

# HR ANALYTICS CASE STUDY

## SUBMISSION

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## Business Objective

- The objective is to understand the factors which influence the employees of the company to leave through the identification of variables which are strong indicators of attrition. The company wants to further utilise this knowledge to make changes to their workplace, in order to get most of their employees to stay

## Strategy

- To create a model that predicts the probability of attrition of an employee
- Identification of the most influencing factors responsible for attrition

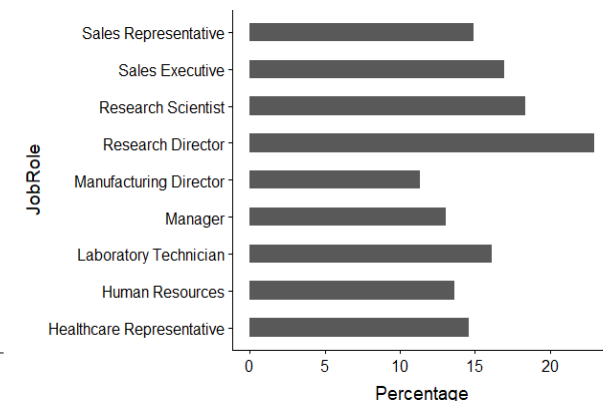
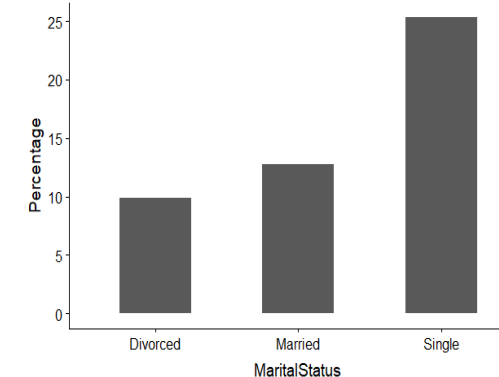
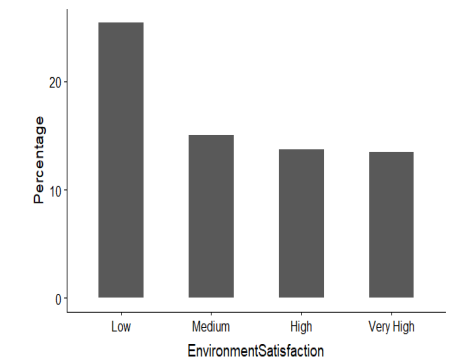
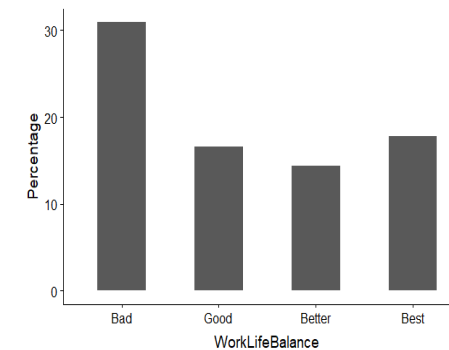
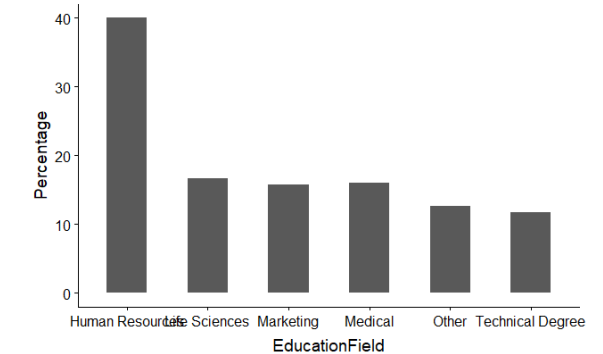
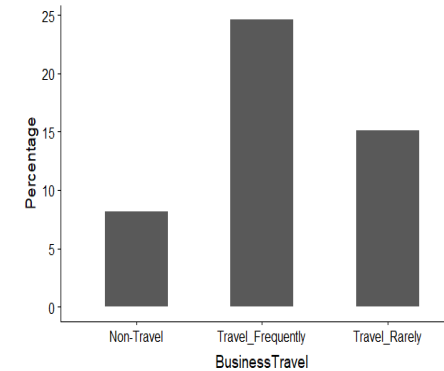
## Data

- There are five sets of data pertaining to 4410 employees provided for analysis:
  - General Employee Information (4410 obs. of 24 variables)
  - Employee survey data (4410 obs. of 4 variables)
  - Manager survey data (4410 obs. of 3 variables)
  - in-time (4410 obs. of 262 variables)
  - out-time (4410 obs. of 262 variables)
- The **Employee ID** is the primary key, which has been used to merged all the files and create a master dataset
- Upon joining the tables we discover that there are three variables (Over18, StandardHours and EmployeeCount) which have the same values in all the rows, hence they have not been included in the analysis
- **Outlier treatment** done for MonthlyIncome and Derived Variables

- Discrete variables – BusinessTravel, JobRole, Department, MaritalStatus, Education Field, Gender were converted into factor type
- Formatted the date types into POSIXct and calculated the number of hours worked by Employees
- Null values in the data (2.4 % of observations) were removed
- Numeric variable were standardized
- Dummy variables created for factor attributes
- Outliers checked and treated
- **Final Dataset created with 4300 observations and 40 variables**
- Data was split into test and train datasets in the 70:30 ratio

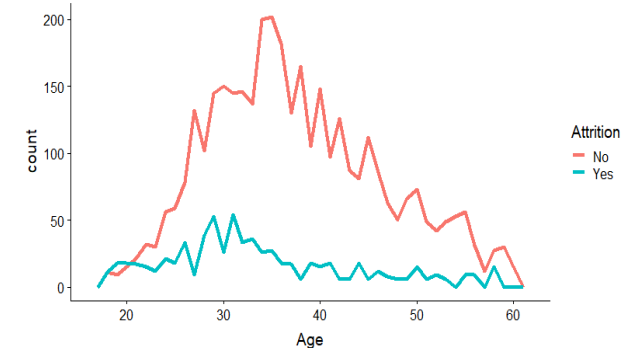
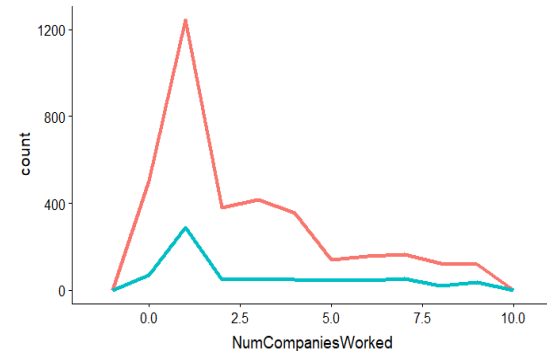
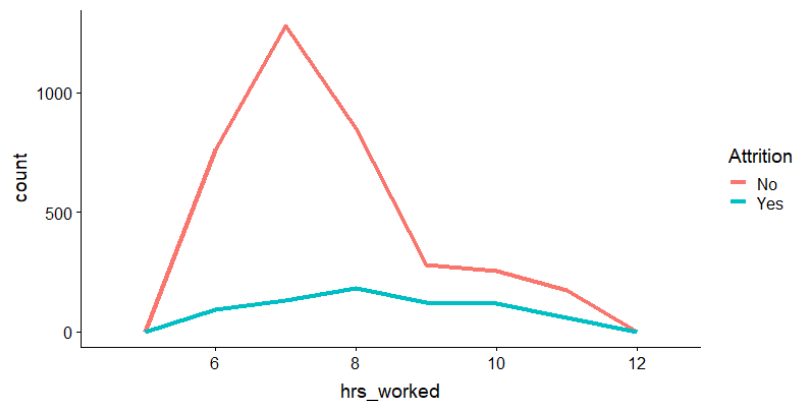
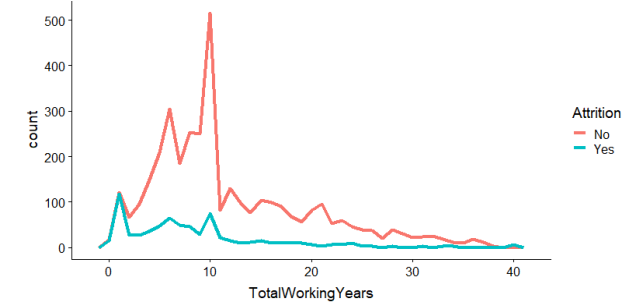
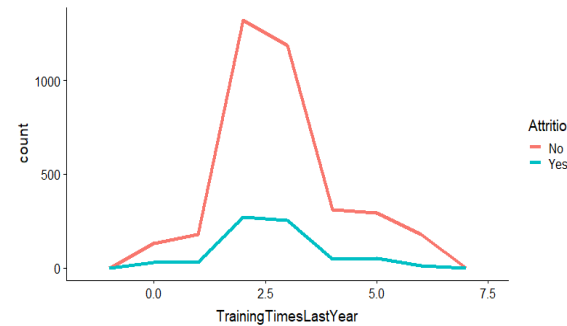
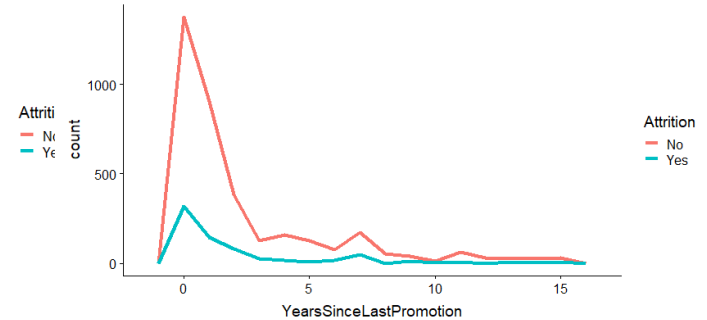
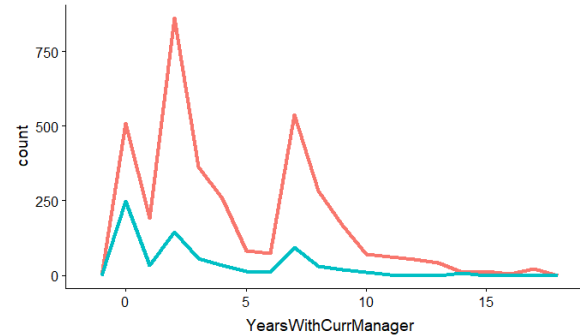
After doing some exploratory data analysis on the dataset, we find that:

- Attrition is more among employees who go on business travel frequently:
- Attrition is least in employees that work as Manufacturing Director and most among Research Directors
- There is more attrition in the HR Department
- There is more attrition among Single employees
- There is more attrition among employees with HR Education
- There is no Gender difference when it comes to attrition.
- Attrition is higher among people who report bad work life balance and low environment satisfaction.



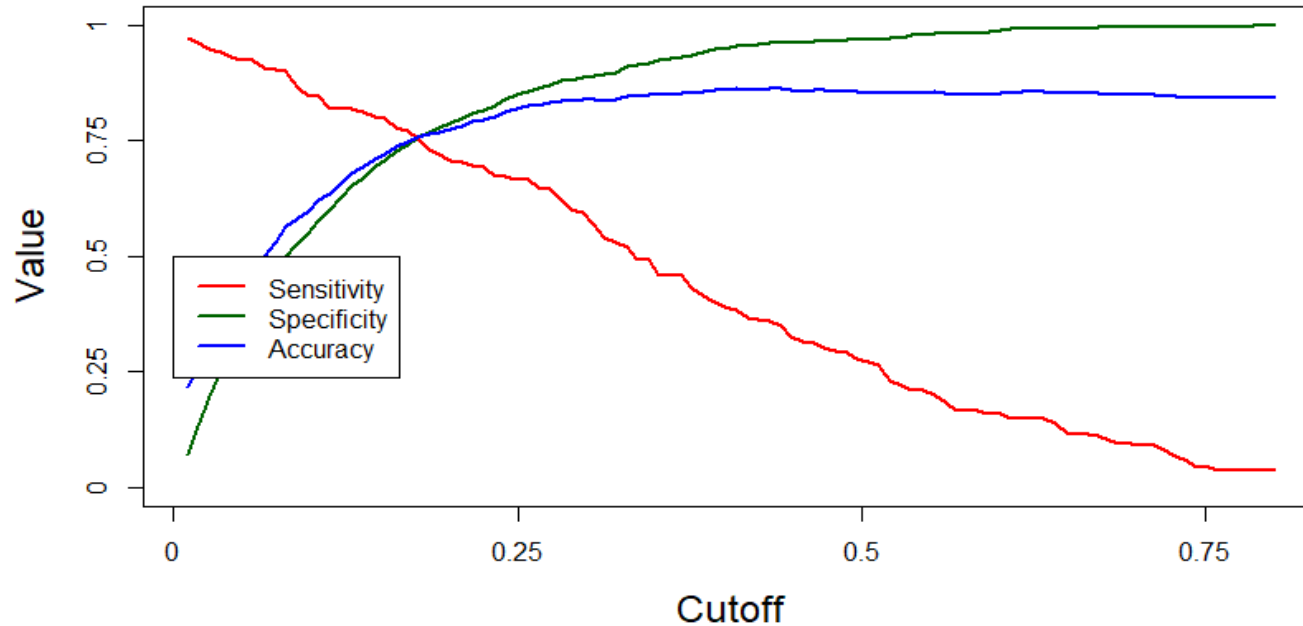
Relevant variables are:

- Years with Current Manager
- Years since Last Promotion
- Training Times Last Year
- Total Working Years
- Hours Worked
- Number of Companies Worked
- Age



In 15 iterations the final model was constructed containing 13 significant variables with significant p values and low VIFs

	Estimate	Std. Error	z value	Pr(> z )		VIF
(Intercept)	2.54	0.42	6.04	0.000	***	
Age	-0.04	0.01	-4.19	0.000	***	1.82072
NumCompaniesWorked	0.13	0.02	5.56	0.000	***	1.24047
TotalWorkingYears	-0.07	0.01	-5.26	0.000	***	2.49502
TrainingTimesLastYear	-0.16	0.04	-3.61	0.000	***	1.02055
YearsSinceLastPromotion	0.20	0.02	8.46	< 0.0000000000000002	***	1.94146
YearsWithCurrManager	-0.15	0.02	-6.36	0.000	***	1.77872
EnvironmentSatisfaction	-0.31	0.05	-6.07	0.000	***	1.04241
JobSatisfaction	-0.33	0.05	-6.57	0.000	***	1.03729
WorkLifeBalance	-0.32	0.08	-4.04	0.000	***	1.02318
hrs_worked	0.66	0.05	12.38	< 0.0000000000000002	***	1.06329
BusinessTravel.xTravel_Frequently	0.70	0.13	5.29	0.000	***	1.02363
JobRole.xManufacturing.Director	-0.88	0.22	-4.09	0.000	***	1.02092
MaritalStatus.xSingle	0.92	0.11	8.02	0.000	***	1.05497



Since this model is aimed at identifying factors that influence attrition, and attrition level has to be brought down, we focused on increasing the Sensitivity (proportion of “Yes” correctly predicted)

The final model derived is capable of predicting fairly accurately basis the fact that the Sensitivity of the model is 76% with an Accuracy of 76%

The optimal probability cut-off value is calculated to be 17.7%

This is the point of intersection of the three lines pertaining to Sensitivity, Specificity and Accuracy. This gives us the following values:

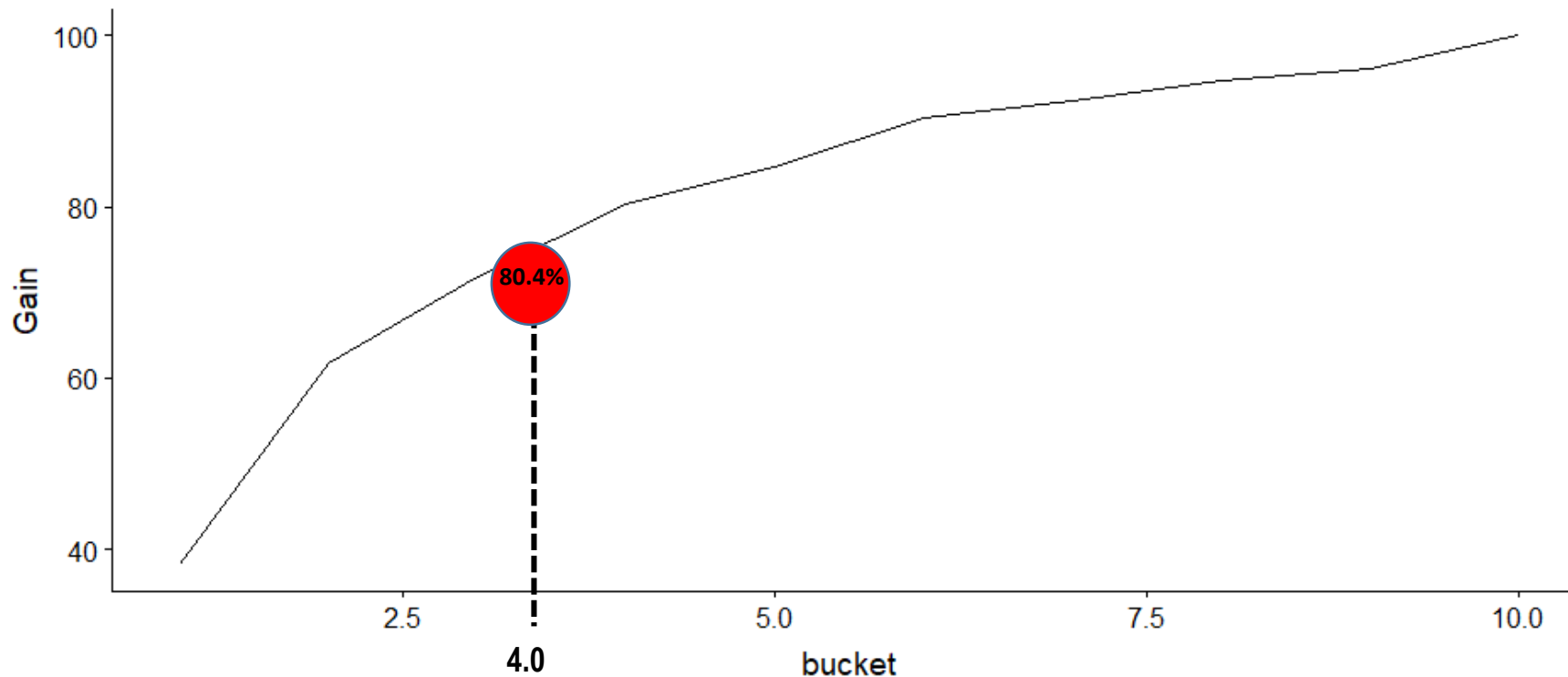
Accuracy: 76%

Sensitivity: 76%

Specificity: 76%



Additionally, if we were to sort our data according to the probability of attrition, then as per our gain table, we would be able to identify close to 80% of the people that were planning to move out of the company, within the 4<sup>th</sup> decile/bucket.



The KS Statistic for this model is  
= 51%

The Gain is 80% by the 4<sup>th</sup>  
Decile

- **Factors Influencing Attrition:**

**Age & Total Working Years**

People who have been in the organization for longer tenure are less likely to switch often

**Number of Companies Worked at**

Number of companies worked variable positively related with Attrition

**Training Times Last Year**

Less frequent trainings are associated with higher attrition

**Marital Status**

Single workers are more likely to leave the organisation

**Environment Satisfaction,  
Job Satisfaction & Work Life  
Balance**

Environment & Job satisfaction along with Work life balance has a significant impact on Attrition

- **Factors Influencing Attrition:**

**Job Role**

Manufacturing Directors are more likely to leave the organisation

**Business Travel**

Attrition is more among employees who go on business travel frequently

**Years Since Last Promotion**

Years since last promotion variable is positively related with Attrition

**Hours Worked**

Number of hours worked variable is positively related with Attrition

**Years with Current Manager**

Years with current manager variable inversely related with Attrition

## Business Travel

- **Attrition is more among employees who go on business travel frequently.**
  - Establishing Incentive based travel model with high per diem/ daily allowances along with the reimbursements
  - Limiting the monthly/quarterly/annual business travels at various designation levels
  - Mandatory breaks/cool-off periods and comp-offs for frequent/ long travel
  - Options to get accompanied with dependents in case of long travel

## Years Since Last Promotion

- **Years since last promotion variable positively related with Attrition.**
  - Periodic rotations of employees based on project profiles, roles & responsibilities to remove biases
  - Better training by increasing skill level in desired interest areas and augment cross-functional learning

## Number of Companies Worked

- **Number of companies worked variable positively related with Attrition.**
  - Changing the hiring pattern by limiting the hiring of people with history of frequent job changes.
  - As number of experience years increases, tendency of person to leave company decreases, hence HR should better manage leadership transition, and promotion processes to improvise job satisfaction.

## Hours Worked

- **Number of hours worked variable positively related with Attrition.**
  - HR should analyze work allocation and dependency of resources with high average number of working hours.
    - If productivity (Work Product/ Working Hours) is high, they should provide help in work delegation along with reporting managers and periodic rewards & recognition to motivate them.
    - If productivity is low, they need to be given adequate training to reduce working hours by better time mgmt
  - Periodic project management trainings for Manager and above level designations to better handle the attrition issues

## Years with Current Manager

- **Years with current manager variable inversely related with Attrition.**
  - Clarity in employee's roles & responsibilities, maintaining transparent performance appraisal process, so that new managers get enough evidences to aptly judge the individual's performance.
  - Encouraging skip level meetings, wherein employees could skip immediate mid-level reporting level to take up issues with the senior management for grievance mitigation.

Thank You