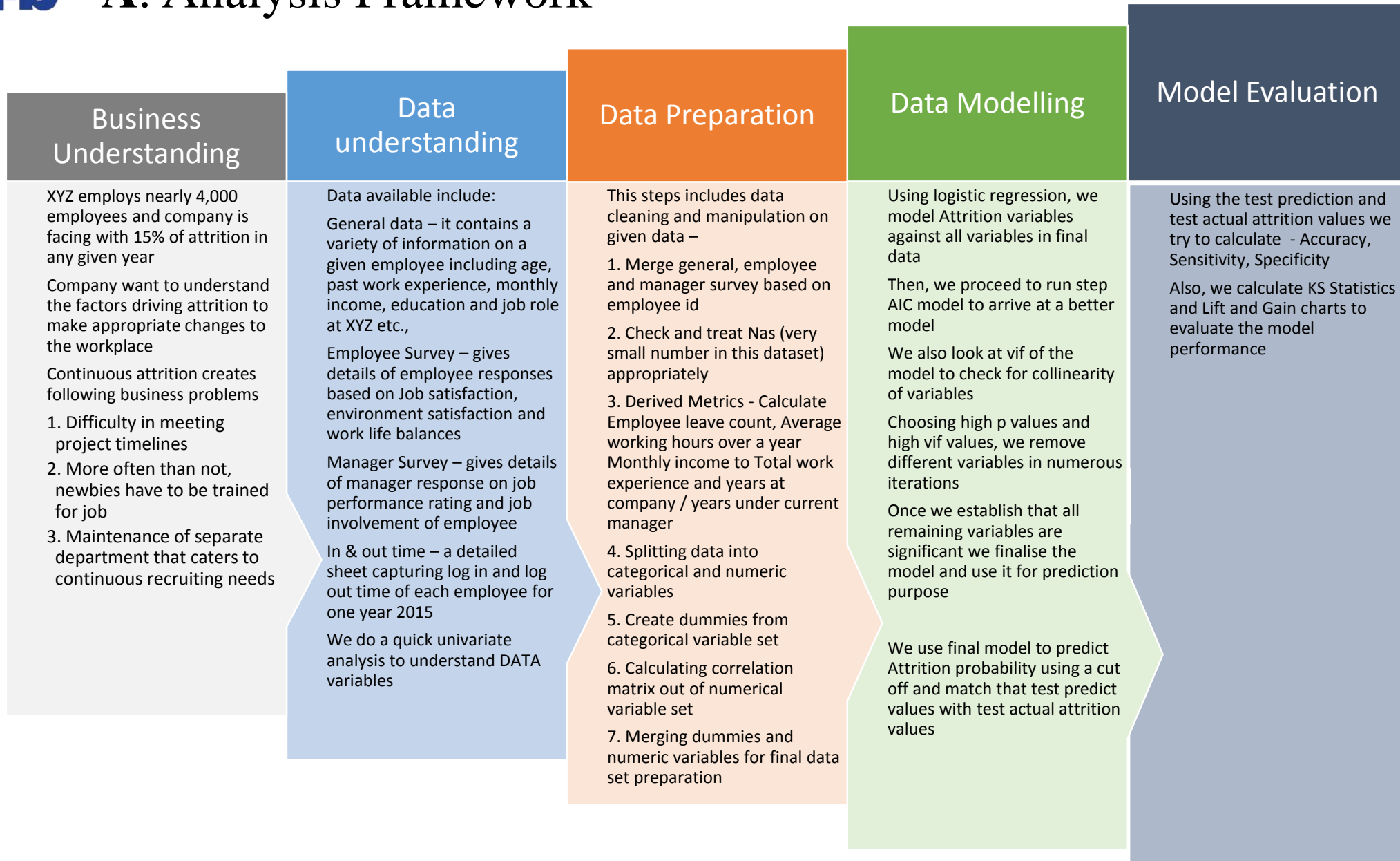# HR ANALYTICS CASE STUDY

SUBMISSION

Group Name: Vectors for Victors

1. Kartik Porwal
2. Keerthika Nandagopal
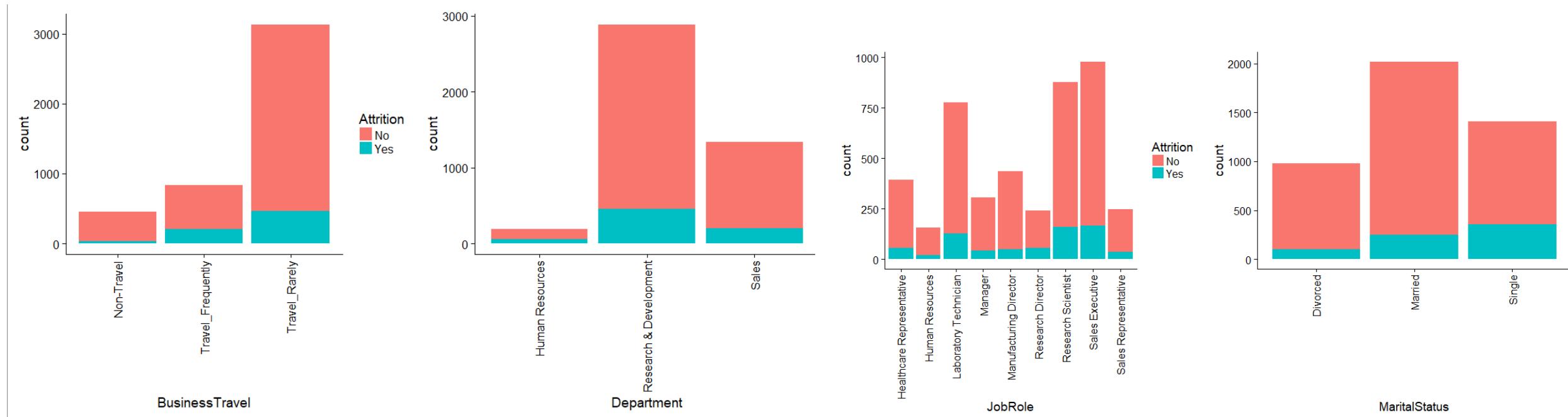3. Rahul Kumar
4. Viveka Manikonda

Abstract

- This presentation contains findings highlighting probability of attrition using a logistics regression on given employee data of XYZ company

- Company want to understand the factors driving attrition and use them to make appropriate changes to workplace

- Section A provides an overview of Analysis framework

- Section B highlights univariate analysis of data variables

- Section C provide final model output

- Section D highlights key charts evaluating model performance

- Section E provides Conclusions of analysis with brief description

- Section F provides actionable recommendation by company

- Section G&H (Appendix) provide correlation and additional charts

A. Analysis Framework

Business Understanding

XYZ employs nearly 4,000 employees and company is facing with 15% of attrition in any given year

Company want to understand the factors driving attrition to make appropriate changes to the workplace

Continuous attrition creates following business problems

1. Difficulty in meeting project timelines
2. More often than not, newbies have to be trained for job
3. Maintenance of separate department that caters to continuous recruiting needs

Data understanding

Data available include:

General data – it contains a variety of information on a given employee including age, past work experience, monthly income, education and job role at XYZ etc.,

Employee Survey – gives details of employee responses based on Job satisfaction, environment satisfaction and work life balances

Manager Survey – gives details of manager response on job performance rating and job involvement of employee

In & out time – a detailed sheet capturing log in and log out time of each employee for one year 2015

We do a quick univariate analysis to understand DATA variables

Data Preparation

This steps includes data cleaning and manipulation on given data –

1. Merge general, employee and manager survey based on employee id
2. Check and treat Nas (very small number in this dataset) appropriately
3. Derived Metrics - Calculate Employee leave count, Average working hours over a year Monthly income to Total work experience and years at company / years under current manager
4. Splitting data into categorical and numeric variables
5. Create dummies from categorical variable set
6. Calculating correlation matrix out of numerical variable set
7. Merging dummies and numeric variables for final data set preparation

Data Modelling

Using logistic regression, we model Attrition variables against all variables in final data

Then, we proceed to run step AIC model to arrive at a better model

We also look at vif of the model to check for collinearity of variables

Choosing high p values and high vif values, we remove different variables in numerous iterations

Once we establish that all remaining variables are significant we finalise the model and use it for prediction purpose

We use final model to predict Attrition probability using a cut off and match that test predict values with test actual attrition values

Model Evaluation

Using the test prediction and test actual attrition values we try to calculate - Accuracy, Sensitivity, Specificity

Also, we calculate KS Statistics and Lift and Gain charts to evaluate the model performance

- Attritions are high among those employees who travel rarely and from R&D department

- Attritions are high among Research scientist, Sales Executive and Laboratory Technician

- High number of attritions are among Married, Single employees
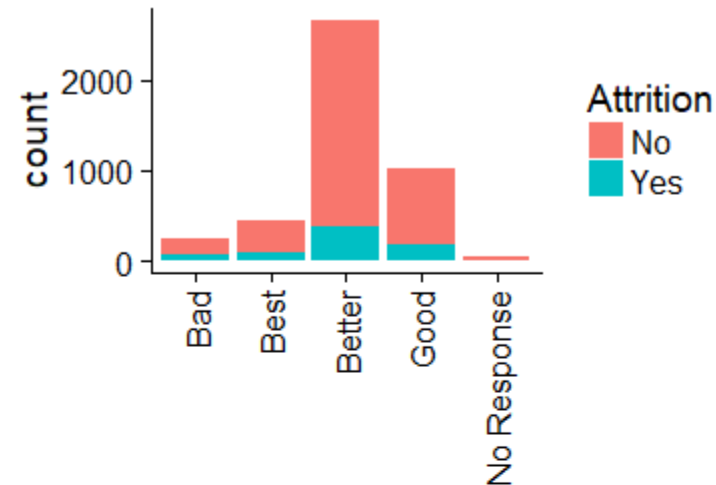
B. Univariate Analysis (Contd.,)

- Attritions are high among those employees who have Bachelor and Master degrees

- Life sciences and Medical educational background employees have high attritions levels

- Level 1 & Level2 employees have high turn over levels and men have high attrition level
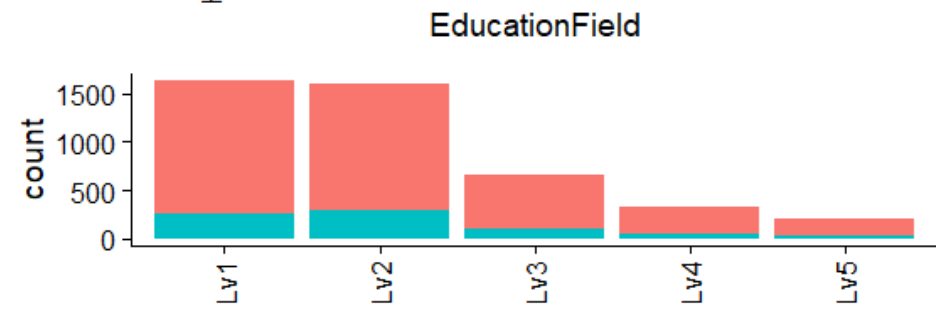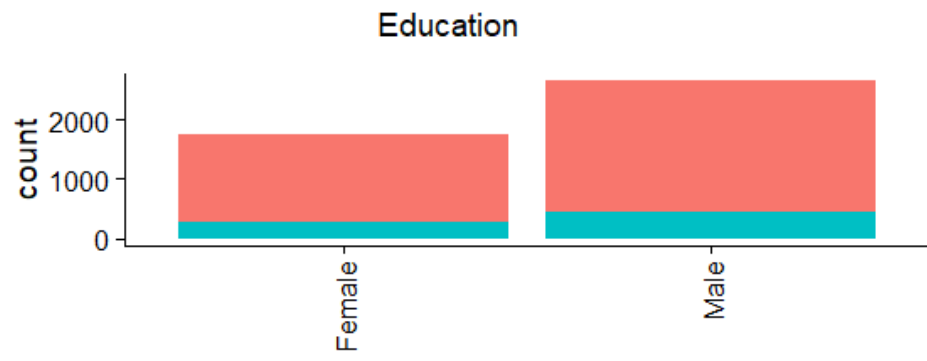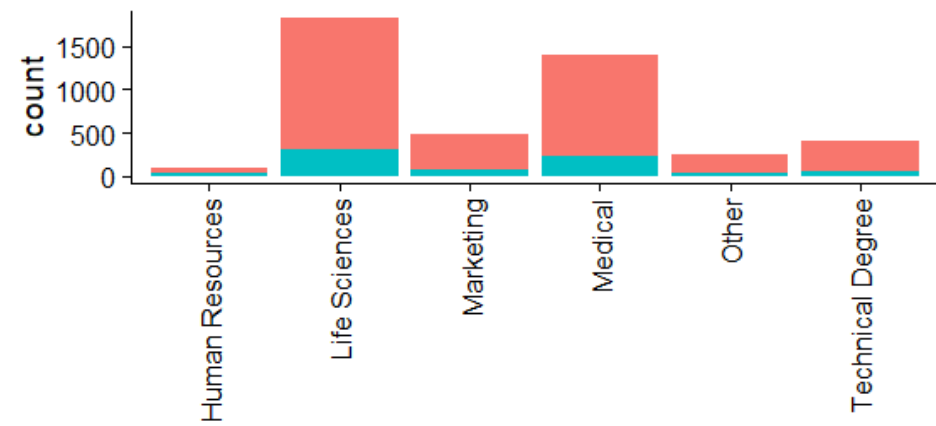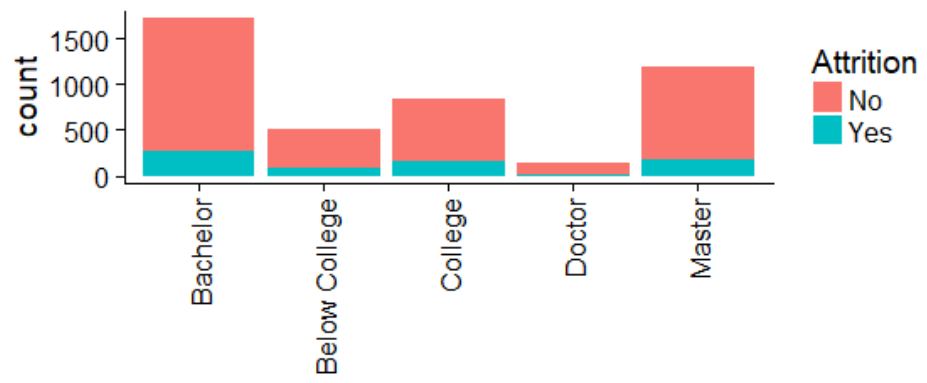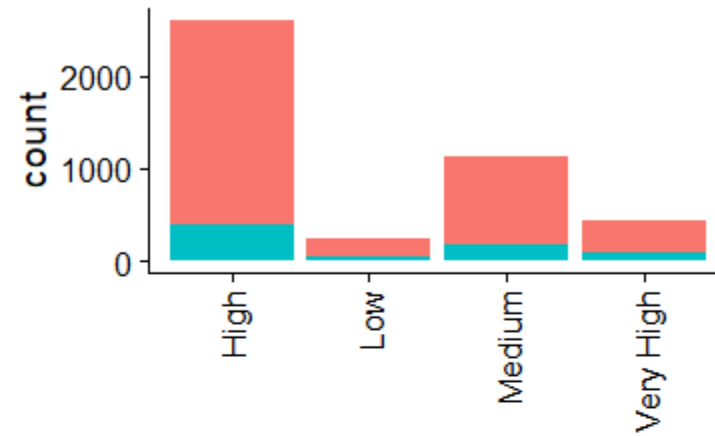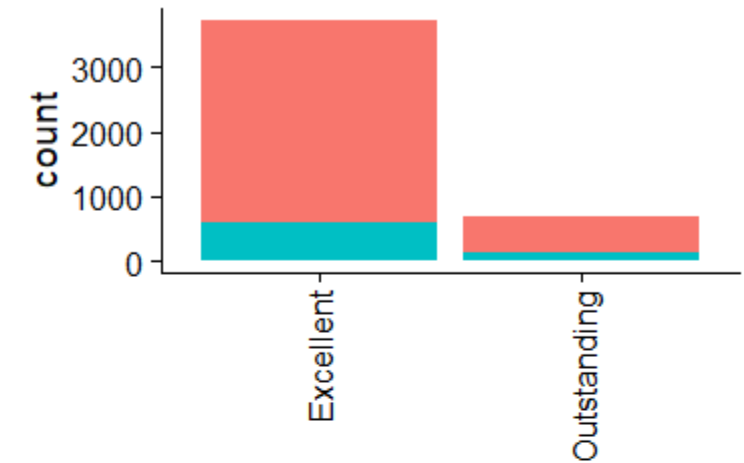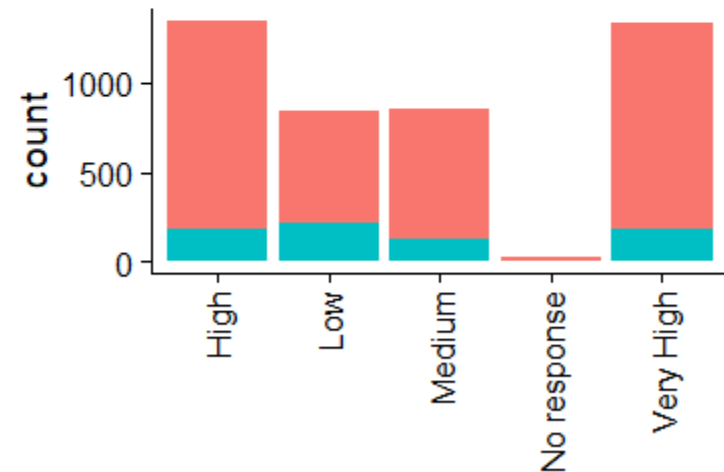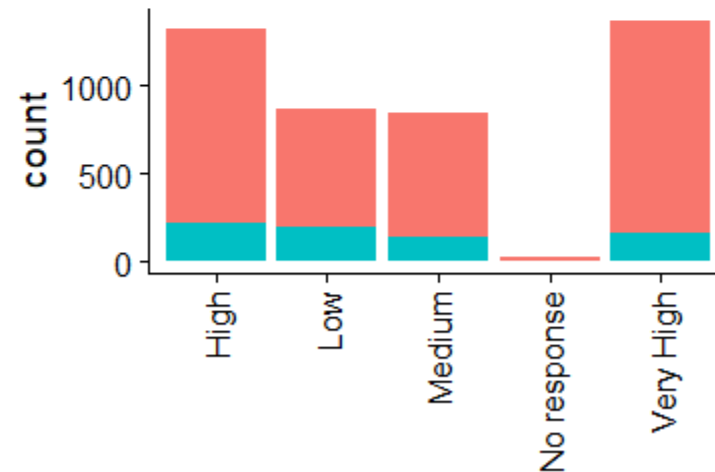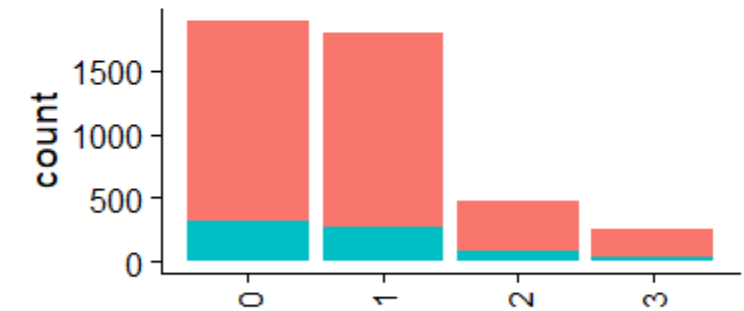
- Employee Work Hour Maintenance is categorised as Good(if employee meets or exceeds standard hours on average) and Bad (if its below standard hours)

- Both Good and Bad seems to have near same levels of attritions but Good category employees are relatively higer
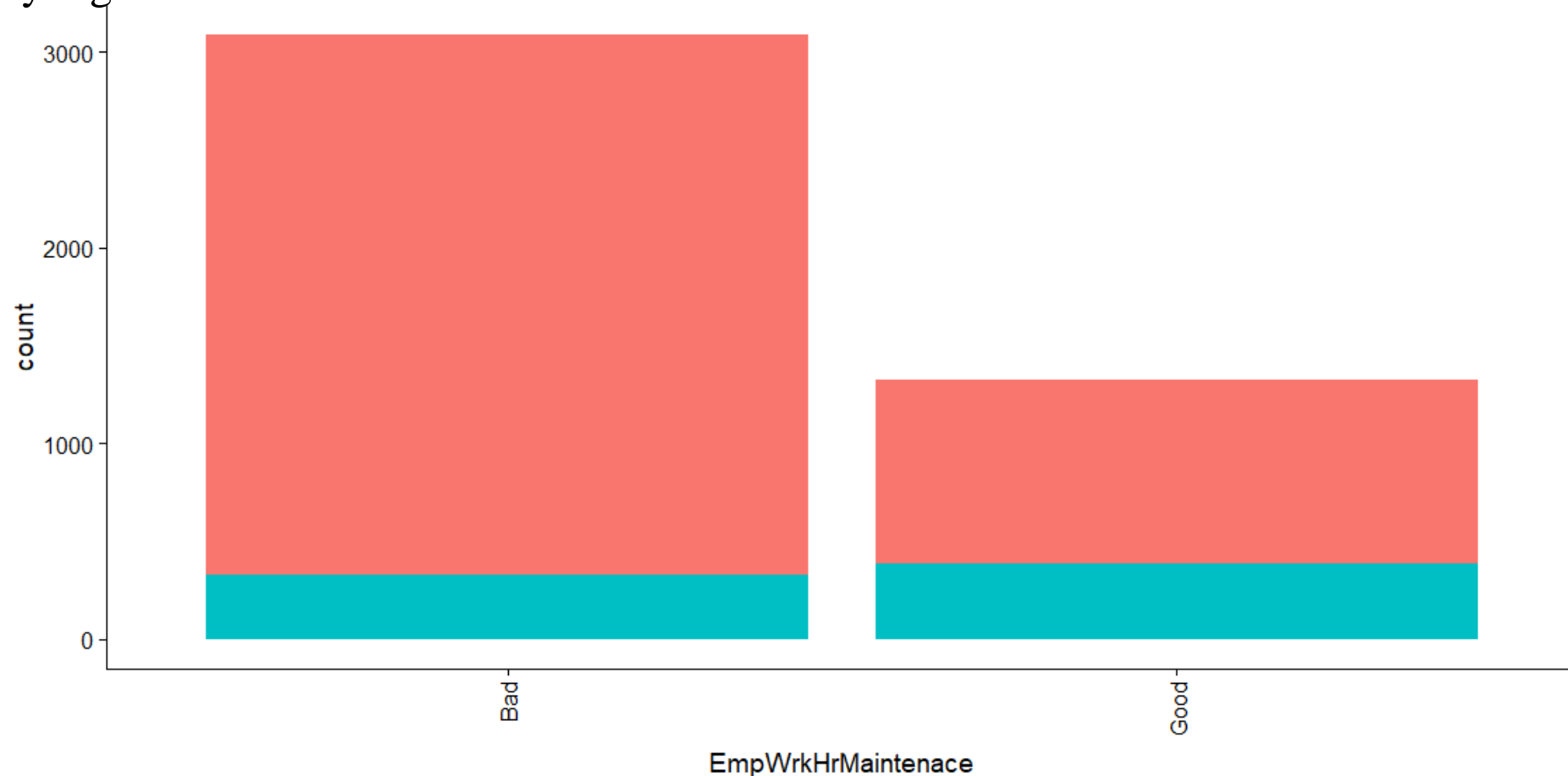
- Below analysis indicate distribution of data and highlight outliers across Attrition categories
- Monthly income has some outliers

- Below analysis indicate distribution of data and highlight outliers across Attrition categories
- Total working years and years at company have some outliers
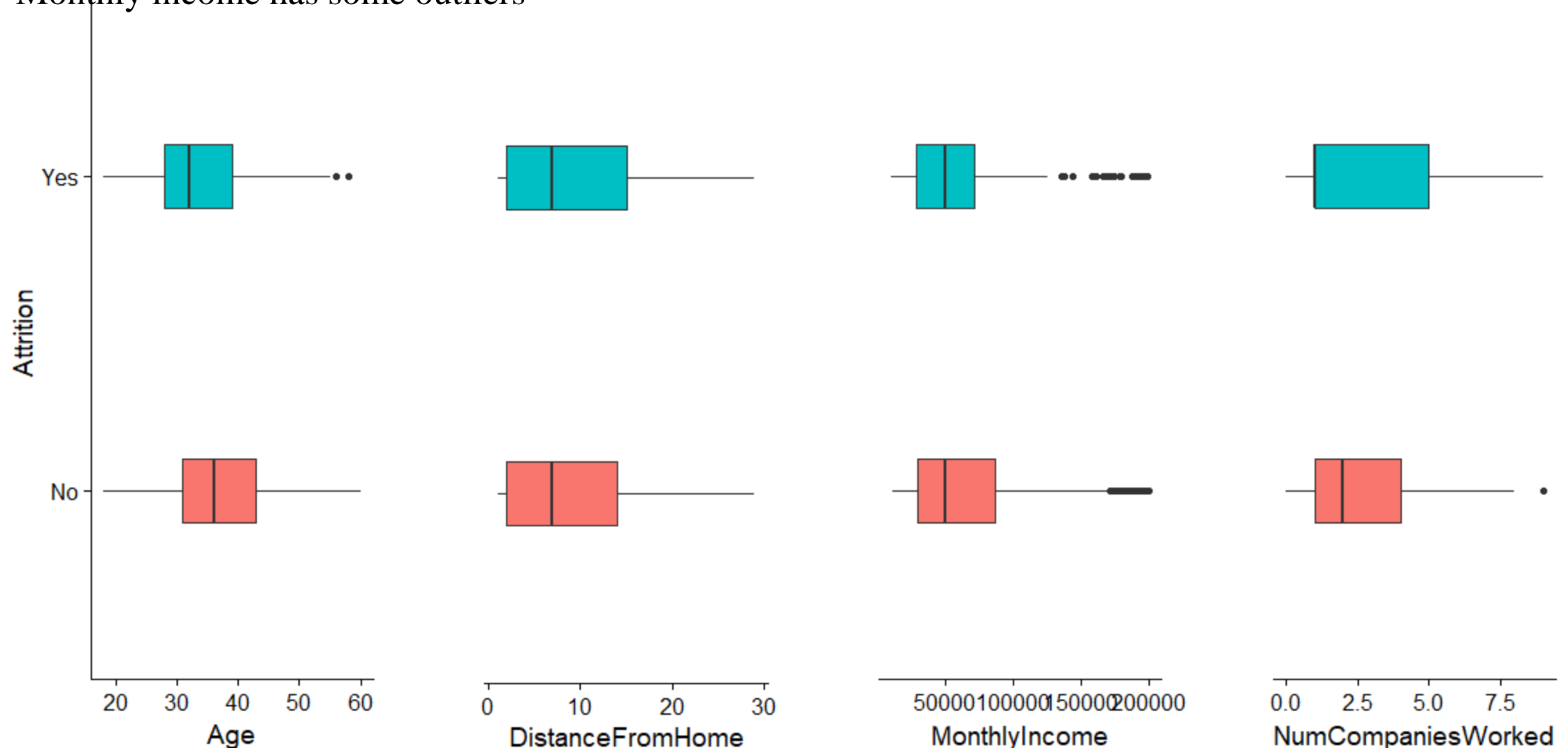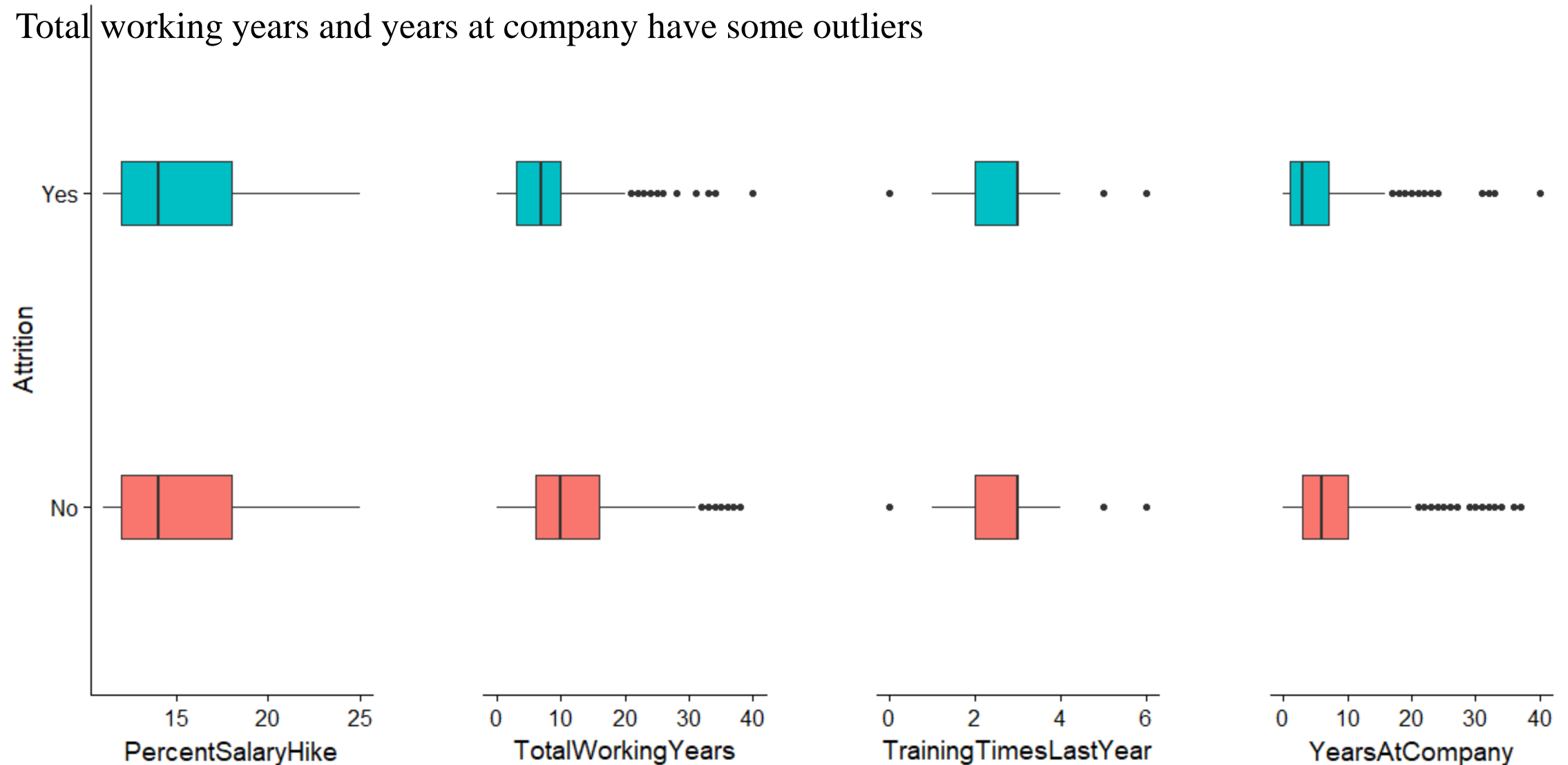
B. Univariate Analysis (Contd.,)

- Below analysis indicate distribution of data and highlight outliers across Attrition categories
- Income to Experience (monthly income to total work experience) has outliers
- ComYrstoMgrYrs (years at company to years at current manager) has outliers
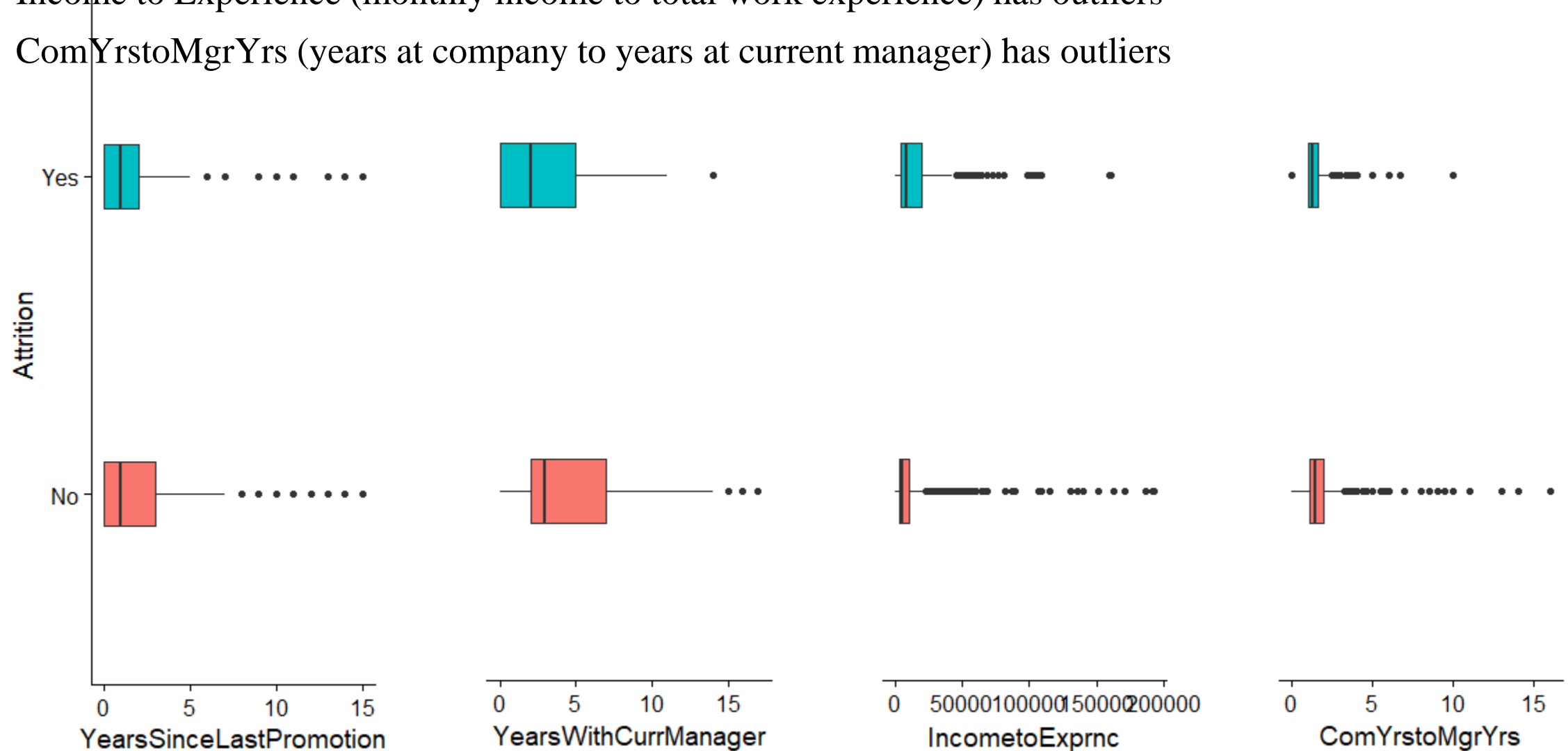
```
Deviance Residuals:
    Min       1Q     Median       3Q        Max
-1.9956   -0.5554   -0.3416   -0.1902     3.3005

Coefficients:
                                     Estimate Std. Error z value Pr(>|z|)
(Intercept)                          -1.04703    0.12196  -8.585  < 2e-16 ***
BusinessTravel.xTravel_Frequently     0.94854    0.13061   7.262 3.80e-13 ***
EducationField.xHuman.Resources       1.62961    0.34547   4.717 2.39e-06 ***
JobRole.xManufacturing.Director      -0.73100    0.21750  -3.361 0.000777 ***
MaritalStatus.xDivorced              -1.00236    0.16039  -6.250 4.11e-10 ***
MaritalStatus.xMarried               -0.80073    0.12462  -6.425 1.31e-10 ***
EnvironmentSatisfaction.xLow          1.11602    0.13139   8.494  < 2e-16 ***
JobSatisfaction.xLow                  0.74035    0.13079   5.661 1.51e-08 ***
WorkLifeBalance.xBad                  1.25758    0.20183   6.231 4.64e-10 ***
EmpWrkHrMaintenace.xBad              -1.59631    0.11753 -13.582  < 2e-16 ***
Age                                  -0.30443    0.07425  -4.100 4.13e-05 ***
NumCompaniesWorked                    0.39521    0.06068   6.513 7.36e-11 ***
TotalWorkingYears                    -0.50096    0.09301  -5.386 7.21e-08 ***
YearsSinceLastPromotion               0.34275    0.06624   5.174 2.29e-07 ***
YearsWithCurrManager                 -0.37880    0.08239  -4.598 4.27e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```
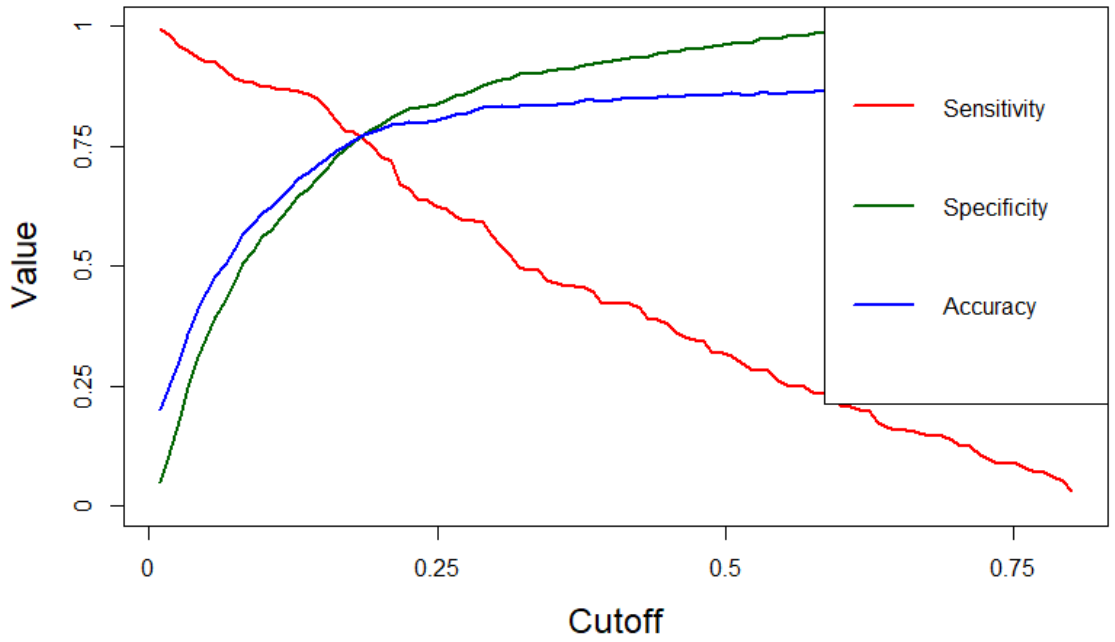
D. Model evaluation

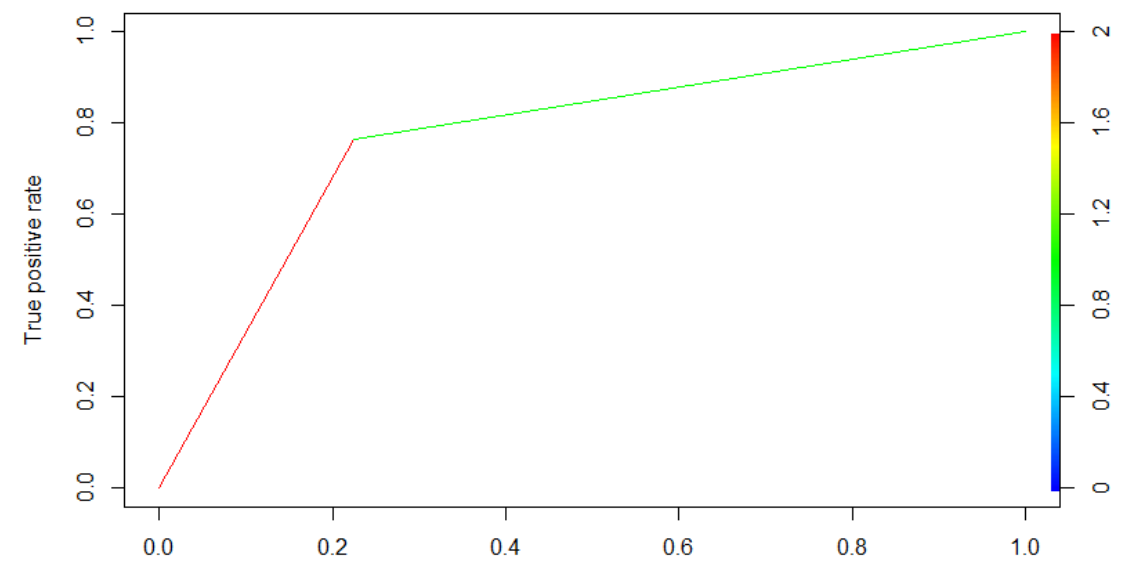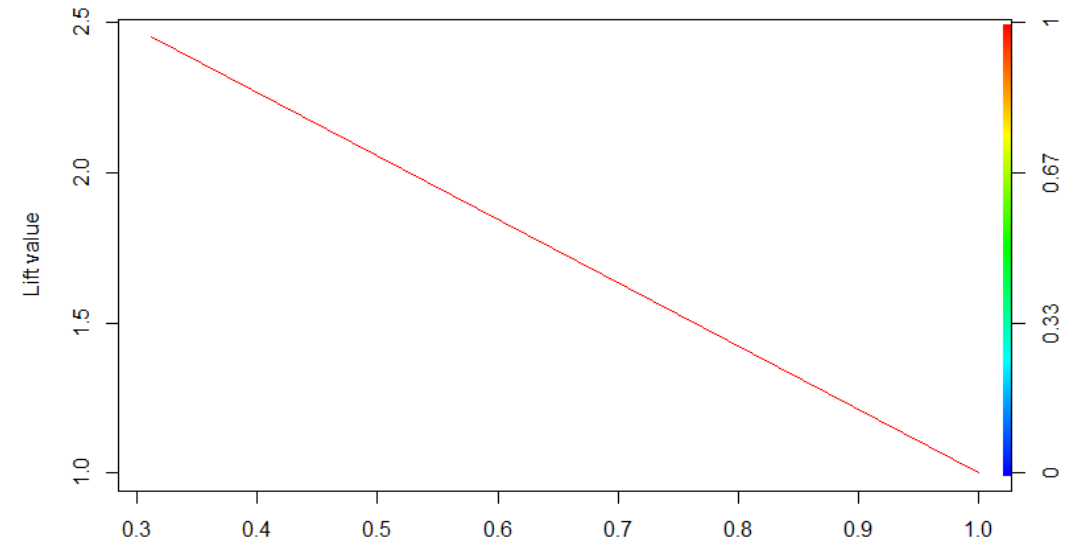- We have optimised cut off value and calculated accuracy, sensitivity and specificity of model


```
   Accuracy                    test_pred_attrn
 0.7732426     test_actual_attrn   No    Yes
 > sens                       No   1030    80
 Sensitivity                  Yes   123    90
   0.7652582       > |
 > spec
 Specificity
   0.7747748
 > |
```

E. Conclusions

- Following are the key variables from final model and analysing each provide insight into potential causes for attrition

- Attrition = -1.04703 + 0.94854 * BusinessTravel.xTravel_Frequently + 1.62961 * EducationField.xHuman.Resources - 0.73100 *JobRole.xManufacturing.Director - 1.00236 * MaritalStatus.xDivorced - 0.80073 * MaritalStatus.xMarried + 1.11602 * EnvironmentSatisfaction.xLow + 0.74035 * JobSatisfaction.xLow +1.25758 * WorkLifeBalance.xBad -1.59631 * EmpWrkHrMaintenace.xBad - 0.30443 * Age + 0.39521 *NumCompaniesWorked -0.50096 * TotalWorkingYears + 0.34275 * YearsSinceLastPromotion - 0.37880 * YearsWithCurrManager

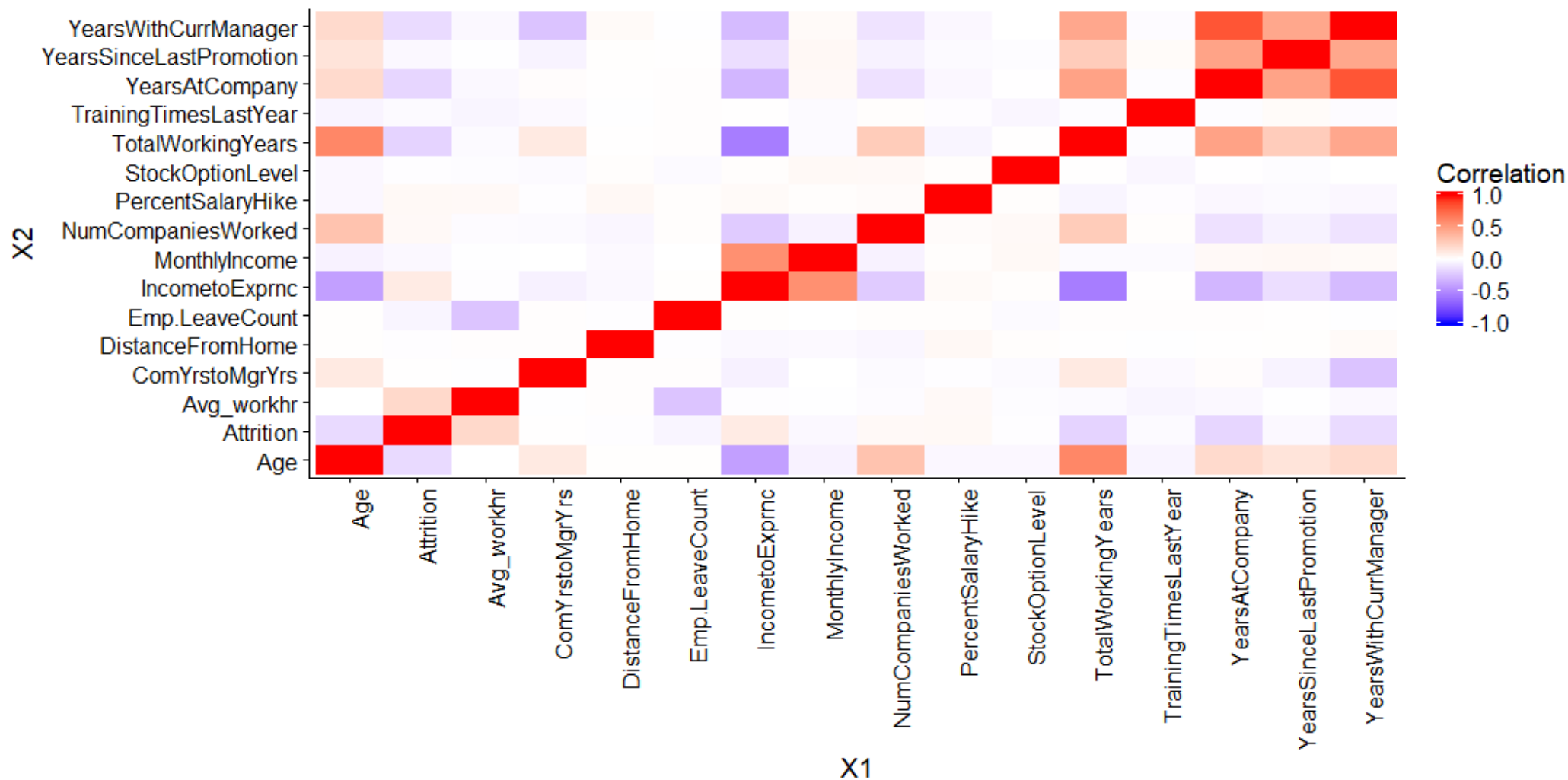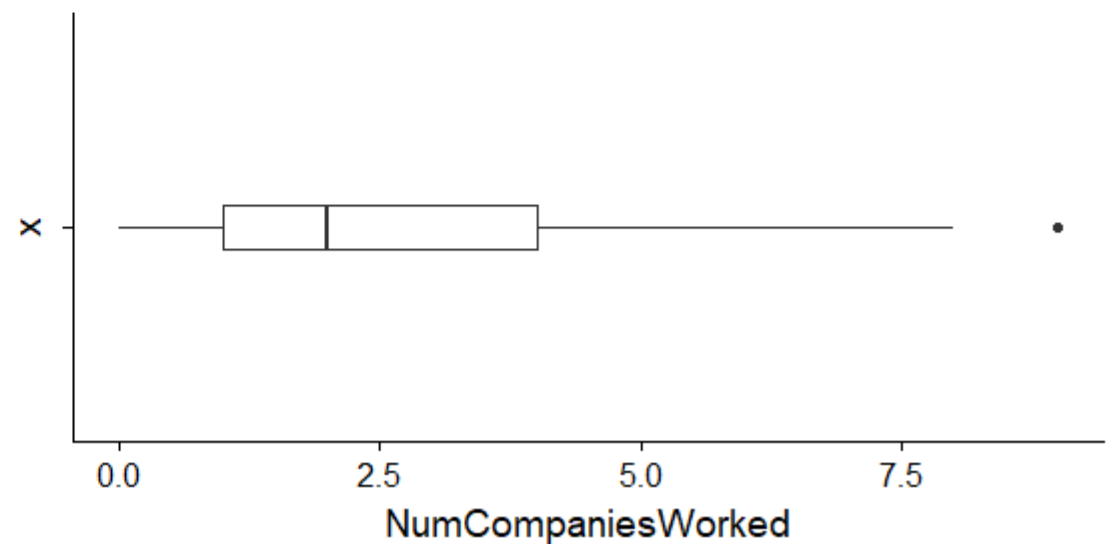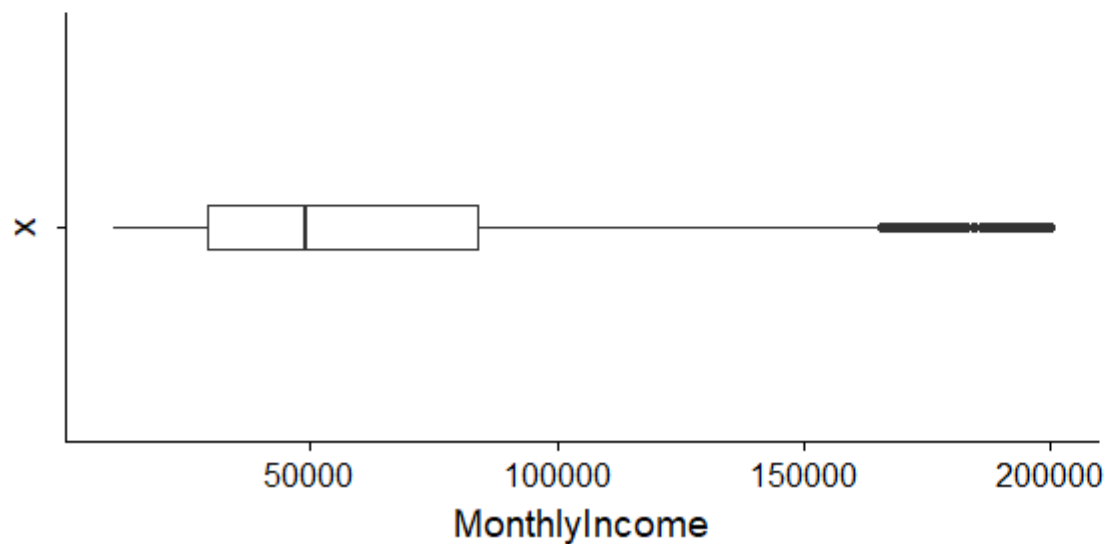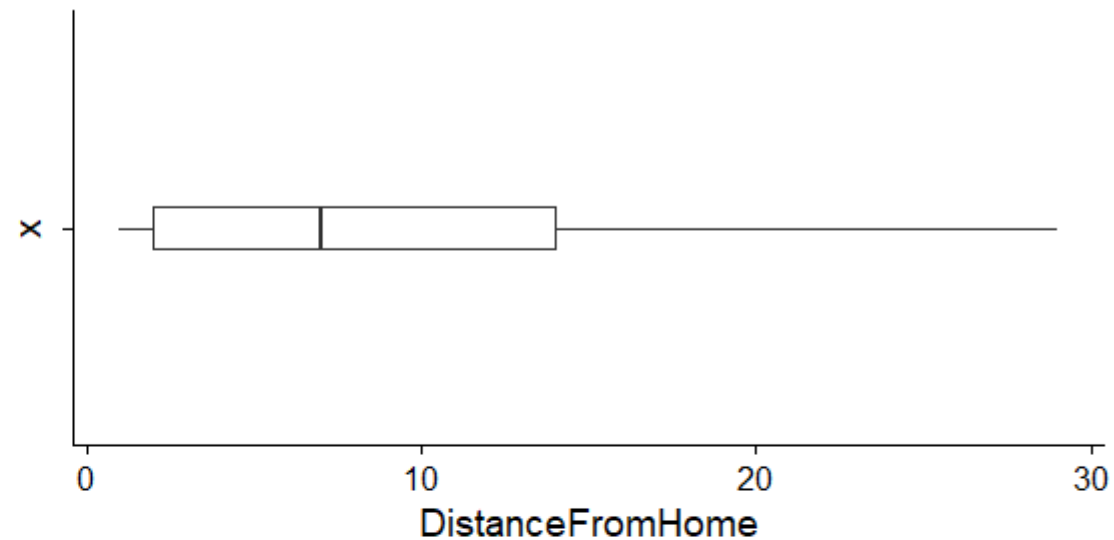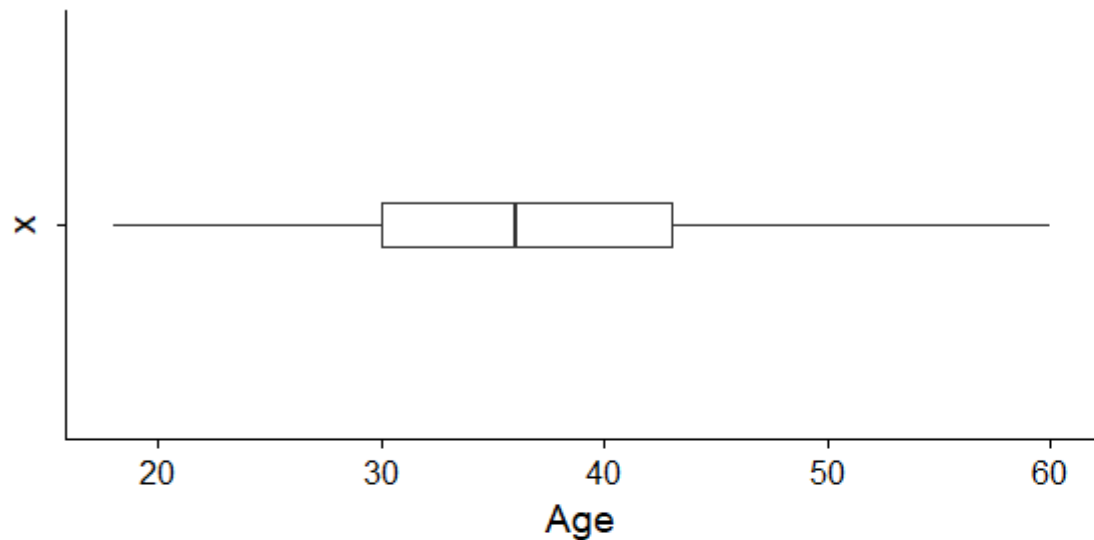| Factor	
BusinessTravel.xTravel_Frequently	Employees who travel tend to quit more than those who don't travel or travel frequently. This might be due to that employees who travel frequently are more exposed to different opportunities and could also establish professional network
EducationField.xHuman.Resources	Employees who have a HR education background tend to move often from company to company – this might be due to the fact that their will have a broader relationship network
JobRole.xManufacturing.Director	Manufacture directors are experienced guys in who manage oversees management of all areas of manufacturing to produce products and direct activities, So, they have good knowledge of business and able to start their own company . Because of their own company they are quitting jobs.
MaritalStatus.xDivorced	Divorced Employees in search of new partner or because loneliness they quit the job.
MaritalStatus.xMarried	Married Employees need more money and time for family ,So it may possible they are searching new job where they get flexible time ,less work load and good pay then current company.
EnvironmentSatisfaction.xLow	Employees who voted environment satisfaction as Low may they not adapt work culture of company. Every company have own work culture. Employees comes from different company not easily adapt other company culture.
JobSatisfaction.xLow	Employees with job satisfaction level as low, tend to look out for more opportunities outside the organisation. This could be because of the similar work they are given everyday or their role is no more exciting or the growth in the company for the employee has become stagnant

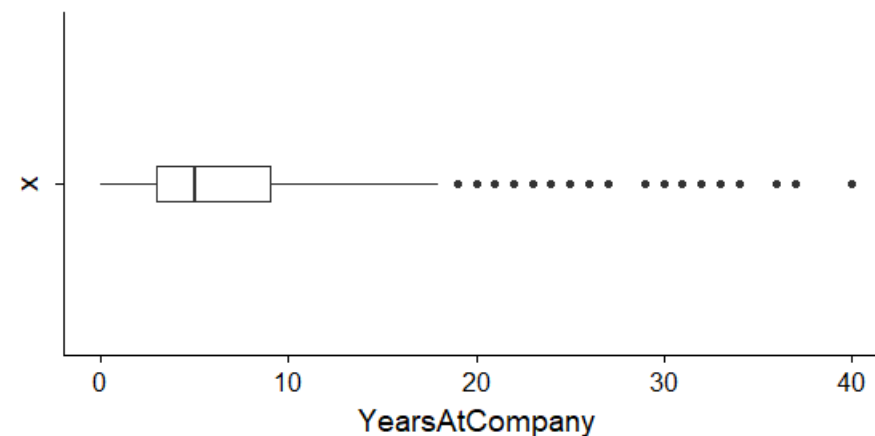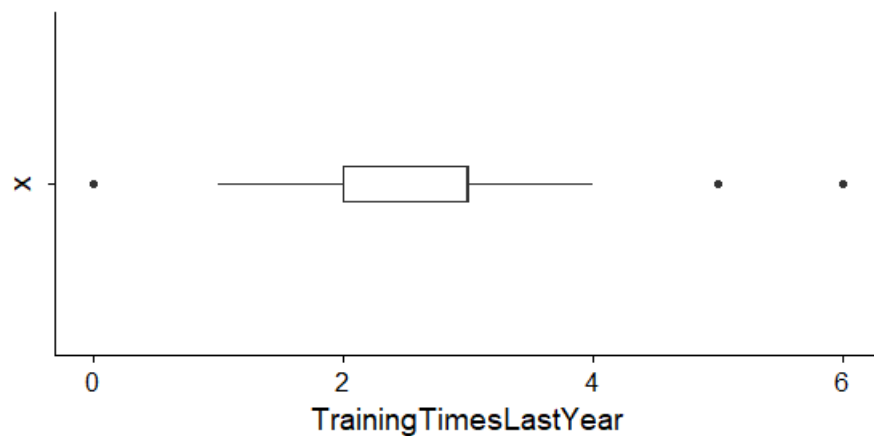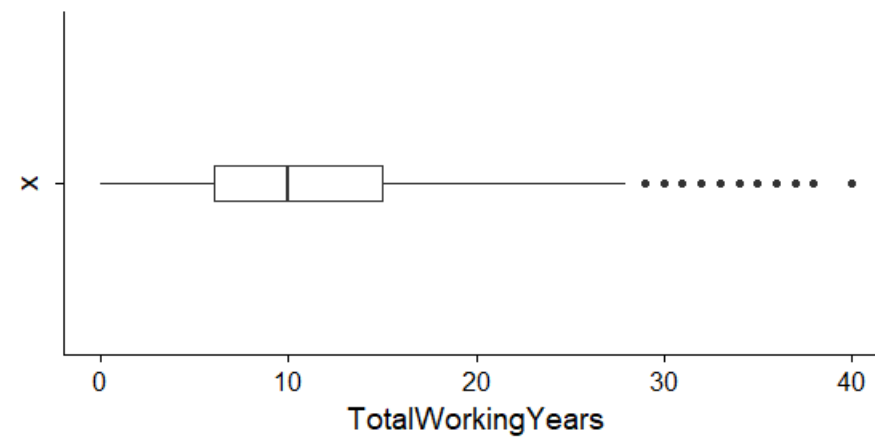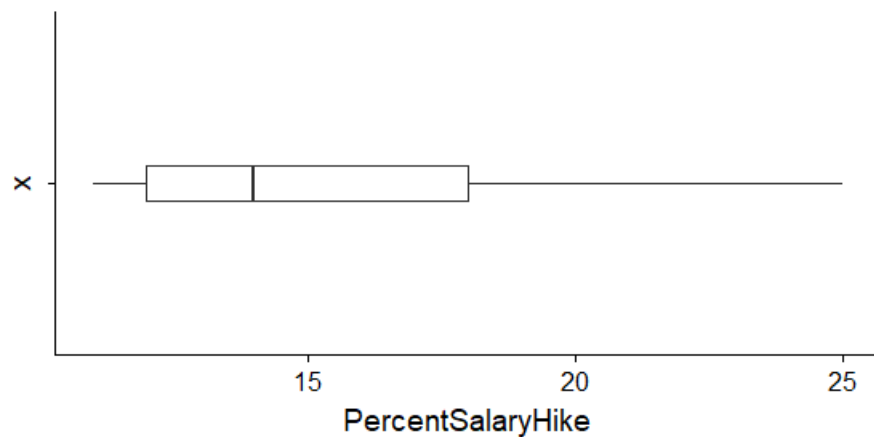| Factor	
WorkLifeBalance.xBad	Employees who are unable to maintain their work life balance, end up leaving the company because they get affected physically and mentally. Also, they take their work along with them to home which also results the environment and the relationships with their family.
EmpWrkHrMaintenace.xBad	Employee work hour maintenance of Bad indicate those employees who do not meet standard hours on average tends to quite more often. Not meeting standard hour indicate lack of interest in job and managers need to keep track of employees and have conversations to look into problem areas
Age	Employees who are young and looking for new opportunites tend to leave the company when they get better roles and packages as compared to their present ones, since they are young they tend to switch more frequently as compared to people with more experience and older
NumCompaniesWorked	Total number of companies employee has worked previous to current company. An employee who worked in many companies earlier tend to leave the company soon and look for companies outside. Recommendation: To reduce intake of employees who have worked in lot of companies for shorter period
TotalWorkingYears	The total experience of the employee. As seen in plots employees with more experience have reduced attrition rate. Such employees can be acquired more
YearsSinceLastPromotion	No Of Years prior to which an employee got a promotion.
YearsWithCurrentManager	No of years the employee is with current manager. If an employee is with the manager for shorter period he tends to leave the company because the employee's performance cannot be recognized properly in shorter period so they move.

- Companies should understand the need of the employee w.r.t their capability and skill and should interact with them in order to understand their job satisfaction needs.

- Companies should try and help their employees in maintaining their work life balance, by providing them flexi hours or giving them leaves in order to spend time with their families, or even organise events with the invitations to their families also.

- Employees who are young should be given more challenging jobs and they should be appreciated in order to make them feel important in the organisation, also they should be awarded for the tasks they have achieved keeping in mind their age and workexp.

- To maintain the same manager or mentor for a longer period for an employee

- XYZ could start actively engaging employees and promote conversations that could enable better communication from employee side to managerial side. Rather than have 2 performance conversations a year (standard across most companies), XYZ could encourage 4 conversations a year between managers and their employees

APPENDIX