.:1	1st Q	
Median : 7.000	Median :3.000	Marketing :159	Median :1	Media	
Mean : 9.193	Mean :2.913	Medical :464	Mean :1	Mean	
3rd Qu.:14.000	3rd Qu.:4.000	Other : 82	3rd Qu.:1	3rd Q	
Max. :29.000	Max. :5.000	Technical Degree:132	Max. :1	Max.	

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

MonthlyRate	JobRole	JobSatisfaction	MaritalStatus	MonthlyIncome
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			

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

StandardHours	StockOptionLevel	TotalWorkingYears	TrainingTimesLastYear	workL
Min. :80	Min. :0.0000	Min. : 0.00	Min. :0.000	Min.
1st Qu.:80	1st Qu.:0.0000	1st Qu.: 6.00	1st Qu.:2.000	1st Q
Median :80	Median :1.0000	Median :10.00	Median :3.000	Media
Mean :80	Mean :0.7939	Mean :11.28	Mean :2.799	Mean
3rd Qu.:80	3rd Qu.:1.0000	3rd Qu.:15.00	3rd Qu.:3.000	3rd Q
Max. :80	Max. :3.0000	Max. :40.00	Max. :6.000	Max.

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

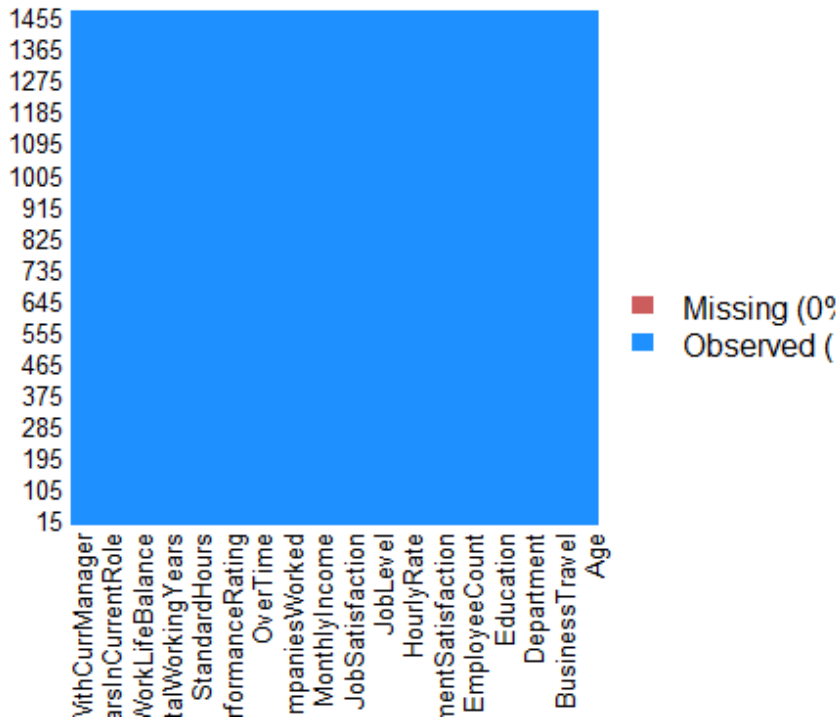
Mean	: 4.229	Mean	: 2.188	Mean	: 4.123
3rd Qu.:	7.000	3rd Qu.:	3.000	3rd Qu.:	7.000
Max.	:18.000	Max.	:15.000	Max.	:17.000

```
> #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			
EducationField	Department	DistanceFromHome	Education
0	0	0	0
Gender	EmployeeCount	EmployeeNumber	Environmentsatisfaction
0	0	0	0
JobRole	HourlyRate	JobInvolvement	JobLevel
0	0	0	0
MonthlyRate	JobSatisfaction	MaritalStatus	MonthlyIncome
0	0	0	0
PercentSalaryHike	NumCompaniesWorked	Over18	OverTime
0	0	0	0
StockOptionLevel	PerformanceRating	RelationshipSatisfaction	StandardHours
0	0	0	0
YearsAtCompany	TotalWorkingYears	TrainingTimesLastYear	workLifeBalance
0	0	0	0
	YearsInCurrentRole	YearsSinceLastPromotion	YearswithCurrManager
	0	0	0

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

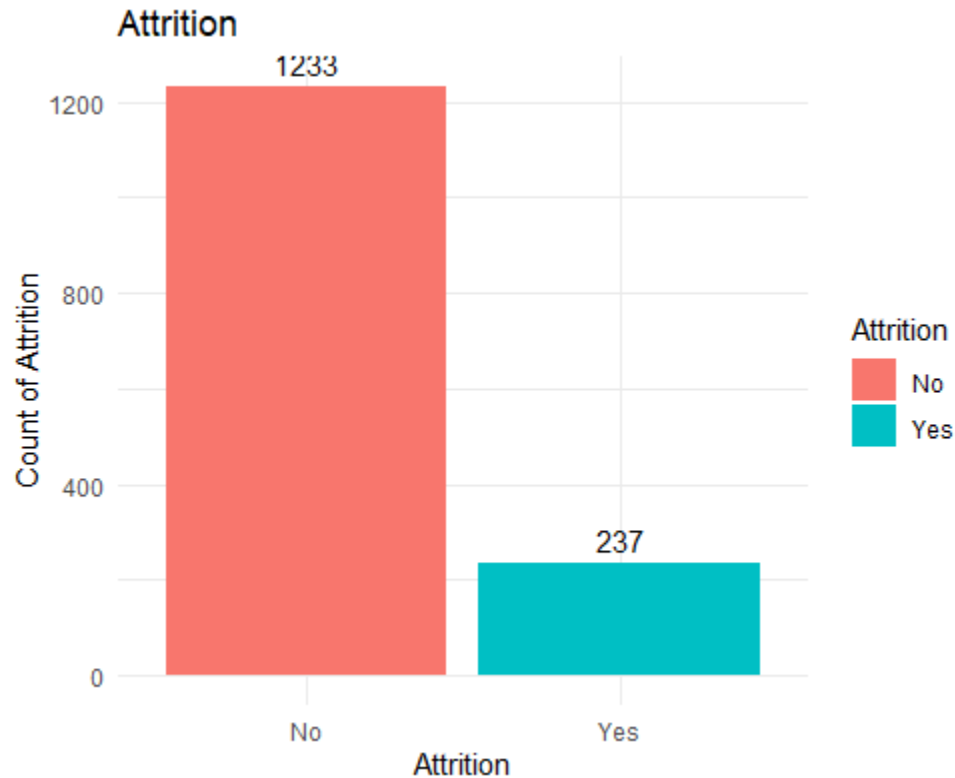
Missing Values VS Observed



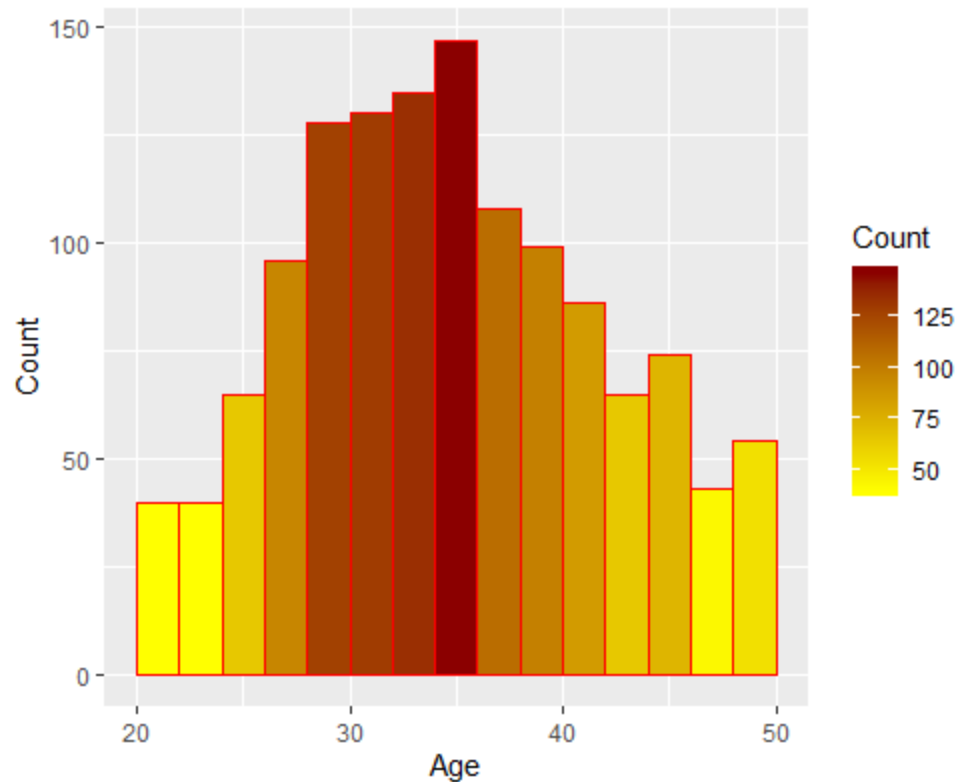
```
> #Removing redundant columns
> attr$EmployeeNumber<- NULL
> attr$StandardHours <- NULL
> attr$Over18 <- NULL
> attr$EmployeeCount <- NULL
> #Converting data type of categorical column
> attr$Education <- factor(attr$Education)
> attr$EnvironmentSatisfaction <- factor(attr$EnvironmentSatisfaction)
> 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','PercentsSalaryHike','TotalWorkingYears',
+           'TrainingTimesLastYear','YearsAtCompany',
+           'YearsInCurrentRole','YearsSinceLastPromotion','YearsWithCurrManager')

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

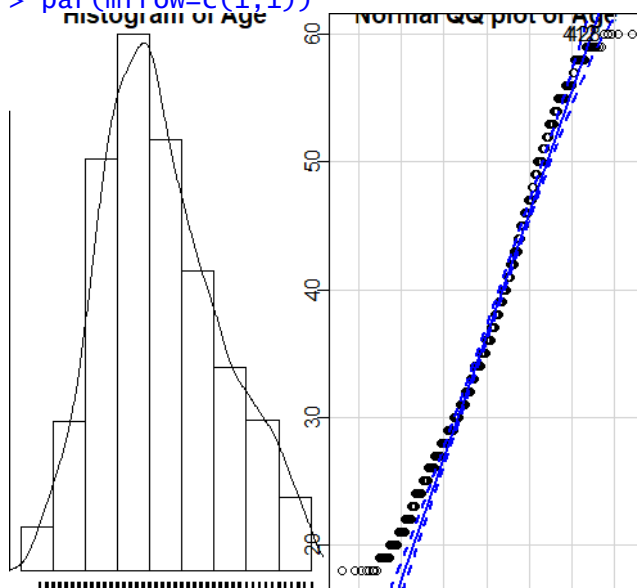
```
+ tally() %>%
+ ggplot(aes(x =Attrition,y = n,fill=Attrition)) +
+ geom_bar(stat = "identity") +
+ theme_minimal()+
+ labs(x="Attrition", y="Count of Attrition")+
+ ggtitle("Attrition")+
+ geom_text(aes(label = n), vjust = -0.5, position = position_dodge(0.9))
```



```
#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")
```



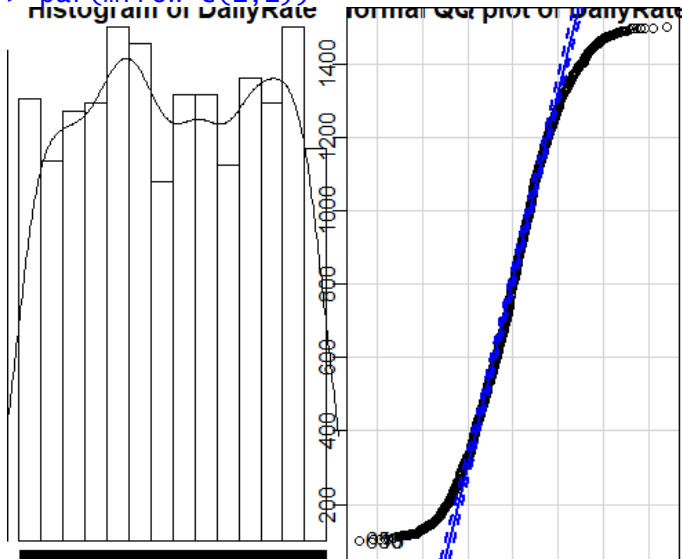
```
> #Checking for distributions in numerical columns
> #The qqPlot show a few extreme outliers which break the assumption of 95% confidence
> #normal distribution
> par(mfrow = c(1,2))
> hist(attr$Age,xlab='',main = 'Histogram of Age',freq = FALSE)
> lines(density(attr$Age,na.rm = T))
> rug(jitter(attr$Age))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

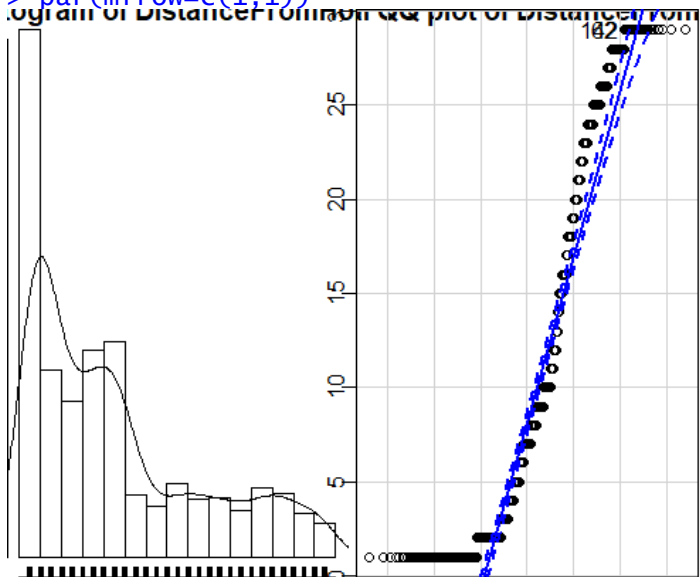
```



```

> 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))

```

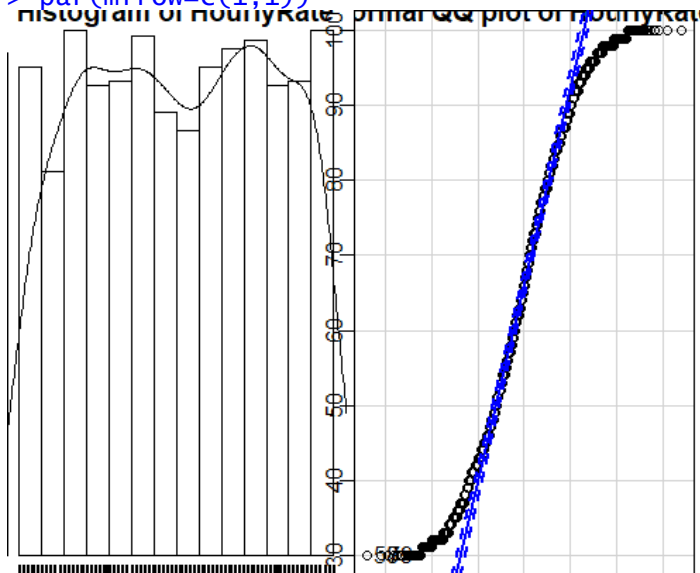


```

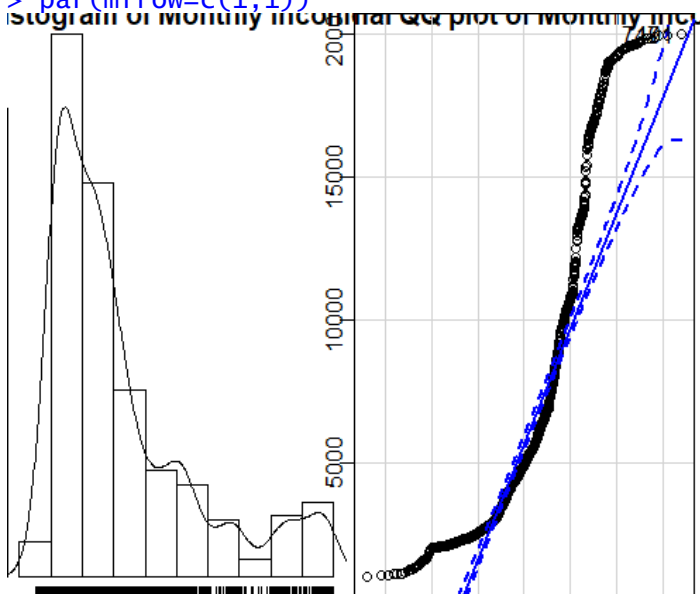
> par(mfrow = c(1,2))
> hist(attr$HourlyRate,xlab='',main = 'Histogram of HourlyRate',freq = FALSE)
> lines(density(attr$HourlyRate,na.rm = T))

```

```
> 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))
```

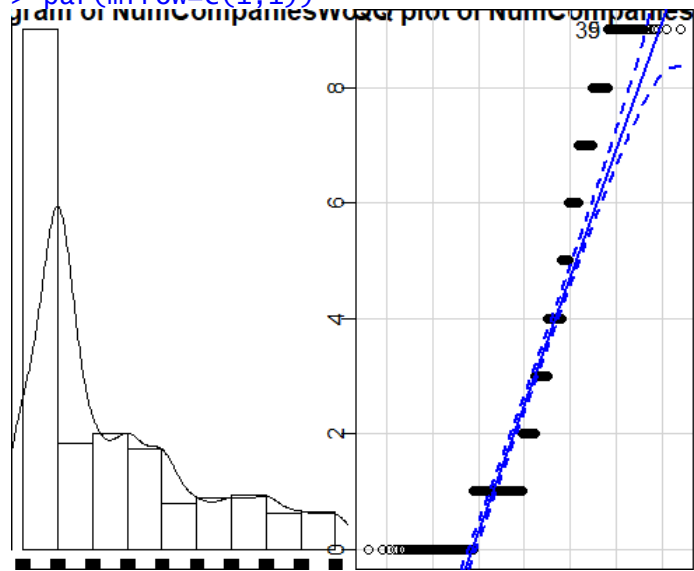


```
> par(mfrow = c(1,2))
> hist(attr$NumCompaniesworked,xlab='',main = 'Histogram of NumCompaniesworke
d',freq = FALSE)
> lines(density(attr$NumCompaniesworked,na.rm = T))
> rug(jitter(attr$NumCompaniesworked))
```

```
> 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)
```

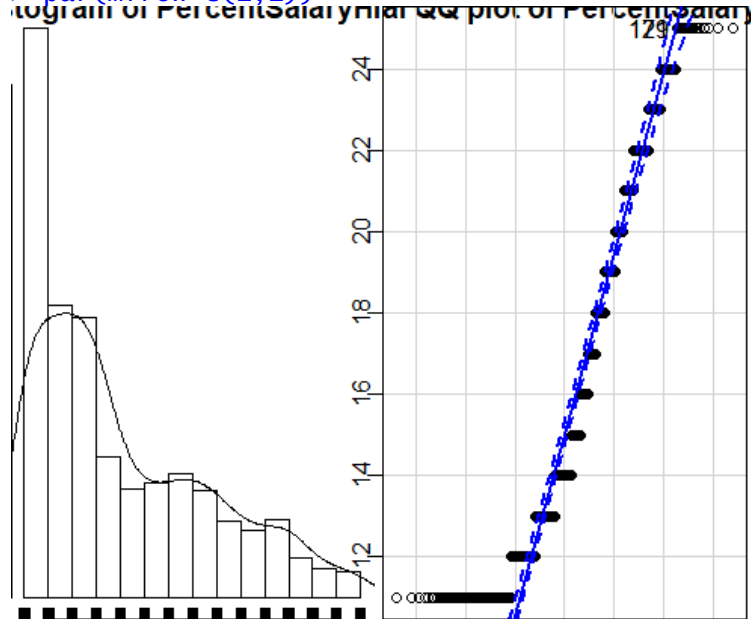
```
> lines(density(attr$PercentSalaryHike,na.rm = T))
```

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

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

```
[1] 121 179
```

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



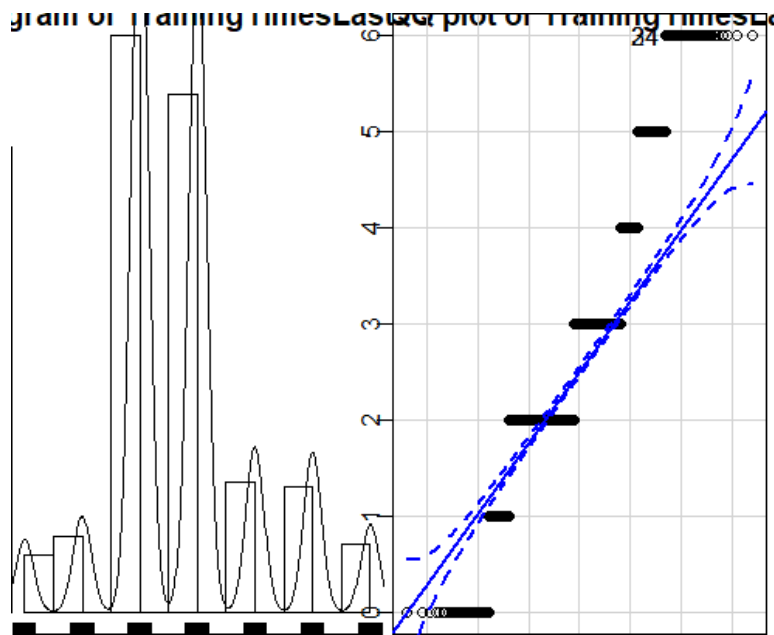
```
> par(mfrow = c(1,2))
```

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

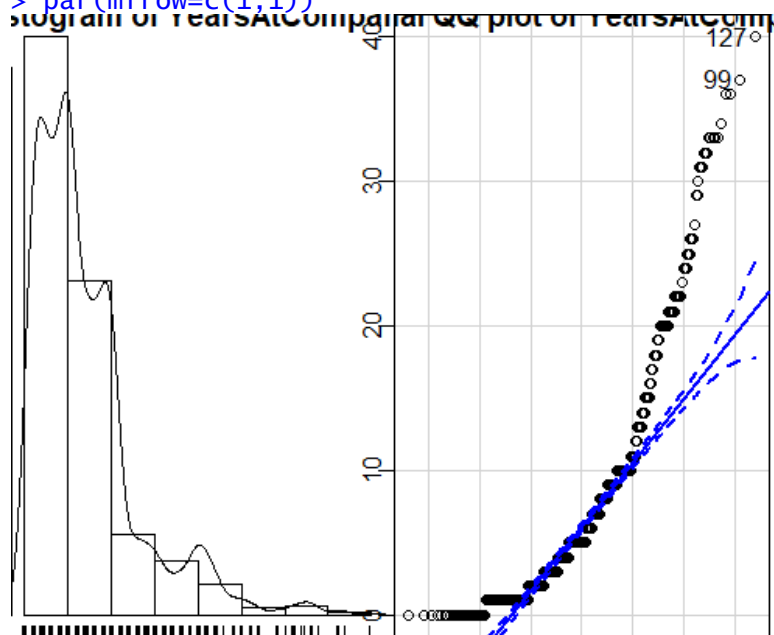
```
> lines(density(attr$TrainingTimesLastYear,na.rm = T))
```

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

```
> qqPlot(attr$TrainingTimesLastYear,main='Normal QQ plot of TrainingTimesLast
Year')
[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))
```

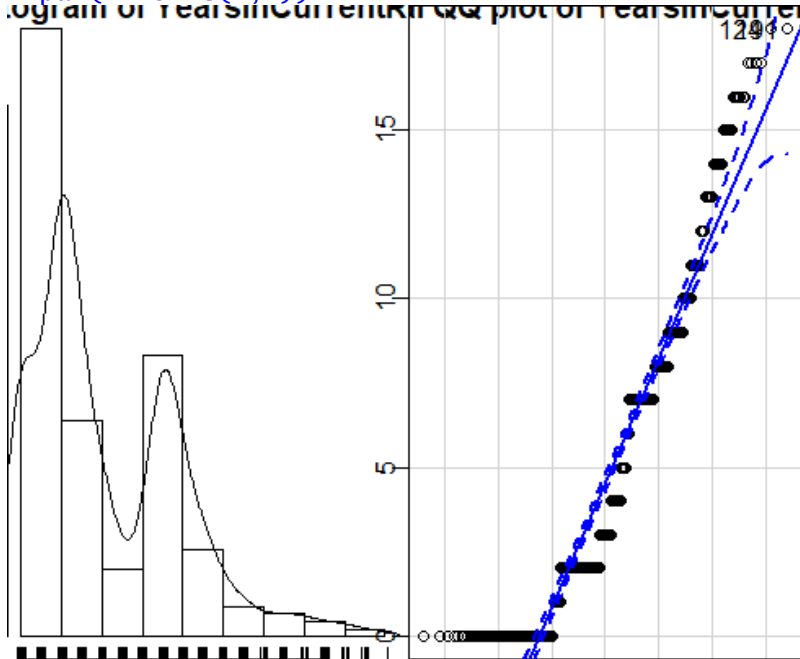


```
> par(mfrow = c(1,2))
```

```

> 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))

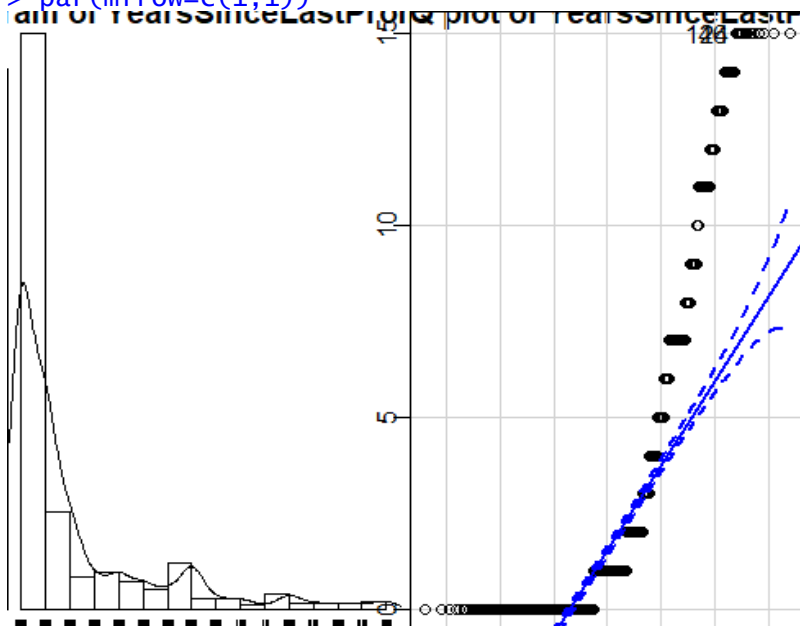
```



```

> 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))

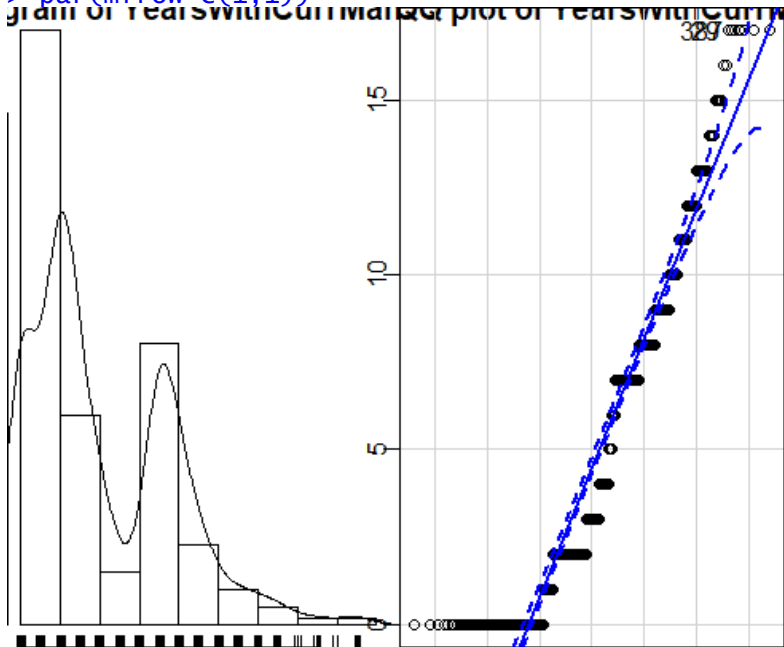
```



```

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

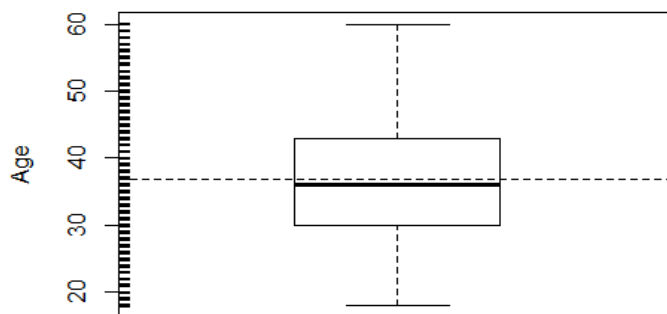
```



```

> #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)

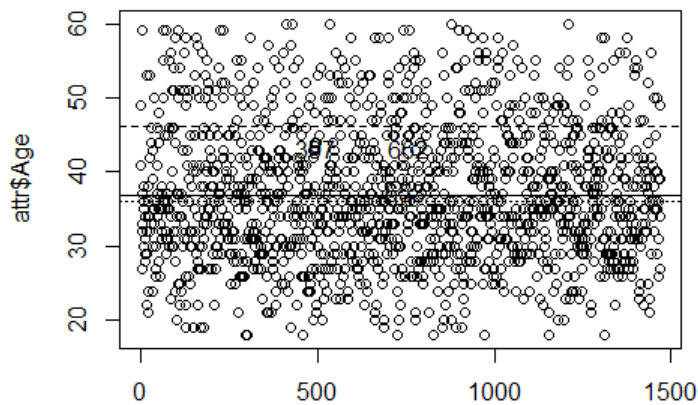
```



```

> #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

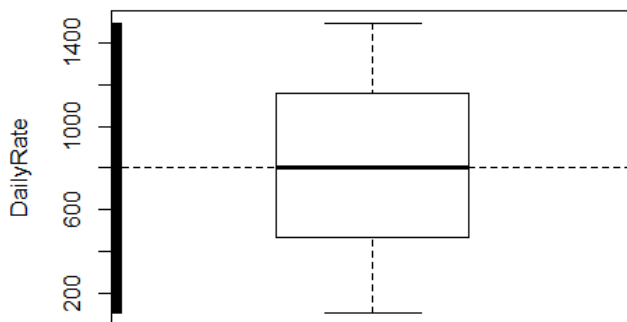
```



```

> #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)

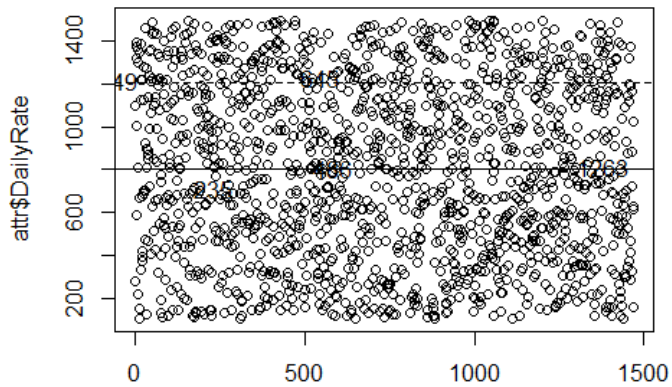
```



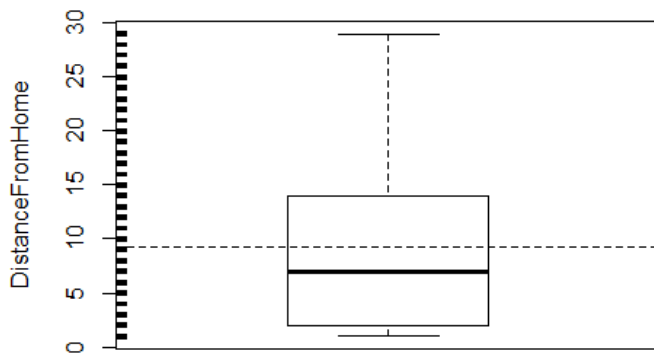
```

> #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

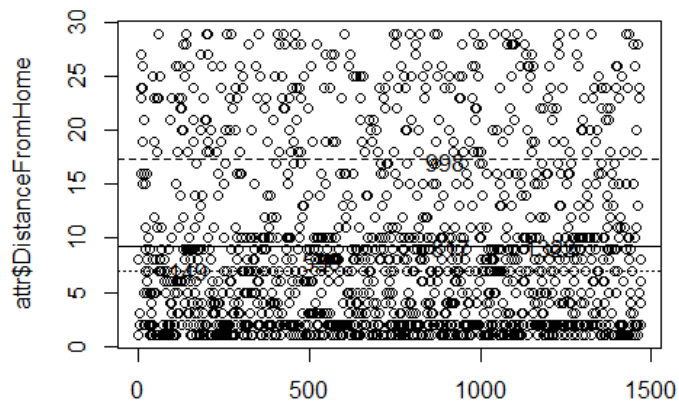
```



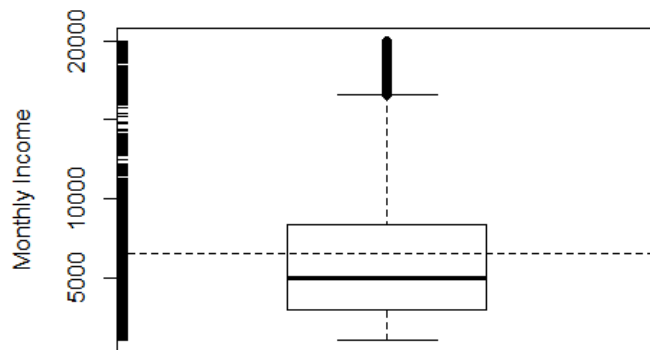
```
> #Boxplot distributions for Distance from home
> boxplot(attr$DistanceFromHome, ylab = "DistanceFromHome",outline = TRUE)
> rug(jitter(attr$DistanceFromHome), side = 2)
> abline(h = mean(attr$DistanceFromHome, na.rm = T), lty = 2)
```



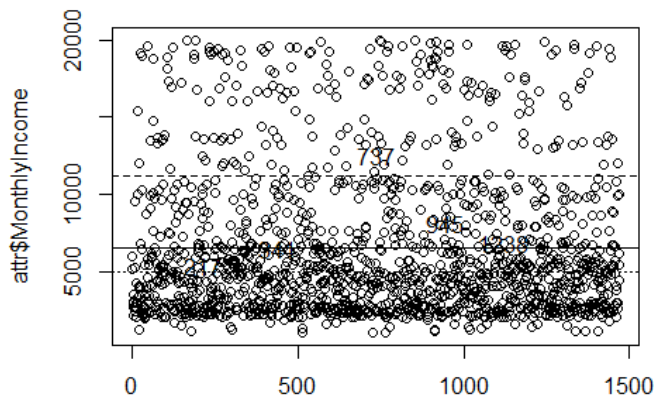
```
> plot(attr$DistanceFromHome, xlab = "")
> abline(h = mean(attr$DistanceFromHome, na.rm = T), lty = 1)
> abline(h = mean(attr$DistanceFromHome, na.rm = T) + sd(attr$DistanceFromHome, na.rm = T), lty = 2)
> abline(h = median(attr$DistanceFromHome, na.rm = T), lty = 3)
> identify(attr$DistanceFromHome)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

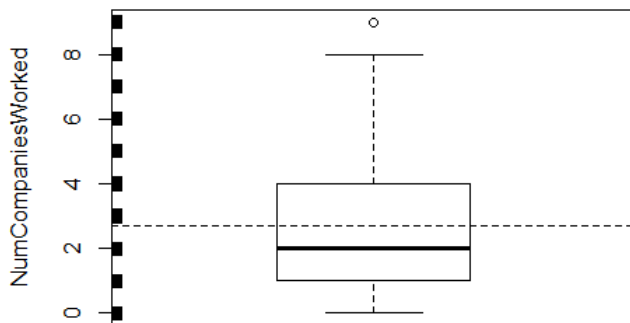
```
> #Boxplot distributions for Monthly Income
> boxplot(attr$MonthlyIncome, ylab = "Monthly Income")
> rug(jitter(attr$MonthlyIncome), side = 2)
> abline(h = mean(attr$MonthlyIncome, na.rm = T), lty = 2)
```



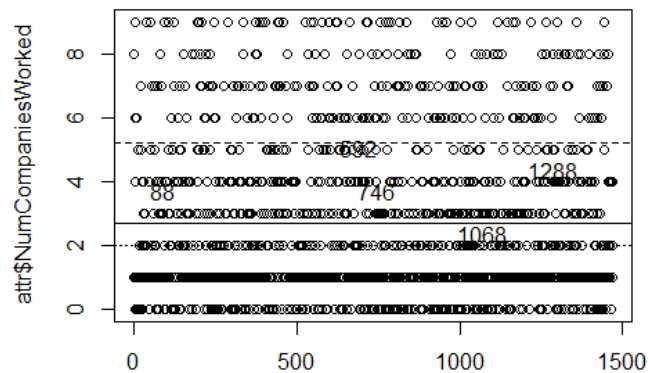
```
> #Plotting the Monthly Income and Age with 3 lines for mean, median and mean+std
> plot(attr$MonthlyIncome, xlab = "")
> abline(h = mean(attr$MonthlyIncome, na.rm = T), lty = 1)
> abline(h = mean(attr$MonthlyIncome, na.rm = T) + sd(attr$MonthlyIncome, na.rm = T), lty = 2)
> abline(h = median(attr$MonthlyIncome,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



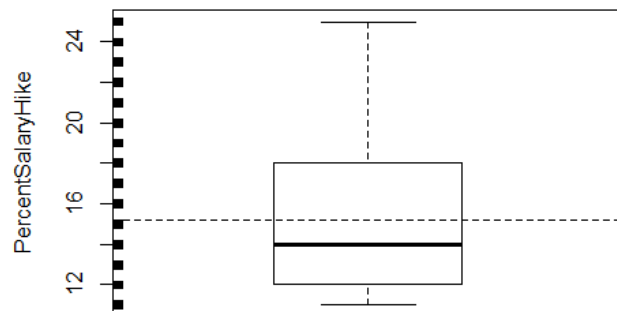
```
> #Boxplot distributions for NumCompaniesWorked
> boxplot(attr$NumCompaniesWorked, ylab = "NumCompaniesWorked")
> rug(jitter(attr$NumCompaniesWorked), side = 2)
> abline(h = mean(attr$NumCompaniesWorked, na.rm = T), lty = 2)
```



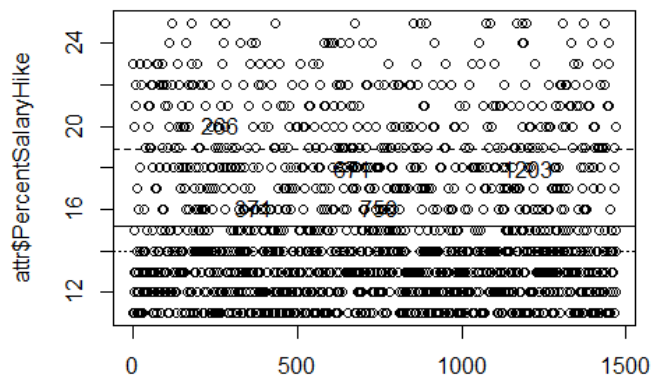
```
> #Plotting the NumCompaniesWorked with 3 lines for mean, median and mean+std
> plot(attr$NumCompaniesWorked, xlab = "")
> abline(h = mean(attr$NumCompaniesWorked, na.rm = T), lty = 1)
> abline(h = mean(attr$NumCompaniesWorked, na.rm = T) + sd(attr$NumCompaniesw
orked, na.rm = T), lty = 2)
> abline(h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



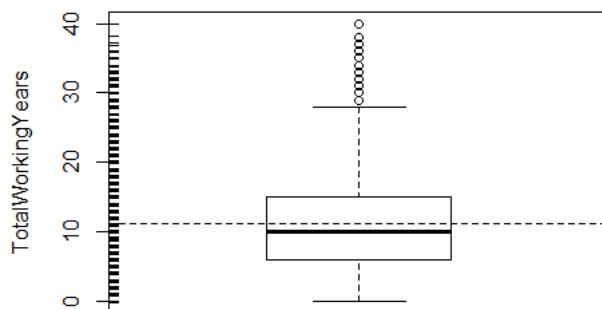
```
> #Boxplot distributions for PercentsSalaryHike
> boxplot(attr$PercentsSalaryHike, ylab = "PercentsSalaryHike")
> rug(jitter(attr$PercentsSalaryHike), side = 2)
> abline(h = mean(attr$PercentsSalaryHike, na.rm = T), lty = 2)
```



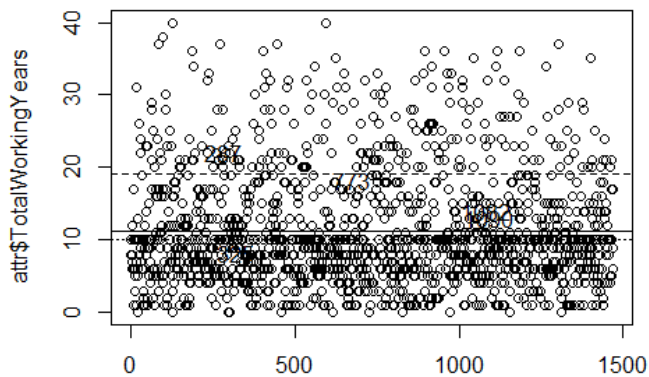
```
> #Plotting the PercentsSalaryHike with 3 lines for mean, median and mean+std
> plot(attr$PercentsSalaryHike, xlab = "")
> abline(h = mean(attr$PercentsSalaryHike, na.rm = T), lty = 1)
> abline(h = mean(attr$PercentsSalaryHike, na.rm = T) + sd(attr$PercentsSalaryHike, na.rm = T), lty = 2)
> abline(h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



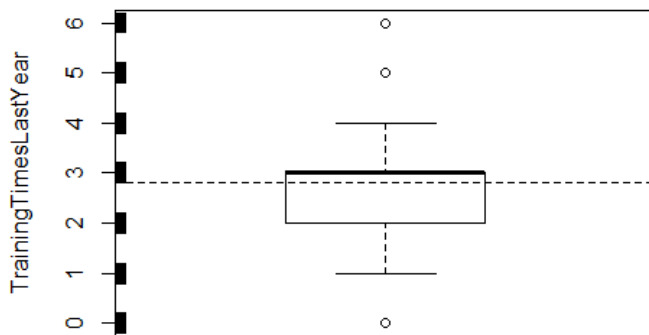
```
> #Boxplot distributions for TotalWorkingYears
> boxplot(attr$TotalWorkingYears, ylab = "TotalWorkingYears")
> rug(jitter(attr$TotalWorkingYears), side = 2)
> abline(h = mean(attr$TotalWorkingYears, na.rm = T), lty = 2)
```



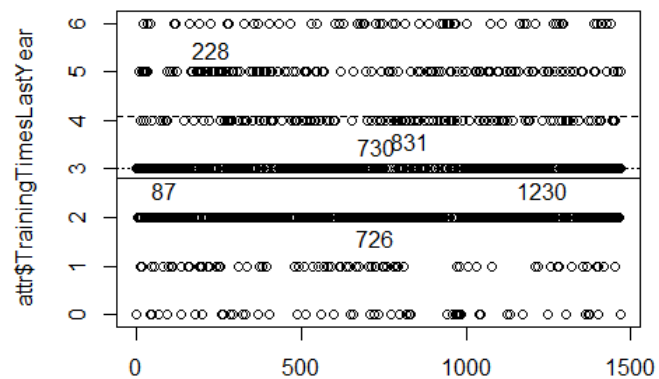
```
> #Plotting the TotalWorkingYears with 3 lines for mean, median and mean+std
> plot(attr$TotalWorkingYears, xlab = "")
> abline(h = mean(attr$TotalWorkingYears, na.rm = T), lty = 1)
> abline(h = mean(attr$TotalWorkingYears, na.rm = T) + sd(attr$TotalWorkingYe
ars, na.rm = T), lty = 2)
> abline(h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



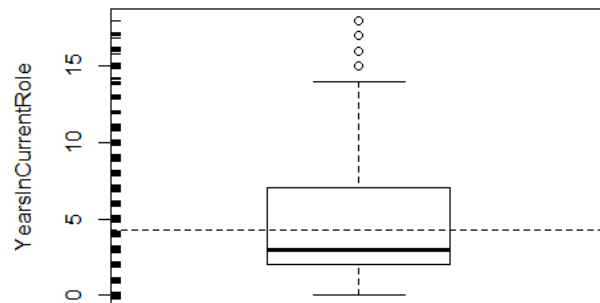
```
> #Boxplot distributions for TrainingTimesLastYear
> boxplot(attr$TrainingTimesLastYear, ylab = "TrainingTimesLastYear")
> rug(jitter(attr$TrainingTimesLastYear), side = 2)
> abline(h = mean(attr$TrainingTimesLastYear, na.rm = T), lty = 2)
```



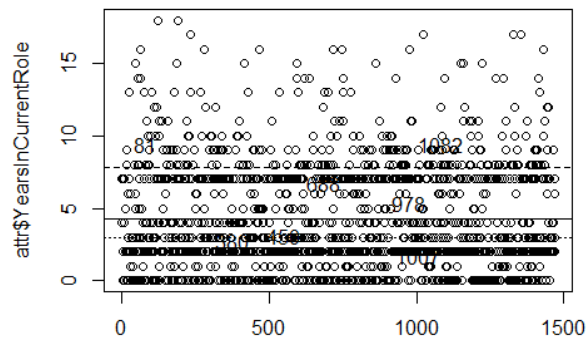
```
> #Plotting the TrainingTimesLastYear with 3 lines for mean, median and mean
+std
> plot(attr$TrainingTimesLastYear, xlab = "")
> abline(h = mean(attr$TrainingTimesLastYear, na.rm = T), lty = 1)
> abline(h = mean(attr$TrainingTimesLastYear, na.rm = T) + sd(attr$TrainingTi
mesLastYear, na.rm = T),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



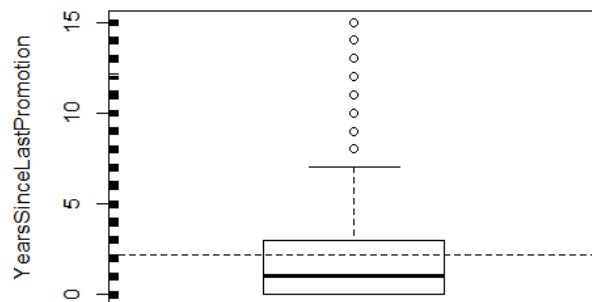
```
> #Boxplot distributions for YearsInCurrentRole
> boxplot(attr$YearsInCurrentRole, ylab = "YearsInCurrentRole")
> rug(jitter(attr$YearsInCurrentRole), side = 2)
> abline(h = mean(attr$YearsInCurrentRole, na.rm = T), lty = 2)
```



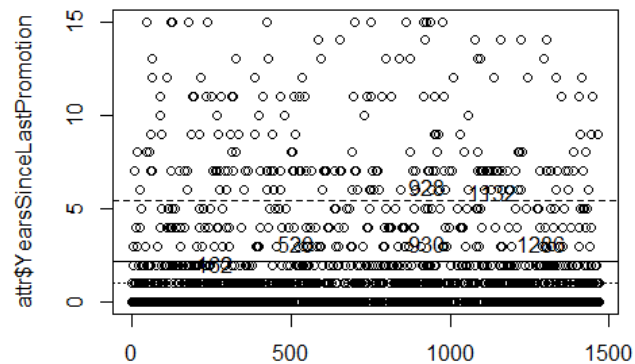
```
> #Plotting the YearsInCurrentRole with 3 lines for mean, median and mean+std
> plot(attr$YearsInCurrentRole, xlab = "")
> abline(h = mean(attr$YearsInCurrentRole, na.rm = T), lty = 1)
> abline(h = mean(attr$YearsInCurrentRole, na.rm = T) + sd(attr$YearsInCurrentRole, na.rm = T), lty = 2)
> abline(h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



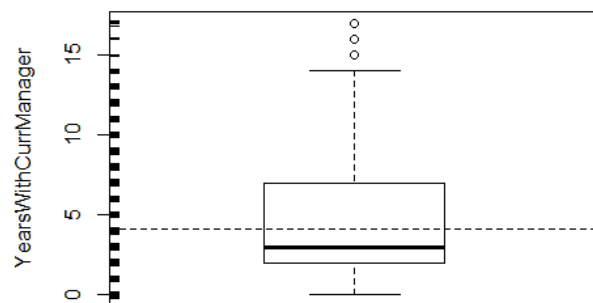
```
> #Boxplot distributions for YearsSinceLastPromotion
> boxplot(attr$YearsSinceLastPromotion, ylab = "YearsSinceLastPromotion")
> rug(jitter(attr$YearsSinceLastPromotion), side = 2)
> abline(h = mean(attr$YearsSinceLastPromotion, na.rm = T), lty = 2)
```



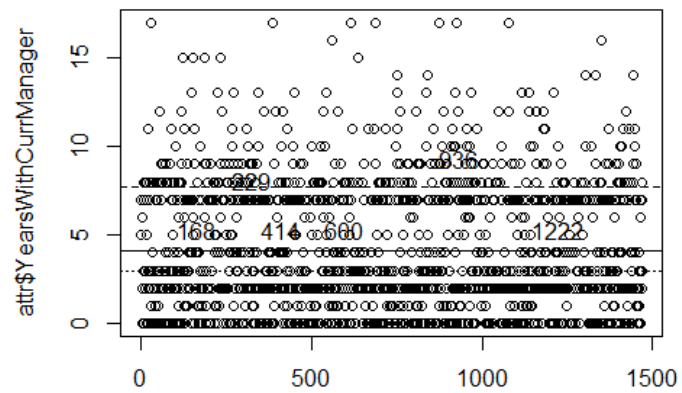
```
> #Plotting the YearsSinceLastPromotion with 3 lines for mean, median and me
an+std
> plot(attr$YearsSinceLastPromotion, xlab = "")
> abline(h = mean(attr$YearsSinceLastPromotion, na.rm = T), lty = 1)
> abline(h = mean(attr$YearsSinceLastPromotion, na.rm = T) + sd(attr$YearsSin
ceLastPromotion, na.rm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



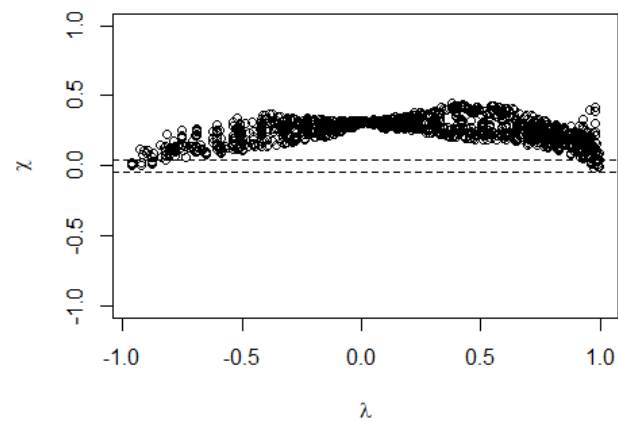
```
> #Boxplot distributions for YearsWithCurrManager
> boxplot(attr$YearsWithCurrManager, ylab = "YearsWithCurrManager")
> rug(jitter(attr$YearsWithCurrManager), side = 2)
> abline(h = mean(attr$YearsWithCurrManager, na.rm = T), lty = 2)
```



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

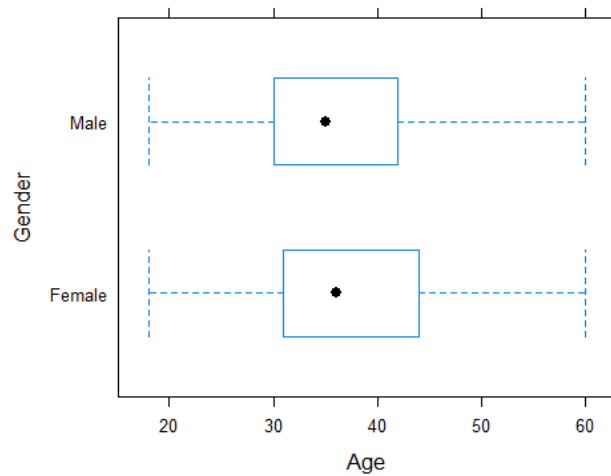
```
> #Chi Plot for inspecting the independence
> chi.plot(attr$MonthlyIncome,attr$Age)
```



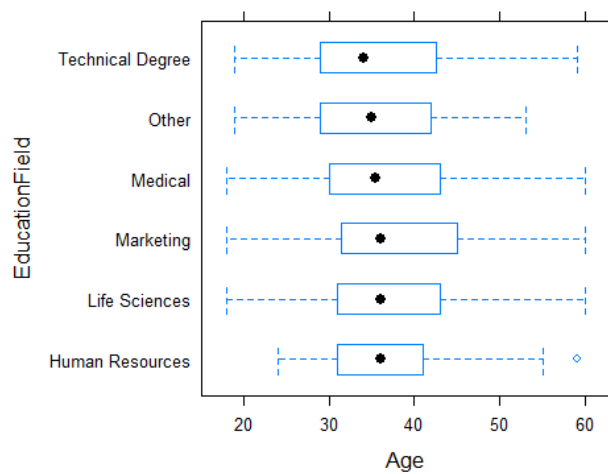
```
> #Plotting joint boxplots for various categories wrt Age
> bwplot(attr$Department ~ attr$Age, data=attr, ylab='Department',xlab='Age')
```



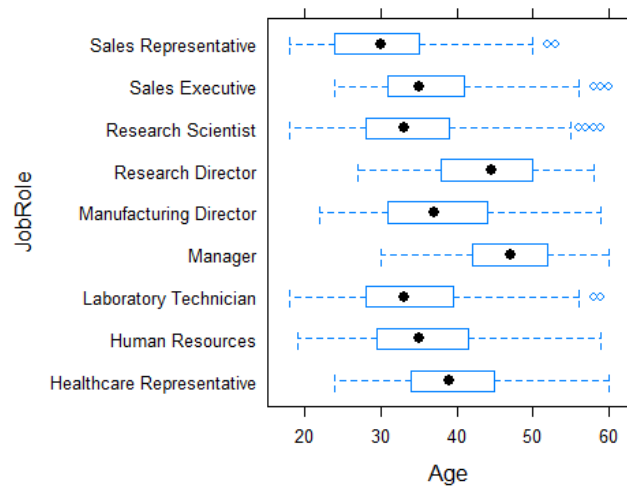
```
> bwplot(attr$Gender ~ attr$Age, data=attr, ylab='Gender',xlab='Age')
```



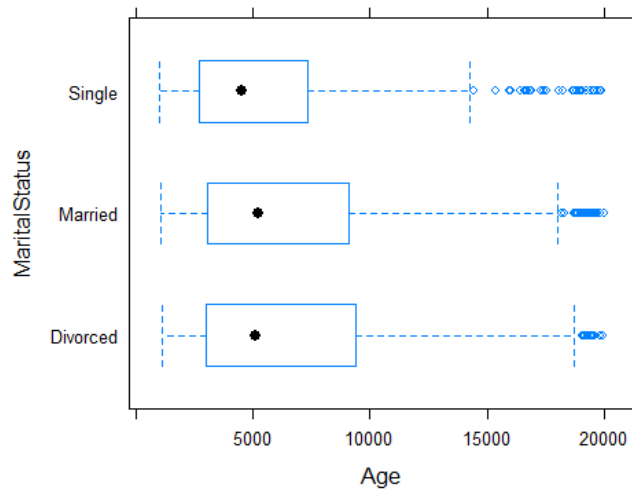
```
> bwplot(attr$EducationField ~ attr$Age, data=attr, ylab='EducationField',xlab='Age')
```



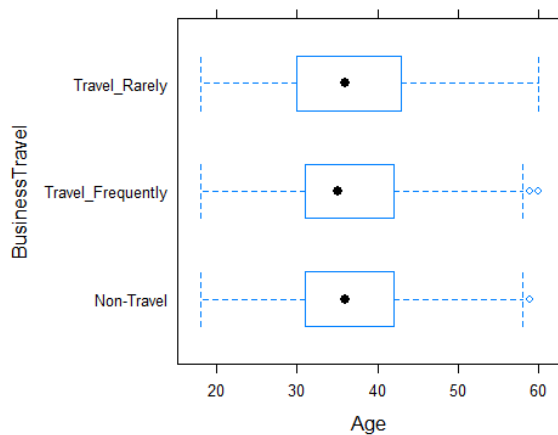
```
> bwplot(attr$JobRole ~ attr$Age, data=attr, ylab='JobRole',xlab='Age')
```



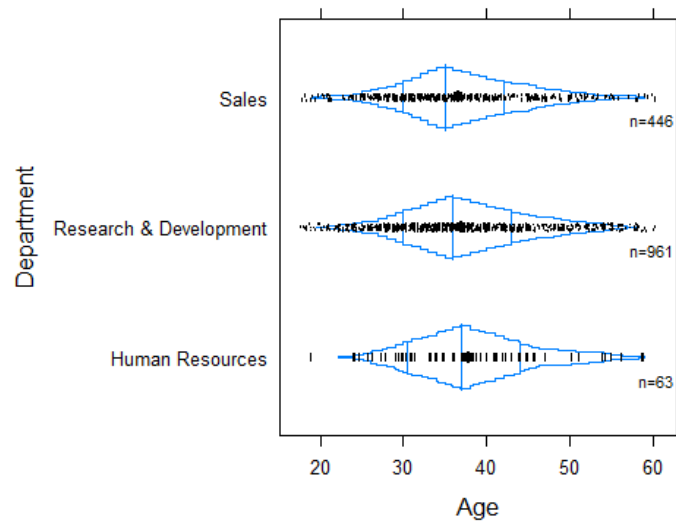
```
> bwplot(attr$MaritalStatus ~ attr$MonthlyIncome, data=attr, ylab='MaritalStatus',xlab='Age')
```



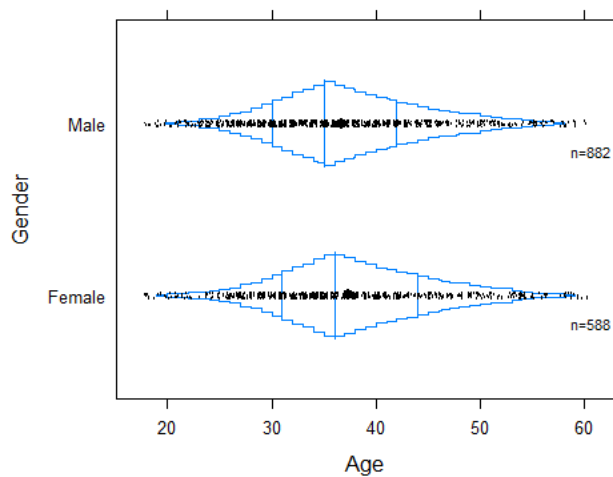
```
> bwplot(attr$BusinessTravel ~ attr$Age, data=attr, ylab='BusinessTravel',xlab='Age')
```



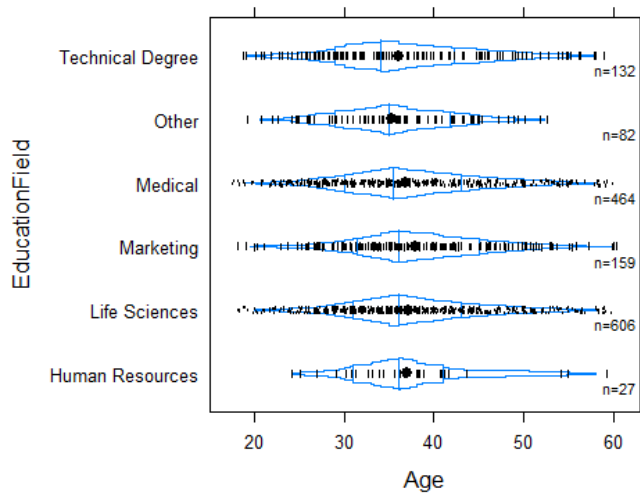
```
#Plotting stripplots for various categories wrt numerical column TotalCharges
> bwplot(attr$Department ~ attr$Age, data=attr,panel=panel.bpplot,
+       probs=seq(.01,.49,by=.01), datadensity=TRUE, ylab='Department',xlab=
+ 'Age')
```



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



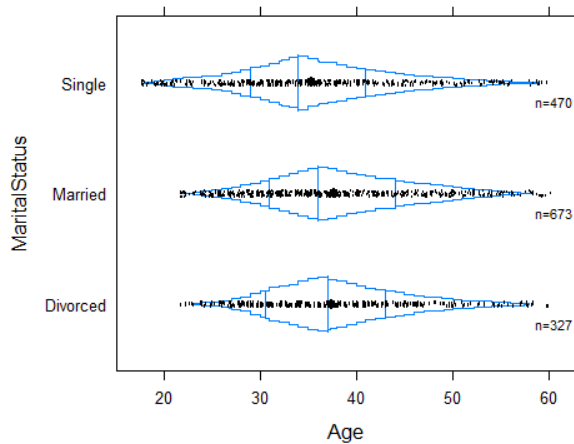
```
> bwplot(attr$EducationField ~ attr$Age, data=attr,panel=panel.bpplot,
+       probs=seq(.01,.49,by=.01), datadensity=TRUE, ylab='EducationField',xlab='Age')
```



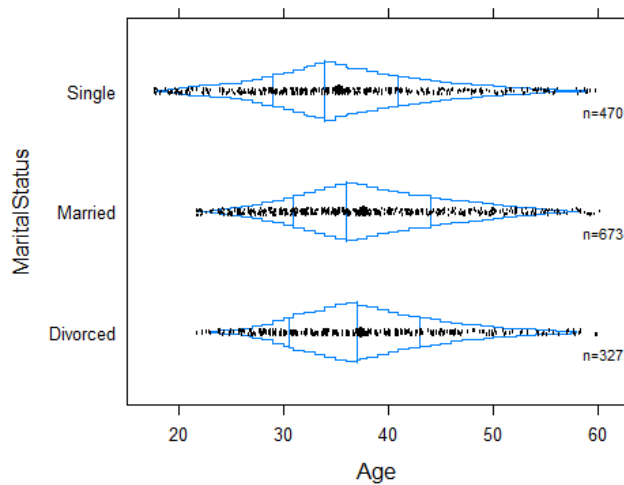
```
> bwplot(attr$JobRole ~ attr$Age, data=attr, panel=panel.bwplot,
+        probs=seq(.01, .49, by=.01), datadensity=TRUE, ylab='JobRole', xlab='Age')
```



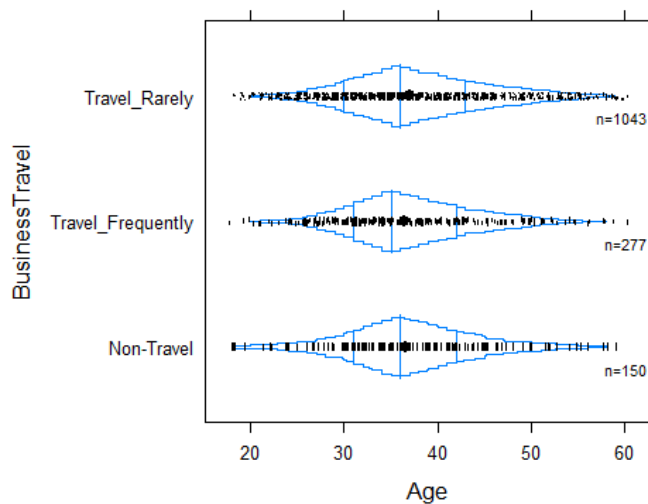
```
> bwplot(attr$MaritalStatus ~ attr$Age, data=attr, panel=panel.bwplot,
+        probs=seq(.01, .49, by=.01), datadensity=TRUE, ylab='MaritalStatus', xlab='Age')
```



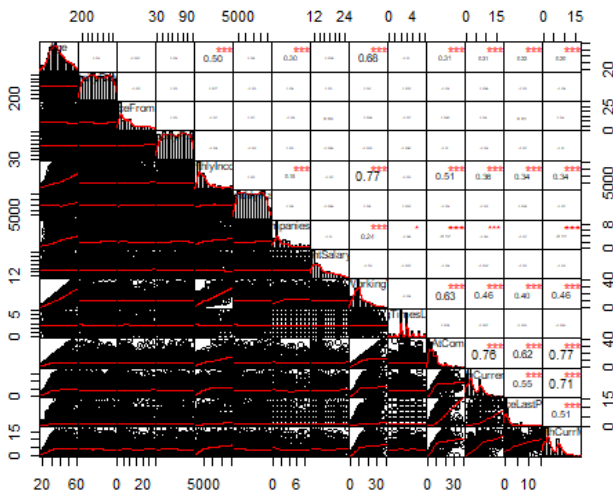
```
> bwplot(attr$MaritalStatus ~ attr$Age, data=attr, panel=panel.bwplot,
+        probs=seq(.01, .49, by=.01), datadensity=TRUE, ylab='MaritalStatus', xlab='Age')
```



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



```
> data<-attr[,c('Age', 'DailyRate', 'DistanceFromHome', 'HourlyRate',
+               'MonthlyIncome', 'MonthlyRate', 'NumCompaniesWorked', 'PercentsSalaryHike', 'T
+               'TrainingTimesLastYear', 'YearsAtCompany',
+               'YearsInCurrentRole', 'YearsSinceLastPromotion', 'YearswithCurrManager')]
> chart.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",
+                 "TrainingTimesLastYear","YearsAtCompany",
+                 "YearsInCurrentRole","YearsSinceLastPromotion","YearsWithCurrManager")
> attr[numeric_col] <- sapply(attr[numeric_col], as.numeric)

e out the numeric columns from categorical columns and storing them as a seperate dataframe
> attr_i <- attr[,c("Age","DailyRate","DistanceFromHome","HourlyRate",
+                 "MonthlyIncome","MonthlyRate","NumCompaniesWorked","PercentSalaryHike",
+                 "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)]
> temporary<- data.frame(sapply(attr_c,function(x) data.frame(model.matrix(~x-1,data =attr_c[,x]))))
> head(temporary)
  Education.x2 Education.x3 Education.x4 Education.x5 EnvironmentSatisfaction.x2 Environm
1             1             0             0             0                     1
2             0             0             0             0                     0
3             1             0             0             0                     0
4             0             0             1             0                     0
5             0             0             0             0                     0
6             1             0             0             0                     0
  EnvironmentSatisfaction.x4 MaritalStatus.xMarried MaritalStatus.xSingle overTime stockO
1              0              0              1              1
2              0              1              0              0
3              1              0              1              1
4              1              1              0              1
5              0              1              0              0
6              1              0              1              0
  StockOptionLevel.x2 StockOptionLevel.x3 workLifeBalance.x2 workLifeBalance.x3 workLifeB
1              0              0              0              0
2              0              0              0              1
3              0              0              0              1
4              0              0              0              1
5              0              0              0              1
6              0              0              1              0
```

```
> View(attr)
```

```
> #Combining the temporary and the numeric columns and create the final dataset
> attr_final <- cbind(attr_i,temporary)
> head(attr_final)
```

	Age	DailyRate	DistanceFromHome	HourlyRate	MonthlyIncome	MonthlyRate	NumCompanies
1	0.44619856	0.7422739	-1.0105654	1.3826677	-0.1083127	0.7257730	2
2	1.32191535	-1.2973331	-0.1470997	-0.2405949	-0.2916193	1.4883696	-0
3	0.00834016	1.4138821	-0.8872132	1.2842882	-0.9373347	-1.6742711	1
4	-0.42951824	1.4609690	-0.7638609	-0.4865438	-0.7633739	1.2427877	-0
5	-1.08630583	-0.5241163	-0.8872132	-1.2735802	-0.6446387	0.3257890	2
6	-0.53898284	0.5018828	-0.8872132	0.6448211	-0.7296013	-0.3440822	-1
	PercentSalaryHike	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrent		
1	-1.15016269	-0.4214990	-2.1712429	-0.164557109	-0.0632		
2	2.12858163	-0.1644554	0.1556541	0.488341541	0.7647		
3	-0.05724792	-0.5500208	0.1556541	-1.143905083	-1.1672		
4	-1.15016269	-0.4214990	0.1556541	0.161892216	0.7647		
5	-0.87693400	-0.6785426	0.1556541	-0.817455758	-0.6152		
6	-0.60370530	-0.4214990	-0.6199782	-0.001332446	0.7647		
	YearsSinceLastPromotion	YearsWithCurrManager	Education.x2	Education.x3	Education.x4	Education.x5	
1	-0.67891464	0.2457504	1	0	0	0	
2	-0.36858985	0.8062671	0	0	0	0	
3	-0.67891464	-1.1555415	1	0	0	0	
4	0.25205973	-1.1555415	0	0	0	1	
5	-0.05826506	-0.5950247	0	0	0	0	
6	0.25205973	0.5260087	1	0	0	0	
	EnvironmentsSatisfaction.x2	EnvironmentsSatisfaction.x3	EnvironmentsSatisfaction.x4	EnvironmentsSatisfaction.x5	EnvironmentsSatisfaction.x6	EnvironmentsSatisfaction.x7	MaritalStatus
1	1	0	0	0	0	0	0
2	0	1	0	0	0	0	0
3	0	0	0	0	0	0	1
4	0	0	0	0	0	0	1
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	1
	MaritalStatus.xSingle	OverTime	StockOptionLevel.x1	StockOptionLevel.x2	StockOptionLevel.x3	StockOptionLevel.x4	StockOptionLevel.x5
1	1	1	0	0	0	0	0
2	0	0	1	0	0	0	0
3	1	1	0	0	0	0	0
4	0	1	0	0	0	0	0
5	0	0	1	0	0	0	0
6	1	0	0	0	0	0	0
	WorkLifeBalance.x2	WorkLifeBalance.x3	WorkLifeBalance.x4	WorkLifeBalance.x5	WorkLifeBalance.x6	WorkLifeBalance.x7	WorkLifeBalance.x8
1	0	0	0	0	0	0	0
2	0	1	0	0	0	0	0
3	0	1	0	0	0	0	0
4	0	1	0	0	0	0	0
5	0	1	0	0	0	0	0
6	1	0	0	0	0	0	0

```
> glimpse(attr_final)
```

```
Observations: 1,470
```

```
Variables: 30
```

```
$ Age          <dbl> 0.44619856, 1.32191535, 0.00834016, -0.42951824, -1.08630583, -0.53898284, ...
$ DailyRate    <dbl> 0.74227393, -1.29733311, 1.41388208, 1.46096900, -0.52411630, 0.50188284, ...
$ DistanceFromHome <dbl> -1.01056544, -0.14709966, -0.88721318, -0.76386093, -0.88721320, -0.88721320, ...
$ HourlyRate    <dbl> 1.38266773, -0.24059489, 1.28428818, -0.48654378, -1.27358020, 0.64482110, ...
$ MonthlyIncome <dbl> -0.108312654, -0.291619349, -0.937334707, -0.763373892, -0.644638700, -0.729601300, ...
$ MonthlyRate   <dbl> 0.72577730, 1.4883696, -1.6742711, 1.2427877, 0.3257890, -0.3440822, ...
$ NumCompaniesworked <dbl> 2.1244130, -0.6778187, 1.3237753, -0.6778187, 2.524731, -0.6778187, ...
$ PercentSalaryHike <dbl> -1.15016269, 2.12858163, -0.05724792, -1.15016269, -0.87693400, 0.50188284, ...
$ TotalWorkingYears <dbl> -0.42149902, -0.16445544, -0.55002081, -0.42149902, -0.67854260, -0.42149902, ...
$ TrainingTimesLastYear <dbl> -2.1712429, 0.1556541, 0.1556541, 0.1556541, 0.1556541, -0.6199782, ...
$ YearsAtCompany <dbl> -0.164557109, 0.488341541, -1.143905083, 0.161892216, -0.817455758, -0.001332446, ...
$ YearsInCurrentRole <dbl> -0.06327437, 0.76473737, -1.16729002, 0.76473737, -0.61527437, 0.76473737, ...
$ YearsSinceLastPromotion <dbl> -0.67891464, -0.36858985, -0.67891464, 0.25205973, -0.05826506, 0.25205973, ...
$ YearsWithCurrManager <dbl> 0.2457504, 0.8062671, -1.1555415, -1.1555415, -0.5950247, 0.5260087, ...
```



```

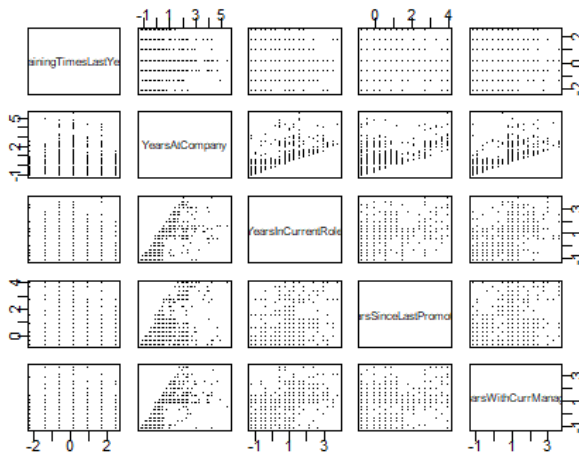
$ Education.x2 <dbl> 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 1,
$ Education.x3 <dbl> 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0,
$ Education.x4 <dbl> 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
$ Education.x5 <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
$ EnvironmentSatisfaction.x2 <dbl> 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0,
$ EnvironmentSatisfaction.x3 <dbl> 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0,
$ EnvironmentSatisfaction.x4 <dbl> 0, 0, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1,
$ MaritalStatus.xMarried <dbl> 0, 1, 0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0,
$ MaritalStatus.xSingle <dbl> 1, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0,
$ OverTime <dbl> 1, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 1, 1,
$ StockOptionLevel.x1 <dbl> 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 1, 1, 1, 0, 1, 0,
$ StockOptionLevel.x2 <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1,
$ StockOptionLevel.x3 <dbl> 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
$ WorkLifeBalance.x2 <dbl> 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1, 1,
$ WorkLifeBalance.x3 <dbl> 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0,
$ WorkLifeBalance.x4 <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,

```

```

##Matrix Plots, Covariance and Correlations Plots
#ScatterPlot matrix
pairs(attr_final[,10:14],pch=".",cex=1.5)

```



```
##Test of Significance
```

```
#T-Test
```

```
#Null Hypothesis - The two means are equal
```

```
#Alternate Hypothesis - Difference in the two means is not zero
```

```
#pvalue >= 0.05, accept null hypothesis
```

```
#Or
```

```
#else accept the alternate hypothesis
```

```
#Univariate mean comparison using t test
```

```
> #Monthly Income and Attrition
```

```
> with(data=attr,t.test(attr$MonthlyIncome[attr$Attrition=="Yes"],attr$MonthlyIncome[attr$Attrition=="No"],var.equal=TRUE))
```

```
Two Sample t-test
```

```
data: attr$MonthlyIncome[attr$Attrition == "Yes"] and attr$MonthlyIncome[attr$Attrition == "No"]
t = -6.2039, df = 1468, p-value = 7.147e-10
```

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

```
95 percent confidence interval:
```

```
-2692.446 -1398.847
sample estimates:
mean of x mean of y
4787.093 6832.740
```

```
> #HourlyRate and Attrition
> with(data=attr,t.test(attr$HourlyRate[attr$Attrition=="Yes"],attr$HourlyRate[attr$Attrition=="No"],var.equal=TRUE))
```

Two Sample t-test

```
data: attr$HourlyRate[attr$Attrition == "Yes"] and attr$HourlyRate[attr$Attrition == "No"]
t = -0.26229, df = 1468, p-value = 0.7931
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-3.207565 2.450946
sample estimates:
mean of x mean of y
65.57384 65.95215
```

```
> #Daily Rate and Attrition
> with(data=attr,t.test(attr$DailyRate[attr$Attrition=="Yes"],attr$DailyRate[attr$Attrition=="No"],var.equal=TRUE))
```

Two Sample t-test

```
data: attr$DailyRate[attr$Attrition == "Yes"] and attr$DailyRate[attr$Attrition == "No"]
t = -2.1741, df = 1468, p-value = 0.02986
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-118.209251 -6.073932
sample estimates:
mean of x mean of y
750.3629 812.5045
```

```
> #Age and Attrition
> with(data=attr,t.test(attr$Age[attr$Attrition=="Yes"],attr$Age[attr$Attrition=="No"],var.equal=TRUE))
```

Two Sample t-test

```
data: attr$Age[attr$Attrition == "Yes"] and attr$Age[attr$Attrition == "No"]
t = -6.1787, df = 1468, p-value = 8.356e-10
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-5.208825 -2.698450
sample estimates:
mean of x mean of y
33.60759 37.56123
```

```
> #DistanceFromHome and Attrition
> with(data = attr,t.test(attr$DistanceFromHome[attr$Attrition=="Yes"],attr$DistanceFromHome[attr$Attrition=="No"],var.equal=TRUE))
```

Two Sample t-test

```
data: attr$DistanceFromHome[attr$Attrition == "Yes"] and attr$DistanceFromHome[attr$Attrition == "No"]
t = -43.048, df = 1468, p-value < 2.2e-16
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
-28.15538 -25.70126
sample estimates:
mean of x mean of y
10.63291 37.56123
```

```
> #Monthly Income and Gender
```

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

Two Sample t-test

```
data: attr$MonthlyIncome[attr$Gender == "Male"] and attr$MonthlyIncome[attr$Gender == "Female"]
t = -1.2213, df = 1468, p-value = 0.2222
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -797.6470  185.5303
sample estimates:
mean of x mean of y
 6380.508  6686.566
```

```
> #DistanceFromHome and Gender
```

```
> with(data = attr,t.test(attr$DistanceFromHome[attr$Gender=="Male"],attr$DistanceFromHome[attr$Gender=="Female"],var.equal = TRUE))
```

Two Sample t-test

```
data: attr$DistanceFromHome[attr$Gender == "Male"] and attr$DistanceFromHome[attr$Gender == "Female"]
t = -0.070902, df = 1468, p-value = 0.9435
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.8775316  0.8163071
sample estimates:
mean of x mean of y
  9.180272  9.210884
```

```
> #Monthly Income and gender
```

```
> t2testgender <- hotelling.test(attr$MonthlyIncome + attr$DistanceFromHome ~ attr$Gender)
```

```
> cat("T2 statistic =",t2testgender$stat[[1]],"\n")
```

```
T2 statistic = 1.499903
```

```
> print(t2testgender)
```

```
Test stat:  0.74944
```

```
Numerator df:  2
```

```
Denominator df:  1467
```

```
P-value:  0.4728
```

```
> #Monthly Income and Attrition
```

```
> t2testattr <- hotelling.test(attr$MonthlyIncome + attr$DistanceFromHome ~ attr$Attrition)
```

```
> cat("T2 statistic =",t2testattr$stat[[1]],"\n")
```

```
T2 statistic = 47.28597
```

```
> print(t2testattr)
```

```
Test stat:  23.627
```

```
Numerator df:  2
```

```
Denominator df:  1467
```

```
P-value:  7.957e-11
```

```
> #PCA
```

```
> #plot.new(); dev.off()
```

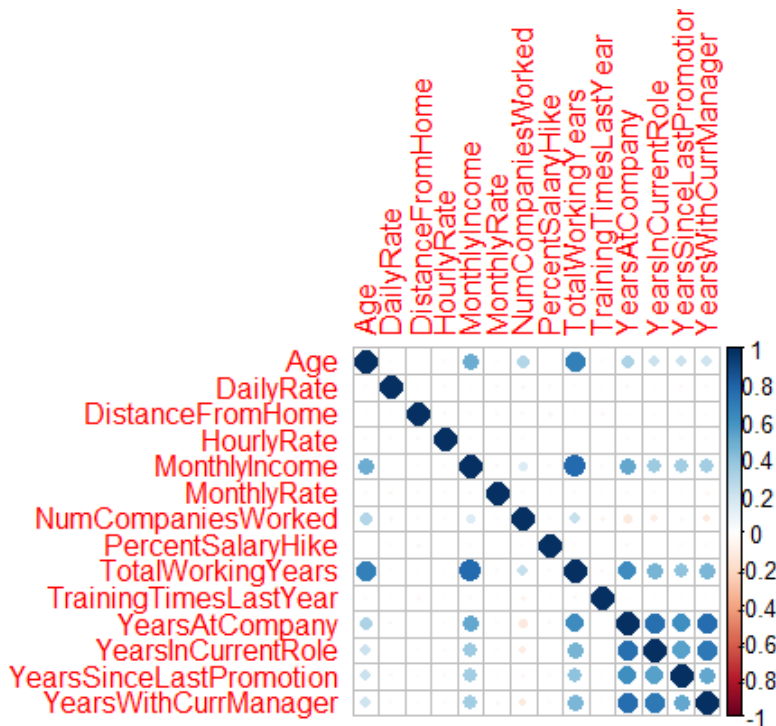
```
> #Considering the numeric columns that will help to get variance in data
```

```
> attr_pca <- attr[,numvar]
```

```
> #Plotting correlation plot to understand the how feature are related to each other
```

```
> correplot<-cor(attr_pca)
```

```
> corrplot(corrplot,method="circle")
```



```
> #Finding the principal components of data
> attr_pca <- prcomp(attr_pca,scale=TRUE)
> attr_pca
Standard deviations (1, ..., p=14):
 [1] 2.0041891 1.2846031 1.0336848 1.0257290 1.0046944 0.9962218 0.9763963 0.9578606 0.84
[11] 0.6854527 0.5321872 0.4397545 0.3742537
```

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

	PC1	PC2	PC3	PC4	PC5
Age	0.280157344	-0.472170158	0.003362193	0.004488409	-0.039563410
DailyRate	-0.006815197	-0.077962430	-0.207301367	-0.609569867	-0.211568990
DistanceFromHome	0.004812032	0.041564987	-0.664884791	0.306131593	0.048941659
HourlyRate	-0.011288550	-0.062668026	-0.352147686	-0.255816205	0.602292088
MonthlyIncome	0.360622909	-0.290395305	0.052415102	0.025332267	-0.034941693
MonthlyRate	0.001123298	-0.086158010	0.020312197	0.664085954	-0.101166486
NumCompaniesWorked	0.030991906	-0.560133264	0.005628265	-0.041875610	0.017785645
PercentSalaryHike	-0.015351368	0.004618486	-0.465841883	-0.055689609	-0.698726672
TotalWorkingYears	0.415285665	-0.318115831	0.009368263	0.007027664	-0.024159198
TrainingTimesLastYear	-0.010993402	0.092457674	0.409028173	-0.138279489	-0.293982017
YearsAtCompany	0.443443529	0.213079968	0.002115638	-0.010571214	0.024921329
YearsInCurrentRole	0.391353065	0.279423881	-0.048111956	-0.038785223	-0.004927194
YearsSinceLastPromotion	0.344322397	0.198658357	0.003993040	0.027659809	0.019935007
YearsWithCurrManager	0.386171187	0.295138965	-0.031745944	-0.034459502	0.021898300

	PC7	PC8	PC9	PC10	PC11
Age	-0.098196914	-0.05927715	-0.183114693	0.005033984	-0.74367068
DailyRate	0.715405171	-0.02770642	-0.028707475	0.040304455	-0.01980752
DistanceFromHome	0.031447533	-0.65217193	0.037737577	0.002338630	0.02927699
HourlyRate	-0.221010405	0.40142111	-0.004675476	0.018009772	0.03725997
MonthlyIncome	-0.012272736	-0.03685912	-0.377381332	0.104651321	0.61775910
MonthlyRate	0.482943083	0.40448871	0.056690883	-0.044889268	-0.01681584
NumCompaniesWorked	-0.032989593	-0.03355765	0.775796629	-0.129586743	0.19687866
PercentSalaryHike	-0.376210309	0.38335261	0.012190972	0.019568502	0.04082482
TotalWorkingYears	-0.029511945	-0.04398227	-0.196663458	-0.038585533	0.08301594
TrainingTimesLastYear	-0.217564575	-0.29622601	0.130785998	-0.017811234	0.02954240
YearsAtCompany	0.005335572	0.01862614	-0.001551392	-0.104225054	0.03762072
YearsInCurrentRole	0.062086964	0.05420752	0.201595025	-0.271683842	-0.04458982
YearsSinceLastPromotion	0.022129234	0.03850513	0.306725567	0.845951303	-0.08053456

```

YearsWithCurrManager    0.011525930  0.04176204  0.161413516 -0.407140185 -0.06576770  0
                        PC13      PC14
Age                    0.1893016403  0.237072230
DailyRate              -0.0099081253  0.018837870
DistanceFromHome       0.0057709912  0.011991386
HourlyRate             0.0049037331 -0.003314012
MonthlyIncome          0.4041044054  0.279006032
MonthlyRate            -0.0083381972  0.009367738
NumCompaniesWorked     -0.0369554196  0.107234673
PercentSalaryHike      -0.0183445446  0.010585240
TotalWorkingYears      -0.4158888971 -0.705989494
TrainingTimesLastYear  0.0008431661 -0.012085362
YearsAtCompany         -0.6494086309  0.562584645
YearsInCurrentRole     0.1948014145 -0.130643692
YearsSinceLastPromotion 0.0977011821 -0.083447864
YearsWithCurrManager   0.3959144832 -0.121010943
> names(attr_pca)
[1] "sdev" "rotation" "center" "scale" "x"
> head(attr_pca)
$sdev
[1] 2.0041891 1.2846031 1.0336848 1.0257290 1.0046944 0.9962218 0.9763963 0.9578606 0.84
[11] 0.6854527 0.5321872 0.4397545 0.3742537

```

```

$rotation
                        PC1      PC2      PC3      PC4      PC5
Age                    0.280157344 -0.472170158  0.003362193  0.004488409 -0.039563410
DailyRate              -0.006815197 -0.077962430 -0.207301367 -0.609569867 -0.211568990
DistanceFromHome       0.004812032  0.041564987 -0.664884791  0.306131593  0.048941659
HourlyRate             -0.011288550 -0.062668026 -0.352147686 -0.255816205  0.602292088
MonthlyIncome          0.360622909 -0.290395305  0.052415102  0.025332267 -0.034941693
MonthlyRate            0.001123298 -0.086158010  0.020312197  0.664085954 -0.101166486
NumCompaniesWorked     0.030991906 -0.560133264  0.005628265 -0.041875610  0.017785645
PercentSalaryHike      -0.015351368  0.004618486 -0.465841883 -0.055689609 -0.698726672
TotalWorkingYears      0.415285665 -0.318115831  0.009368263  0.007027664 -0.024159198
TrainingTimesLastYear  -0.010993402  0.092457674  0.409028173 -0.138279489 -0.293982017
YearsAtCompany         0.443443529  0.213079968  0.002115638 -0.010571214  0.024921329
YearsInCurrentRole     0.391353065  0.279423881 -0.048111956 -0.038785223 -0.004927194
YearsSinceLastPromotion 0.344322397  0.198658357  0.003993040  0.027659809  0.019935007
YearsWithCurrManager   0.386171187  0.295138965 -0.031745944 -0.034459502  0.021898300
                        PC7      PC8      PC9      PC10     PC11
Age                    -0.098196914 -0.05927715 -0.183114693  0.005033984 -0.74367068 -0
DailyRate              0.715405171 -0.02770642 -0.028707475  0.040304455 -0.01980752  0
DistanceFromHome       0.031447533 -0.65217193  0.037737577  0.002338630  0.02927699  0
HourlyRate             -0.221010405  0.40142111 -0.004675476  0.018009772  0.03725997 -0
MonthlyIncome          -0.012272736 -0.03685912 -0.377381332  0.104651321  0.61775910 -0
MonthlyRate            0.482943083  0.40448871  0.056690883 -0.044889268 -0.01681584  0
NumCompaniesWorked     -0.032989593 -0.03355765  0.775796629 -0.129586743  0.19687866  0
PercentSalaryHike      -0.376210309  0.38335261  0.012190972  0.019568502  0.04082482  0
TotalWorkingYears      -0.029511945 -0.04398227 -0.196663458 -0.038585533  0.08301594  0
TrainingTimesLastYear  -0.217564575 -0.29622601  0.130785998 -0.017811234  0.02954240 -0
YearsAtCompany         0.005335572  0.01862614 -0.001551392 -0.104225054  0.03762072  0
YearsInCurrentRole     0.062086964  0.05420752  0.201595025 -0.271683842 -0.04458982 -0
YearsSinceLastPromotion 0.022129234  0.03850513  0.306725567  0.845951303 -0.08053456  0
YearsWithCurrManager   0.011525930  0.04176204  0.161413516 -0.407140185 -0.06576770  0
                        PC13      PC14
Age                    0.1893016403  0.237072230
DailyRate              -0.0099081253  0.018837870
DistanceFromHome       0.0057709912  0.011991386
HourlyRate             0.0049037331 -0.003314012
MonthlyIncome          0.4041044054  0.279006032
MonthlyRate            -0.0083381972  0.009367738
NumCompaniesWorked     -0.0369554196  0.107234673
PercentSalaryHike      -0.0183445446  0.010585240
TotalWorkingYears      -0.4158888971 -0.705989494

```

TrainingTimesLastYear	0.0008431661	-0.012085362
YearsAtCompany	-0.6494086309	0.562584645
YearsInCurrentRole	0.1948014145	-0.130643692
YearsSinceLastPromotion	0.0977011821	-0.083447864
YearsWithCurrManager	0.3959144832	-0.121010943

\$center

Age	DailyRate	DistanceFromHome	Hour
36.923810	802.485714	9.192517	65.
MonthlyIncome	MonthlyRate	NumCompaniesWorked	PercentSala
6502.931293	14313.103401	2.693197	15.
TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurre
11.279592	2.799320	7.008163	4.
YearsSinceLastPromotion	YearsWithCurrManager		
2.187755	4.123129		

\$scale

Age	DailyRate	DistanceFromHome	Hour
9.135373	403.509100	8.106864	20.
MonthlyIncome	MonthlyRate	NumCompaniesWorked	PercentSala
4707.956783	7117.786044	2.498009	3.
TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurre
7.780782	1.289271	6.126525	3.
YearsSinceLastPromotion	YearsWithCurrManager		
3.222430	3.568136		

\$x

	PC1	PC2	PC3	PC4	PC5	PC6
[1,]	-0.243044079	-1.805296680	-0.3104169553	-0.384994275	2.0169575215	0.984793983
[2,]	0.854288163	0.381073595	-0.5252390003	1.608645799	-1.5927436292	-0.481865695
[3,]	-2.198275394	-1.413301606	-0.0582282745	-2.596801032	0.6022422032	-0.023230640
[4,]	-0.570845554	0.682294015	0.9530781591	-0.112517223	0.0144209522	-0.415235118
[5,]	-1.567685771	-0.965438549	1.6427717726	0.537047071	-0.0703157168	0.940560119
[6,]	-0.033228256	1.476192828	0.1768758528	-0.871158691	0.9282306482	0.367849216
[7,]	-1.176981984	-2.344142438	-0.5229233979	-1.666338771	-0.8793271137	-0.417767837
[8,]	-2.668563284	0.310022541	-2.6128166708	-0.330963952	-1.2486460778	-0.052250851
[9,]	0.910894519	1.213005861	-1.5039201417	1.144947290	-1.1238829367	1.049881443
[10,]	1.339778839	-0.208584655	-1.9076328247	-0.281672326	1.0866328829	-1.252674274
[11,]	-1.227202504	0.961999888	0.0613545738	0.034499533	0.4709461858	-2.043427871
[12,]	-0.073116546	1.760186112	0.5344916830	1.247906142	0.5189044912	0.442256861
[13,]	-1.087474516	1.023377864	-1.5147071841	1.573775407	-0.7475549471	1.511464717
[14,]	-1.814073316	0.601874393	-1.3014136722	-1.101977678	1.6522331947	-0.334506872
[15,]	-1.659410211	0.292702788	-0.0672556843	1.527211158	0.0369416431	-0.176183833
[16,]	1.744251934	1.686663324	-1.1177364895	-0.381693162	0.6609099755	1.223658522
[17,]	-1.118546968	1.132058901	1.4189672811	0.273681898	0.7687430566	-1.460717606
[18,]	-2.875446285	0.684977918	-1.2101773533	-1.069482747	1.5219403902	-0.105065952
[19,]	4.306398521	-1.060188116	0.2102166478	-0.374474127	-0.3205736368	-1.006842601
[20,]	-1.274793286	-0.518252552	1.7607337154	-0.263605442	0.4775025923	1.296215086
[21,]	-1.707674413	1.416074395	-0.2866612249	-0.911443288	0.0740619531	-1.694982203
[22,]	-0.973935456	-1.013413533	-1.1120212000	-1.850388185	-1.3640205357	-0.666890243
[23,]	1.686994016	1.312303531	1.5096245660	1.224455487	0.2429059015	-0.652215366
[24,]	-3.186960204	1.127496005	0.4028852195	0.661084708	0.6427677466	-2.782189999
[25,]	-1.236420346	0.070998887	0.2998566707	0.248336464	1.5088956715	0.030328006
[26,]	4.335210193	-1.187855044	0.8439064948	-1.135518002	0.1502712115	0.089980426
[27,]	0.202667449	1.487707345	-1.0496066009	-1.510499974	-1.5194444667	-1.172856717
[28,]	0.522611662	0.517960123	0.7496484428	1.189509235	0.3725504816	0.467749272
[29,]	4.167497779	1.068632778	1.1917707595	-0.655936499	-0.3603395503	0.680646739
[30,]	0.855668649	-2.594944348	0.7337329455	0.725830150	0.9881939586	-0.389610046
[31,]	-2.101453288	-0.598109160	0.9218830885	-1.261397525	1.1285699242	0.185406411
[32,]	-0.628686779	-0.506577343	1.0557480273	-0.359363863	-1.2767722294	-1.259019980
[33,]	-0.585760317	1.290594877	1.0175278792	0.759970743	0.8434796204	-1.537202603
[34,]	-1.453000790	-0.878346751	1.6553451372	-1.466979255	-0.7652620288	-1.050427892
[35,]	-2.295426038	0.497391245	0.3961407175	-1.173667681	0.0495687553	1.396660954
[36,]	-0.832994065	0.042990012	0.7006144001	-0.308495224	0.3417332881	-0.722274641

[37,]	-1.354693336	-0.382172652	-0.0113330121	-1.423881781	1.0314915947	0.517495020	-
[38,]	-1.788459375	0.520002398	0.3186189447	-1.168483914	1.3010327250	-0.499080505	-
[39,]	-1.940888185	-1.947119717	0.3014065269	-0.616302576	0.6580712905	-0.112112477	-
[40,]	-0.826827035	0.269317986	0.4683770185	-1.617065750	-1.5424619460	1.078602496	-
[41,]	-2.540242339	0.231335668	0.9249250633	-0.019213294	1.0357898965	0.023182442	-
[42,]	-2.775064596	0.699871648	2.2688244419	-0.255818018	-1.5958498425	-1.351223462	-
[43,]	-2.660977369	0.709039810	-1.1151323620	-0.173311857	0.1700305471	0.580484544	-
[44,]	0.494241988	1.355663630	-0.4558314906	-0.773576913	-0.0893201999	2.889936395	-
[45,]	0.755465347	1.607572626	-0.5109637132	-0.506888091	-1.4233075836	1.057147451	-
[46,]	5.804951893	1.078091201	-0.6975281151	0.051444706	0.4337848886	1.614106696	-
[47,]	0.806658069	1.653442819	-2.3068106160	-0.295882847	-0.4722918379	0.134169049	-
[48,]	-1.995881882	-0.926896408	-1.9960316143	0.633599363	-0.1729888148	1.021151201	-
[49,]	0.844245935	-0.616849916	-0.8194206960	-0.921810229	-0.7717068286	-1.818536061	-
[50,]	-2.418330657	0.297326189	-0.3513459999	-1.101751982	-1.5156578641	1.499053343	-
[51,]	-0.617002088	-3.634989196	0.3562096372	0.118216390	1.4389894618	-0.220229442	-
[52,]	-1.874898008	0.830881805	0.6248015543	-1.142134976	-0.3600199657	0.329946720	-
[53,]	-0.595964470	-1.218466650	-0.8408839570	-2.447215614	-0.9399446833	0.774272087	-
[54,]	-0.697653611	-0.440311397	-0.1001609790	-1.002941201	0.6741005136	-0.305412825	-
[55,]	-2.079810230	-0.955185144	-1.8161177942	0.441813227	-1.3960822450	0.253432093	-
[56,]	3.708466615	1.814109184	-0.0097541922	-0.036909451	2.1090226075	0.552998695	-
[57,]	0.809848967	1.103897503	-1.7108414088	-0.291327045	-1.1137226784	-0.318923581	-
[58,]	-1.465681948	0.058005177	-0.5799431432	0.624721643	-1.1676958094	0.275086845	-
[59,]	0.172118882	0.857390902	-0.3222266947	-0.286150650	-1.6974104391	0.722818482	-
[60,]	-0.134488687	0.774824505	0.0742047436	-1.668328387	-0.8320217703	1.458220908	-
[61,]	1.154466224	1.922306493	0.5340354541	0.208456672	-2.0449281318	1.172737829	-
[62,]	1.015549604	1.685679343	-1.0836803069	0.522264077	0.9425346951	0.960676995	-
[63,]	5.230825960	-1.151655660	0.8119758029	0.364485427	-0.0405314789	0.826552609	-
[64,]	5.030282900	-0.755218265	-1.7678975054	-2.044562287	1.6478909242	-0.737221001	-
[65,]	3.788984539	1.946298043	-0.0945560272	-1.067010987	0.3184679516	0.860439229	-
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[67,]	-0.689313482	0.194433528	-0.4992692899	-0.091816631	0.9077818943	-1.467101142	-
[68,]	-0.360119052	-2.235551626	-0.3033093916	-0.208683127	-0.8858009134	0.057772762	-
[69,]	-1.590660053	-0.244778958	0.5118655703	-0.944308747	1.1711060680	0.909011154	-
[70,]	-2.349000231	-0.024496709	-1.0212757577	1.625278907	0.8108621115	0.977055716	-
[71,]	0.537061435	-3.049510452	0.9612799574	0.240109595	0.1951466351	0.179765350	-

	PC8	PC9	PC10	PC11	PC12	PC
[1,]	1.5917738507	1.1863471823	-0.8721216003	-0.0964053395	0.1652689774	2.697995e-
[2,]	1.4396138690	-0.2915207036	-0.9133153760	-1.2704956060	-0.1223848585	3.003787e-
[3,]	0.1645450520	0.7037177946	0.2334286037	-0.2063109991	0.0757180104	-2.034191e-
[4,]	0.3788485663	-0.0232142896	0.4483748666	-0.4255970757	-1.1905425766	-5.888785e-
[5,]	-0.2110090034	2.3132854086	-0.0092829889	0.7911383832	0.0932147601	-1.001822e-
[6,]	0.8232618244	-0.2219554949	-0.0872069258	-0.4352547853	-0.2311142456	2.074828e-
[7,]	0.6783978017	-0.4439152914	0.2850426885	-1.9955214056	0.0476998780	-7.608564e-
[8,]	-0.3684730529	-0.4875080936	0.4800518063	0.0543954145	0.1020736714	-4.659415e-
[9,]	-0.9351740522	-0.8467583073	-0.7791175369	0.1173708729	-0.0207647030	7.178969e-
[10,]	-0.9887551265	1.8168832792	0.5496258442	0.0893646974	0.1719743118	1.482873e-
[11,]	-0.7428933771	-0.3487121205	-0.3578297611	-0.5029560805	-0.2422407358	-3.914638e-
[12,]	-1.0813690872	-0.3767620037	-1.1058405989	0.0965394361	0.4399899746	-2.594555e-
[13,]	-1.2884619372	-0.0363538480	0.8308304610	-0.2190499489	0.3017206595	-5.138678e-
[14,]	-0.8195524226	-0.7310455341	0.3812739185	-0.4949317648	-0.0110627441	2.587105e-
[15,]	-1.9271549894	1.2343495139	-0.5198251249	0.4250203594	0.1772497877	-2.805626e-
[16,]	-1.2962378063	0.1672283742	0.9190505173	0.6052322133	-0.1396419825	7.886224e-
[17,]	-0.0866130578	-0.4359922773	-0.4908235512	-0.1712840455	0.4964863948	-6.197885e-
[18,]	-0.3703968876	-0.4515944960	0.4707221281	0.6870011577	0.0480464742	-1.323742e-
[19,]	1.1419762947	-1.3201148540	-0.5553725566	-0.0202145544	0.0106513546	-1.330532e+
[20,]	-0.9326540622	0.6299363640	-0.0098247146	-0.2880597580	-0.0739027515	1.175321e-
[21,]	0.0042898132	-0.3112305780	0.1801517860	0.6691640181	0.1912063602	-6.152712e-
[22,]	0.3446067836	1.3648622584	-0.4792426584	0.2130812121	0.0911878469	-3.605121e-
[23,]	-0.2496196395	-0.6875524464	-0.9335162824	0.6027692112	0.8094891808	7.005028e-
[24,]	-0.3520700093	0.2822430507	0.2555611279	0.6350192662	0.0179911182	-1.389628e-
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[26,]	-0.6259760526	-0.5375940379	-0.5583140528	0.3347066400	-1.0951792994	8.320370e-
[27,]	-0.6537874675	0.3570074959	0.9290619928	-0.0189461399	1.1560600116	-2.554831e-
[28,]	-0.0648482848	-0.7354981588	0.5503138531	-0.7380133792	-0.9496643546	8.389053e-


```

[29,] -1.2648397307  0.3155536872 -1.1110140575 -0.1549320265  2.1008653026 -1.743973e-
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[38,]  0.6935995880 -0.2003120841  0.5271573093 -0.6067308937 -0.0279386513  2.824748e-
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[43,] -1.9884712967 -0.3763602810  0.3022550599  0.1729522027  0.2552767122 -3.327794e-
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[48,]  0.0379981462  0.0139823408  0.2379323987 -0.1482978143  0.0345722067 -2.626249e-
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[50,] -0.4960323101 -0.6439180110  0.3515209761 -0.5484838822  0.2054958400  1.408071e-
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[68,]  0.3270971145 -1.6969908177  0.3987065997 -0.0530068030  0.1509487886 -4.247686e-
[69,]  0.3792991801  0.4293974391  0.0802128266 -0.3229283966 -0.0234897322 -3.881229e-
[70,]  1.5255487349 -1.1502222404  0.3958031962 -0.5136583440 -0.0367616655  1.303524e-
[71,]  0.4884620531  0.4469007175 -0.3625035208 -1.6091056814  0.0695982865 -7.853735e-
[ reached getOption("max.print") -- omitted 1399 rows ]

```

```
> summary(attr_pca)
```

```
Importance of components:
```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
Standard deviation	2.0042	1.2846	1.03368	1.02573	1.0047	0.99622	0.9764	0.95786	0.8500
Proportion of Variance	0.2869	0.1179	0.07632	0.07515	0.0721	0.07089	0.0681	0.06554	0.0516
Cumulative Proportion	0.2869	0.4048	0.48111	0.55626	0.6284	0.69925	0.7673	0.83288	0.8845

	PC12	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

```
> #Extract variance against features
```

```
> eigenvalues<-attr_pca$sdev^2
```

```
> eigenvalues
```

```
[1] 4.0167738 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.9174969 0.72
[11] 0.4698454 0.2832233 0.1933840 0.1400658
```

```
> sum(eigenvalues)
```

```
[1] 14
```

```
> names(eigenvalues) <- paste("PC",1:14,sep="")
```

```
> eigenvalues
```



```

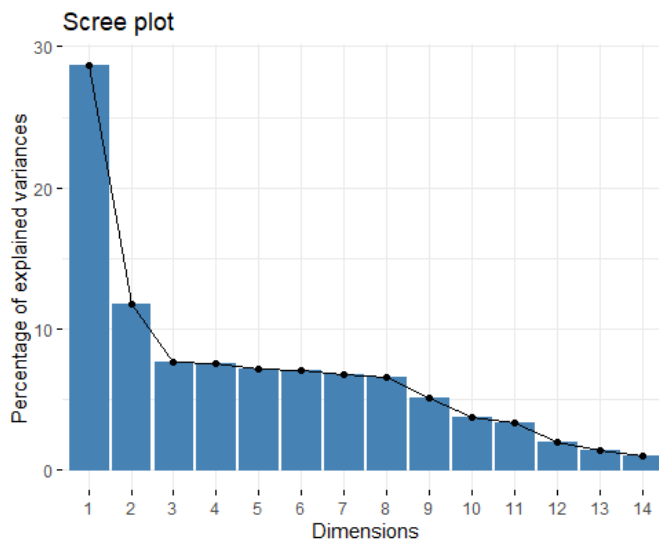
      PC1      PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9
4.0167738 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.9174969 0.7224654
      PC12     PC13     PC14
0.2832233 0.1933840 0.1400658
> sumoflambdas <- sum(eigenvalues)
> sumoflambdas
[1] 14
> #Variance %
> pctvar<- (eigenvalues/sumoflambdas)*100
> pctvar
      PC1      PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9
28.691241 11.787180  7.632173  7.515143  7.210077  7.088985  6.809641  6.553550  5.160467
      PC12     PC13     PC14
 2.023023  1.381314  1.000470
> #Calculate cumulative of variance
> cumvar <- cumsum(pctvar)
> cumvar
      PC1      PC2      PC3      PC4      PC5      PC6      PC7      PC8      PC9
28.69124 40.47842 48.11059 55.62574 62.83581 69.92480 76.73444 83.28799 88.44846
      PC12     PC13     PC14
97.61822 98.99953 100.00000

```

```

> #Visualize PCA using Scree plot
> fviz_screplot(attr_pca, ncp=14)

```



```

> summary(attr_pca)
Importance of components:

```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
Standard deviation	2.0042	1.2846	1.03368	1.02573	1.0047	0.99622	0.9764	0.95786	0.8500
Proportion of Variance	0.2869	0.1179	0.07632	0.07515	0.0721	0.07089	0.0681	0.06554	0.0516
Cumulative Proportion	0.2869	0.4048	0.48111	0.55626	0.6284	0.69925	0.7673	0.83288	0.8845

	PC12	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

```

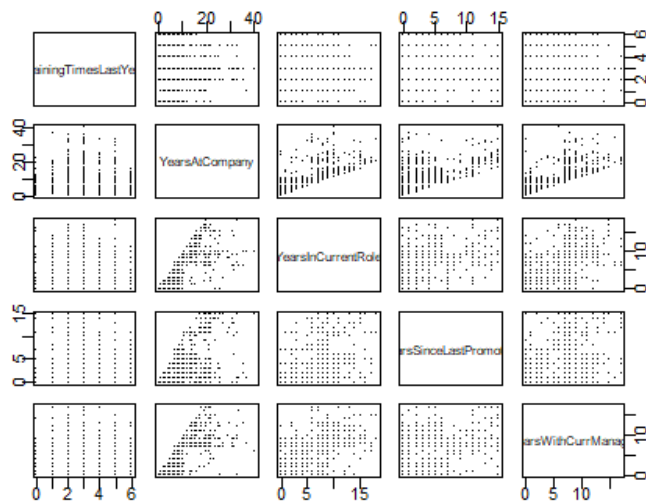
> #PCA
> #plot.new(); dev.off()
> #Considering the numeric columns that will help to get variance in data
> attr_pca <- attr[,numvar]
> # solve the error "Figure margins too large"
> par("mar")
[1] 5.1 4.1 4.1 2.1

```

```

> par(mar=c(1,1,1,1))
> #graphics.off()
> #dev.off()
> ##Matrix Plots, Covariance and Correlations Plots
> #ScatterPlot matrix
> pairs(attr_pca[,10:14],pch=".",cex=1.5)

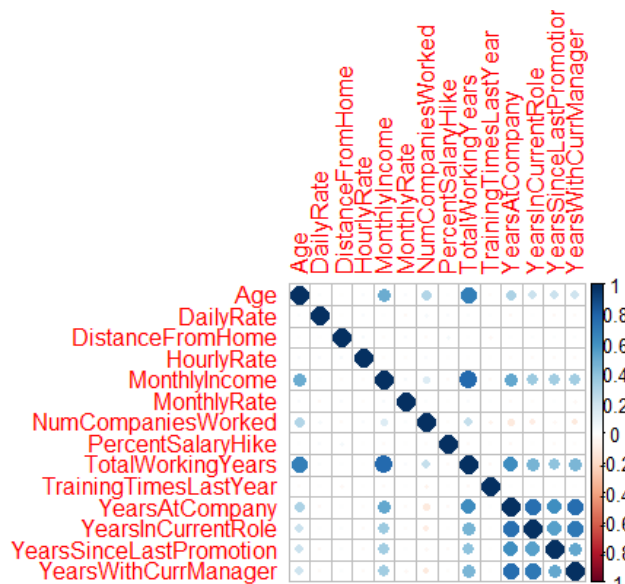
```



```

> #Plotting correlation plot to understand the how feature are related to each other
> correplot<-cor(attr_pca)
> corplot(correplot,method="circle")

```



```

> #Finding the principal components of data
> attr_pca_done <- prcomp(attr_pca,scale=TRUE)
> attr_pca_done
Standard deviations (1, ..., p=14):
[1] 2.0041891 1.2846031 1.0336848 1.0257290 1.0046944 0.9962218 0.9763963 0.9578606 0.84
[11] 0.6854527 0.5321872 0.4397545 0.3742537

```

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

	PC1	PC2	PC3	PC4	PC5
Age	0.280157344	-0.472170158	0.003362193	0.004488409	-0.039563410
DailyRate	-0.006815197	-0.077962430	-0.207301367	-0.609569867	-0.211568990
DistanceFromHome	0.004812032	0.041564987	-0.664884791	0.306131593	0.048941659
HourlyRate	-0.011288550	-0.062668026	-0.352147686	-0.255816205	0.602292088
MonthlyIncome	0.360622909	-0.290395305	0.052415102	0.025332267	-0.034941693
MonthlyRate	0.001123298	-0.086158010	0.020312197	0.664085954	-0.101166486
NumCompaniesWorked	0.030991906	-0.560133264	0.005628265	-0.041875610	0.017785645
PercentsSalaryHike	-0.015351368	0.004618486	-0.465841883	-0.055689609	-0.698726672
TotalWorkingYears	0.415285665	-0.318115831	0.009368263	0.007027664	-0.024159198
TrainingTimesLastYear	-0.010993402	0.092457674	0.409028173	-0.138279489	-0.293982017
YearsAtCompany	0.443443529	0.213079968	0.002115638	-0.010571214	0.024921329
YearsInCurrentRole	0.391353065	0.279423881	-0.048111956	-0.038785223	-0.004927194
YearsSinceLastPromotion	0.344322397	0.198658357	0.003993040	0.027659809	0.019935007
YearsWithCurrManager	0.386171187	0.295138965	-0.031745944	-0.034459502	0.021898300

	PC7	PC8	PC9	PC10	PC11
Age	-0.098196914	-0.05927715	-0.183114693	0.005033984	-0.74367068
DailyRate	0.715405171	-0.02770642	-0.028707475	0.040304455	-0.01980752
DistanceFromHome	0.031447533	-0.65217193	0.037737577	0.002338630	0.02927699
HourlyRate	-0.221010405	0.40142111	-0.004675476	0.018009772	0.03725997
MonthlyIncome	-0.012272736	-0.03685912	-0.377381332	0.104651321	0.61775910
MonthlyRate	0.482943083	0.40448871	0.056690883	-0.044889268	-0.01681584
NumCompaniesWorked	-0.032989593	-0.03355765	0.775796629	-0.129586743	0.19687866
PercentsSalaryHike	-0.376210309	0.38335261	0.012190972	0.019568502	0.04082482
TotalWorkingYears	-0.029511945	-0.04398227	-0.196663458	-0.038585533	0.08301594
TrainingTimesLastYear	-0.217564575	-0.29622601	0.130785998	-0.017811234	0.02954240
YearsAtCompany	0.005335572	0.01862614	-0.001551392	-0.104225054	0.03762072
YearsInCurrentRole	0.062086964	0.05420752	0.201595025	-0.271683842	-0.04458982
YearsSinceLastPromotion	0.022129234	0.03850513	0.306725567	0.845951303	-0.08053456
YearsWithCurrManager	0.011525930	0.04176204	0.161413516	-0.407140185	-0.06576770

	PC13	PC14
Age	0.1893016403	0.237072230
DailyRate	-0.0099081253	0.018837870
DistanceFromHome	0.0057709912	0.011991386
HourlyRate	0.0049037331	-0.003314012
MonthlyIncome	0.4041044054	0.279006032
MonthlyRate	-0.0083381972	0.009367738
NumCompaniesWorked	-0.0369554196	0.107234673
PercentsSalaryHike	-0.0183445446	0.010585240
TotalWorkingYears	-0.4158888971	-0.705989494
TrainingTimesLastYear	0.0008431661	-0.012085362
YearsAtCompany	-0.6494086309	0.562584645
YearsInCurrentRole	0.1948014145	-0.130643692
YearsSinceLastPromotion	0.0977011821	-0.083447864
YearsWithCurrManager	0.3959144832	-0.121010943

```

> names(attr_pca_done)
[1] "sdev" "rotation" "center" "scale" "x"
> head(attr_pca_done)
$sdev
[1] 2.0041891 1.2846031 1.0336848 1.0257290 1.0046944 0.9962218 0.9763963 0.9578606 0.84
[11] 0.6854527 0.5321872 0.4397545 0.3742537

```

\$rotation

	PC1	PC2	PC3	PC4	PC5
Age	0.280157344	-0.472170158	0.003362193	0.004488409	-0.039563410
DailyRate	-0.006815197	-0.077962430	-0.207301367	-0.609569867	-0.211568990
DistanceFromHome	0.004812032	0.041564987	-0.664884791	0.306131593	0.048941659
HourlyRate	-0.011288550	-0.062668026	-0.352147686	-0.255816205	0.602292088
MonthlyIncome	0.360622909	-0.290395305	0.052415102	0.025332267	-0.034941693
MonthlyRate	0.001123298	-0.086158010	0.020312197	0.664085954	-0.101166486
NumCompaniesWorked	0.030991906	-0.560133264	0.005628265	-0.041875610	0.017785645
PercentsSalaryHike	-0.015351368	0.004618486	-0.465841883	-0.055689609	-0.698726672
TotalWorkingYears	0.415285665	-0.318115831	0.009368263	0.007027664	-0.024159198
TrainingTimesLastYear	-0.010993402	0.092457674	0.409028173	-0.138279489	-0.293982017

YearsAtCompany	0.443443529	0.213079968	0.002115638	-0.010571214	0.024921329
YearsInCurrentRole	0.391353065	0.279423881	-0.048111956	-0.038785223	-0.004927194
YearsSinceLastPromotion	0.344322397	0.198658357	0.003993040	0.027659809	0.019935007
YearsWithCurrManager	0.386171187	0.295138965	-0.031745944	-0.034459502	0.021898300
	PC7	PC8	PC9	PC10	PC11
Age	-0.098196914	-0.05927715	-0.183114693	0.005033984	-0.74367068
DailyRate	0.715405171	-0.02770642	-0.028707475	0.040304455	-0.01980752
DistanceFromHome	0.031447533	-0.65217193	0.037737577	0.002338630	0.02927699
HourlyRate	-0.221010405	0.40142111	-0.004675476	0.018009772	0.03725997
MonthlyIncome	-0.012272736	-0.03685912	-0.377381332	0.104651321	0.61775910
MonthlyRate	0.482943083	0.40448871	0.056690883	-0.044889268	-0.01681584
NumCompaniesworked	-0.032989593	-0.03355765	0.775796629	-0.129586743	0.19687866
PercentSalaryHike	-0.376210309	0.38335261	0.012190972	0.019568502	0.04082482
TotalWorkingYears	-0.029511945	-0.04398227	-0.196663458	-0.038585533	0.08301594
TrainingTimesLastYear	-0.217564575	-0.29622601	0.130785998	-0.017811234	0.02954240
YearsAtCompany	0.005335572	0.01862614	-0.001551392	-0.104225054	0.03762072
YearsInCurrentRole	0.062086964	0.05420752	0.201595025	-0.271683842	-0.04458982
YearsSinceLastPromotion	0.022129234	0.03850513	0.306725567	0.845951303	-0.08053456
YearsWithCurrManager	0.011525930	0.04176204	0.161413516	-0.407140185	-0.06576770

	PC13	PC14
Age	0.1893016403	0.237072230
DailyRate	-0.0099081253	0.018837870
DistanceFromHome	0.0057709912	0.011991386
HourlyRate	0.0049037331	-0.003314012
MonthlyIncome	0.4041044054	0.279006032
MonthlyRate	-0.0083381972	0.009367738
NumCompaniesworked	-0.0369554196	0.107234673
PercentSalaryHike	-0.0183445446	0.010585240
TotalWorkingYears	-0.4158888971	-0.705989494
TrainingTimesLastYear	0.0008431661	-0.012085362
YearsAtCompany	-0.6494086309	0.562584645
YearsInCurrentRole	0.1948014145	-0.130643692
YearsSinceLastPromotion	0.0977011821	-0.083447864
YearsWithCurrManager	0.3959144832	-0.121010943

\$center

Age	DailyRate	DistanceFromHome	HourlyRate
36.923810	802.485714	9.192517	65.15
MonthlyIncome	MonthlyRate	NumCompaniesworked	PercentSalaryHike
6502.931293	14313.103401	2.693197	15.15
TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole
11.279592	2.799320	7.008163	4.15
YearsSinceLastPromotion	YearsWithCurrManager		
2.187755	4.123129		

\$scale

Age	DailyRate	DistanceFromHome	HourlyRate
9.135373	403.509100	8.106864	20.15
MonthlyIncome	MonthlyRate	NumCompaniesworked	PercentSalaryHike
4707.956783	7117.786044	2.498009	3.15
TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole
7.780782	1.289271	6.126525	3.15
YearsSinceLastPromotion	YearsWithCurrManager		
3.222430	3.568136		

\$x

	PC1	PC2	PC3	PC4	PC5	PC6
[1,]	-0.243044079	-1.805296680	-0.3104169553	-0.384994275	2.0169575215	0.984793983
[2,]	0.854288163	0.381073595	-0.5252390003	1.608645799	-1.5927436292	-0.481865695
[3,]	-2.198275394	-1.413301606	-0.0582282745	-2.596801032	0.6022422032	-0.023230640
[4,]	-0.570845554	0.682294015	0.9530781591	-0.112517223	0.0144209522	-0.415235118
[5,]	-1.567685771	-0.965438549	1.6427717726	0.537047071	-0.0703157168	0.940560119
[6,]	-0.033228256	1.476192828	0.1768758528	-0.871158691	0.9282306482	0.367849216
[7,]	-1.176981984	-2.344142438	-0.5229233979	-1.666338771	-0.8793271137	-0.417767837

[8,]	-2.668563284	0.310022541	-2.6128166708	-0.330963952	-1.2486460778	-0.052250851
[9,]	0.910894519	1.213005861	-1.5039201417	1.144947290	-1.1238829367	1.049881443
[10,]	1.339778839	-0.208584655	-1.9076328247	-0.281672326	1.0866328829	-1.252674274
[11,]	-1.227202504	0.961999888	0.0613545738	0.034499533	0.4709461858	-2.043427871
[12,]	-0.073116546	1.760186112	0.5344916830	1.247906142	0.5189044912	0.442256861
[13,]	-1.087474516	1.023377864	-1.5147071841	1.573775407	-0.7475549471	1.511464717
[14,]	-1.814073316	0.601874393	-1.3014136722	-1.101977678	1.6522331947	-0.334506872
[15,]	-1.659410211	0.292702788	-0.0672556843	1.527211158	0.0369416431	-0.176183833
[16,]	1.744251934	1.686663324	-1.1177364895	-0.381693162	0.6609099755	1.223658522
[17,]	-1.118546968	1.132058901	1.4189672811	0.273681898	0.7687430566	-1.460717606
[18,]	-2.875446285	0.684977918	-1.2101773533	-1.069482747	1.5219403902	-0.105065952
[19,]	4.306398521	-1.060188116	0.2102166478	-0.374474127	-0.3205736368	-1.006842601
[20,]	-1.274793286	-0.518252552	1.7607337154	-0.263605442	0.4775025923	1.296215086
[21,]	-1.707674413	1.416074395	-0.2866612249	-0.911443288	0.0740619531	-1.694982203
[22,]	-0.973935456	-1.013413533	-1.1120212000	-1.850388185	-1.3640205357	-0.666890243
[23,]	1.686994016	1.312303531	1.5096245660	1.224455487	0.04956875015	-0.652215366
[24,]	-3.186960204	1.127496005	0.4028852195	0.661084708	0.6427677466	-2.782189999
[25,]	-1.236420346	0.070998887	0.2998566707	0.248336464	1.5088956715	0.030328006
[26,]	4.335210193	-1.187855044	0.8439064948	-1.135518002	0.1502712115	0.089980426
[27,]	0.202667449	1.487707345	-1.0496066009	-1.510499974	-1.5194444667	-1.172856717
[28,]	0.522611662	0.517960123	0.7496484428	1.189509235	0.3725504816	0.467749272
[29,]	4.167497779	1.068632778	1.1917707595	-0.655936499	-0.3603395503	0.680646739
[30,]	0.855668649	-2.594944348	0.7337329455	0.725830150	0.9881939586	-0.389610046
[31,]	-2.101453288	-0.598109160	0.9218830885	-1.261397525	1.1285699242	0.185406411
[32,]	-0.628686779	-0.506577343	1.0557480273	-0.359363863	-1.2767722294	-1.259019980
[33,]	-0.585760317	1.290594877	1.0175278792	0.759970743	0.8434796204	-1.537202603
[34,]	-1.453000790	-0.878346751	1.6553451372	-1.466979255	-0.7652620288	-1.050427892
[35,]	-2.295426038	0.497391245	0.3961407175	-1.173667681	0.0495687553	1.396660954
[36,]	-0.832994065	0.042990012	0.7006144001	-0.308495224	0.3417332881	-0.722274641
[37,]	-1.354693336	-0.382172652	-0.0113330121	-1.423881781	1.0314915947	0.517495020
[38,]	-1.788459375	0.520002398	0.3186189447	-1.168483914	1.3010327250	-0.499080505
[39,]	-1.940888185	-1.947119717	0.3014065269	-0.616302576	0.6580712905	-0.112112477
[40,]	-0.826827035	0.269317986	0.4683770185	-1.617065750	-1.5424619460	1.078602496
[41,]	-2.540242339	0.231335668	0.9249250633	-0.019213294	1.0357898965	0.023182442
[42,]	-2.775064596	0.699871648	2.2688244419	-0.255818018	-1.5958498425	-1.351223462
[43,]	-2.660977369	0.709039810	-1.1151323620	-0.173311857	0.1700305471	0.580484544
[44,]	0.494241988	1.355663630	-0.4558314906	-0.773576913	-0.0893201999	2.889936395
[45,]	0.755465347	1.607572626	-0.5109637132	-0.506888091	-1.4233075836	1.057147451
[46,]	5.804951893	1.078091201	-0.6975281151	0.051444706	0.4337848886	1.614106696
[47,]	0.806658069	1.653442819	-2.3068106160	-0.295882847	-0.4722918379	0.134169049
[48,]	-1.995881882	-0.926896408	-1.9960316143	0.633599363	-0.1729888148	1.021151201
[49,]	0.844245935	-0.616849916	-0.8194206960	-0.921810229	-0.7717068286	-1.818536061
[50,]	-2.418330657	0.297326189	-0.3513459999	-1.101751982	-1.5156578641	1.499053343
[51,]	-0.617002088	-3.634989196	0.3562096372	0.118216390	1.4389894618	-0.220229442
[52,]	-1.874898008	0.830881805	0.6248015543	-1.142134976	-0.3600199657	0.329946720
[53,]	-0.595964470	-1.218466650	-0.8408839570	-2.447215614	-0.9399446833	0.774272087
[54,]	-0.697653611	-0.440311397	-0.1001609790	-1.002941201	0.6741005136	-0.305412825
[55,]	-2.079810230	-0.955185144	-1.8161177942	0.441813227	-1.3960822450	0.253432093
[56,]	3.708466615	1.814109184	-0.0097541922	-0.036909451	2.1090226075	0.552998695
[57,]	0.809848967	1.103897503	-1.7108414088	-0.291327045	-1.1137226784	-0.318923581
[58,]	-1.465681948	0.058005177	-0.5799431432	0.624721643	-1.1676958094	0.275086845
[59,]	0.172118882	0.857390902	-0.3222266947	-0.286150650	-1.6974104391	0.722818482
[60,]	-0.134488687	0.774824505	0.0742047436	-1.668328387	-0.8320217703	1.458220908
[61,]	1.154466224	1.922306493	0.5340354541	0.208456672	-2.0449281318	1.172737829
[62,]	1.015549604	1.685679343	-1.0836803069	0.522264077	0.9425346951	0.960676995
[63,]	5.230825960	-1.151655660	0.8119758029	0.364485427	-0.0405314789	0.826552609
[64,]	5.030282900	-0.755218265	-1.7678975054	-2.044562287	1.6478909242	-0.737221001
[65,]	3.788984539	1.946298043	-0.0945560272	-1.067010987	0.3184679516	0.860439229
[66,]	0.660742882	-2.427444222	0.7464731633	1.051907583	-0.8666771968	0.700339962
[67,]	-0.689313482	0.194433528	-0.4992692899	-0.091816631	0.9077818943	-1.467101142
[68,]	-0.360119052	-2.235551626	-0.3033093916	-0.208683127	-0.8858009134	0.057772762
[69,]	-1.590660053	-0.244778958	0.5118655703	-0.944308747	1.1711060680	0.909011154
[70,]	-2.349000231	-0.024496709	-1.0212757577	1.625278907	0.8108621115	0.977055716
[71,]	0.537061435	-3.049510452	0.9612799574	0.240109595	0.1951466351	0.179765350

	PC8	PC9	PC10	PC11	PC12	PC13
[1,]	1.5917738507	1.1863471823	-0.8721216003	-0.0964053395	0.1652689774	2.697995e-
[2,]	1.4396138690	-0.2915207036	-0.9133153760	-1.2704956060	-0.1223848585	3.003787e-
[3,]	0.1645450520	0.7037177946	0.2334286037	-0.2063109991	0.0757180104	-2.034191e-
[4,]	0.3788485663	-0.0232142896	0.4483748666	-0.4255970757	-1.1905425766	-5.888785e-
[5,]	-0.2110090034	2.3132854086	-0.0092829889	0.7911383832	0.0932147601	-1.001822e-
[6,]	0.8232618244	-0.2219554949	-0.0872069258	-0.4352547853	-0.2311142456	2.074828e-
[7,]	0.6783978017	-0.4439152914	0.2850426885	-1.9955214056	0.0476998780	-7.608564e-
[8,]	-0.3684730529	-0.4875080936	0.4800518063	0.0543954145	0.1020736714	-4.659415e-
[9,]	-0.9351740522	-0.8467583073	-0.7791175369	0.1173708729	-0.0207647030	7.178969e-
[10,]	-0.9887551265	1.8168832792	0.5496258442	0.0893646974	0.1719743118	1.482873e-
[11,]	-0.7428933771	-0.3487121205	-0.3578297611	-0.5029560805	-0.2422407358	-3.914638e-
[12,]	-1.0813690872	-0.3767620037	-1.1058405989	0.0965394361	0.4399899746	-2.594555e-
[13,]	-1.2884619372	-0.0363538480	0.8308304610	-0.2190499489	0.3017206595	-5.138678e-
[14,]	-0.8195524226	-0.7310455341	0.3812739185	-0.4949317648	-0.0110627441	2.587105e-
[15,]	-1.9271549894	1.2343495139	-0.5198251249	0.4250203594	0.1772497877	-2.805626e-
[16,]	-1.2962378063	0.1672283742	0.9190505173	0.6052322133	-0.1396419825	7.886224e-
[17,]	-0.0866130578	-0.4359922773	-0.4908235512	-0.1712840455	0.4964863948	-6.197885e-
[18,]	-0.3703968876	-0.4515944960	0.4707221281	0.6870011577	0.0480464742	-1.323742e-
[19,]	1.1419762947	-1.3201148540	-0.5553725566	-0.0202145544	0.0106513546	-1.330532e+
[20,]	-0.9326540622	0.6299363640	-0.0098247146	-0.2880597580	-0.0739027515	1.175321e-
[21,]	0.0042898132	-0.3112305780	0.1801517860	0.6691640181	0.1912063602	-6.152712e-
[22,]	0.3446067836	1.3648622584	-0.4792426584	0.2130812121	0.0911878469	-3.605121e-
[23,]	-0.2496196395	-0.6875524464	-0.9335162824	0.6027692112	0.8094891808	7.005028e-
[24,]	-0.3520700093	0.2822430507	0.2555611279	0.6350192662	0.0179911182	-1.389628e-
[25,]	0.5077089246	-0.1612550579	-0.0186130089	-0.3041024579	0.2026623054	-1.190615e-
[26,]	-0.6259760526	-0.5375940379	-0.5583140528	0.3347066400	-1.0951792994	8.320370e-
[27,]	-0.6537874675	0.3570074959	0.9290619928	-0.0189461399	1.1560600116	-2.554831e-
[28,]	-0.0648482848	-0.7354981588	0.5503138531	-0.7380133792	-0.9496643546	8.389053e-
[29,]	-1.2648397307	0.3155536872	-1.1110140575	-0.1549320265	2.1008653026	-1.743973e-
[30,]	0.9457428880	-1.6915126800	0.7155359778	1.0274567321	-0.2257845320	7.444228e-
[31,]	-0.1895100955	0.2414887412	0.1464112473	-0.0495438258	-0.1690167656	-2.514129e-
[32,]	-1.1586344712	-0.3666531671	0.0562237019	-0.6611355034	0.2298295473	2.991824e-
[33,]	-0.1491699406	0.0895757307	-0.5992509197	-0.0332054293	1.5600371817	-5.381913e-
[34,]	-1.5329294741	-0.2065832996	0.1820633909	-0.4482305144	0.1077454163	-8.542825e-
[35,]	0.2134201607	-0.1299260602	0.8657952064	0.4687972163	0.1202434785	-4.949487e-
[36,]	0.7203396398	-0.3895527430	-0.1574012260	-1.2429413892	0.1954059923	1.912162e-
[37,]	0.2688390818	-0.9067448813	0.0479551510	-1.6866316116	-0.1441330064	4.304295e-
[38,]	0.6935995880	-0.2003120841	0.5271573093	-0.6067308937	-0.0279386513	2.824748e-
[39,]	0.2429085978	1.7646246196	-0.1129573297	0.2507919469	-0.1314289782	-1.482093e-
[40,]	-0.1179524881	-0.3580190226	0.0556865761	0.1396045303	0.0353093528	-1.389953e-
[41,]	0.0181823818	-0.5107722810	0.3263458397	-0.5465772678	-0.0602546854	5.658773e-
[42,]	-0.7388494377	-0.0587506994	0.2787045616	0.0926434197	0.0901210156	-1.196858e-
[43,]	-1.9884712967	-0.3763602810	0.3022550599	0.1729522027	0.2552767122	-3.327794e-
[44,]	-0.3462124514	-0.6086221030	-0.7113741266	0.7779144715	-0.3180020334	4.068577e-
[45,]	1.5058488466	0.0966839023	-0.4001732785	0.0586933619	-0.1521141805	-3.945470e-
[46,]	0.0542470485	-0.2605203348	2.2309102556	0.7861699813	-1.1179707031	4.072934e-
[47,]	-0.3676769926	0.0803763634	1.3065788470	-0.3439303856	0.5396748825	1.926447e-
[48,]	0.0379981462	0.0139823408	0.2379323987	-0.1482978143	0.0345722067	-2.626249e-
[49,]	1.5880220441	0.4128727770	-1.2321509722	-0.6278155609	0.3533099316	1.678164e-
[50,]	-0.4960323101	-0.6439180110	0.3515209761	-0.5484838822	0.2054958400	1.408071e-
[51,]	1.1704670085	0.8200564211	-0.1123759892	-0.2977384011	0.1285674151	-6.899389e-
[52,]	-0.3941110717	-0.1764307635	0.5591763859	0.0448168714	0.0596852002	2.356005e-
[53,]	0.8857772453	0.2519075061	0.0130817786	-0.4850733698	0.0278447233	1.985134e-
[54,]	-0.6111756017	-0.7690695559	0.6284517406	0.6011938058	0.6113545988	3.056229e-
[55,]	-0.5984018598	1.3970676765	-0.0643320469	0.9721652618	-0.1949743264	-3.069309e-
[56,]	1.7422401316	0.1408058227	-0.0199461188	0.7410413537	-0.5297862525	1.093202e+
[57,]	-0.0108146406	-0.3106679951	-0.8493487541	0.3863867848	-0.1458192162	6.892529e-
[58,]	-1.8215348214	0.3621471351	0.4006851921	-0.2172714122	0.0608335537	2.928318e-
[59,]	0.3335120551	0.4740138563	-0.8411057977	0.4163000283	-0.0858083206	2.931242e-
[60,]	0.2284006406	-0.6348604010	-0.7475512841	-0.2920548376	0.2496513450	4.888034e-
[61,]	0.7408606053	0.5122781140	0.5793496320	-0.0105572994	-0.0042066309	5.488545e-
[62,]	-2.4733087118	0.5540510535	1.2979592812	-0.9935329529	1.2766076994	1.734229e-
[63,]	-0.4001018830	0.0656254162	2.1963468297	0.5895255433	1.4470277217	-1.086096e+

```

[64,] -1.7992385929 1.6436332545 -0.5355851584 -1.3269684512 -1.2755865234 -5.269145e-
[65,] -0.1566109309 0.5395449026 1.4430413025 0.0325762440 -1.0121301749 2.073019e-
[66,] -0.5389467786 -2.0662901268 0.1446763110 -0.3168046990 0.3722514197 2.468134e-
[67,] 0.6267828319 -0.5362398552 -0.3750836045 -0.0545365082 -0.4224485744 2.452230e-
[68,] 0.3270971145 -1.6969908177 0.3987065997 -0.0530068030 0.1509487886 -4.247686e-
[69,] 0.3792991801 0.4293974391 0.0802128266 -0.3229283966 -0.0234897322 -3.881229e-
[70,] 1.5255487349 -1.1502222404 0.3958031962 -0.5136583440 -0.0367616655 1.303524e-
[71,] 0.4884620531 0.4469007175 -0.3625035208 -1.6091056814 0.0695982865 -7.853735e-
[ reached getOption("max.print") -- omitted 1399 rows ]

```

```

> summary(attr_pca_done)
Importance of components:

```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
Standard deviation	2.0042	1.2846	1.03368	1.02573	1.0047	0.99622	0.9764	0.95786	0.8500
Proportion of Variance	0.2869	0.1179	0.07632	0.07515	0.0721	0.07089	0.0681	0.06554	0.0516
Cumulative Proportion	0.2869	0.4048	0.48111	0.55626	0.6284	0.69925	0.7673	0.83288	0.8845

	PC12	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

```

> #Extract variance against features

```

```

> eigenvalues<-attr_pca_done$sdev^2

```

```

> eigenvalues

```

```

[1] 4.0167738 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.9174969 0.7224654
[11] 0.4698454 0.2832233 0.1933840 0.1400658

```

```

> sum(eigenvalues)

```

```

[1] 14

```

```

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

```

```

> eigenvalues

```

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

```

> sumoflambdas <- sum(eigenvalues)

```

```

> sumoflambdas

```

```

[1] 14

```

```

> #Variance %

```

```

> pctvar<- (eigenvalues/sumoflambdas)*100

```

```

> pctvar

```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
28.691241	11.787180	7.632173	7.515143	7.210077	7.088985	6.809641	6.553550	5.160467	
	PC12	PC13	PC14						
2.023023	1.381314	1.000470							

```

> #Calculate cumulative of variance

```

```

> cumvar <- cumsum(pctvar)

```

```

> cumvar

```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
28.69124	40.47842	48.11059	55.62574	62.83581	69.92480	76.73444	83.28799	88.44846	
	PC12	PC13	PC14						
97.61822	98.99953	100.00000							

```

> matlambdas <- rbind(eigenvalues,pctvar,cumvar)

```

```

> matlambdas

```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7		
eigenvalues	4.016774	1.650205	1.068504	1.052120	1.009411	0.9924579	0.9533497	0.9174969	0.7224654
pctvar	28.691241	11.787180	7.632173	7.515143	7.210077	7.0889848	6.8096407	6.553550	5.160467
cumvar	28.691241	40.478422	48.110594	55.625738	62.835815	69.9247997	76.7344404	83.28799	88.44846
	PC10	PC11	PC12	PC13	PC14				
eigenvalues	0.5306975	0.4698454	0.2832233	0.193384	0.1400658				
pctvar	3.7906965	3.3560388	2.0230233	1.381314	1.0004700				
cumvar	92.2391537	95.5951925	97.6182158	98.999530	100.0000000				

```

> rownames(matlambdas) <- c("Eigenvalues","Prop. variance","Cum. prop. variance")

```

```

> round(matlambdas,4)

```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
Eigenvalues	4.0168	1.6502	1.0685	1.0521	1.0094	0.9925	0.9533	0.9175	0.7225


```

Prop. variance      28.6912 11.7872  7.6322  7.5151  7.2101  7.0890  6.8096  6.5535  5.16
Cum. prop. variance 28.6912 40.4784 48.1106 55.6257 62.8358 69.9248 76.7344 83.2880 88.44
Eigenvalues          0.2832  0.1934  0.1401
Prop. variance       2.0230  1.3813  1.0005
Cum. prop. variance 97.6182 98.9995 100.0000

```

```
> attr_pca_done$rotation
```

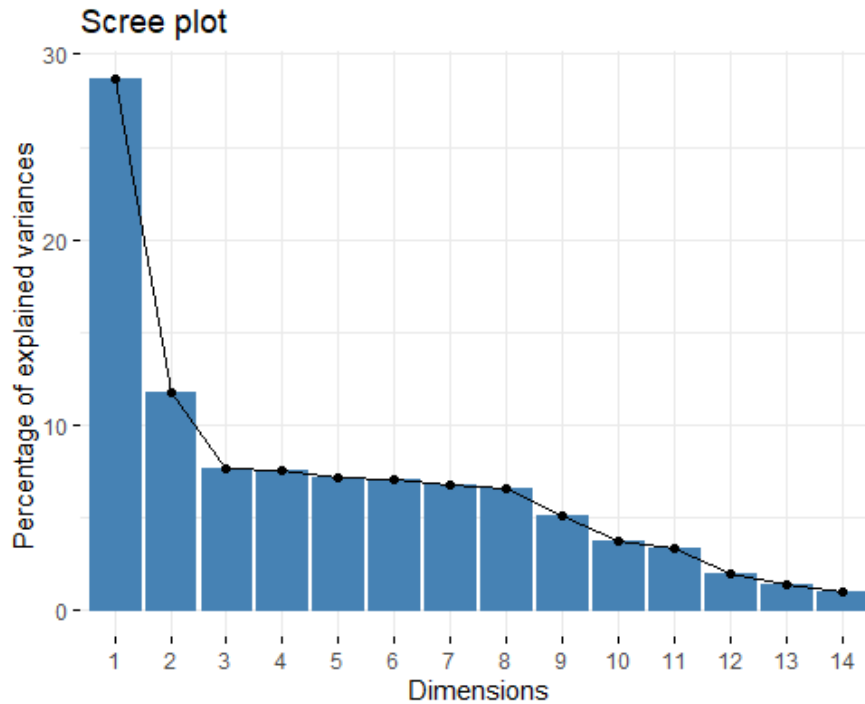
	PC1	PC2	PC3	PC4	PC5
Age	0.280157344	-0.472170158	0.003362193	0.004488409	-0.039563410
DailyRate	-0.006815197	-0.077962430	-0.207301367	-0.609569867	-0.211568990
DistanceFromHome	0.004812032	0.041564987	-0.664884791	0.306131593	0.048941659
HourlyRate	-0.011288550	-0.062668026	-0.352147686	-0.255816205	0.602292088
MonthlyIncome	0.360622909	-0.290395305	0.052415102	0.025332267	-0.034941693
MonthlyRate	0.001123298	-0.086158010	0.020312197	0.664085954	-0.101166486
NumCompaniesWorked	0.030991906	-0.560133264	0.005628265	-0.041875610	0.017785645
PercentSalaryHike	-0.015351368	0.004618486	-0.465841883	-0.055689609	-0.698726672
TotalWorkingYears	0.415285665	-0.318115831	0.009368263	0.007027664	-0.024159198
TrainingTimesLastYear	-0.010993402	0.092457674	0.409028173	-0.138279489	-0.293982017
YearsAtCompany	0.443443529	0.213079968	0.002115638	-0.010571214	0.024921329
YearsInCurrentRole	0.391353065	0.279423881	-0.048111956	-0.038785223	-0.004927194
YearsSinceLastPromotion	0.344322397	0.198658357	0.003993040	0.027659809	0.019935007
YearsWithCurrManager	0.386171187	0.295138965	-0.031745944	-0.034459502	0.021898300

	PC7	PC8	PC9	PC10	PC11
Age	-0.098196914	-0.05927715	-0.183114693	0.005033984	-0.74367068
DailyRate	0.715405171	-0.02770642	-0.028707475	0.040304455	-0.01980752
DistanceFromHome	0.031447533	-0.65217193	0.037737577	0.002338630	0.02927699
HourlyRate	-0.221010405	0.40142111	-0.004675476	0.018009772	0.03725997
MonthlyIncome	-0.012272736	-0.03685912	-0.377381332	0.104651321	0.61775910
MonthlyRate	0.482943083	0.40448871	0.056690883	-0.044889268	-0.01681584
NumCompaniesWorked	-0.032989593	-0.03355765	0.775796629	-0.129586743	0.19687866
PercentSalaryHike	-0.376210309	0.38335261	0.012190972	0.019568502	0.04082482
TotalWorkingYears	-0.029511945	-0.04398227	-0.196663458	-0.038585533	0.08301594
TrainingTimesLastYear	-0.217564575	-0.29622601	0.130785998	-0.017811234	0.02954240
YearsAtCompany	0.005335572	0.01862614	-0.001551392	-0.104225054	0.03762072
YearsInCurrentRole	0.062086964	0.05420752	0.201595025	-0.271683842	-0.04458982
YearsSinceLastPromotion	0.022129234	0.03850513	0.306725567	0.845951303	-0.08053456
YearsWithCurrManager	0.011525930	0.04176204	0.161413516	-0.407140185	-0.06576770

	PC13	PC14
Age	0.1893016403	0.237072230
DailyRate	-0.0099081253	0.018837870
DistanceFromHome	0.0057709912	0.011991386
HourlyRate	0.0049037331	-0.003314012
MonthlyIncome	0.4041044054	0.279006032
MonthlyRate	-0.0083381972	0.009367738
NumCompaniesWorked	-0.0369554196	0.107234673
PercentSalaryHike	-0.0183445446	0.010585240
TotalWorkingYears	-0.4158888971	-0.705989494
TrainingTimesLastYear	0.0008431661	-0.012085362
YearsAtCompany	-0.6494086309	0.562584645
YearsInCurrentRole	0.1948014145	-0.130643692
YearsSinceLastPromotion	0.0977011821	-0.083447864
YearsWithCurrManager	0.3959144832	-0.121010943

```
> #Visualize PCA using Scree plot
```

```
> fviz_screplot(attr_pca_done, ncp=14)
```

```
> summary(attr_pca_done)
Importance of components:
```

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
Standard deviation	2.0042	1.2846	1.03368	1.02573	1.0047	0.99622	0.9764	0.95786	0.8500
Proportion of Variance	0.2869	0.1179	0.07632	0.07515	0.0721	0.07089	0.0681	0.06554	0.0516
Cumulative Proportion	0.2869	0.4048	0.48111	0.55626	0.6284	0.69925	0.7673	0.83288	0.8845

	PC12	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
```

```
> #we need to calculate the scores on each of these components for each individual in our
> attr_pca_done$x
```

	PC1	PC2	PC3	PC4	PC5	PC6
[1,]	-0.243044079	-1.805296680	-0.3104169553	-0.384994275	2.0169575215	0.984793983
[2,]	0.854288163	0.381073595	-0.5252390003	1.608645799	-1.5927436292	-0.481865695
[3,]	-2.198275394	-1.413301606	-0.0582282745	-2.596801032	0.6022422032	-0.023230640
[4,]	-0.570845554	0.682294015	0.9530781591	-0.112517223	0.0144209522	-0.415235118
[5,]	-1.567685771	-0.965438549	1.6427717726	0.537047071	-0.0703157168	0.940560119
[6,]	-0.033228256	1.476192828	0.1768758528	-0.871158691	0.9282306482	0.367849216
[7,]	-1.176981984	-2.344142438	-0.5229233979	-1.666338771	-0.8793271137	-0.417767837
[8,]	-2.668563284	0.310022541	-2.6128166708	-0.330963952	-1.2486460778	-0.052250851
[9,]	0.910894519	1.213005861	-1.5039201417	1.144947290	-1.1238829367	1.049881443
[10,]	1.339778839	-0.208584655	-1.9076328247	-0.281672326	1.0866328829	-1.252674274
[11,]	-1.227202504	0.961999888	0.0613545738	0.034499533	0.4709461858	-2.043427871
[12,]	-0.073116546	1.760186112	0.5344916830	1.247906142	0.5189044912	0.442256861
[13,]	-1.087474516	1.023377864	-1.5147071841	1.573775407	-0.7475549471	1.511464717
[14,]	-1.814073316	0.601874393	-1.3014136722	-1.101977678	1.6522331947	-0.334506872
[15,]	-1.659410211	0.292702788	-0.0672556843	1.527211158	0.0369416431	-0.176183833
[16,]	1.744251934	1.686663324	-1.1177364895	-0.381693162	0.6609099755	1.223658522
[17,]	-1.118546968	1.132058901	1.4189672811	0.273681898	0.7687430566	-1.460717606
[18,]	-2.875446285	0.684977918	-1.2101773533	-1.069482747	1.5219403902	-0.105065952
[19,]	4.306398521	-1.060188116	0.2102166478	-0.374474127	-0.3205736368	-1.006842601
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6	No	-0.03322826	1.47619283	0.176875853	-0.87115869	0.92823065	0.36784922	0.
7	No	-1.17698198	-2.34414244	-0.522923398	-1.66633877	-0.87932711	-0.41776784	-0.
8	No	-2.66856328	0.31002254	-2.612816671	-0.33096395	-1.24864608	-0.05225085	0.
9	No	0.91089452	1.21300586	-1.503920142	1.14494729	-1.12388294	1.04988144	-1.
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35	Yes	-2.29542604	0.49739124	0.396140718	-1.17366768	0.04956876	1.39666095	-0.
36	No	-0.83299406	0.04299001	0.700614400	-0.30849522	0.34173329	-0.72227464	1.
37	Yes	-1.35469334	-0.38217265	-0.011333012	-1.42388178	1.03149159	0.51749502	-0.
38	No	-1.78845938	0.52000240	0.318618945	-1.16848391	1.30103272	-0.49908050	-0.
39	No	-1.94088819	-1.94711972	0.301406527	-0.61630258	0.65807129	-0.11211248	-0.
40	No	-0.82682704	0.26931799	0.468377019	-1.61706575	-1.54246195	1.07860250	-0.
41	No	-2.54024234	0.23133567	0.924925063	-0.01921329	1.03578990	0.02318244	-0.
42	No	-2.77506460	0.69987165	2.268824442	-0.25581802	-1.59584984	-1.35122346	1.
43	Yes	-2.66097737	0.70903981	-1.115132362	-0.17331186	0.17003055	0.58048454	1.
44	No	0.49424199	1.35566363	-0.455831491	-0.77357691	-0.08932020	2.88993639	0.
45	No	0.75546535	1.60757263	-0.510963713	-0.50688809	-1.42330758	1.05714745	-0.
46	Yes	5.80495189	1.07809120	-0.697528115	0.05144471	0.43378489	1.61410670	2.
47	No	0.80665807	1.65344282	-2.306810616	-0.29588285	-0.47229184	0.13416905	-0.
48	No	-1.99588188	-0.92689641	-1.996031614	0.63359936	-0.17298881	1.02115120	-1.
49	No	0.84424593	-0.61684992	-0.819420696	-0.92181023	-0.77170683	-1.81853606	-0.
50	No	-2.41833066	0.29732619	-0.351346000	-1.10175198	-1.51565786	1.49905334	0.
51	Yes	-0.61700209	-3.63498920	0.356209637	0.11821639	1.43898946	-0.22022944	-0.
52	Yes	-1.87489801	0.83088181	0.624801554	-1.14213498	-0.36001997	0.32994672	1.
53	No	-0.59596447	-1.21846665	-0.840883957	-2.44721561	-0.93994468	0.77427209	-0.
54	No	-0.69765361	-0.44031140	-0.100160979	-1.00294120	0.67410051	-0.30541283	0.
55	No	-2.07981023	-0.95518514	-1.816117794	0.44181323	-1.39608225	0.25343209	1.
56	No	3.70846662	1.81410918	-0.009754192	-0.03690945	2.10902261	0.55299870	0.
57	No	0.80984897	1.10389750	-1.710841409	-0.29132705	-1.11372268	-0.31892358	-0.
58	No	-1.46568195	0.05800518	-0.579943143	0.62472164	-1.16769581	0.27508684	1.
59	No	0.17211888	0.85739090	-0.322226695	-0.28615065	-1.69741044	0.72281848	-1.
60	No	-0.13448869	0.77482451	0.074204744	-1.66832839	-0.83202177	1.45822091	-0.
61	No	1.15446622	1.92230649	0.534035454	0.20845667	-2.04492813	1.17273783	-1.
62	No	1.01554960	1.68567934	-1.083680307	0.52226408	0.94253470	0.96067700	0.
63	No	5.23082596	-1.15165566	0.811975803	0.36448543	-0.04053148	0.82655261	1.
64	No	5.03028290	-0.75521827	-1.767897505	-2.04456229	1.64789092	-0.73722100	0.
65	No	3.78898454	1.94629804	-0.094556027	-1.06701099	0.31846795	0.86043923	1.
66	No	0.66074288	-2.42744422	0.746473163	1.05190758	-0.86667720	0.70033996	0.
		PC9	PC10	PC11	PC12	PC13	PC14	

1	1.18634718	-0.872121600	-0.09640534	0.165268977	0.269799504	0.56169756
2	-0.29152070	-0.913315376	-1.27049561	-0.122384858	0.300378690	0.39264772
3	0.70371779	0.233428604	-0.20631100	0.075718010	-0.203419065	-0.03027029
4	-0.02321429	0.448374867	-0.42559708	-1.190542577	-0.588878508	0.03760515
5	2.31328541	-0.009282989	0.79113838	0.093214760	-0.100182192	-0.01465031
6	-0.22195549	-0.087206926	-0.43525479	-0.231114246	0.207482785	-0.34016769
7	-0.44391529	0.285042689	-1.99552141	0.047699878	-0.076085636	0.15272680
8	-0.48750809	0.480051806	0.05439541	0.102073671	-0.046594152	0.32533830
9	-0.84675831	-0.779117537	0.11737087	-0.020764703	0.717896928	0.20342651
10	1.81688328	0.549625844	0.08936470	0.171974312	0.148287350	-0.75927968
11	-0.34871212	-0.357829761	-0.50295608	-0.242240736	-0.039146384	-0.02624589
12	-0.37676200	-1.105840599	0.09653944	0.439989975	-0.025945549	-0.29403497
13	-0.03635385	0.830830461	-0.21904995	0.301720660	-0.051386781	0.06517152
14	-0.73104553	0.381273918	-0.49493176	-0.011062744	0.258710503	0.07880223
15	1.23434951	-0.519825125	0.42502036	0.177249788	-0.280562634	-0.04452694
16	0.16722837	0.919050517	0.60523221	-0.139641983	0.788622438	-0.08889241
17	-0.43599228	-0.490823551	-0.17128405	0.496486395	-0.061978852	-0.08960470
18	-0.45159450	0.470722128	0.68700116	0.048046474	-0.132374244	0.07059914
19	-1.32011485	-0.555372557	-0.02021455	0.010651355	-1.330532123	0.54193113
20	0.62993636	-0.009824715	-0.28805976	-0.073902751	0.117532074	0.21483103
21	-0.31123058	0.180151786	0.66916402	0.191206360	-0.061527117	-0.18474214
22	1.36486226	-0.479242658	0.21308121	0.091187847	-0.360512122	0.06632427
23	-0.68755245	-0.933516282	0.60276921	0.809489181	0.700502805	0.11071287
24	0.28224305	0.255561128	0.63501927	0.017991118	-0.138962804	-0.11188786
25	-0.16125506	-0.018613009	-0.30410246	0.202662305	-0.119061534	-0.15837894
26	-0.53759404	-0.558314053	0.33470664	-1.095179299	0.832036960	0.02989736
27	0.35700750	0.929061993	-0.01894614	1.156060012	-0.255483067	-0.06819902
28	-0.73549816	0.550313853	-0.73801338	-0.949664355	0.008389053	0.25967553
29	0.31555369	-1.111014058	-0.15493203	2.100865303	-0.174397307	0.02246194
30	-1.69151268	0.715535978	1.02745673	-0.225784532	0.744422810	-0.26383596
31	0.24148874	0.146411247	-0.04954383	-0.169016766	-0.251412918	-0.16472346
32	-0.36665317	0.056223702	-0.66113550	0.229829547	0.299182395	0.24667601
33	0.08957573	-0.599250920	-0.03320543	1.560037182	-0.538191327	-0.12374748
34	-0.20658330	0.182063391	-0.44823051	0.107745416	-0.854282470	-1.14616941
35	-0.12992606	0.865795206	0.46879722	0.120243478	-0.494948660	-0.31419900
36	-0.38955274	-0.157401226	-1.24294139	0.195405992	0.191216222	0.23944677
37	-0.90674488	0.047955151	-1.68663161	-0.144133006	0.430429526	0.61334413
38	-0.20031208	0.527157309	-0.60673089	-0.027938651	0.282474819	0.12472443
39	1.76462462	-0.112957330	0.25079195	-0.131428978	-0.148209341	0.29073071
40	-0.35801902	0.055686576	0.13960453	0.035309353	-0.138995276	-0.15147123
41	-0.51077228	0.326345840	-0.54657727	-0.060254685	0.056587730	0.29700932
42	-0.05875070	0.278704562	0.09264342	0.090121016	-0.119685794	0.13898868
43	-0.37636028	0.302255060	0.17295220	0.255276712	-0.003327794	0.13586788
44	-0.60862210	-0.711374127	0.77791447	-0.318002033	0.406857687	0.01109437
45	0.09668390	-0.400173278	0.05869336	-0.152114181	-0.394547025	-0.25084901
46	-0.26052033	2.230910256	0.78616998	-1.117970703	0.407293367	0.32005748
47	0.08037636	1.306578847	-0.34393039	0.539674882	0.192644669	-0.23562251
48	0.01398234	0.237932399	-0.14829781	0.034572207	-0.262624929	-0.03020186
49	0.41287278	-1.232150972	-0.62781556	0.353309932	0.167816354	0.06690825
50	-0.64391801	0.351520976	-0.54848388	0.205495840	0.140807097	0.35162772
51	0.82005642	-0.112375989	-0.29773840	0.128567415	-0.689938913	-0.79242652
52	-0.17643076	0.559176386	0.04481687	0.059685200	0.235600513	0.06709468
53	0.25190751	0.013081779	-0.48507337	0.027844723	0.198513442	0.29335630
54	-0.76906956	0.628451741	0.60119381	0.611354599	0.305622885	0.15411449
55	1.39706768	-0.064332047	0.97216526	-0.194974326	-0.306930947	0.23036887
56	0.14080582	-0.019946119	0.74104135	-0.529786253	1.093201883	-0.15809731
57	-0.31066800	-0.849348754	0.38638678	-0.145819216	0.689252882	0.21050825
58	0.36214714	0.400685192	-0.21727141	0.060833554	0.292831786	0.21548050
59	0.47401386	-0.841105798	0.41630003	-0.085808321	0.293124207	-0.22251524
60	-0.63486040	-0.747551284	-0.29205484	0.249651345	0.488803355	0.22308994
61	0.51227811	0.579349632	-0.01055730	-0.004206631	0.548854514	-0.23403874
62	0.55405105	1.297959281	-0.99353295	1.276607699	0.173422905	-0.18562460
63	0.06562542	2.196346830	0.58952554	1.447027722	-1.086096447	1.03490915
64	1.64363325	-0.535585158	-1.32696845	-1.275586523	-0.526914507	-0.10402533

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65 0.53954490 1.443041303 0.03257624 -1.012130175 0.207301917 -0.21108226
66 -2.06629013 0.144676311 -0.31680470 0.372251420 0.246813433 0.15949383
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'data.frame': 1470 obs. of 15 variables:
 $ Attrition: Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 1 1 1 1 ...
 $ PC1      : num -0.243 0.854 -2.198 -0.571 -1.568 ...
 $ PC2      : num -1.805 0.381 -1.413 0.682 -0.965 ...
 $ PC3      : num -0.3104 -0.5252 -0.0582 0.9531 1.6428 ...
 $ PC4      : num -0.385 1.609 -2.597 -0.113 0.537 ...
 $ PC5      : num 2.017 -1.5927 0.6022 0.0144 -0.0703 ...
 $ PC6      : num 0.9848 -0.4819 -0.0232 -0.4152 0.9406 ...
 $ PC7      : num 1.332 -1.043 -0.245 2.255 0.333 ...
 $ PC8      : num 1.592 1.44 0.165 0.379 -0.211 ...
 $ PC9      : num 1.1863 -0.2915 0.7037 -0.0232 2.3133 ...
 $ PC10     : num -0.87212 -0.91332 0.23343 0.44837 -0.00928 ...
 $ PC11     : num -0.0964 -1.2705 -0.2063 -0.4256 0.7911 ...
 $ PC12     : num 0.1653 -0.1224 0.0757 -1.1905 0.0932 ...
 $ PC13     : num 0.27 0.3 -0.203 -0.589 -0.1 ...
 $ PC14     : num 0.5617 0.3926 -0.0303 0.0376 -0.0147 ...

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> #typ_pca
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> typ_pca
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	Attrition	PC1	PC2	PC3	PC4	PC5	PC6
1	Yes	-0.24304408	-1.80529668	-0.310416955	-0.38499428	2.01695752	0.98479398
2	No	0.85428816	0.38107360	-0.525239000	1.60864580	-1.59274363	-0.48186570
3	Yes	-2.19827539	-1.41330161	-0.058228274	-2.59680103	0.60224220	-0.02323064
4	No	-0.57084555	0.68229402	0.953078159	-0.11251722	0.01442095	-0.41523512
5	No	-1.56768577	-0.96543855	1.642771773	0.53704707	-0.07031572	0.94056012
6	No	-0.03322826	1.47619283	0.176875853	-0.87115869	0.92823065	0.36784922
7	No	-1.17698198	-2.34414244	-0.522923398	-1.66633877	-0.87932711	-0.41776784
8	No	-2.66856328	0.31002254	-2.612816671	-0.33096395	-1.24864608	-0.05225085
9	No	0.91089452	1.21300586	-1.503920142	1.14494729	-1.12388294	1.04988144
10	No	1.33977884	-0.20858466	-1.907632825	-0.28167233	1.08663288	-1.25267427
11	No	-1.22720250	0.96199989	0.061354574	0.03449953	0.47094619	-2.04342787
12	No	-0.07311655	1.76018611	0.534491683	1.24790614	0.51890449	0.44225686
13	No	-1.08747452	1.02337786	-1.514707184	1.57377541	-0.74755495	1.51146472
14	No	-1.81407332	0.60187439	-1.301413672	-1.10197768	1.65223319	-0.33450687
15	Yes	-1.65941021	0.29270279	-0.067255684	1.52721116	0.03694164	-0.17618383
16	No	1.74425193	1.68666332	-1.117736489	-0.38169316	0.66090998	1.22365852
17	No	-1.11854697	1.13205890	1.418967281	0.27368190	0.76874306	-1.46071761
18	No	-2.87544628	0.68497792	-1.210177353	-1.06948275	1.52194039	-0.10506595
19	No	4.30639852	-1.06018812	0.210216648	-0.37447413	-0.32057364	-1.00684260
20	No	-1.27479329	-0.51825255	1.760733715	-0.26360544	0.47750259	1.29621509
21	No	-1.70767441	1.41607440	-0.286661225	-0.91144329	0.07406195	-1.69498220
22	Yes	-0.97393546	-1.01341353	-1.112021200	-1.85038818	-1.36402054	-0.66689024
23	No	1.68699402	1.31230353	1.509624566	1.22445549	0.24290590	-0.65221537
24	No	-3.18696020	1.12749600	0.402885220	0.66108471	0.64276775	-2.78219000
25	Yes	-1.23642035	0.07099889	0.299856671	0.24833646	1.50889567	0.03032801
26	No	4.33521019	-1.18785504	0.843906495	-1.13551800	0.15027121	0.08998043
27	Yes	0.20266745	1.48770734	-1.049606601	-1.51049997	-1.51944447	-1.17285672
28	No	0.52261166	0.51796012	0.749648443	1.18950923	0.37255048	0.46774927
29	No	4.16749778	1.06863278	1.191770760	-0.65593650	-0.36033955	0.68064674
30	No	0.85566865	-2.59494435	0.733732945	0.72583015	0.98819396	-0.38961005
31	No	-2.10145329	-0.59810916	0.921883088	-1.26139753	1.12856992	0.18540641
32	No	-0.62868678	-0.50657734	1.055748027	-0.35936386	-1.27677223	-1.25901998
33	No	-0.58576032	1.29059488	1.017527879	0.75997074	0.84347962	-1.53720260
34	Yes	-1.45300079	-0.87834675	1.655345137	-1.46697925	-0.76526203	-1.05042789
35	Yes	-2.29542604	0.49739124	0.396140718	-1.17366768	0.04956876	1.39666095
36	No	-0.83299406	0.04299001	0.700614400	-0.30849522	0.34173329	-0.72227464
37	Yes	-1.35469334	-0.38217265	-0.011333012	-1.42388178	1.03149159	0.51749502
38	No	-1.78845938	0.52000240	0.318618945	-1.16848391	1.30103272	-0.49908050
39	No	-1.94088819	-1.94711972	0.301406527	-0.61630258	0.65807129	-0.11211248
40	No	-0.82682704	0.26931799	0.468377019	-1.61706575	-1.54246195	1.07860250
41	No	-2.54024234	0.23133567	0.924925063	-0.01921329	1.03578990	0.02318244

42	No	-2.77506460	0.69987165	2.268824442	-0.25581802	-1.59584984	-1.35122346	1.
43	Yes	-2.66097737	0.70903981	-1.115132362	-0.17331186	0.17003055	0.58048454	1.
44	No	0.49424199	1.35566363	-0.455831491	-0.77357691	-0.08932020	2.88993639	0.
45	No	0.75546535	1.60757263	-0.510963713	-0.50688809	-1.42330758	1.05714745	-0.
46	Yes	5.80495189	1.07809120	-0.697528115	0.05144471	0.43378489	1.61410670	2.
47	No	0.80665807	1.65344282	-2.306810616	-0.29588285	-0.47229184	0.13416905	-0.
48	No	-1.99588188	-0.92689641	-1.996031614	0.63359936	-0.17298881	1.02115120	-1.
49	No	0.84424593	-0.61684992	-0.819420696	-0.92181023	-0.77170683	-1.81853606	-0.
50	No	-2.41833066	0.29732619	-0.351346000	-1.10175198	-1.51565786	1.49905334	0.
51	Yes	-0.61700209	-3.63498920	0.356209637	0.11821639	1.43898946	-0.22022944	-0.
52	Yes	-1.87489801	0.83088181	0.624801554	-1.14213498	-0.36001997	0.32994672	1.
53	No	-0.59596447	-1.21846665	-0.840883957	-2.44721561	-0.93994468	0.77427209	-0.
54	No	-0.69765361	-0.44031140	-0.100160979	-1.00294120	0.67410051	-0.30541283	0.
55	No	-2.07981023	-0.95518514	-1.816117794	0.44181323	-1.39608225	0.25343209	1.
56	No	3.70846662	1.81410918	-0.009754192	-0.03690945	2.10902261	0.55299870	0.
57	No	0.80984897	1.10389750	-1.710841409	-0.29132705	-1.11372268	-0.31892358	-0.
58	No	-1.46568195	0.05800518	-0.579943143	0.62472164	-1.16769581	0.27508684	1.
59	No	0.17211888	0.85739090	-0.322226695	-0.28615065	-1.69741044	0.72281848	-1.
60	No	-0.13448869	0.77482451	0.074204744	-1.66832839	-0.83202177	1.45822091	-0.
61	No	1.15446622	1.92230649	0.534035454	0.20845667	-2.04492813	1.17273783	-1.
62	No	1.01554960	1.68567934	-1.083680307	0.52226408	0.94253470	0.96067700	0.
63	No	5.23082596	-1.15165566	0.811975803	0.36448543	-0.04053148	0.82655261	1.
64	No	5.03028290	-0.75521827	-1.767897505	-2.04456229	1.64789092	-0.73722100	0.
65	No	3.78898454	1.94629804	-0.094556027	-1.06701099	0.31846795	0.86043923	1.
66	No	0.66074288	-2.42744422	0.746473163	1.05190758	-0.86667720	0.70033996	0.

	PC9	PC10	PC11	PC12	PC13	PC14
1	1.18634718	-0.872121600	-0.09640534	0.165268977	0.269799504	0.56169756
2	-0.29152070	-0.913315376	-1.27049561	-0.122384858	0.300378690	0.39264772
3	0.70371779	0.233428604	-0.20631100	0.075718010	-0.203419065	-0.03027029
4	-0.02321429	0.448374867	-0.42559708	-1.190542577	-0.588878508	0.03760515
5	2.31328541	-0.009282989	0.79113838	0.093214760	-0.100182192	-0.01465031
6	-0.22195549	-0.087206926	-0.43525479	-0.231114246	0.207482785	-0.34016769
7	-0.44391529	0.285042689	-1.99552141	0.047699878	-0.076085636	0.15272680
8	-0.48750809	0.480051806	0.05439541	0.102073671	-0.046594152	0.32533830
9	-0.84675831	-0.779117537	0.11737087	-0.020764703	0.717896928	0.20342651
10	1.81688328	0.549625844	0.08936470	0.171974312	0.148287350	-0.75927968
11	-0.34871212	-0.357829761	-0.50295608	-0.242240736	-0.039146384	-0.02624589
12	-0.37676200	-1.105840599	0.09653944	0.439989975	-0.025945549	-0.29403497
13	-0.03635385	0.830830461	-0.21904995	0.301720660	-0.051386781	0.06517152
14	-0.73104553	0.381273918	-0.49493176	-0.011062744	0.258710503	0.07880223
15	1.23434951	-0.519825125	0.42502036	0.177249788	-0.280562634	-0.04452694
16	0.16722837	0.919050517	0.60523221	-0.139641983	0.788622438	-0.08889241
17	-0.43599228	-0.490823551	-0.17128405	0.496486395	-0.061978852	-0.08960470
18	-0.45159450	0.470722128	0.68700116	0.048046474	-0.132374244	0.07059914
19	-1.32011485	-0.555372557	-0.02021455	0.010651355	-1.330532123	0.54193113
20	0.62993636	-0.009824715	-0.28805976	-0.073902751	0.117532074	0.21483103
21	-0.31123058	0.180151786	0.66916402	0.191206360	-0.061527117	-0.18474214
22	1.36486226	-0.479242658	0.21308121	0.091187847	-0.360512122	0.06632427
23	-0.68755245	-0.933516282	0.60276921	0.809489181	0.700502805	0.11071287
24	0.28224305	0.255561128	0.63501927	0.017991118	-0.138962804	-0.11188786
25	-0.16125506	-0.018613009	-0.30410246	0.202662305	-0.119061534	-0.15837894
26	-0.53759404	-0.558314053	0.33470664	-1.095179299	0.832036960	0.02989736
27	0.35700750	0.929061993	-0.01894614	1.156060012	-0.255483067	-0.06819902
28	-0.73549816	0.550313853	-0.73801338	-0.949664355	0.008389053	0.25967553
29	0.31555369	-1.111014058	-0.15493203	2.100865303	-0.174397307	0.02246194
30	-1.69151268	0.715535978	1.02745673	-0.225784532	0.744422810	-0.26383596
31	0.24148874	0.146411247	-0.04954383	-0.169016766	-0.251412918	-0.16472346
32	-0.36665317	0.056223702	-0.66113550	0.229829547	0.299182395	0.24667601
33	0.08957573	-0.599250920	-0.03320543	1.560037182	-0.538191327	-0.12374748
34	-0.20658330	0.182063391	-0.44823051	0.107745416	-0.854282470	-1.14616941
35	-0.12992606	0.865795206	0.46879722	0.120243478	-0.494948660	-0.31419900
36	-0.38955274	-0.157401226	-1.24294139	0.195405992	0.191216222	0.23944677
37	-0.90674488	0.047955151	-1.68663161	-0.144133006	0.430429526	0.61334413
38	-0.20031208	0.527157309	-0.60673089	-0.027938651	0.282474819	0.12472443


```

39 1.76462462 -0.112957330 0.25079195 -0.131428978 -0.148209341 0.29073071
40 -0.35801902 0.055686576 0.13960453 0.035309353 -0.138995276 -0.15147123
41 -0.51077228 0.326345840 -0.54657727 -0.060254685 0.056587730 0.29700932
42 -0.05875070 0.278704562 0.09264342 0.090121016 -0.119685794 0.13898868
43 -0.37636028 0.302255060 0.17295220 0.255276712 -0.003327794 0.13586788
44 -0.60862210 -0.711374127 0.77791447 -0.318002033 0.406857687 0.01109437
45 0.09668390 -0.400173278 0.05869336 -0.152114181 -0.394547025 -0.25084901
46 -0.26052033 2.230910256 0.78616998 -1.117970703 0.407293367 0.32005748
47 0.08037636 1.306578847 -0.34393039 0.539674882 0.192644669 -0.23562251
48 0.01398234 0.237932399 -0.14829781 0.034572207 -0.262624929 -0.03020186
49 0.41287278 -1.232150972 -0.62781556 0.353309932 0.167816354 0.06690825
50 -0.64391801 0.351520976 -0.54848388 0.205495840 0.140807097 0.35162772
51 0.82005642 -0.112375989 -0.29773840 0.128567415 -0.689938913 -0.79242652
52 -0.17643076 0.559176386 0.04481687 0.059685200 0.235600513 0.06709468
53 0.25190751 0.013081779 -0.48507337 0.027844723 0.198513442 0.29335630
54 -0.76906956 0.628451741 0.60119381 0.611354599 0.305622885 0.15411449
55 1.39706768 -0.064332047 0.97216526 -0.194974326 -0.306930947 0.23036887
56 0.14080582 -0.019946119 0.74104135 -0.529786253 1.093201883 -0.15809731
57 -0.31066800 -0.849348754 0.38638678 -0.145819216 0.689252882 0.21050825
58 0.36214714 0.400685192 -0.21727141 0.060833554 0.292831786 0.21548050
59 0.47401386 -0.841105798 0.41630003 -0.085808321 0.293124207 -0.22251524
60 -0.63486040 -0.747551284 -0.29205484 0.249651345 0.488803355 0.22308994
61 0.51227811 0.579349632 -0.01055730 -0.004206631 0.548854514 -0.23403874
62 0.55405105 1.297959281 -0.99353295 1.276607699 0.173422905 -0.18562460
63 0.06562542 2.196346830 0.58952554 1.447027722 -1.086096447 1.03490915
64 1.64363325 -0.535585158 -1.32696845 -1.275586523 -0.526914507 -0.10402533
65 0.53954490 1.443041303 0.03257624 -1.012130175 0.207301917 -0.21108226
66 -2.06629013 0.144676311 -0.31680470 0.372251420 0.246813433 0.15949383
[ reached 'max' / getOption("max.print") -- omitted 1404 rows ]

```

```
> str(typ_pca)
```

```

'data.frame': 1470 obs. of 15 variables:
 $ Attrition: Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 1 1 1 1 ...
 $ PC1      : num -0.243 0.854 -2.198 -0.571 -1.568 ...
 $ PC2      : num -1.805 0.381 -1.413 0.682 -0.965 ...
 $ PC3      : num -0.3104 -0.5252 -0.0582 0.9531 1.6428 ...
 $ PC4      : num -0.385 1.609 -2.597 -0.113 0.537 ...
 $ PC5      : num 2.017 -1.5927 0.6022 0.0144 -0.0703 ...
 $ PC6      : num 0.9848 -0.4819 -0.0232 -0.4152 0.9406 ...
 $ PC7      : num 1.332 -1.043 -0.245 2.255 0.333 ...
 $ PC8      : num 1.592 1.44 0.165 0.379 -0.211 ...
 $ PC9      : num 1.1863 -0.2915 0.7037 -0.0232 2.3133 ...
 $ PC10     : num -0.87212 -0.91332 0.23343 0.44837 -0.00928 ...
 $ PC11     : num -0.0964 -1.2705 -0.2063 -0.4256 0.7911 ...
 $ PC12     : num 0.1653 -0.1224 0.0757 -1.1905 0.0932 ...
 $ PC13     : num 0.27 0.3 -0.203 -0.589 -0.1 ...
 $ PC14     : num 0.5617 0.3926 -0.0303 0.0376 -0.0147 ...

```

```
> #typ_pca
```

```
> #T-Test-- we see that true difference in all the means is different from zero.
```

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

```
Welch Two Sample t-test
```

```

data: PC1 by attr$Attrition
t = 7.0668, df = 332.39, p-value = 9.363e-12
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.7147174 1.2660970
sample estimates:
mean in group No mean in group Yes
 0.1596779      -0.8307293

```

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

```
Welch Two Sample t-test
```



```
data: PC2 by attr$Attrition
t = -0.85944, df = 359.22, p-value = 0.3907
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.23869831 0.09351411
sample estimates:
mean in group No mean in group Yes
 -0.01170362      0.06088848
```

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

```
Welch Two Sample t-test
```

```
data: PC3 by attr$Attrition
t = 1.9682, df = 330.99, p-value = 0.04988
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.0000754401 0.2902563607
sample estimates:
mean in group No mean in group Yes
 0.0234043      -0.1217616
```

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

```
Welch Two Sample t-test
```

```
data: PC4 by attr$Attrition
t = -2.9421, df = 316.05, p-value = 0.003501
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.37886461 -0.07520897
sample estimates:
mean in group No mean in group Yes
 -0.03660389      0.19043290
```

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

```
Welch Two Sample t-test
```

```
data: PC5 by attr$Attrition
t = -1.8185, df = 335.9, p-value = 0.06988
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.26708955 0.01048367
sample estimates:
mean in group No mean in group Yes
 -0.02068558      0.10761736
```

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

```
Welch Two Sample t-test
```

```
data: PC6 by attr$Attrition
t = -2.045, df = 337.68, p-value = 0.04163
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.27902161 -0.00542244
sample estimates:
mean in group No mean in group Yes
 -0.02292967      0.11929235
```

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

Welch Two Sample t-test

```
data: PC7 by attr$Attrition
t = 0.12903, df = 338.09, p-value = 0.8974
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.1252946  0.1428859
sample estimates:
mean in group No mean in group Yes
 0.001418073      -0.007377570
```

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

Welch Two Sample t-test

```
data: PC8 by attr$Attrition
t = 1.2417, df = 333.18, p-value = 0.2152
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.04925478  0.21789000
sample estimates:
mean in group No mean in group Yes
 0.01359406      -0.07072355
```

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

Welch Two Sample t-test

```
data: PC9 by attr$Attrition
t = -4.0487, df = 341.99, p-value = 6.374e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.3508967 -0.1214329
sample estimates:
mean in group No mean in group Yes
 -0.03807555      0.19808925
```

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

Welch Two Sample t-test

```
data: PC10 by attr$Attrition
t = -4.7135, df = 407.32, p-value = 3.348e-06
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.2874191 -0.1182375
sample estimates:
mean in group No mean in group Yes
 -0.03270088      0.17012739
```

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

Welch Two Sample t-test

```
data: PC11 by attr$Attrition
t = -1.716, df = 344.09, p-value = 0.08705
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.17290429  0.01177642
sample estimates:
mean in group No mean in group Yes
 -0.01298888      0.06757505
```

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

Welch Two Sample t-test

```
data: PC12 by attr$Attrition
t = -1.3139, df = 419.64, p-value = 0.1896
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.10145603  0.02016025
sample estimates:
mean in group No mean in group Yes
 -0.006553436      0.034094458
```

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

Welch Two Sample t-test

```
data: PC13 by attr$Attrition
t = 2.8529, df = 328.06, p-value = 0.004608
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 0.02802803 0.15253970
sample estimates:
mean in group No mean in group Yes
 0.01455597      -0.07572789
```

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

Welch Two Sample t-test

```
data: PC14 by attr$Attrition
t = -1.1951, df = 362.54, p-value = 0.2328
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.07713631  0.01882051
sample estimates:
mean in group No mean in group Yes
 -0.004700967      0.024456932
```

```
> #F-Test #Testing Variation
```

```
>
```

```
>
```

```
> #Variance Test- Test for variance
```

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

F test to compare two variances

```
data: PC1 by attr$Attrition
F = 0.99326, 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:
 0.8099491 1.2018726
sample estimates:
ratio of variances
 0.9932578
```

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

F test to compare two variances

```
data: PC2 by attr$Attrition
F = 1.2515, 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:
 1.020537 1.514360
```

```
sample estimates:
ratio of variances
    1.251506
```

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

```
F test to compare two variances
```

```
data: PC3 by attr$Attrition
F = 0.97956, num df = 1232, denom df = 236, p-value = 0.8191
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.7987755 1.1852922
sample estimates:
ratio of variances
    0.9795553
```

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

```
F test to compare two variances
```

```
data: PC4 by attr$Attrition
F = 0.8328, num df = 1232, denom df = 236, p-value = 0.06007
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.6791035 1.0077126
sample estimates:
ratio of variances
    0.832799
```

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

```
F test to compare two variances
```

```
data: PC5 by attr$Attrition
F = 1.0274, num df = 1232, denom df = 236, p-value = 0.8065
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.8377538 1.2431317
sample estimates:
ratio of variances
    1.027355
```

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

```
F test to compare two variances
```

```
data: PC6 by attr$Attrition
F = 1.0446, num df = 1232, denom df = 236, p-value = 0.6821
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.8518521 1.2640519
sample estimates:
ratio of variances
    1.044644
```

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

```
F test to compare two variances
```

```
data: PC7 by attr$Attrition
F = 1.0486, num df = 1232, denom df = 236, p-value = 0.6552
alternative hypothesis: true ratio of variances is not equal to 1
```

```
95 percent confidence interval:
 0.8550597 1.2688116
sample estimates:
ratio of variances
 1.048578
```

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

```
F test to compare two variances
```

```
data: PC8 by attr$Attrition
F = 1.0009, num df = 1232, denom df = 236, p-value = 0.9893
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.8162071 1.2111588
sample estimates:
ratio of variances
 1.000932
```

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

```
F test to compare two variances
```

```
data: PC9 by attr$Attrition
F = 1.0863, num df = 1232, denom df = 236, p-value = 0.4278
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.8858151 1.3144492
sample estimates:
ratio of variances
 1.086294
```

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

```
F test to compare two variances
```

```
data: PC10 by attr$Attrition
F = 1.702, num df = 1232, denom df = 236, p-value = 7.271e-07
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 1.387916 2.059510
sample estimates:
ratio of variances
 1.702031
```

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

```
F test to compare two variances
```

```
data: PC11 by attr$Attrition
F = 1.1066, num df = 1232, denom df = 236, p-value = 0.3303
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.9023918 1.3390472
sample estimates:
ratio of variances
 1.106622
```

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

```
F test to compare two variances
```

```
data: PC12 by attr$Attrition
```

```
F = 1.8153, num df = 1232, denom df = 236, p-value = 3.477e-08
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 1.480290 2.196582
sample estimates:
ratio of variances
 1.815311
```

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

F test to compare two variances

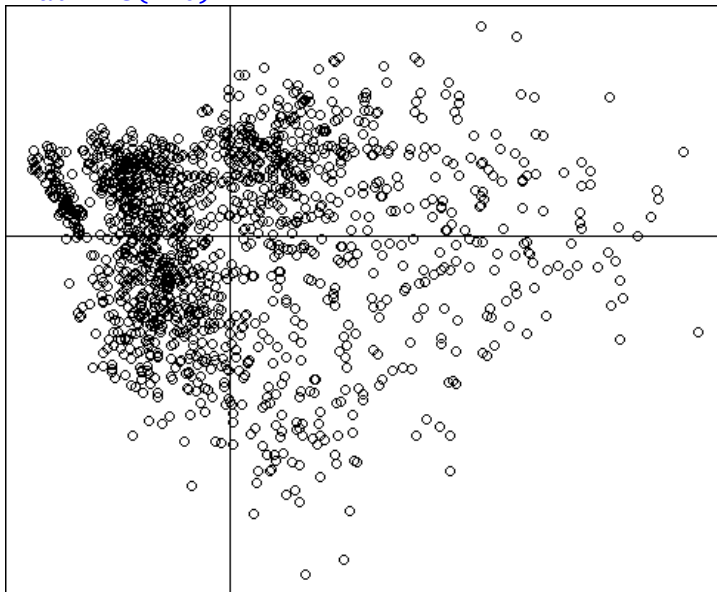
```
data: PC13 by attr$Attrition
F = 0.95092, num df = 1232, denom df = 236, p-value = 0.5988
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.7754288 1.1506484
sample estimates:
ratio of variances
 0.9509248
```

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

F test to compare two variances

```
data: PC14 by attr$Attrition
F = 1.2831, num df = 1232, denom df = 236, p-value = 0.01698
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 1.046275 1.552554
sample estimates:
ratio of variances
 1.28307
```

```
> #Plotting the scores of Principal Component 1 and Principal component 2
> plot(typ_pca$PC1, typ_pca$PC2,xlab="PC1:", ylab="PC2")
> abline(h=0)
> abline(v=0)
```

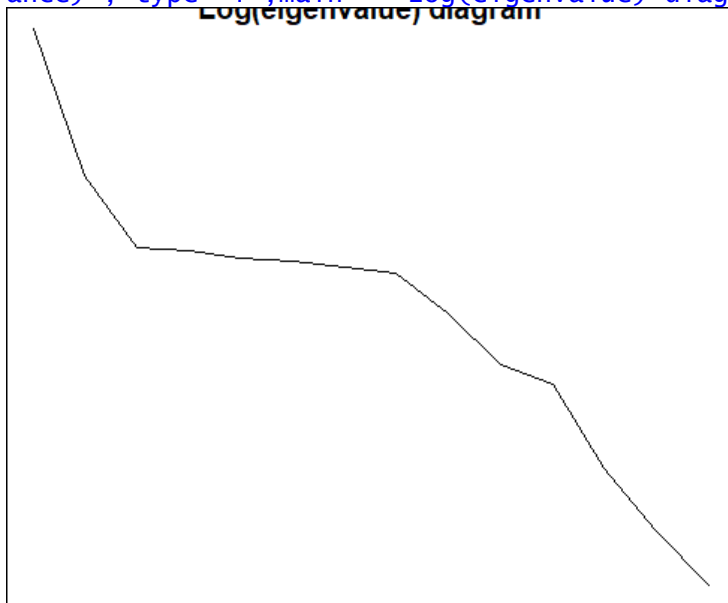


```
> #Plotting the Variance of Principal Components
```

```
> plot(eigenvalues, xlab= "Component number", ylab = "Component variance", type = "l", ma
```



```
> #Plotting the Log variance of Components
> plot(log(eigenvalues), xlab = "Component number", ylab = "log(Component vari
ance)", 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      P
C8      PC9      PC10     PC11
4.0167738 1.6502052 1.0685042 1.0521201 1.0094108 0.9924579 0.9533497 0.91749
69 0.7224654 0.5306975 0.4698454
      PC12      PC13      PC14
0.2832233 0.1933840 0.1400658
```

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

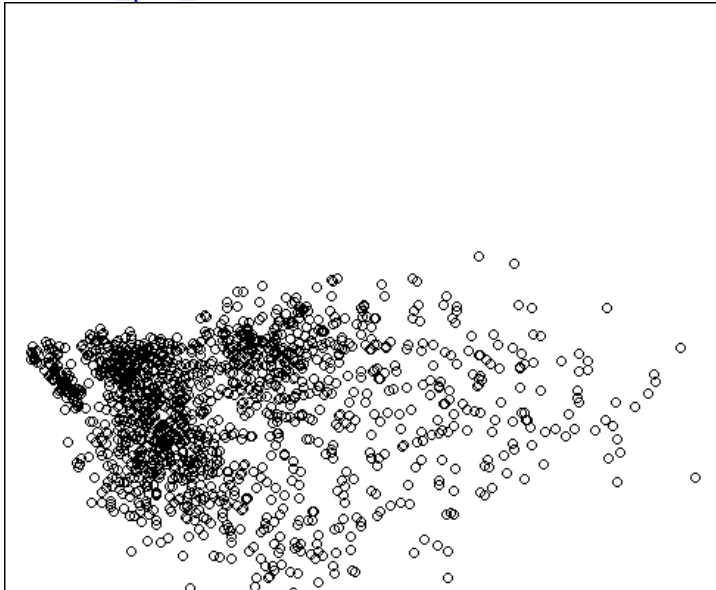
```
> #x_pca$x
```

```
> #Plotting the scores
```

```
>
```

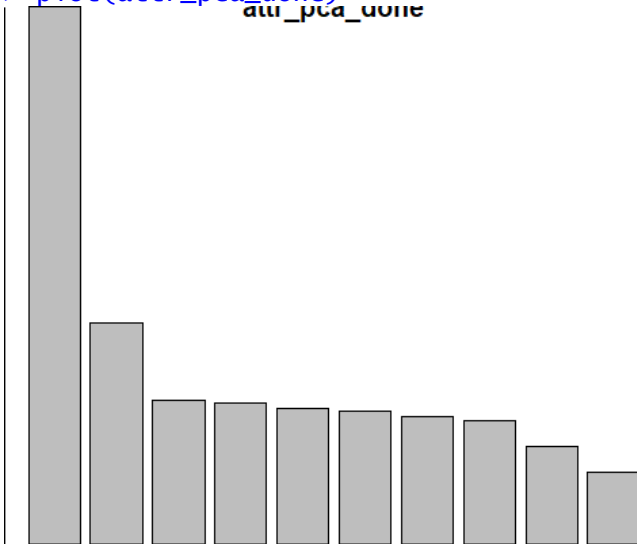
```
> xlim <- range(attr_pca_done$x[,1])
```

```
> 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	DistanceF
romHome Education					
"1" [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"					

"1"	[5,]	"27"	"Travel_Rarely"	" 591"	"Research & Development"	" 2"
"2"	[6,]	"32"	"Travel_Frequently"	"1005"	"Research & Development"	" 2"
"3"	[7,]	"59"	"Travel_Rarely"	"1324"	"Research & Development"	" 3"
"1"	[8,]	"30"	"Travel_Rarely"	"1358"	"Research & Development"	"24"
"3"	[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"
"2"	[12,]	"29"	"Travel_Rarely"	" 153"	"Research & Development"	"15"
"1"	[13,]	"31"	"Travel_Rarely"	" 670"	"Research & Development"	"26"
"2"	[14,]	"34"	"Travel_Rarely"	"1346"	"Research & Development"	"19"
"3"	[15,]	"28"	"Travel_Rarely"	" 103"	"Research & Development"	"24"
"4"	[16,]	"29"	"Travel_Rarely"	"1389"	"Research & Development"	"21"
"2"	[17,]	"32"	"Travel_Rarely"	" 334"	"Research & Development"	" 5"
"2"	[18,]	"22"	"Non-Travel"	"1123"	"Research & Development"	"16"
"4"	[19,]	"53"	"Travel_Rarely"	"1219"	"Sales"	" 2"
"3"	[20,]	"38"	"Travel_Rarely"	" 371"	"Research & Development"	" 2"
"2"	[21,]	"24"	"Non-Travel"	" 673"	"Research & Development"	"11"
"4"	[22,]	"36"	"Travel_Rarely"	"1218"	"Sales"	" 9"
"4"	[23,]	"34"	"Travel_Rarely"	" 419"	"Research & Development"	" 7"
"2"	[24,]	"21"	"Travel_Rarely"	" 391"	"Research & Development"	"15"
"1"	[25,]	"34"	"Travel_Rarely"	" 699"	"Research & Development"	" 6"
"3"	[26,]	"53"	"Travel_Rarely"	"1282"	"Research & Development"	" 5"
"1"	[27,]	"32"	"Travel_Frequently"	"1125"	"Research & Development"	"16"
"4"	[28,]	"42"	"Travel_Rarely"	" 691"	"Sales"	" 8"
"4"	[29,]	"44"	"Travel_Rarely"	" 477"	"Research & Development"	" 7"
"4"	[30,]	"46"	"Travel_Rarely"	" 705"	"Sales"	" 2"
"3"	[31,]	"33"	"Travel_Rarely"	" 924"	"Research & Development"	" 2"
"4"	[32,]	"44"	"Travel_Rarely"	"1459"	"Research & Development"	"10"
"2"	[33,]	"30"	"Travel_Rarely"	" 125"	"Research & Development"	" 9"
		EducationField	EnvironmentSatisfaction	Gender	HourlyRate	JobInv
"2"	[1,]	"Life Sciences"	"2"	"Female"	" 94"	"3"
"2"	[2,]	"Life Sciences"	"3"	"Male"	" 61"	"2"

"1"	[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"
"3"	[9,]	"Life Sciences"	"4"	"Male"	" 44"	"2"
"2"	[10,]	"Medical"	"3"	"Male"	" 94"	"3"
"1"	[11,]	"Medical"	"1"	"Male"	" 84"	"4"
"2"	[12,]	"Life Sciences"	"4"	"Female"	" 49"	"2"
"1"	[13,]	"Life Sciences"	"1"	"Male"	" 31"	"3"
"1"	[14,]	"Medical"	"2"	"Male"	" 93"	"3"
"1"	[15,]	"Life Sciences"	"3"	"Male"	" 50"	"2"
"3"	[16,]	"Life Sciences"	"2"	"Female"	" 51"	"4"
"1"	[17,]	"Life Sciences"	"1"	"Male"	" 80"	"4"
"1"	[18,]	"Medical"	"4"	"Male"	" 96"	"4"
"4"	[19,]	"Life Sciences"	"1"	"Female"	" 78"	"2"
"1"	[20,]	"Life Sciences"	"4"	"Male"	" 45"	"3"
"2"	[21,]	"Other"	"1"	"Female"	" 96"	"4"
"1"	[22,]	"Life Sciences"	"3"	"Male"	" 82"	"2"
"3"	[23,]	"Life Sciences"	"1"	"Female"	" 53"	"3"
"1"	[24,]	"Life Sciences"	"3"	"Male"	" 96"	"3"
"1"	[25,]	"Medical"	"2"	"Male"	" 83"	"3"
"5"	[26,]	"Other"	"3"	"Female"	" 58"	"3"
"1"	[27,]	"Life Sciences"	"2"	"Female"	" 72"	"1"
"2"	[28,]	"Marketing"	"3"	"Male"	" 48"	"3"
"3"	[29,]	"Medical"	"1"	"Female"	" 42"	"2"
"5"	[30,]	"Marketing"	"2"	"Female"	" 83"	"3"
"1"	[31,]	"Medical"	"3"	"Male"	" 78"	"3"
"2"	[32,]	"Other"	"4"	"Male"	" 41"	"3"
"1"	[33,]	"Medical"	"4"	"Male"	" 83"	"2"

JobRole
me MonthlyRate NumCompaniesWorked

JobSatisfaction MaritalStatus MonthlyInco

[1,] "19479"	"Sales Executive" "8"	"4"	"Single"	" 5993"
[2,] "24907"	"Research Scientist" "1"	"2"	"Married"	" 5130"
[3,] " 2396"	"Laboratory Technician" "6"	"3"	"Single"	" 2090"
[4,] "23159"	"Research Scientist" "1"	"3"	"Married"	" 2909"
[5,] "16632"	"Laboratory Technician" "9"	"2"	"Married"	" 3468"
[6,] "11864"	"Laboratory Technician" "0"	"4"	"Single"	" 3068"
[7,] " 9964"	"Laboratory Technician" "4"	"1"	"Married"	" 2670"
[8,] "13335"	"Laboratory Technician" "1"	"3"	"Divorced"	" 2693"
[9,] " 8787"	"Manufacturing Director" "0"	"3"	"Single"	" 9526"
[10,] "16577"	"Healthcare Representative" "6"	"3"	"Married"	" 5237"
[11,] "16479"	"Laboratory Technician" "0"	"2"	"Married"	" 2426"
[12,] "12682"	"Laboratory Technician" "0"	"3"	"Single"	" 4193"
[13,] "15170"	"Research Scientist" "1"	"3"	"Divorced"	" 2911"
[14,] " 8758"	"Laboratory Technician" "0"	"4"	"Divorced"	" 2661"
[15,] "12947"	"Laboratory Technician" "5"	"3"	"Single"	" 2028"
[16,] "10195"	"Manufacturing Director" "1"	"1"	"Divorced"	" 9980"
[17,] "15053"	"Research Scientist" "0"	"2"	"Divorced"	" 3298"
[18,] " 7324"	"Laboratory Technician" "1"	"4"	"Divorced"	" 2935"
[19,] "22021"	"Manager" "2"	"4"	"Married"	"15427"
[20,] " 4306"	"Research Scientist" "5"	"4"	"Single"	" 3944"
[21,] " 8232"	"Manufacturing Director" "0"	"3"	"Divorced"	" 4011"
[22,] " 6986"	"Sales Representative" "7"	"1"	"Single"	" 3407"
[23,] "21293"	"Research Director" "0"	"2"	"Single"	"11994"
[24,] "19281"	"Research Scientist" "1"	"4"	"Single"	" 1232"
[25,] "17102"	"Research Scientist" "2"	"1"	"Single"	" 2960"
[26,] "10735"	"Manager" "4"	"3"	"Divorced"	"19094"
[27,] " 4681"	"Research Scientist" "1"	"1"	"Single"	" 3919"
[28,] "21173"	"Sales Executive" "0"	"2"	"Married"	" 6825"
[29,] " 2094"	"Healthcare Representative" "3"	"4"	"Married"	"10248"
[30,] "22822"	"Manager" "3"	"1"	"Single"	"18947"
[31,] " 6670"	"Laboratory Technician" "4"	"4"	"Single"	" 2496"
[32,] "19121"	"Healthcare Representative" "2"	"4"	"Married"	" 6465"

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

```

```

[ reached getOption("max.print") -- omitted 1437 rows ]
> #drop(scale(new_attrition,center=center, scale=scale)%%attr_pca_done$rotation[,1])
> predict(attr_pca_done)[,2]
[1] -1.805296680 0.381073595 -1.413301606 0.682294015 -0.965438549 1.47
6192828 -2.344142438 0.310022541
[9] 1.213005861 -0.208584655 0.961999888 1.760186112 1.023377864 0.60
1874393 0.292702788 1.686663324
[17] 1.132058901 0.684977918 -1.060188116 -0.518252552 1.416074395 -1.01
3413533 1.312303531 1.127496005
[25] 0.070998887 -1.187855044 1.487707345 0.517960123 1.068632778 -2.59
4944348 -0.598109160 -0.506577343
[33] 1.290594877 -0.878346751 0.497391245 0.042990012 -0.382172652 0.52
0002398 -1.947119717 0.269317986
[41] 0.231335668 0.699871648 0.709039810 1.355663630 1.607572626 1.07
8091201 1.653442819 -0.926896408
[49] -0.616849916 0.297326189 -3.634989196 0.830881805 -1.218466650 -0.44
0311397 -0.955185144 1.814109184
[57] 1.103897503 0.058005177 0.857390902 0.774824505 1.922306493 1.68
5679343 -1.151655660 -0.755218265

```

[65]	1.946298043	-2.427444222	0.194433528	-2.235551626	-0.244778958	-0.02
4496709	-3.049510452	1.199023366				
[73]	0.353967605	1.166637222	-0.497612851	1.320776948	1.812350789	-2.25
8070681	-1.427059293	-2.441897724				
[81]	0.807194469	0.584129288	-2.585230554	-0.141167810	0.218580349	-2.89
5430481	0.296723552	-0.954905426				
[89]	2.241429270	0.576023363	0.887965015	-0.042960092	1.380522111	0.35
6013463	1.079549026	-3.413896182				
[97]	0.914909460	1.261721220	-0.434370191	-1.169248554	-0.568926672	0.12
9102948	1.011087824	2.027920770				
[105]	-1.948838372	-4.702450356	-2.298624579	0.839192498	0.669627564	0.89
5286352	0.077625437	0.891821802				
[113]	-1.597047470	1.280947911	-1.497945925	-0.429277187	1.224072878	1.02
0308582	-0.957789430	0.880262420				
[121]	1.353815226	1.191138861	-2.058379440	0.529500165	0.751679496	1.33
5263326	0.671199838	0.982963851				
[129]	1.045174946	1.174952007	-1.368344149	-1.863951177	0.022177967	-0.26
4011818	2.036444725	-1.141406936				
[137]	-1.829267033	0.575714072	0.355998339	1.719478916	-0.717497517	-0.91
1991127	-0.552194752	1.056369733				
[145]	1.374272905	-0.221398169	0.984904608	-1.015512767	-0.170499565	0.87
0864126	1.323777612	0.842682999				
[153]	-0.130298641	-0.105131907	1.179951656	1.186521001	-1.542771737	-2.15
0763323	-0.281846005	-0.473514038				
[161]	1.442829624	-0.246305750	1.013239689	-1.617706706	0.316334689	-1.90
8112085	0.459857669	1.028425912				
[169]	-0.503335039	0.520151016	1.016160016	1.138364241	0.275200700	2.43
5407419	-0.740295345	-1.959211019				
[177]	0.657391803	1.312314683	1.475401478	0.313869373	-1.186616073	0.25
1497956	0.176563050	-0.650092650				
[185]	-0.653420939	1.530587781	0.650794334	-1.496934318	1.121355381	-1.55
7550077	1.217522098	1.167325207				
[193]	-0.706157496	-0.338535155	-1.601562460	1.171786028	-0.380339605	-0.23
2375365	-2.690539375	0.586173357				
[201]	-0.379354454	-0.099598881	0.685503217	-1.309110283	-2.277533882	1.40
5549600	1.141579640	0.855506760				
[209]	-1.740164487	-2.419827577	1.386354812	1.266122553	1.023754676	-1.02
5292143	-0.091748705	-1.969695384				
[217]	-0.328858475	0.920927227	-0.356579427	-1.158333264	-0.336179804	-0.57
4363551	0.590940088	2.077646912				
[225]	0.996531429	-1.393185423	0.946643526	1.313998196	0.820141343	0.71
6831172	-1.920647021	2.015699008				
[233]	-2.596950603	-2.868673366	-0.270110430	-0.456100687	-0.106858898	0.29
0135161	0.296073467	0.790979516				
[241]	-1.594967526	0.704070565	-1.187363115	1.105805165	-0.759239466	-2.12
5592581	0.442831846	0.326168549				
[249]	-0.870100460	-1.372383853	-2.079610765	1.289365861	1.134590189	-1.17
1984649	-0.012491244	1.135983263				
[257]	1.712019144	0.523153032	-1.160211079	1.292640892	0.236595751	0.18
2429198	0.096507056	-1.186671020				
[265]	0.134266014	-0.514082583	1.277490688	1.069225272	0.547145926	2.60
1335417	0.008092276	0.769896066				
[273]	0.993772287	-0.553756106	0.977359671	-1.083806073	-0.753986277	0.87
1988007	0.963924380	-2.091565779				
[281]	-2.252752216	1.708700830	1.594191407	-0.119955338	1.098683465	1.68
3621266	-1.691363538	-2.036793449				
[289]	0.525600519	0.892866704	-3.711227520	0.104349489	1.031413296	1.52
0857872	0.473115865	-0.791143696				
[297]	1.009848060	1.710231468	-0.707554545	-2.050277481	-0.120838847	1.08
7088224	1.213645850	0.852701192				
[305]	1.254855369	-0.130287571	1.430153491	-0.960837004	-1.275995353	0.83
1525254	-0.489933412	1.149837686				
[313]	1.161399149	-0.150550244	1.263023911	1.477125975	-3.033069111	-0.19
5916530	0.687582276	2.247438397				

[321]	0.987656073	0.342069059	-0.510910929	-0.314411292	1.498546319	1.82
3274743	0.425938296	-1.411326957				
[329]	0.631088025	-2.748517333	0.151196917	0.923918009	-1.444700203	-2.72
3449105	-0.386767126	-0.469344410				
[337]	1.800778713	1.116045123	1.218205478	1.506695120	-1.423296616	1.22
0046981	1.554219085	1.418490592				
[345]	1.422286260	0.884577024	-1.104769407	-1.506959695	-1.837521719	0.66
1610739	0.239309897	0.928176528				
[353]	-2.227861990	0.188797707	-0.642782258	1.841730098	-1.502857977	1.18
4556891	-0.858822239	0.616062127				
[361]	-1.605018266	0.374095875	1.511082210	0.383587594	-1.244265844	-1.11
9350322	1.260148516	-2.451461096				
[369]	0.098990208	1.342061333	0.575022769	-1.028549141	-2.185260871	0.60
1978395	1.064107598	-3.420182356				
[377]	-1.064441925	-0.315474220	-1.191197774	-2.906444217	0.873531932	0.43
5598169	1.390570963	1.052637686				
[385]	1.131817389	-1.122396375	2.243123477	-1.108810210	-0.376939255	-1.09
4049070	0.676465003	-2.072444087				
[393]	-2.952980072	-1.733601519	2.541414826	-1.408016991	-0.904561550	1.01
3603065	1.190655067	0.783768941				
[401]	-0.041346691	-3.428786411	1.255444619	0.446196792	0.890068359	-0.06
1714372	-1.465377380	-0.580728506				
[409]	-2.435734307	-0.601369210	0.101486379	-0.900598516	-0.162110635	0.63
7918222	1.058720506	0.812458954				
[417]	-0.015721666	0.961063130	0.934464599	0.059114215	0.249811227	-0.28
8511717	0.985203863	1.962127218				
[425]	-3.271781082	0.741342234	1.982873795	0.357718898	-1.892575171	-3.16
2984341	1.127853389	-2.991612702				
[433]	0.477860732	-1.276710916	1.295048452	-0.900028552	-0.639744203	0.97
1176922	-0.575224933	-1.066429549				
[441]	-2.004491780	-0.945631187	1.074115541	-0.042114063	0.431105701	-1.74
7435280	-0.629659088	-0.392221803				
[449]	-0.489213167	0.703218734	-0.041305760	1.534024810	0.942095249	1.30
5404827	-0.074743009	-1.288912304				
[457]	-1.880987143	1.018577148	-1.743417373	0.525502638	-0.282247149	0.66
1390613	1.467297359	0.660096978				
[465]	-0.730678144	-2.501114946	-0.240121414	1.206961303	-0.122389417	-1.41
4121432	1.578950914	-1.780168899				
[473]	-0.613244511	-0.090095234	1.379110753	1.288840097	0.689298139	-0.42
2310162	1.299011519	1.125474075				
[481]	0.424664278	0.702773906	0.008538431	-0.362734228	0.861434591	1.45
6977872	-1.473659609	0.592223933				
[489]	0.202230874	-2.449653448	-0.669277167	0.207261192	-3.187812330	-1.57
0551426	1.193612042	0.846565869				
[497]	0.997581144	-2.839341919	1.469610530	0.273807866	0.587776293	0.34
3800441	-0.689478142	2.048574287				
[505]	-0.535791637	0.727709690	1.304045278	0.648517571	1.812971264	1.04
6879714	-0.836301038	-0.658787991				
[513]	0.771001162	1.146318038	1.928955363	0.256594939	0.804239916	1.15
7540139	1.171926355	1.732972326				
[521]	-1.354477478	0.929237421	-0.860887766	0.798830043	1.185347467	-1.15
0257736	1.726978084	1.120745269				
[529]	-1.339746556	1.138393610	1.414437451	0.876373017	-0.162318832	0.27
1367405	-2.738029715	-0.091663186				
[537]	-2.991236675	1.707548241	0.178242634	-1.595790568	0.506659573	-1.50
6043181	-1.285683679	0.243620926				
[545]	-1.318280939	0.168529203	0.588126756	-1.213417381	-0.618505583	-0.25
2927477	1.272428101	-1.275156250				
[553]	-3.276158804	0.322549566	-0.536973345	0.687516163	-1.135138991	-0.91
2647683	1.468767498	-1.589209789				
[561]	-0.346714086	0.188580145	2.029806672	1.412630784	0.341711974	1.01
9488772	-0.866931380	0.892785071				
[569]	-3.323311627	0.711553285	-0.215143734	0.222354399	0.171714269	-0.24
2100920	0.126947395	-2.366260589				

[577]	0.733512097	0.842631663	0.096019534	0.859774673	0.293462481	-0.17
8604462	1.088444853	-0.974131320				
[585]	0.896449250	0.765114617	0.585712764	-2.206069723	-2.976740322	0.46
4113624	1.262231295	-0.623600008				
[593]	-0.046320896	0.913777612	1.345206146	-1.392450621	-0.322637564	-1.81
4111742	-0.509469707	-0.359358548				
[601]	1.834841532	-1.419360956	-1.254008747	-0.276287348	1.293970634	-0.12
7166641	0.619666687	0.798766978				
[609]	-0.636043357	-2.804028599	1.379612180	-0.308564996	1.700677241	0.51
8263924	1.501920474	0.887389313				
[617]	-0.103149805	-1.933067331	-0.527136480	1.504208198	0.623900019	1.96
0415008	0.404418761	-1.085359284				
[625]	-3.507392490	-1.817490014	-0.554828082	-2.238368802	-1.257404256	0.73
1357136	-0.229697559	-0.516114842				
[633]	-1.037509231	0.767057993	1.017088487	2.035863533	1.466797865	0.70
9647631	0.692892542	-0.780112077				
[641]	1.424217571	1.354487526	0.538840289	-1.049729876	0.188099574	-0.45
8596590	-3.178695989	0.727446360				
[649]	-0.869691363	-2.108792812	-1.025070774	1.083894103	0.526972971	0.10
6547585	-1.579128575	0.065329357				
[657]	0.362530777	-0.177879268	0.598067693	0.418378237	-2.902964529	-1.23
0015642	1.243788376	0.859241204				
[665]	1.654441086	-0.292713246	1.368412168	-0.659675458	-0.190981199	-1.23
9029629	0.520093303	0.382524528				
[673]	-1.080826985	-0.268560449	-2.160340763	0.800037634	0.966701327	-0.50
0732388	-1.696270774	0.499792694				
[681]	0.084230184	1.154382836	-0.731843360	0.679340328	-1.310150122	1.45
6904777	2.066599285	0.848466379				
[689]	1.273738663	0.892292380	1.743700198	-1.989868837	1.036180508	1.21
0608773	0.533118397	-0.249391121				
[697]	0.697966169	0.690692543	0.213663152	-1.056586184	-1.909022558	-0.95
4658182	0.503572421	0.132231545				
[705]	-0.192053690	1.036734221	-2.563733572	0.719381064	-0.144036597	0.91
2270536	0.252931707	-0.684606751				
[713]	0.136546310	-0.737521649	-3.995057539	0.403012092	0.545256731	-0.88
1191625	0.975659441	-0.295213590				
[721]	0.094592538	-0.919723252	0.106698207	-1.299295889	1.182820530	0.46
6544476	0.460641236	1.117911893				
[729]	-2.379598710	1.276309417	1.302119593	0.652201964	0.960109684	1.31
2218520	1.292043938	-1.326227574				
[737]	-1.479578319	-1.111836490	1.106182705	1.091951949	0.635498360	-3.04
1335367	-1.496481562	-2.603776947				
[745]	-1.677375775	-0.293546413	1.074951565	-2.617511762	-0.581796000	0.11
9321105	0.462492662	0.694623823				
[753]	3.049980309	0.577345739	0.610029980	-2.089980114	-0.161876417	0.66
5944831	-2.040609880	0.428826248				
[761]	-0.118533283	-1.631148320	-0.237885343	0.015757724	0.556103411	-0.25
4237024	-1.907949301	-0.169166448				
[769]	0.896046442	1.104786805	-3.880338858	-1.806915487	-1.160531838	1.48
8108118	-2.906441123	-2.002030974				
[777]	1.255015121	1.172039821	-0.903007564	-2.204968495	1.314794885	1.06
5786785	0.264396426	0.913158107				
[785]	1.262887991	0.094824595	0.817248085	-2.336743504	1.208718320	-1.96
7371922	-0.630803993	1.037714783				
[793]	1.750661157	1.060593112	0.345906410	-0.669580728	2.015411488	0.47
6849284	-0.092840055	0.874742084				
[801]	0.502614487	-1.494061418	0.712997018	-0.615738226	-2.092470529	1.20
2090305	-2.355768143	1.013557580				
[809]	0.278271263	1.442868021	-0.554104808	-1.967516548	-2.306238589	-0.49
4975233	0.090958740	1.323404706				
[817]	-1.694717488	0.443213958	0.987312263	0.886539334	0.209260156	-1.76
4583449	-0.080849348	1.050100682				
[825]	-1.294323856	0.871036310	0.852224049	0.634126880	0.918854147	0.41
7536233	-0.624551328	1.020767232				

```

[833] -1.088651944 0.978270876 0.647594872 0.632415006 1.976245376 -1.04
8172325 2.020071014 -0.879779154
[841] -0.593110595 -0.337341915 0.391539946 1.326394378 0.845217248 -1.31
1688564 0.218156670 1.576609572
[849] 0.435458968 -1.794870287 0.193258943 -3.299758216 1.544260981 1.28
7126204 -1.345361400 1.366509702
[857] 1.112169475 0.063993033 -1.547828834 1.029721549 1.185256107 -0.63
6884579 -0.498717142 0.846163046
[865] -1.694006753 -0.930261463 -1.625781834 -2.565543396 1.143691500 -2.90
0696534 -0.188629805 0.774776820
[873] 0.769710196 1.366970161 2.205826944 2.912812860 1.476151058 -0.53
1774967 -1.512547826 0.255021570
[881] 0.863329108 0.493868424 0.566730435 2.571738400 -1.402021735 0.97
4544158 1.879496181 -1.817146074
[889] 0.282595032 2.140026931 -3.186542503 1.011376168 1.101740089 0.82
1801343 -2.154799129 0.281011823
[897] 1.284042243 -1.958870135 -1.667331648 -2.888220529 1.352165617 -1.72
9894773 0.946347812 0.119271676
[905] -3.589861627 0.205507718 0.320568170 -1.157182430 1.218452381 1.08
1773710 0.936087694 1.052826050
[913] 1.265668267 -0.253877062 -0.117743653 1.278727250 -1.175011090 0.69
3400158 -0.245288304 -2.167305191
[921] 1.003050594 1.058588976 0.948234680 0.721555833 0.796882461 -1.99
6086917 1.459244489 0.474921323
[929] 0.213835796 0.913024261 0.825876322 -0.261549249 1.311149791 0.57
2968919 1.135871854 1.388433823
[937] -2.460102481 -0.446967250 -0.746971777 0.348847161 0.320911276 1.58
6772180 0.377149133 -0.525933102
[945] 1.896676090 -2.824252329 -0.462978817 -1.677706981 0.297657326 1.56
3448209 1.761526611 1.245765405
[953] 0.739778837 -0.962039268 0.435410396 -0.382159830 -2.897456049 -1.98
0587913 0.859705214 1.369469220
[961] 0.714977119 0.705616525 -0.250102356 0.223683709 1.776657658 0.65
6231086 -2.135907972 -0.207573580
[969] 1.608540593 0.274435098 -1.191804496 -2.807291532 0.971948342 0.44
3529382 -0.033995378 -1.567980309
[977] -0.371907292 0.397392501 0.364272767 0.728723037 -1.152437211 0.43
7515868 0.314790710 1.831260375
[985] 0.725716171 1.153724997 -0.126986304 -1.142008579 -0.445127086 -0.89
8134615 -1.142960124 0.796077351
[993] -0.619061781 0.326989090 -1.759930469 0.652537049 1.165257302 1.69
4508000 1.195786083 0.416643969
[ reached getOption("max.print") -- omitted 470 entries ]

```

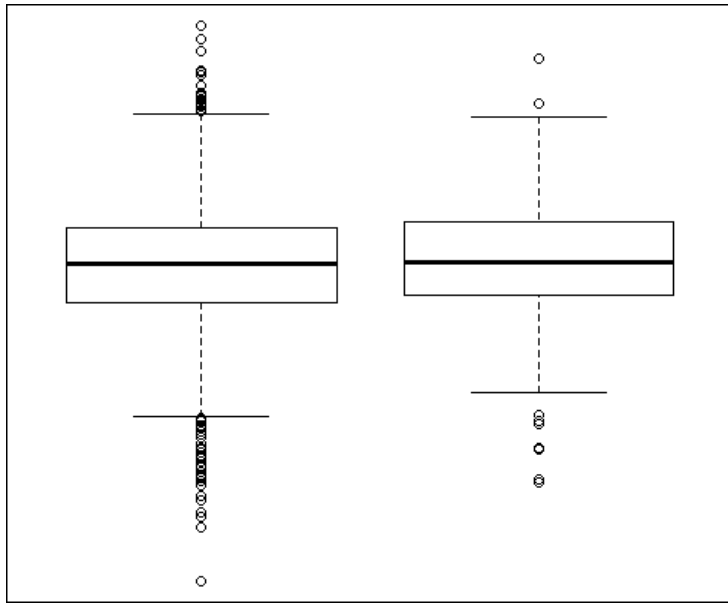
```
> #The aboved two gives us the same thing. predict is a good function to know
```

```

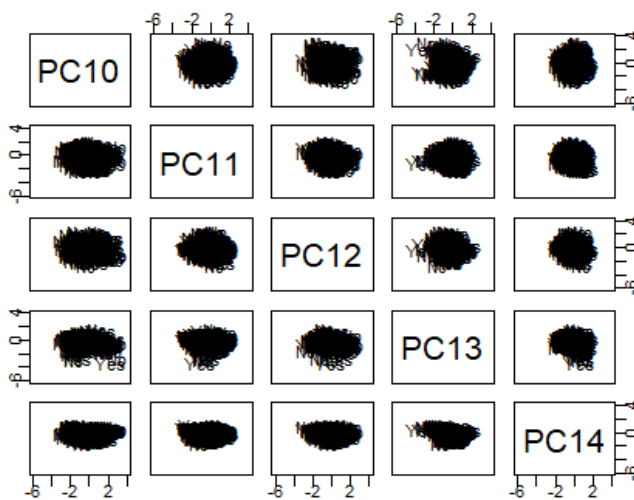
> out <- sapply(10:14, function(i){plot(attr$Attrition,attr_pca_done$x[,i],xlab=paste("PC",i,sep=""),ylab="Attrition")})
> out

```

	[,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)})
```



```
> # 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 482, 988
```

Cluster means:

	Age	DailyRate	DistanceFromHome	HourlyRate	MonthlyIncome	MonthlyRate
1	0.5608866	0.006781204	0.006450863	-0.05740890	0.8210216	0.00111
4956	-0.008405938	-0.0351402				
2	-0.2736309	-0.003308239	-0.003147081	0.02800718	-0.4005389	-0.00054
3936	0.004100873	0.0171433				
	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager

1	0.9133144	0.0011713194	0.9868202	1.0086744
0.8437371		0.9632583		
2	-0.4455643	-0.0005714331	-0.4814244	-0.4920861
-0.4116207		-0.4699297		

Clustering vector:

```
[1] 2 1 2 2 2 2 2 2 1 1 2 2 2 2 2 1 2 2 1 2 2 2 1 2 2 1 2 2 1 1 2 2 2 2
2 2 2 2 2 2 2 2 1 1 1 1 2 1 2 2 2 2 2 2 2 1 1 2
[59] 2 2 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 1 2 1 2 2 1 1 1 2 1
1 1 2 2 2 1 2 2 2 2 1 2 1 1 2 2 2 1 2 1 2 2 2
[117] 1 1 2 1 2 2 2 1 1 2 1 2 2 1 2 2 2 1 2 2 2 1 2 2 2 1 2 2 2 2 2 1 2 2 1
2 1 1 1 2 2 2 1 2 2 2 2 2 2 1 1 1 2 2 2 2 2 1
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2 1 1 2 1 2 2 2 2 1 2 1 2 1 1 2 2 1 1 1 2 2 1
[233] 2 1 2 1 2 1 2 2 2 2 2 1 1 2 2 1 2 2 2 1 2 2 2 2 1 2 2 2 1 2 1 2 2 2
2 1 1 1 2 2 2 2 1 2 2 1 1 2 2 1 2 1 2 2 2 2 2
[291] 1 2 2 2 1 2 1 2 2 1 2 2 1 1 1 1 1 2 2 2 2 1 2 1 1 2 1 1 2 1 2 2 2 2 1
1 1 2 2 1 2 2 2 2 1 2 2 2 2 2 2 1 1 2 1 2 2 2
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2 1 2 1 2 2 2 1 2 1 2 1 2 2 2 1 2 1 1 2 1 2 2
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2 1 2 1 1 1 1 2 2 2 1 2 2 2 2 2 2 2 2 2 2 1 2
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2 2 2 1 1 2 2 1 2 1 1 1 2 2 2 1 2 2 2 2 2 2 2
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2 1 2 2 1 1 2 2 2 2 2 1 1 2 2 2 2 2 2 2 2 1 2
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2 1 2 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 2 1 2 2 2
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2 1 2 2 1 2 2 2 1 2 2 2 2 1 1 2 2 1 2 2 1 2 1
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2 2 2 2 2 1 2 1 2 2 2 2 1 2 1 1 2 2 1 1 1 1 1
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1 2 1 1 2 2 2 2 2 1 2 2 2 2 1 1 1 1 2 2 2 1 2
[813] 1 1 1 2 2 1 2 2 2 1 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 1 1 1 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 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 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 2 2 2 1 1 2 2 1 2 2 2 1 2 2 2
[987] 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	Monthly
Rate	NumCompaniesWorked	PercentsSalaryHike			

```

1 -0.2736309 -0.003308239 -0.003147081 0.02800718 -0.4005389 -0.00054
3936 0.004100873 0.0171433
2 0.5608866 0.006781204 0.006450863 -0.05740890 0.8210216 0.00111
4956 -0.008405938 -0.0351402
TotalWorkingYears TrainingTimesLastYear YearsAtCompany YearsInCurrentRole Y
earsSinceLastPromotion 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 2 1 1 1 2 1 1 2 1 1 2 2 1 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 1 1 1 1 1 1 1 1 1 1 1 1 2 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 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 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 2 1 1 1 2 1 1 1 1 1 1 2 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 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 1 1 1 1 2 1 1 2 2 1 2 2 1 2 1 2 1 1 1
[291] 2 1 1 1 1 2 1 1 1 2 1 1 2 1 1 2 2 2 2 2 1 1 1 2 1 2 2 1 2 2 1 2 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 2 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 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 1 1 2 2 1 1 1 1 1 1 1 1 1 1 1 1
[465] 1 1 2 2 1 1 2 1 2 2 2 1 1 1 2 1 1 1 1 1 1 1 1 2 1 1 1 1 1 2 1 1 1 1 2 1
1 1 1 2 2 1 1 2 1 2 2 2 1 1 1 2 1 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 1 2 2 1 1 1 1 1 1 2 1 1 1 1
1 2 1 1 2 2 1 1 1 1 1 2 2 1 1 1 1 1 1 1 1 2 1
[581] 1 1 1 1 2 1 1 1 2 1 2 1 2 1 2 1 1 1 1 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 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 1 1 2 1 1 1 1 1 1 1 1
1 2 1 1 2 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 1 2 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 2 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 2 1 1 1 1 2 2 2 2 1 1 1 1 1
[813] 2 2 2 1 1 2 1 1 2 1 1 2 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 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 2 1 1 2 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 2 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$betweenss/kmeans2_attr_std$to
tss),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  MonthlyR
ate NumCompaniesWorked PercentSalaryHike
1  0.5013783 -0.07679400      0.01893852 -0.02292678      0.7731900 -0.005035
529      -0.0942477      -0.020767791
2 -0.6413051 -0.06732578      -0.01639876 -0.02736942     -0.5304961 -0.074517
134      -0.5051990      -0.001439503
3  0.6736539  0.19007053      0.01158465  0.06962204      0.2267312  0.136639
746      0.9817944      0.021700073
      TotalWorkingYears TrainingTimesLastYear YearsAtCompany YearsInCurrentRole Y
earsSinceLastPromotion 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 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 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 1 2 2 1
2 3 1 1 2 3 1 2 2 2 3 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 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 2 3 1 3 2 2 2 3 1 3 2 2 2 3 3 2 2 3 3 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 1 2 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 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 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 3 2 2 1 2 2 2 2 2 3 2
[523] 2 1 1 3 1 2 3 1 2 3 2 2 1 1 1 3 2 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 2 3 2 2 1 2
[581] 2 2 2 3 1 2 2 3 3 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 3 2 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 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 3 2 2 1 3 2 1 2 1
[697] 2 2 2 1 3 1 1 2 1 2 3 1 2 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 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 2 1 3
[813] 3 1 1 2 3 1 2 2 2 3 2 2 3 2 2 2 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 2 3 2 3
[871] 3 2 2 2 1 1 2 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 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 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
te NumCompaniesWorked PercentSalaryHike						
1	0.7707463	0.22961595	0.008257502	0.03633025	0.2669399	0.098029
93		0.9613245	0.009213117			
2	-0.7192085	-0.11199075	-0.020883872	0.03636112	-0.6095477	-0.037908
53		-0.4054590	-0.022606422			
3	1.0047487	-0.10884912	-0.068027703	0.03341739	1.7607150	-0.028025
79		0.1176866	-0.006455403			
4	-0.1019796	-0.01370473	0.050135454	-0.10160815	-0.0835745	-0.027787
16		-0.3827921	0.026712984			
TotalWorkingYears TrainingTimesLastYear YearsAtCompany YearsInCurrentRole Y						
earsSinceLastPromotion 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 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 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 4 2 3 1 3 4 4 4 4 1 1 2 2  
[291] 1 4 2 2 3 1 4 2 3 2 2 4 2 1 3 2 2 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 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 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 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 4 2 2 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 1 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 3 2 3 2 3 1 4 2 3 4 4 2 1 3 3
[929] 4 2 4 1 4 3 2 1 3 1 2 2 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
1	0.29439958	0.12871318	-0.07860849	0.085796939	-0.34473854	-0.0042
2	1.42504729	0.15367721	0.01601076	0.005353989	1.72713466	0.2180
3	-0.80816195	-0.09282987	0.02676321	0.023482118	-0.61613188	-0.0173
4	-0.09401635	-0.01885408	0.06916728	-0.103630113	-0.08568613	-0.0314
5	0.95782658	-0.10766111	-0.09078668	-0.019597347	1.70062617	-0.0339
	0.06190082	-0.02160939				
	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager
1	-0.19463320	-0.06075160	-0.5888511	-0.6168071		
2	1.65396859	-0.06870235	-0.3331776	-0.2776906		
	-0.2557445	-0.4236271				

3	-0.84002580	0.03529737	-0.5578441	-0.6027906
-0.4541967		-0.6300570		
4	0.05219558	0.07708356	0.5108114	0.8629518
0.4172976		0.9067233		
5	1.73915719	-0.11413105	2.2873612	1.4807475
1.7856938		1.5211290		

Clustering vector:

```
[1] 1 4 1 3 1 4 1 3 4 4 3 4 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 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 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 5 1 2 1 4 1 1 3 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 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] 1 2 1 4 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 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 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
1	0.29572817	0.06720409	-0.37970677	0.083120684	-0.33509590	-0.05149656
2	-0.25566270	0.03786530	1.67053208	0.038629426	-0.32910387	0.24140707
3	1.44167150	0.14005703	-0.03745321	-0.018189835	1.75468907	0.18300839
4	-0.86588529	-0.05984460	-0.36052931	0.076390996	-0.66450191	-0.05898106
5	0.98035288	-0.09522849	-0.02745725	-0.003152513	1.75533922	-0.04414310
6	-0.06671192	-0.03189258	-0.24201442	-0.178297661	-0.06644952	-0.08060037

	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion
1	-0.21096808	-0.02409561	-0.5941230	-0.6284252	-0.4562689
2	-0.35912815	-0.27018326	-0.2701731	-0.2188648	-0.2712331
3	1.70405369	-0.05648465	-0.3375473	-0.2826621	-0.2359724
4	-0.88690899	0.09436436	-0.5835152	-0.6340835	-0.4624483
5	1.76916941	-0.11260971	2.3500845	1.4931387	1.7313523
6	0.09143376	0.14868735	0.5489399	0.9275301	0.4973464

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 1 1 6 1 4 1 2 2 4 3 6 6 1 4 4 4 6 6
[175] 1 1 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 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 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 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 %)

```

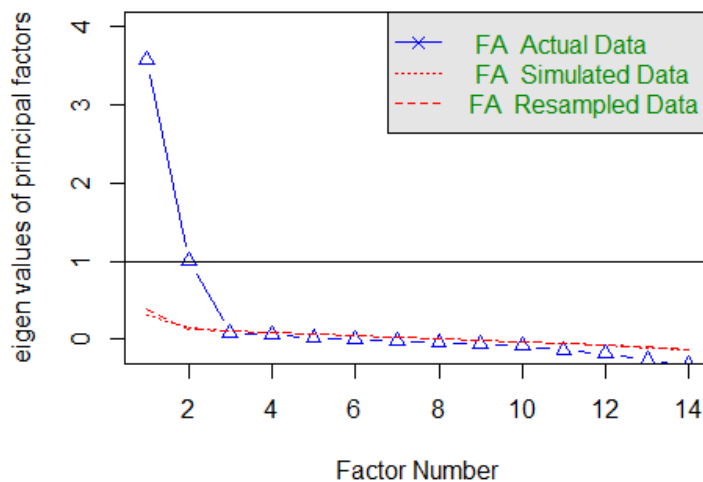
Available components:

```

[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
PercentSalaryHike	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 0.7224654 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
MonthlyIncome		MonthlyRate	NumCompaniesWorked
PercentSalaryHike			

```

0.23285647      0.66447336      0.01269573      0.52164264
TotalWorkingYears TrainingTimesLastYear      YearsAtCompany
YearsInCurrentRole      0.85983230      0.19335717      0.86479626
0.74651548
YearsSinceLastPromotion      YearswithCurrManager
0.54136294      0.74383547

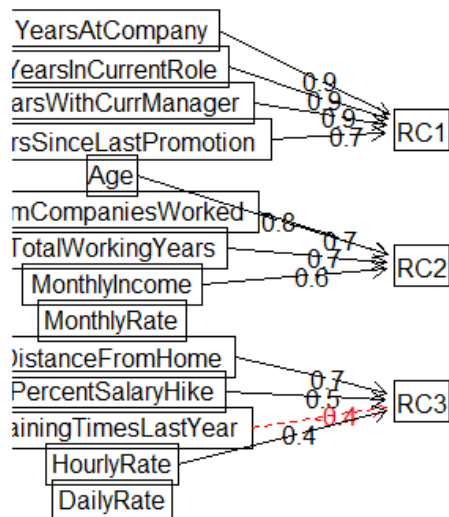
```

```

> #Rotated factor scores
> head(threefactor$scores)
      RC1      RC2      RC3
[1,] -0.5982509  1.2242118  0.4724958
[2,]  0.5308061 -0.1775199  0.4632603
[3,] -1.4124116  0.6169246  0.2028231
[4,] -0.1259390 -0.4919472 -0.9774844
[5,] -1.0834488  0.5907171 -1.4763255
[6,]  0.3852668 -1.0510701 -0.3112959
> #round threefactor values
> round(threefactor$values,3)

```

Components Analysis



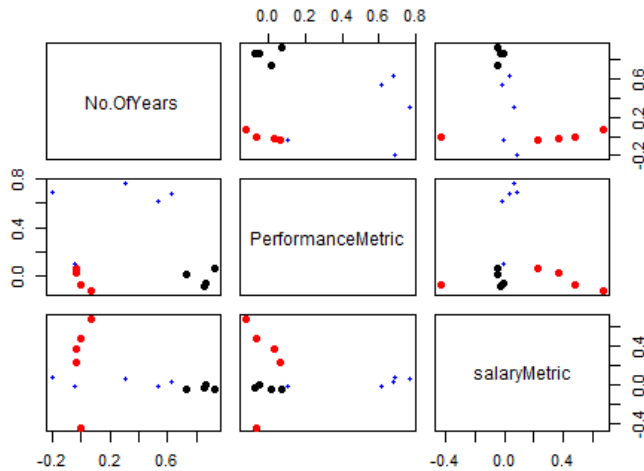
```

[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$loadings)<- c("No.OfYears","PerformanceMetric","salary
Metric")
> colnames(threefactor$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+TrainingTimesLastYear
+YearsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrManager)
> fit_attr
```

Call:

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

Coefficients:

	(Intercept)	Age	DailyRate	HourlyRate	MonthlyIncome	MonthlyRate	NumCompaniesWorked	PercentSalaryHike	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager
DistanceFromHome	1.475e+00	-1.762e-04	-4.622e-05	-4.842e-03	-6.435e-06	6.944e-07	1.400e-02	-1.302e-03	-2.215e-03	-1.642e-02	6.547e-03	-1.359e-02	-1.202e-02	1.211e-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	***
PercentsSalaryHike	-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

> coefficients(fit_attr)

	Age	DailyRate	DistanceFromHome
(Intercept)	1.475108e+00	-4.621800e-05	3.6072
MonthlyIncome	-6.435379e-06	NumCompaniesWorked	PercentsSalaryHike
TrainingTimesLastYear	-1.641803e-02	YearsAtCompany	YearsInCurrentRole
	6.547309e-03	-1.358638e-02	1.2112

> #install.packages("GGally")

> #install.packages("FFally")

> library(GGally)

> confint(fit_attr, level=0.95)

	2.5 %	97.5 %
(Intercept)	1.330087e+00	1.620129e+00
Age	-7.645349e-03	-2.038416e-03
DailyRate	-9.144038e-05	-9.956195e-07
DistanceFromHome	1.359397e-03	5.855019e-03
HourlyRate	-1.071269e-03	7.188886e-04
MonthlyIncome	-1.256787e-05	-3.028915e-07
MonthlyRate	-1.866389e-06	3.255127e-06
NumCompaniesWorked	5.900450e-03	2.210677e-02
PercentsSalaryHike	-6.278083e-03	3.674043e-03
TotalWorkingYears	-7.244350e-03	2.814421e-03
TrainingTimesLastYear	-3.055144e-02	-2.284612e-03
YearsAtCompany	2.164117e-04	1.287821e-02
YearsInCurrentRole	-2.179721e-02	-5.375559e-03
YearsSinceLastPromotion	4.833295e-03	1.939077e-02
YearsWithCurrManager	-2.045105e-02	-3.581037e-03

>

> #Predicted values

> fitted(fit_attr)

1	2	3	4	5	6	7	8	9
1.1925071	1.0383735	1.2114521	1.1756231	1.3404380	1.1029924	1.0752183	1.2906399	1.0986213

13	14	15	16	17	18	19	20	21
1.3565093	1.2095810	1.3442734	1.1851934	1.1367118	1.3122560	0.9681044	1.2245651	1.1889457
25	26	27	28	29	30	31	32	33
1.2162329	0.8538387	1.1992116	1.1499223	1.0171349	1.0492551	1.2245549	1.0792900	1.2132042
37	38	39	40	41	42	43	44	45
1.0986304	1.1779045	1.2903062	1.1263251	1.2338891	1.1899926	1.3186586	1.1194586	1.1183320
49	50	51	52	53	54	55	56	57
0.9875015	1.2088953	1.2107472	1.1976104	1.1027696	1.1769008	1.3606416	1.0112144	1.0503242
61	62	63	64	65	66	67	68	69
1.1211843	1.3153139	1.2506461	1.0175200	1.1003593	1.0510820	1.1122561	1.0848700	1.2303231
73	74	75	76	77	78	79	80	81
1.1892773	1.0753403	1.2749839	1.1142876	1.0191567	1.1368875	1.1631061	1.1776661	1.2154409
85	86	87	88	89	90	91	92	93
1.1609122	0.9956106	1.2958829	1.1106158	1.1673794	1.0287419	1.1614188	1.1296730	1.0635080
97	98	99	100	101	102	103	104	105
1.1807700	1.1843033	1.0248456	1.2489043	1.2033316	1.2331328	1.2678573	1.0151671	1.2031133
109	110	111	112	113	114	115	116	117
1.2695059	1.2958267	1.0488521	1.0757890	1.0982503	1.2722436	1.2531769	1.1033592	0.9705148
121	122	123	124	125	126	127	128	129
1.1226320	1.1136118	1.2376346	0.9238711	1.2045781	1.2445552	1.2860723	1.3935309	1.2818995
133	134	135	136	137	138	139	140	141
1.3195736	1.0624707	1.2040892	1.2907501	1.0422071	1.0880367	1.2933060	1.0953369	1.2224581
145	146	147	148	149	150	151	152	153
1.0986776	1.2878876	1.1557796	1.0801260	1.1889117	1.2779218	1.0974692	1.0334471	1.0270869
157	158	159	160	161	162	163	164	165
1.1210851	1.1146537	1.0298291	1.2555301	1.2242867	1.3429739	1.3120264	1.1289271	1.2157031
169	170	171	172	173	174	175	176	177
1.1004251	1.2256223	1.2551233	1.2292413	1.2153224	1.1496661	1.0947804	1.0976988	1.2138019
181	182	183	184	185	186	187	188	189
1.3662143	1.2709999	1.1244172	1.1179438	1.1092612	1.0901779	1.0636192	0.8713907	0.9927435
193	194	195	196	197	198	199	200	201
1.3122680	1.1653183	1.1941978	1.1565519	1.2342299	1.1445573	1.2215024	1.1268367	1.3203772
205	206	207	208	209	210	211	212	213
1.3031391	1.2172490	1.2678543	1.2283262	1.2111871	1.1105075	1.1633427	1.0933400	1.1020469
217	218	219	220	221	222	223	224	225
1.3068679	1.1919425	1.2379731	0.9965779	1.1066303	1.2914905	1.0551588	0.9429311	1.1232812
229	230	231	232	233	234	235	236	237
0.9977769	1.2504511	1.1374029	0.8987928	1.1950058	0.9576079	1.2505982	0.9467761	1.1774490
241	242	243	244	245	246	247	248	249
1.2315940	1.2584024	1.2108354	1.1298656	1.1069697	1.2103574	1.1970361	1.1504932	1.1470058
253	254	255	256	257	258	259	260	261
1.2311208	1.2051040	1.2273537	1.1999189	1.1094561	0.9086445	1.1789862	1.2706130	1.1780597
265	266	267	268	269	270	271	272	273
1.2168443	1.1803276	1.2684178	1.2157573	1.0363435	1.0378193	0.9268986	1.1513654	1.1716387
277	278	279	280	281	282	283	284	285
1.2010757	1.2398192	1.0586538	0.9287098	0.9339764	1.0766204	1.0798757	1.0431391	1.2696837
289	290	291	292	293	294	295	296	297
1.2622179	1.1812315	1.1138797	1.3107934	1.1917659	1.2542990	1.1983138	1.2465311	1.3512552
301	302	303	304	305	306	307	308	309
1.0286514	1.3389128	1.1339686	1.2147086	0.9627429	1.1552994	1.1104839	1.1584355	1.0813643
313	314	315	316	317	318	319	320	321
1.2289444	1.2295554	1.1216704	1.0387382	1.0400082	1.1450574	1.2198362	1.1790678	1.1194127
325	326	327	328	329	330	331	332	333
1.1323977	1.1168309	1.2133564	1.1780946	1.1367316	1.0381902	1.1275023	1.2121315	1.0836258
337	338	339	340	341	342	343	344	345
1.1100736	1.2362541	1.1540241	1.0702784	1.2140869	1.0081543	1.0749396	1.1384309	0.9438025
349	350	351	352	353	354	355	356	357
1.1657029	1.1775770	1.1432945	1.1345310	1.1751491	1.1377581	1.3759847	1.1624170	1.0574483
361	362	363	364	365	366	367	368	369
1.0465785	1.0890640	1.2623572	1.2677748	1.1756622	1.1647613	1.0696806	1.0863400	1.1786251
373	374	375	376	377	378	379	380	381
1.2475162	1.1667711	1.1773788	1.1330966	1.0230550	1.2304282	1.2567775	0.9255460	1.2187198
385	386	387	388	389	390	391	392	393
1.2377444	1.3337785	1.1672134	1.1613907	1.1619905	1.1849491	1.0162353	1.2047646	0.9695657

397	398	399	400	401	402	403	404	405
1.1394370	1.1831933	1.2413566	1.2447004	0.9754143	1.0796019	1.1324159	1.0257759	1.2317715
409	410	411	412	413	414	415	416	417
0.9434221	1.1919258	1.1919812	1.0546437	0.9805107	1.0957466	1.1495476	1.2273134	1.1586543
421	422	423	424	425	426	427	428	429
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589	590	591	592	593	594	595	596	597
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757	758	759	760	761	762	763	764	765
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781	782	783	784	785	786	787	788	789
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817	818	819	820	821	822	823	824	825
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901	902	903	904	905	906	907	908	909
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925	926	927	928	929	930	931	932	933
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-0.222893121	-0.212017614	-0.158920679	-0.158542052	-0.240167327	-0.204672358	-0.06667424
586	587	588	589	590	591	592
0.739461954	-0.269766945	-0.168620928	0.028855723	0.727931201	-0.085388064	0.70404519
595	596	597	598	599	600	601
-0.142266053	0.901689560	-0.232861677	-0.175618634	0.719631189	-0.243204124	-0.06095178
604	605	606	607	608	609	610
-0.176544497	-0.160197200	-0.171152895	-0.219728083	0.957665694	0.857010165	-0.14631431
613	614	615	616	617	618	619
-0.188550768	-0.163415241	0.859467302	-0.227615389	0.045329901	-0.253387850	-0.32645860
622	623	624	625	626	627	628
0.002893483	-0.243106679	-0.246692181	-0.048775663	-0.099818723	-0.238836703	-0.02802474
631	632	633	634	635	636	637
-0.291891790	-0.130005529	-0.205099206	-0.100405275	-0.210249849	0.035163132	0.68376026
640	641	642	643	644	645	646
-0.087691007	-0.219286842	-0.182084751	-0.171169926	-0.115227493	-0.222540353	0.72021169
649	650	651	652	653	654	655
-0.258379461	-0.090208765	-0.209955283	-0.106014038	-0.154575976	-0.158718707	-0.16049166
658	659	660	661	662	663	664
-0.202101956	-0.251376947	-0.200260290	0.792216285	-0.257288024	0.738816319	0.70587534
667	668	669	670	671	672	673
0.789397179	0.818595089	-0.290547625	0.762514140	-0.261475892	-0.261528822	-0.15174225
676	677	678	679	680	681	682
-0.277184854	-0.133647081	-0.105493365	-0.199522552	-0.201196143	-0.180416416	0.07891746

685	686	687	688	689	690	69
-0.188902788	-0.081126551	0.073824862	-0.029309406	0.621607890	0.677401612	-0.23831243
694	695	696	697	698	699	70
0.956863474	-0.141953171	0.682935831	0.024083552	-0.213667554	-0.224279095	0.07755747
703	704	705	706	707	708	70
-0.296704962	-0.217952275	-0.068622912	0.023866663	0.830860599	-0.026687714	-0.07325948
712	713	714	715	716	717	71
0.725571469	-0.231596123	-0.133985973	-0.030121051	-0.154975840	0.168603402	-0.38568648
721	722	723	724	725	726	72
0.624434046	0.009423860	-0.189115540	-0.047483885	-0.242051717	0.782740076	-0.17589694
730	731	732	733	734	735	73
-0.289811969	-0.061713126	0.688091130	0.765144812	-0.149788752	-0.281743162	-0.17138174
739	740	741	742	743	744	74
-0.170276445	-0.198111371	-0.174331528	-0.127162779	-0.155044400	0.024385544	0.75762573
748	749	750	751	752	753	75
-0.250457408	0.628476592	1.045598187	-0.074203224	0.050784796	0.816853202	-0.14281987
757	758	759	760	761	762	76
-0.356561371	-0.130716221	0.024629139	-0.173887366	-0.025875951	0.698363859	0.67168472
766	767	768	769	770	771	77
-0.180034381	-0.002847480	-0.206988404	-0.213943814	-0.175211862	-0.156718441	-0.16528485
775	776	777	778	779	780	78
-0.065685838	-0.195835888	0.733342553	0.740612802	-0.070042504	0.789911804	0.87953211
784	785	786	787	788	789	79
-0.075612064	-0.058723511	-0.183705024	-0.170720415	0.023004884	-0.130077754	0.82790287
793	794	795	796	797	798	79
0.835744188	-0.246306274	-0.160351974	-0.192501807	0.845138792	0.666154442	0.65898200
802	803	804	805	806	807	80
0.893385873	-0.160268028	-0.252231567	0.034729940	-0.003809684	-0.117786447	-0.05274688
811	812	813	814	815	816	81
0.043505743	-0.282449560	-0.224725588	0.732183239	-0.042179442	-0.206345142	-0.24463546
820	821	822	823	824	825	82
-0.136761436	-0.182936313	-0.074935568	-0.161437420	-0.237860221	-0.290076850	-0.19412872
829	830	831	832	833	834	83
0.613160196	0.848966678	-0.234941718	0.788457855	-0.351559585	-0.323739141	-0.10602107
838	839	840	841	842	843	84
-0.094791139	0.894528472	-0.165616399	-0.244248847	-0.406867113	0.775221654	-0.07046682
847	848	849	850	851	852	85
-0.128580492	-0.046417285	-0.231456376	0.798574399	-0.219795166	-0.027767277	-0.03370393
856	857	858	859	860	861	86
-0.030160374	-0.261061792	0.899229652	0.150849708	-0.222749116	0.801154043	-0.11686047
865	866	867	868	869	870	87
0.738929677	-0.314666242	-0.223302818	0.073710261	-0.251808358	-0.045505104	-0.07954629
874	875	876	877	878	879	88
-0.049942127	-0.160807100	-0.150525850	-0.356794908	-0.107133703	-0.180507793	0.07589986
883	884	885	886	887	888	88
-0.092601368	-0.070142350	-0.290986784	-0.190434099	-0.077555281	-0.148689775	-0.07745412
892	893	894	895	896	897	89
-0.096952186	0.689355375	-0.140507234	0.174023669	-0.168513706	-0.107147487	-0.10677734
901	902	903	904	905	906	90
-0.055516356	-0.167874722	-0.189208425	-0.249321406	-0.058706602	-0.039247389	-0.20222495
910	911	912	913	914	915	91
-0.404328936	-0.290535958	0.654977152	-0.237833738	1.120545842	-0.298734140	0.67253763
919	920	921	922	923	924	92
-0.061757334	-0.013588517	-0.228481388	-0.206471867	-0.020788788	-0.084384401	-0.17962297
928	929	930	931	932	933	93
-0.115566553	0.911974484	-0.260884478	-0.094767663	-0.216936837	0.772167738	-0.23898620
937	938	939	940	941	942	94
-0.107742950	-0.314086441	-0.156197631	0.804006421	0.767061116	-0.161104360	-0.15205240
946	947	948	949	950	951	95
-0.106310251	0.748689900	0.852661309	-0.166949984	-0.053949494	-0.116573400	-0.28116175
955	956	957	958	959	960	96
0.033294209	0.042149334	-0.007889177	-0.378986147	-0.100691898	-0.095278198	-0.06714502
964	965	966	967	968	969	97
-0.042976943	-0.177884233	-0.246943481	0.966898384	-0.155239230	-0.111341656	0.04019410

```

973          974          975          976          977          978          979
-0.237942222 -0.159983032 -0.249997849  0.907915193 -0.085938867 -0.262310117 -0.16299161
982          983          984          985          986          987          988
  0.708542467 -0.189387222 -0.037325119 -0.309793949  0.703363645 -0.166400825 -0.05562676
991          992          993          994          995          996          997
-0.203332063 -0.191474281 -0.105327831 -0.239442304 -0.099778858 -0.074379317 -0.27114460
1000
0.066358953

```

```
[ reached getOption("max.print") -- omitted 470 entries ]
```

```
> #Anova table
```

```
> anova(fit_attr)
```

```
Analysis of Variance Table
```

```
Response: Attrition
```

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
Age	1	5.039	5.0386	40.0387	3.307e-10	***
DailyRate	1	0.600	0.6004	4.7712	0.0290991	*
DistanceFromHome	1	1.190	1.1904	9.4593	0.0021399	**
HourlyRate	1	0.003	0.0034	0.0270	0.8695254	
MonthlyIncome	1	1.665	1.6647	13.2284	0.0002854	***
MonthlyRate	1	0.064	0.0637	0.5066	0.4767412	
NumCompaniesWorked	1	1.985	1.9850	15.7739	7.487e-05	***
PercentSalaryHike	1	0.055	0.0551	0.4381	0.5081493	
TotalWorkingYears	1	0.298	0.2978	2.3665	0.1241812	
TrainingTimesLastYear	1	0.619	0.6188	4.9174	0.0267408	*
YearsAtCompany	1	0.049	0.0487	0.3872	0.5338555	
YearsInCurrentRole	1	1.860	1.8602	14.7818	0.0001259	***
YearsSinceLastPromotion	1	1.279	1.2795	10.1671	0.0014601	**
YearsWithCurrManager	1	0.983	0.9826	7.8086	0.0052681	**
Residuals	1455	183.101	0.1258			

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

```
> vcov(fit_attr)
```

	(Intercept)	Age	DailyRate	DistanceFromHome	HourlyRate
(Intercept)	5.465664e-03	-5.401767e-05	-4.077725e-07	-1.001031e-05	-1.329590e-08
Age	-5.401767e-05	2.042546e-06	4.174337e-10	5.386738e-09	-1.899115e-08
DailyRate	-4.077725e-07	4.174337e-10	5.314811e-10	1.366512e-10	-2.360246e-10
DistanceFromHome	-1.001031e-05	5.386738e-09	1.366512e-10	1.313108e-06	-1.691089e-08
HourlyRate	-1.329590e-08	-1.899115e-08	-2.360246e-10	-1.691089e-08	2.082497e-10
MonthlyIncome	-2.253115e-08	2.173753e-10	-5.393647e-14	1.178725e-10	2.497249e-11
MonthlyRate	-2.527187e-08	-8.279939e-12	1.066478e-12	-4.359249e-11	9.431299e-12
NumCompaniesWorked	-2.109799e-05	-7.736385e-07	-1.773406e-09	1.538901e-07	-2.299436e-08
PercentSalaryHike	-9.596482e-05	-8.172910e-08	-1.172098e-09	-1.147267e-07	1.368832e-08
TotalWorkingYears	5.246665e-05	-1.885600e-06	-1.842474e-09	-7.478390e-08	1.832019e-09
TrainingTimesLastYear	-1.500646e-04	-2.084194e-07	-1.130791e-09	3.131160e-07	2.197160e-08
YearsAtCompany	-1.717430e-05	3.245154e-07	3.611569e-09	3.716019e-08	-1.114114e-08
YearsInCurrentRole	-7.091218e-06	9.130808e-08	-5.957290e-09	-6.190303e-08	2.078335e-08
YearsSinceLastPromotion	7.009198e-06	-1.115776e-07	2.115227e-09	-2.165622e-08	2.835607e-08
YearsWithCurrManager	-2.480019e-05	2.263869e-07	1.708163e-09	-1.238252e-08	6.067163e-09
	NumCompaniesWorked	PercentSalaryHike	TotalWorkingYears	TrainingTimesLastYear	YearsAtCompany
(Intercept)	-2.109799e-05	-9.596482e-05	5.246665e-05	-1.500646e-04	-1.717430e-05
Age	-7.736385e-07	-8.172910e-08	-1.885600e-06	-2.084194e-07	3.245154e-07
DailyRate	-1.773406e-09	-1.172098e-09	-1.842474e-09	-1.130791e-09	3.611569e-09
DistanceFromHome	1.538901e-07	-1.147267e-07	-7.478390e-08	3.131160e-07	3.716019e-08
HourlyRate	-2.299436e-08	1.368832e-08	1.832019e-09	2.197160e-08	-1.114114e-08
MonthlyIncome	4.319924e-10	9.467275e-11	-4.638835e-09	2.497249e-11	9.431299e-12
MonthlyRate	3.410154e-11	2.579984e-11	-6.255431e-11	9.431299e-12	9.431299e-12
NumCompaniesWorked	1.706435e-05	2.062118e-07	-2.260527e-06	-2.299436e-08	-2.299436e-08
PercentSalaryHike	2.062118e-07	6.435062e-06	-1.525629e-08	-1.147267e-07	1.368832e-08
TotalWorkingYears	-2.260527e-06	-1.525629e-08	6.573714e-06	-7.478390e-08	1.832019e-09
TrainingTimesLastYear	1.607156e-06	7.752798e-08	5.188159e-07	3.131160e-07	2.197160e-08
YearsAtCompany	2.973260e-06	3.611138e-07	-2.523337e-06	3.716019e-08	-1.114114e-08
YearsInCurrentRole	-2.199886e-07	-3.475784e-07	3.788685e-08	-6.190303e-08	2.078335e-08
YearsSinceLastPromotion	-5.707867e-07	5.136124e-08	2.107781e-07	-2.165622e-08	2.835607e-08

YearsWithCurrManager	2.757224e-07	-1.350262e-07	-4.741292e-07	2
(Intercept)	-7.091218e-06	7.009198e-06	-2.480019e-05	
Age	9.130808e-08	-1.115776e-07	2.263869e-07	
DailyRate	-5.957290e-09	2.115227e-09	1.708163e-09	
DistanceFromHome	-6.190303e-08	-2.165622e-08	-1.238252e-08	
HourlyRate	2.078902e-08	2.835623e-08	6.067393e-09	
MonthlyIncome	1.864849e-10	-4.541142e-10	1.056369e-09	
MonthlyRate	-1.007534e-10	-8.061954e-11	1.696906e-10	
NumCompaniesWorked	-2.199886e-07	-5.707867e-07	2.757224e-07	
PercentSalaryHike	-3.475784e-07	5.136124e-08	-1.350262e-07	
TotalWorkingYears	3.788685e-08	2.107781e-07	-4.741292e-07	
TrainingTimesLastYear	2.880460e-07	5.326433e-09	2.595454e-07	
YearsAtCompany	-4.877024e-06	-3.256264e-06	-5.812570e-06	
YearsInCurrentRole	1.752082e-05	-2.194322e-06	-5.468174e-06	
YearsSinceLastPromotion	-2.194322e-06	1.376870e-05	-4.383185e-07	
YearsWithCurrManager	-5.468174e-06	-4.383185e-07	1.849064e-05	

```
> temp<-influence.measures(fit_attr)
```

```
> temp
```

Influence measures of

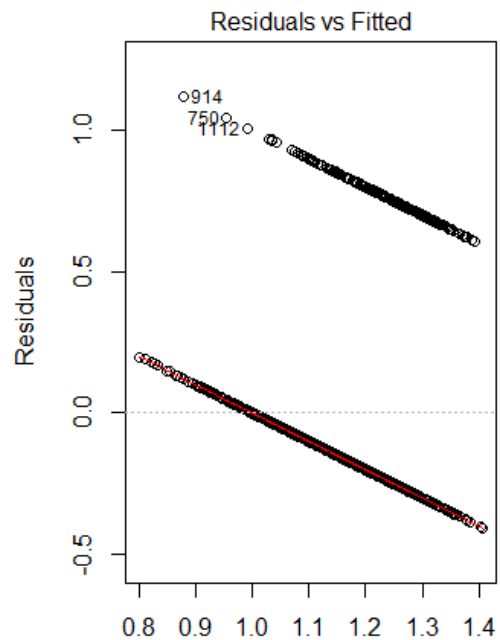
```
lm(formula = Attrition ~ Age + DailyRate + DistanceFromHome + HourlyRate + NumCompaniesWorked + PercentSalaryHike + TotalWorkingYears + TrainingTimesLastYear + YearsAtCompany + YearsInCurrentRole + YearsSinceLastPromotion + YearsWithCurrManager) :
```

	dfb.1_	dfb.Age	dfb.DlyR	dfb.DsFH	dfb.HrlyR	dfb.MntI	dfb.MntR	dfb.NmCW	dfb.P
1	-0.012824	0.049286	0.044617	-0.061209	0.079634	0.031221	0.051700	0.134764	-0.066
2	0.006144	-0.006300	0.003586	0.000856	0.000597	0.000392	-0.004363	0.001719	-0.005
3	-0.007932	0.005024	0.075128	-0.048524	0.069570	-0.041534	-0.094111	0.063525	-0.003
4	-0.007951	0.001107	-0.019468	0.010194	0.006185	0.012910	-0.016615	0.007261	0.015
5	-0.042692	0.033609	0.013695	0.018529	0.031669	0.005191	-0.007961	-0.073200	0.020
6	-0.005141	0.001028	-0.003629	0.007419	-0.005203	0.004969	0.001943	0.008037	0.004
7	0.012454	-0.016242	-0.006821	0.004573	-0.003321	0.006813	0.003282	0.002336	-0.006
8	0.019995	-0.004251	-0.030314	-0.037962	0.000695	-0.007840	0.002548	0.009822	-0.037
9	0.001215	-0.005125	0.010798	-0.012217	0.007819	-0.010304	0.006206	0.006164	-0.010
10	0.007357	0.019847	-0.019869	-0.037016	-0.022667	0.020210	-0.005007	-0.019014	0.012
11	0.005548	-0.004550	-0.000191	-0.008571	-0.008704	0.005324	-0.003181	0.009408	0.006
12	-0.020340	0.009146	0.018646	-0.008771	0.009730	0.006439	0.002659	0.008772	0.010
13	-0.027446	0.000244	0.004810	-0.053950	0.046694	0.007098	-0.001573	0.012013	-0.010
14	-0.001878	-0.010605	-0.021237	-0.018608	-0.019091	-0.001185	0.011636	0.017614	0.019
15	0.052771	-0.045171	-0.084298	0.093910	-0.040170	-0.029502	-0.013099	0.069127	-0.017
16	-0.017772	0.009096	-0.020847	-0.020515	0.009947	-0.018581	0.008214	0.005609	0.017
17	-0.003794	0.001053	0.011073	0.004907	-0.007441	0.004270	-0.001534	0.008498	0.008
18	-0.020212	0.023752	-0.018201	-0.019461	-0.033241	-0.008525	0.021989	0.008870	0.014
19	-0.003120	0.000830	0.002736	-0.002252	0.001423	-0.000879	0.002827	-0.000834	0.000
20	-0.025282	-0.010709	0.018106	0.012024	0.017587	-0.000233	0.024029	-0.016204	0.018
21	0.003185	0.016470	0.005171	-0.002953	-0.021466	-0.001617	0.011539	0.009957	-0.011
22	-0.090815	-0.023978	0.053247	-0.001236	0.044516	-0.042211	-0.057273	0.116410	0.130
23	-0.001066	0.000346	0.001486	0.000363	0.000985	-0.002983	-0.001885	0.001299	0.002
24	0.001114	0.026153	0.022245	-0.016472	-0.033573	0.001789	-0.014708	0.004106	0.006
25	0.046807	-0.005346	-0.012603	-0.025191	0.048207	-0.040022	0.024563	-0.022006	-0.066
26	-0.002734	0.009227	0.011076	-0.004418	-0.004091	0.021972	-0.006496	-0.000302	-0.013
27	-0.062927	-0.030610	0.053358	0.049792	0.017567	-0.040958	-0.074596	-0.016180	0.111
28	-0.007322	-0.013342	0.002181	0.001789	0.009582	-0.001382	-0.009916	0.012970	0.013
29	-0.000803	0.000104	0.000785	0.000202	0.001511	0.000788	0.001992	-0.000700	0.000
30	-0.000783	0.000491	0.001218	0.003198	-0.003356	-0.009151	-0.003615	0.003722	0.003
31	-0.018841	0.005785	-0.003678	0.013530	-0.009184	0.011396	0.017701	-0.006000	0.018
32	0.004280	-0.008179	-0.010094	-0.001367	0.007604	-0.002220	-0.004010	0.002686	0.004
33	-0.006643	0.012805	0.023776	0.000193	-0.013882	0.020054	-0.005864	0.002912	0.007
34	0.070479	-0.072920	0.004633	-0.028294	-0.035629	-0.177100	-0.106131	-0.048733	-0.023
35	0.099020	-0.076502	-0.000240	-0.052213	-0.011202	-0.038428	-0.081657	-0.012731	0.014
36	0.004756	-0.011601	-0.008746	0.006235	-0.001778	0.003059	-0.008094	0.005478	0.006
37	-0.053245	0.208312	0.011128	-0.051136	0.059579	0.011280	-0.095425	-0.063476	-0.026
38	0.001649	-0.011133	-0.002855	0.011860	-0.020073	0.000519	0.007727	0.008776	0.008
39	0.002110	0.001066	-0.000605	0.009008	-0.015722	0.002438	0.003481	-0.056704	0.006

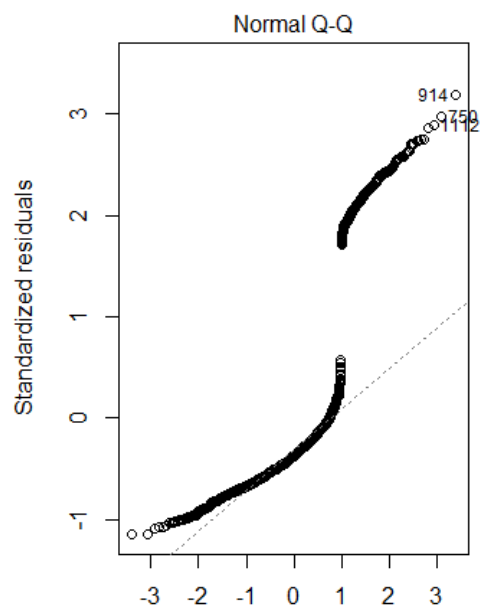
40	-0.006578	0.004169	-0.007246	0.009086	0.010942	0.001926	0.014241	0.003006	-0.009
41	-0.011145	-0.016531	0.013738	0.010331	-0.007477	-0.000868	0.008349	0.010765	0.014
42	-0.007386	0.003489	-0.016795	0.010257	0.022534	-0.000588	-0.011227	0.004745	0.008
43	0.061987	-0.016124	0.074170	0.102505	-0.050297	0.010073	-0.026794	-0.020880	-0.050
44	-0.018059	0.007442	-0.003738	0.001222	0.012389	-0.010071	0.013805	0.003095	0.001
45	-0.001190	0.008335	0.002196	0.010227	0.002609	0.009038	0.003377	0.002897	-0.019
46	0.052187	-0.014960	0.099810	0.021881	-0.048390	0.147709	0.012618	-0.039170	-0.057
47	0.008841	0.001689	-0.012622	-0.027178	-0.004999	0.007632	0.009940	0.016802	-0.021
48	0.001178	-0.002224	0.024924	-0.026556	-0.006631	0.013185	0.015511	-0.007186	-0.036
49	-0.002541	0.000907	0.000881	-0.000579	0.001446	-0.000415	0.000942	0.000434	0.001
50	-0.004668	-0.016053	-0.017039	0.001683	0.023858	-0.003421	0.019801	0.009562	-0.014
	dfb.YICR	dfb.YSLP	dfb.YWCM	dffit	cov.r	cook.d	hat	inf	
1	-0.001035	-0.052115	0.044194	0.26249	0.970	4.58e-03	0.01292		
2	-0.001575	0.002920	-0.001613	-0.01173	1.022	9.17e-06	0.01149		
3	-0.023205	0.010303	-0.020357	0.19760	0.967	2.60e-03	0.00776	*	
4	-0.020545	-0.002355	0.032123	-0.05132	1.019	1.76e-04	0.01052		
5	0.002327	-0.011741	-0.000867	-0.09751	1.011	6.34e-04	0.01012		
6	-0.007112	-0.001838	-0.002964	-0.01990	1.014	2.64e-05	0.00466		
7	0.002889	-0.000241	0.002327	-0.02397	1.023	3.83e-05	0.01247		
8	0.014195	-0.001972	0.010258	-0.07713	1.012	3.97e-04	0.00871		
9	-0.004153	0.006889	-0.008391	-0.02960	1.021	5.84e-05	0.01109		
10	-0.008257	-0.030125	-0.014777	-0.07575	1.019	3.83e-04	0.01319		
11	-0.004518	0.005899	0.002187	-0.02892	1.014	5.58e-05	0.00554		
12	0.002714	0.013621	-0.015570	-0.03922	1.015	1.03e-04	0.00721		
13	0.020746	-0.028649	0.001020	-0.09576	1.009	6.11e-04	0.00892		
14	0.001047	-0.004329	-0.000552	-0.05196	1.014	1.80e-04	0.00762		
15	-0.015056	-0.023455	0.006151	0.17520	0.984	2.04e-03	0.00881		
16	-0.011431	-0.023603	-0.009648	-0.05895	1.020	2.32e-04	0.01244		
17	0.007765	0.006011	-0.008255	-0.03105	1.015	6.43e-05	0.00641		
18	0.011913	-0.002993	0.011865	-0.07377	1.009	3.63e-04	0.00693		
19	-0.002335	-0.003987	-0.003996	0.01167	1.027	9.09e-06	0.01632		
20	0.000545	-0.000181	0.001847	-0.05104	1.013	1.74e-04	0.00642		
21	0.005551	-0.001140	-0.001831	-0.04537	1.015	1.37e-04	0.00715		
22	-0.009755	-0.034149	-0.006533	0.22448	0.965	3.35e-03	0.00927	*	
23	0.001235	0.001505	-0.004351	-0.00716	1.021	3.42e-06	0.01017		
24	0.006518	-0.003807	0.007977	-0.08634	1.014	4.97e-04	0.01054		
25	-0.021552	0.000599	0.010460	0.12753	0.964	1.08e-03	0.00330	*	
26	0.027428	-0.007279	-0.001792	0.04737	1.022	1.50e-04	0.01289		
27	-0.125335	0.088043	0.061723	0.25234	0.970	4.23e-03	0.01216		
28	-0.013885	-0.004003	0.017910	-0.03649	1.016	8.88e-05	0.00735		
29	0.003763	0.000749	-0.004440	-0.00705	1.031	3.31e-06	0.02045	*	
30	-0.000734	-0.001601	0.000412	-0.01611	1.024	1.73e-05	0.01312		
31	-0.000333	-0.000049	0.010727	-0.04299	1.011	1.23e-04	0.00457		
32	0.002805	0.000318	-0.002145	-0.02009	1.018	2.69e-05	0.00796		
33	0.042149	0.007534	-0.028784	-0.07027	1.020	3.29e-04	0.01331		
34	-0.026740	0.008724	-0.042084	0.33054	0.966	7.26e-03	0.01754	*	
35	-0.037184	0.043004	-0.040588	0.16593	0.977	1.83e-03	0.00696		
36	0.001820	0.001116	-0.003219	-0.02124	1.016	3.01e-05	0.00653		
37	-0.001571	-0.019804	-0.003277	0.27143	0.955	4.89e-03	0.01112	*	
38	0.000591	-0.008536	-0.000288	-0.03669	1.013	8.98e-05	0.00530		
39	0.000708	0.002619	0.011716	-0.06964	1.011	3.23e-04	0.00714		
40	0.001351	0.001153	0.001250	-0.02650	1.015	4.69e-05	0.00548		
41	0.006445	-0.000692	0.008083	-0.04514	1.011	1.36e-04	0.00465		
42	0.007596	-0.000798	0.005953	-0.05476	1.018	2.00e-04	0.01025		
43	-0.036698	0.003650	-0.001299	0.17670	0.980	2.08e-03	0.00831		
44	-0.009571	0.008090	-0.004413	-0.03530	1.020	8.31e-05	0.01076		
45	-0.004923	0.002839	0.000826	-0.02927	1.017	5.72e-05	0.00759		
46	0.115176	0.195603	-0.119345	0.40341	0.968	1.08e-02	0.02436	*	
47	0.012673	-0.037113	-0.013293	-0.06290	1.015	2.64e-04	0.00910		
48	0.011515	-0.000302	0.012966	-0.07646	1.009	3.90e-04	0.00702		
49	0.000039	-0.001118	0.001241	0.00348	1.020	8.09e-07	0.00959		
50	0.011023	-0.000928	0.000388	-0.05180	1.014	1.79e-04	0.00762		

[reached 'max' / getOption("max.print") -- omitted 1420 rows]


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

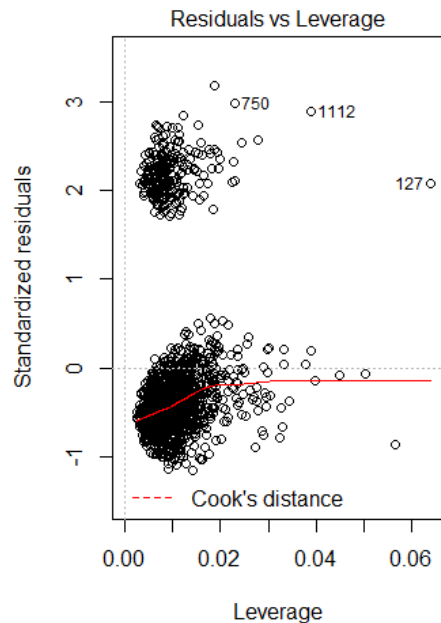
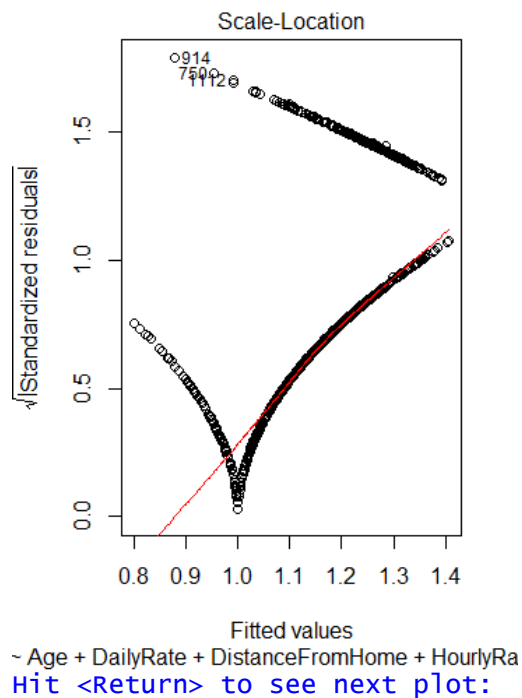


Fitted values
~ Age + DailyRate + DistanceFromHome + HourlyRa
Hit <Return> to see next plot:



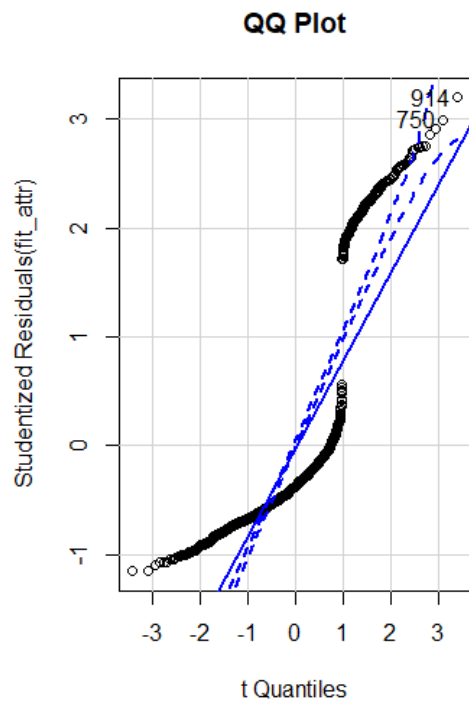
Theoretical Quantiles
~ Age + DailyRate + DistanceFromHome + HourlyRa

Hit <Return> to see next plot:



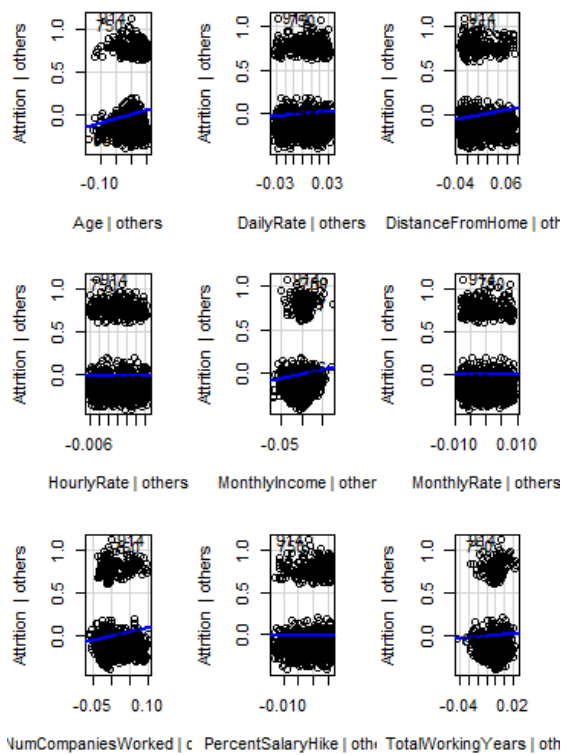
```
~ Age + DailyRate + DistanceFromHome + HourlyRa
> #Assessing outliers
> outlierTest(fit_attr)
No Studentized residuals with Bonferroni p < 0.05
Largest |rstudent|:
      rstudent unadjusted p-value Bonferroni p
914 3.198679      0.0014104      NA
> qqPlot(fit_attr, main="QQ Plot")
```

[1] 750 914

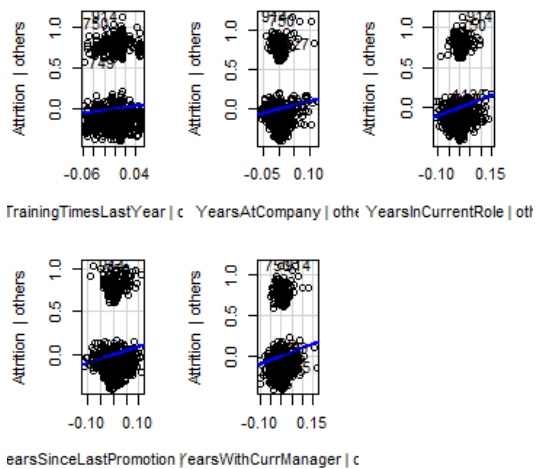


```
> # graphics.off()
> # par(mfrow = c(1,2))
> plot.new();
> dev.off()
null device
      1
> leveragePlots(fit_attr)
```

Hit <Return> to see next plot:



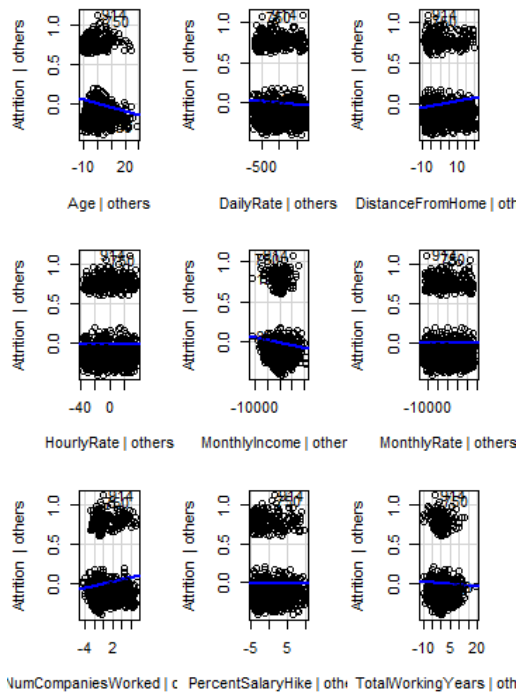
Hit <Return> to see next plot:
Leverage Plots



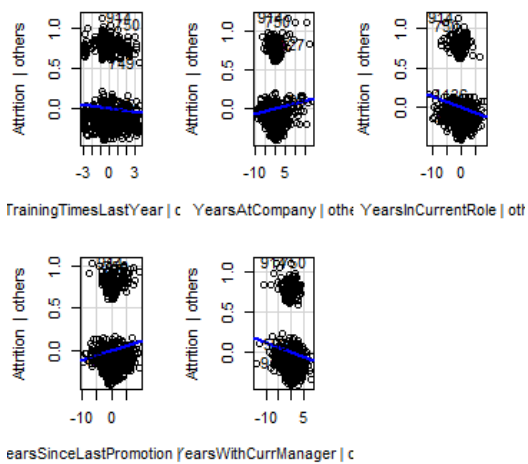
> # Influential observations
> # added variable plots

```
> avPlots(fit_attr)
```

Hit <Return> to see next plot:

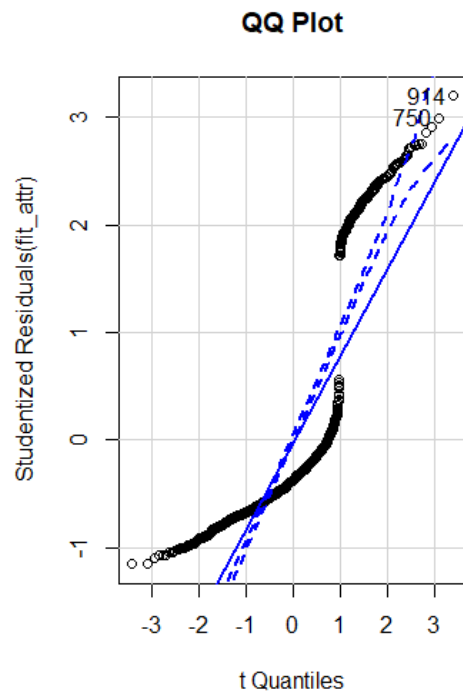


Hit <Return> to see next plot:
Added-Variable Plots



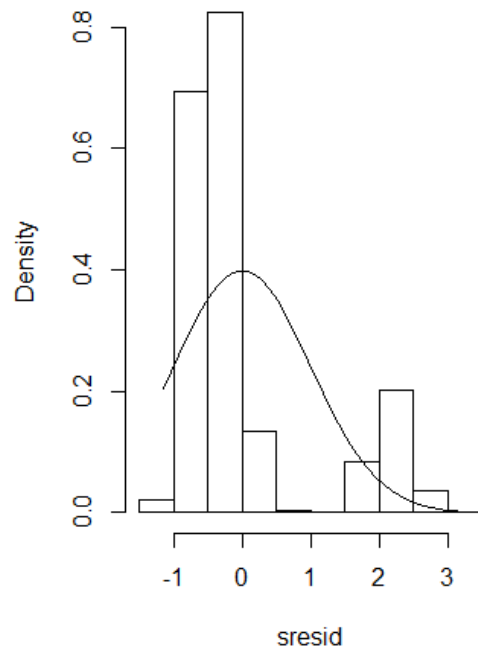
```
> # Normality of Residuals
```

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



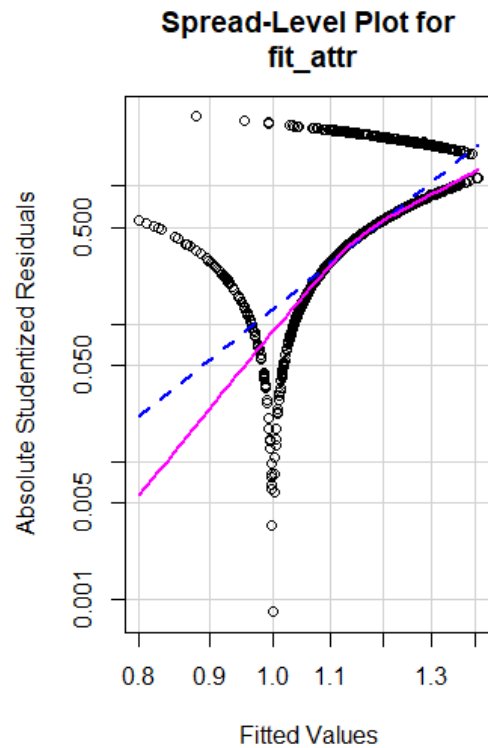
```
> # distribution of studentized residuals
> library(MASS)
> sresid <- studres(fit_attr)
> hist(sresid, freq=FALSE,
+      main="Distribution of Studentized Residuals")
> xfit<-seq(min(sresid),max(sresid),length=40)
> yfit<-dnorm(xfit)
> lines(xfit, yfit)
```

Distribution of Studentized Residual:



```
> #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
```

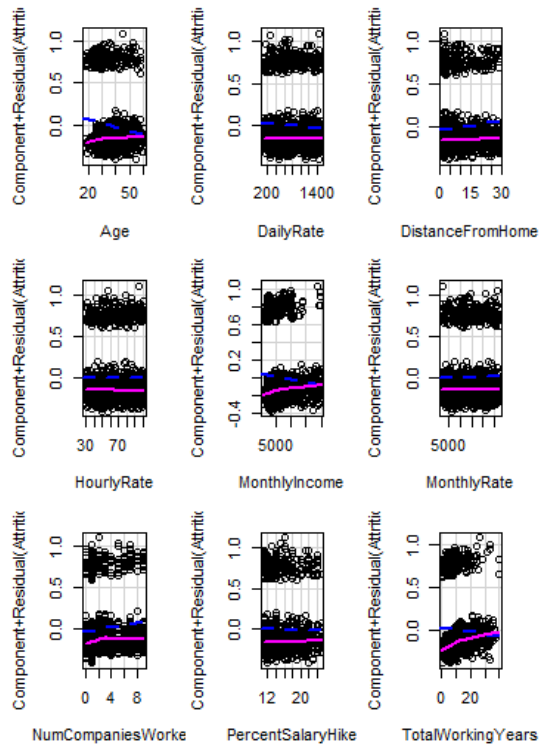
	Age	DailyRate	DistanceFromHome
HourlyRate	1.989844	1.010157	1.007398
MonthlyIncome	2.528796		
MonthlyRate			
NumCompaniesworked			
PercentsSalaryHike			
TotalWorkingYears	1.007865	1.243004	1.006224
TrainingTimesLastYear			
YearsAtCompany	1.007298		
YearsInCurrentRole			
YearsSinceLastPromotion			
arsWithCurrManager	4.563884	2.684841	1.668993

```
> sqrt(vif(fit_attr)) > 2 # problem?
```

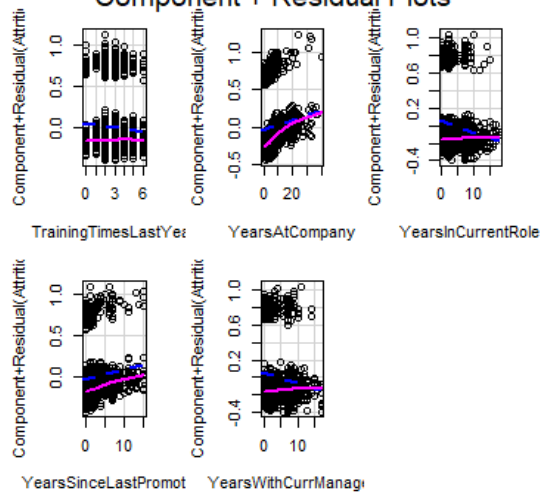
	Age	DailyRate	DistanceFromHome
HourlyRate	FALSE	FALSE	FALSE
MonthlyIncome	FALSE	FALSE	FALSE
MonthlyRate	FALSE	FALSE	FALSE
NumCompaniesworked	FALSE	FALSE	FALSE
PercentsSalaryHike	FALSE	FALSE	FALSE
TotalWorkingYears	FALSE	FALSE	FALSE
TrainingTimesLastYear	FALSE	FALSE	FALSE
YearsAtCompany	FALSE	FALSE	FALSE
YearsInCurrentRole	FALSE	FALSE	FALSE
YearsSinceLastPromotion	FALSE	FALSE	FALSE
arsWithCurrManager	TRUE	FALSE	FALSE
	TRUE	FALSE	FALSE
	FALSE	FALSE	FALSE

```
> #Nonlinearity
> # component + residual plot
> crPlots(fit_attr)
```


Hit <Return> to see next plot:



Hit <Return> to see next plot:
Component + Residual Plots



```
> library(gvlma)
```

```
> gvmmodel <- gvlma(fit_attr)
> summary(gvmmodel)
```

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)
DistanceFromHome
HourlyRate
Age
DailyRate
```

3.607e-03	1.475e+00	-1.762e-04	-4.842e-03	-4.622e-05
PercentSalaryHike	MonthlyIncome	TotalWorkingYears	MonthlyRate	NumCompaniesWorked
-1.302e-03	-6.435e-06	-2.215e-03	6.944e-07	1.400e-02
TrainingTimesLastYear	YearsAtCompany	YearsInCurrentRole	YearsSinceLastPromotion	YearsWithCurrManager
1.211e-02	-1.642e-02	-1.202e-02	6.547e-03	-1.359e-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+
    NumCompaniesWorked+PercentSalaryHike+TotalWorkingYears+TrainingTimesLastYear+
    YearsAtCompany+YearsInCurrentRole+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

Coefficients:

	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+TrainingTimesLastYear+YearsAtCompany+YearsInCurrentRole+YearsSinceLastPromotion+YearsWithCurrManager,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+
YearsInCurrentRole+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+
YearsInCurrentRole+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 + NumCompaniesWor
ked +

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,
  NumCompaniesWorked=1, YearsInCurrentRole=3, YearsSinceLastPromotion=1))
```

```
1
1.230249
```