# Employees Promotion Analysis Project

### Univariant Analysis & Understanding Dataset

## About Dataset:

The HR team stored data of promotion cycle last year, which consists of details of all the employees in the company working last year and also if they got promoted or not, but every time this process gets delayed due to so many details available for each employee - it gets difficult to compare and decide. this time HR team wants to utilize the stored data to make a model, that will predict if a person is eligible for promotion or not. Need to come up with a model that will help the HR team to predict if a person is eligible for promotion or not.

## Objectives:

- Understanding Data
- Univariant analysis

# Understanding Dataset

## Data Feature Dictionary:

| Feature Name | Description |
|---|---|
| EmployeeID | Unique ID for the employee |
| Department | Department of employee |
| Region_Employment | Region of employment (unordered) |
| Education Level | Education Level |
| Gender | Gender of Employee |
| Recruitment Channel | Channel of recruitment for employee |
| NO_Trainings_LstYear | no of other trainings completed in the previous year on soft skills, technical skills, etc. |
| Age | Age of Employee |
| previous_year_rating | Employee Rating for the previous year |
| Service Length | Length of service in years |
| Awards | if awards won during the previous year |
| Avg_Training_Score | Average score in current training evaluations |
| Is Promoted | Recommended for promotion |

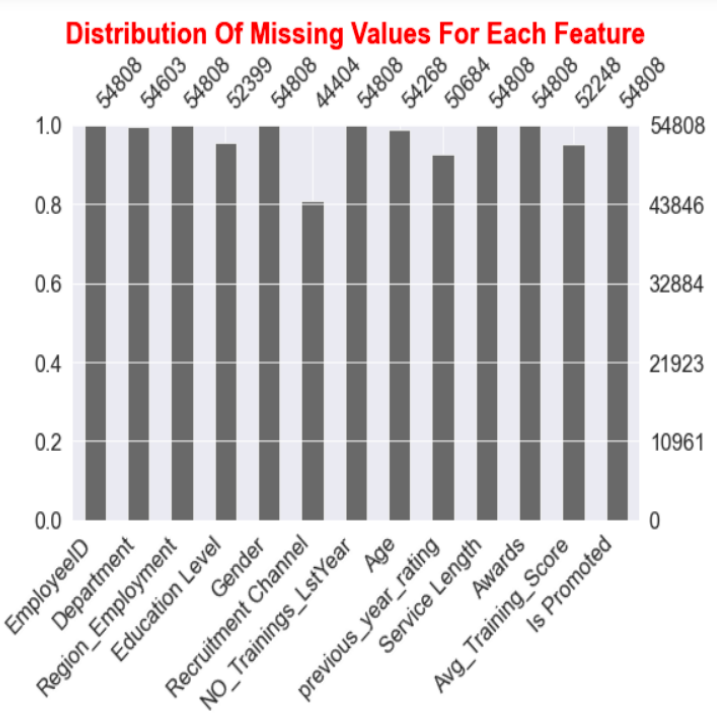
# Sample of Data

| | EmployeeID | Department | Region_Employment | Education Level | Gender | Recruitment Channel | NO_Trainings_LstYear | Age | previous_year_rating | Service Length | Awards |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 65438 | Sales & Marketing | region_7 | Master's & above | f | sourcing | 1 | 35.0 | 5.0 | 8 | NO |
| **1** | 65141 | Operations | region_22 | Bachelor's | m | other | 1 | 30.0 | 5.0 | 4 | NO |
| **2** | 7513 | Sales & Marketing | region_19 | Bachelor's | m | sourcing | 1 | 34.0 | 3.0 | 7 | NO |

| | EmployeeID | Department | Region_Employment | Education Level | Gender | Recruitment Channel | NO_Trainings_LstYear | Age | previous_year_rating | Service Length | Awards |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **54805** | 13918 | Analytics | region_1 | Bachelor's | m | other | 1 | 0.0 | 5.0 | 3 | NO |
| **54806** | 13614 | Sales & Marketing | region_9 | NaN | m | sourcing | 1 | 29.0 | 1.0 | 2 | NO |
| **54807** | 51526 | HR | region_22 | Bachelor's | m | other | 1 | 27.0 | 1.0 | 5 | NO |

- Data Consist of (54808) row and (13) Columns
- Dtype: float64(3), int64(4), object (6)
- Memory usage: 5.4+ MB
- No Duplicated Records
- **Some features have missing values**

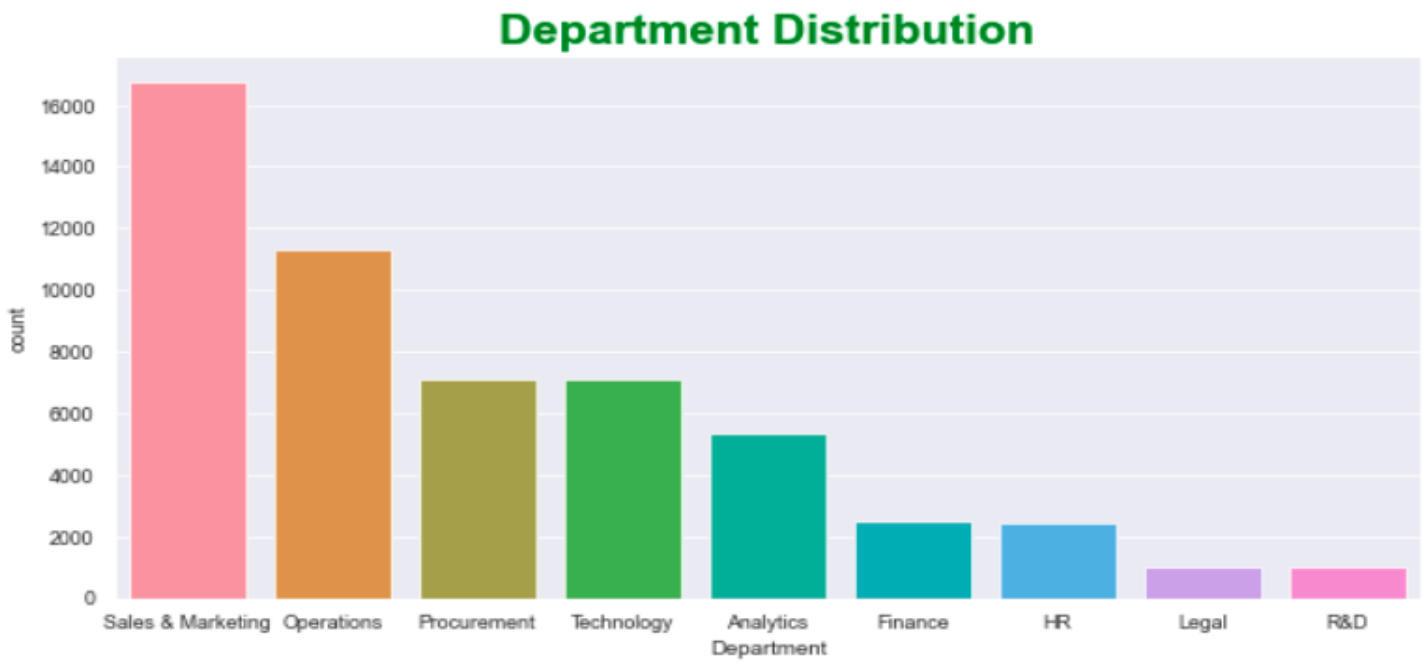
| | Percentage of missing value |
|---|---|
| **EmployeeID** | 0.000000 |
| **Department** | 0.000000 |
| **Region_Employment** | 0.000000 |
| **Education Level** | 4.395344 |
| **Gender** | 0.000000 |
| **Recruitment Channel** | 18.982630 |
| **NO_Trainings_LstYear** | 0.000000 |
| **Age** | 0.985258 |
| **previous_year_rating** | 7.524449 |
| **Service Length** | 0.000000 |
| **Awards** | 0.000000 |
| **Avg_Training_Score** | 4.670851 |
| **Is Promoted** | 0.000000 |



# Univariant Analysis

## Department Feature:

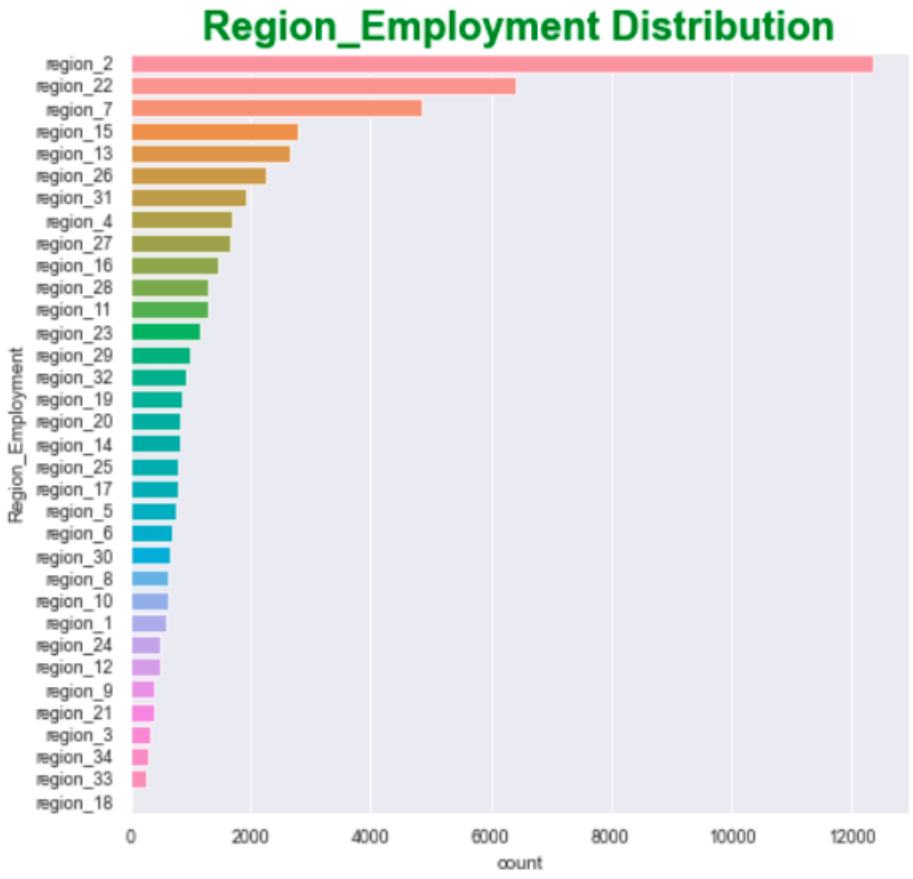
| | Sales & Marketing | Operations | Procurement | Technology | Analytics | Finance | HR | Legal | R&D |
|---|---|---|---|---|---|---|---|---|---|
| **Department** | 16773 | 11304 | 7117 | 7113 | 5330 | 2525 | 2411 | 1035 | 995 |




- Department Feature has 9 unique department
- has 205 (-) converted to null values
- (Sales & Marketing) is most Frequent and (R&D) is least Frequent

## Region_Employment Feature Distribution

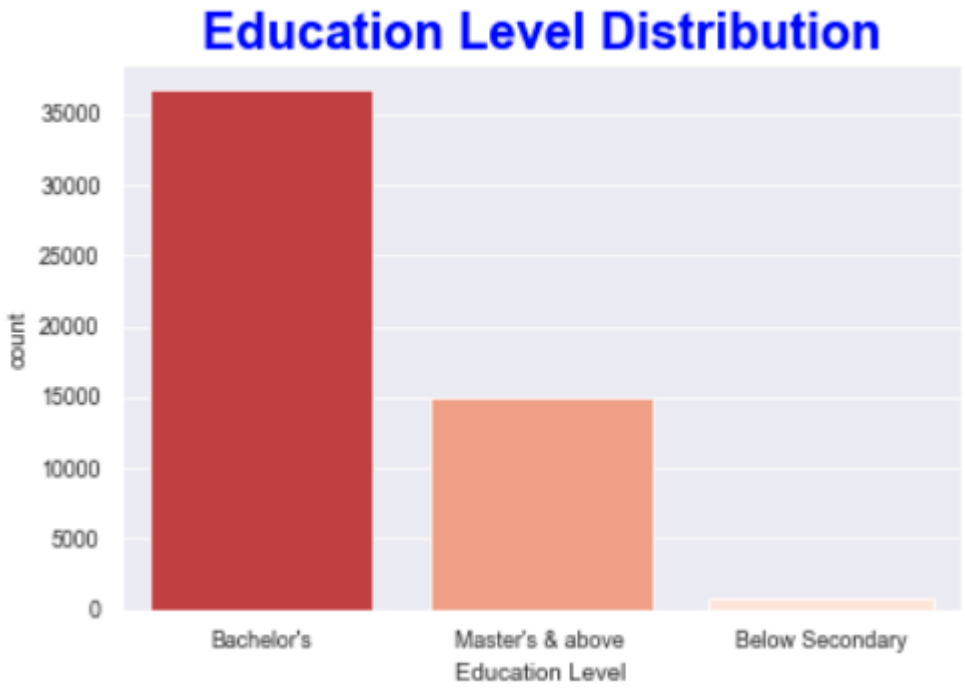
| | Region_Employment |
|---|---|
| region_2 | 12343 |
| region_22 | 6428 |
| region_7 | 4843 |
| region_15 | 2808 |
| region_13 | 2648 |
| region_26 | 2260 |
| region_31 | 1935 |
| region_4 | 1703 |
| region_27 | 1659 |
| region_16 | 1465 |
| region_28 | 1318 |
| region_11 | 1315 |
| region_23 | 1175 |
| region_29 | 994 |
| region_32 | 945 |
| region_19 | 874 |
| region_20 | 850 |
| region_14 | 827 |
| region_25 | 819 |
| region_17 | 796 |
| region_5 | 766 |
| region_6 | 690 |
| region_30 | 657 |
| region_8 | 655 |
| region_10 | 648 |
| region_1 | 610 |
| region_24 | 508 |
| region_12 | 500 |
| region_9 | 420 |
| region_21 | 411 |
| region_3 | 346 |
| region_34 | 292 |
| region_33 | 269 |
| region_18 | 31 |




- Region Employment has no missing values
- has 34 unique regions numbered from 1 to 34
- Region_2 is most frequent and Region_18 is the least frequent

## Education Level Feature Distribution

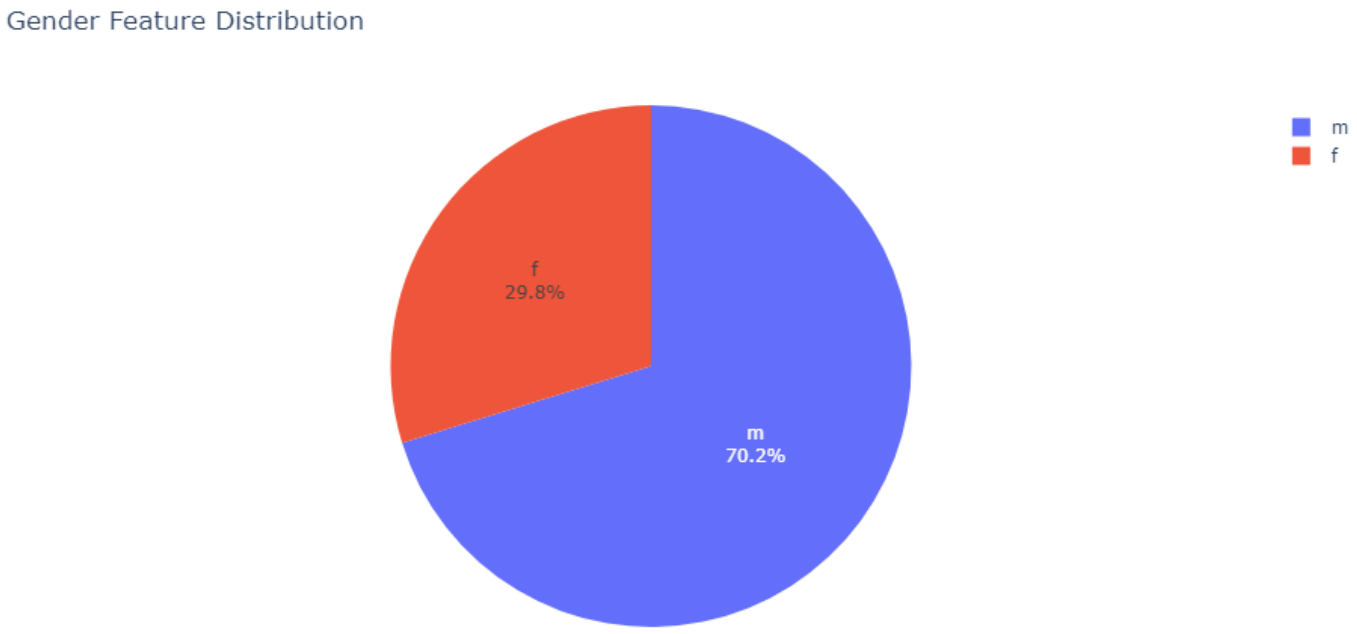
| | Bachelor's | Master's & above | Below Secondary |
|---|---|---|---|
| **Education Level** | 36669 | 14925 | 805 |




- Education Level Feature has (2409) missing value
- Has (3) unique Education level
- (Bachelor's) is the most frequent and (Below Secondary) is the least frequent

## Gender Feature Distribution

| | m | f |
|---|---|---|
| **Gender** | 38496 | 16312 |




- Gender Feature has no missing values
- Gender Feature has (2) unique values (m, f)
- Male is the majority with percentage (70.2 %)

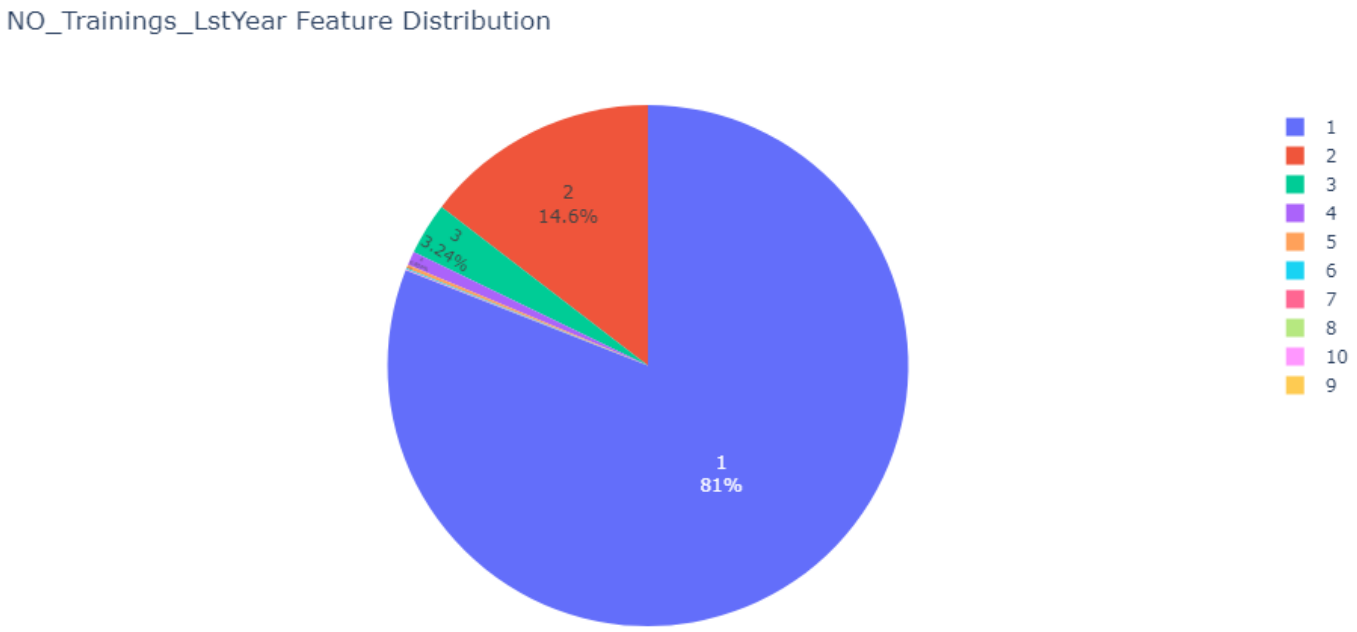
## Recruitment Channel Feature Distribution

| | other | sourcing | referred |
|---|---|---|---|
| **Recruitment Channel** | 24672 | 18802 | 930 |


- Recruitment Channel Feature has 3 different values
- Recruitment Channel Feature has (10404) missing value with percentage (19%)
- other Recruitment is most frequent and referred is least frequent

## NO_Trainings_LstYear Feature Distribution

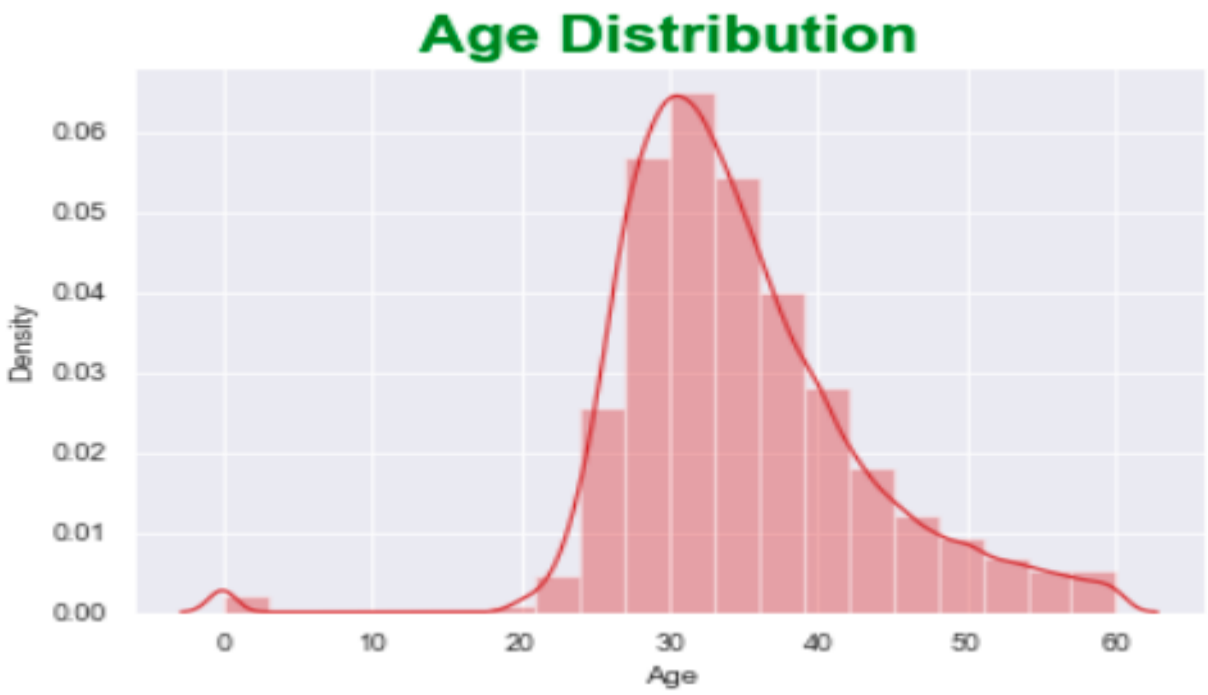
| | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| **NO_Trainings_LstYear** | 54808.0 | 1.253011 | 0.609264 | 1.0 | 1.0 | 1.0 | 1.0 | 10.0 |

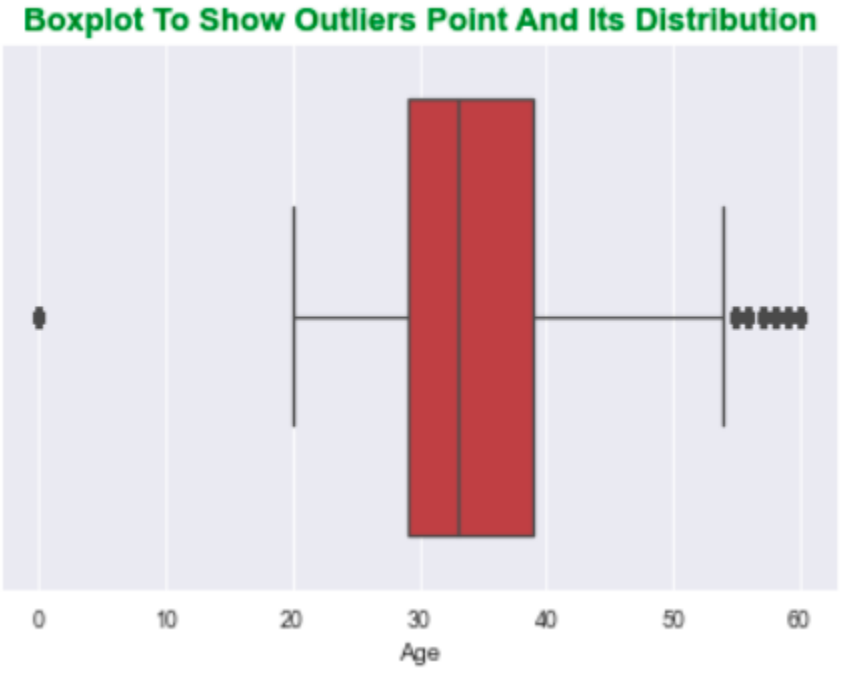



- Number of Trainings has **NO** missing values
- The majority of employees take (1) training last year
- Min value = (1) and Max value = (10)

## Age Feature Distribution

| | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| **Age** | 54268.0 | 34.586644 | 8.114136 | 0.0 | 29.0 | 33.0 | 39.0 | 60.0 |




* Age Feature is nearly normally distributed with **skewness to the left**

* Has outlier points (1748)

* Has (540) missing values

* With (median = 33.0)

and (mean = 34.586644)

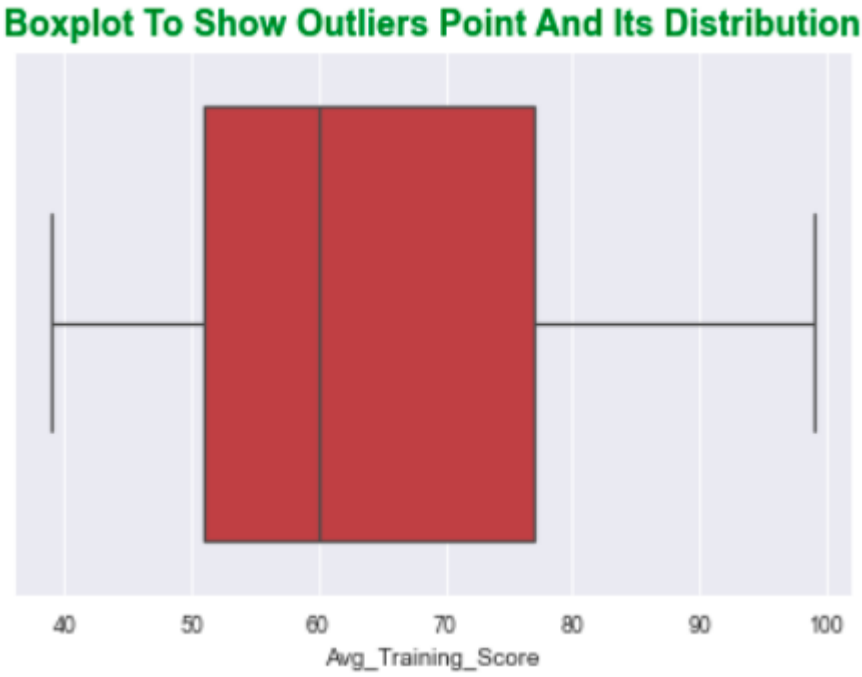
* Min value = (0)

and max value = (60.0)

* Min value = (0) is very strange need to deal with it!

## Avg_Training_Score Feature Distribution

| | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| **Avg_Training_Score** | 52248.0 | 63.712238 | 13.52191 | 39.0 | 51.0 | 60.0 | 77.0 | 99.0 |


* Average Training Score Feature nearly not normally distributed

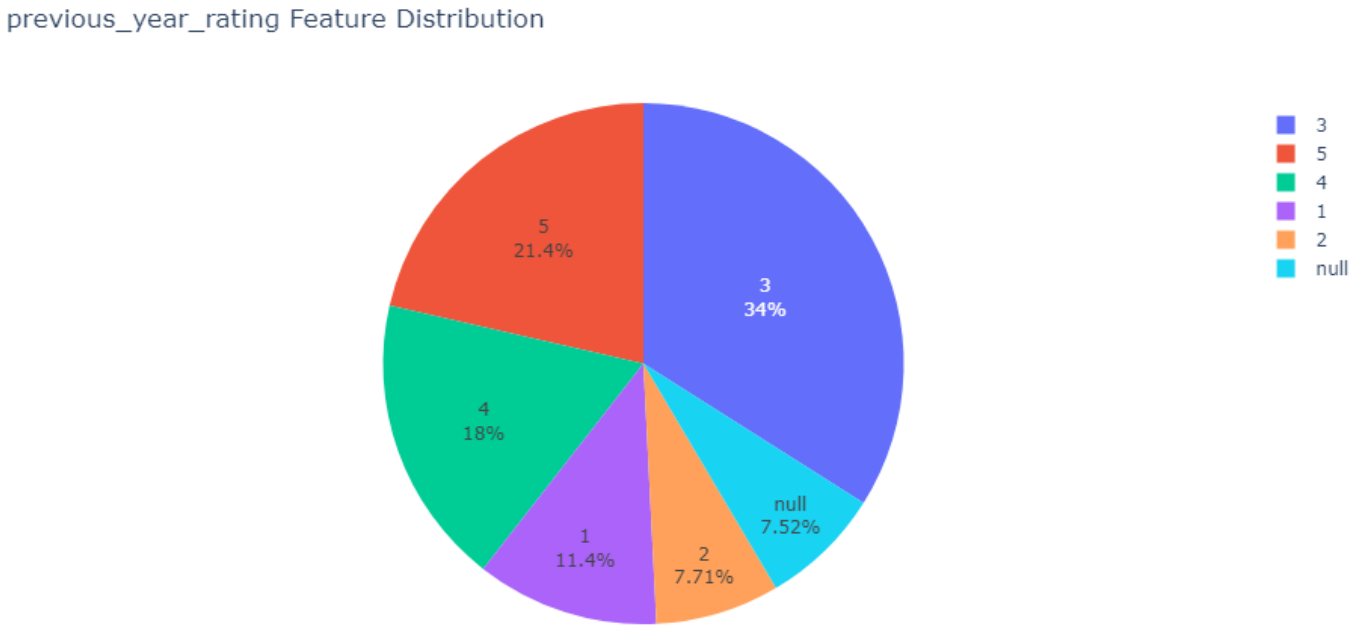
* Has (2560) points missing value

* **Has no outlier points**

* Points from (39) to (99) with mean (63.712238) and median (60.0)

## previous_year_rating Feature Distribution

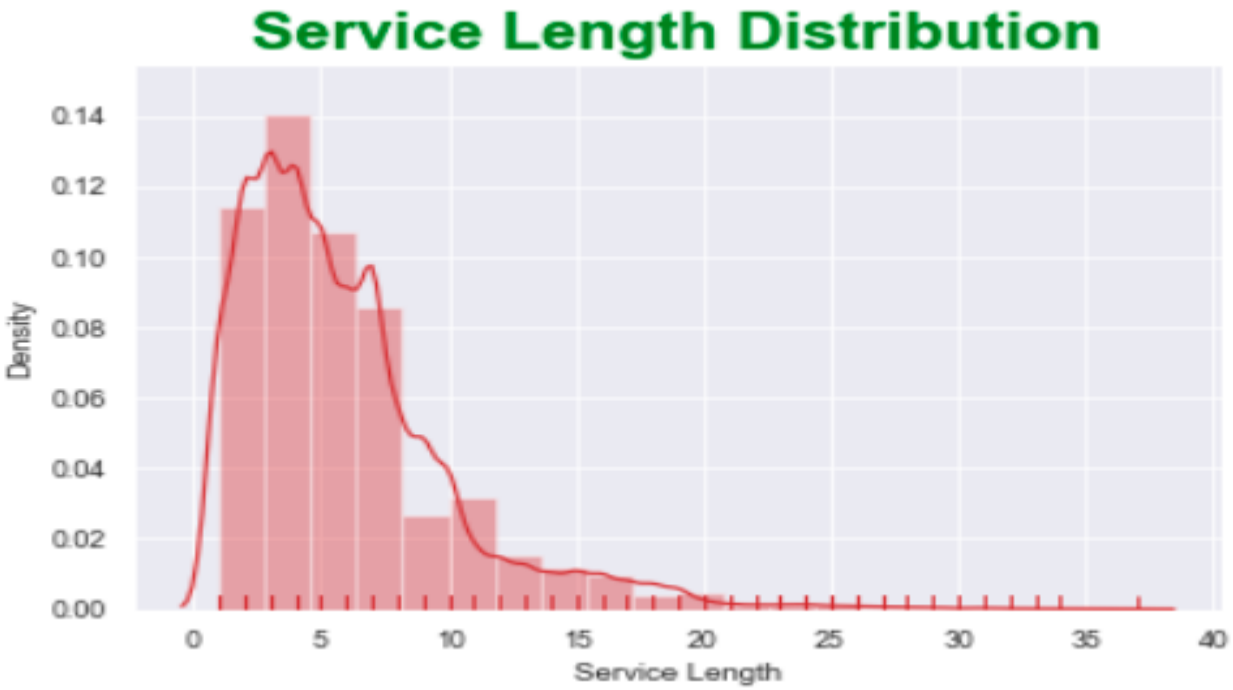
| | 3.0 | 5.0 | 4.0 | 1.0 | 2.0 |
|---|---|---|---|---|---|
| **previous_year_rating** | 18618 | 11741 | 9877 | 6223 | 4225 |



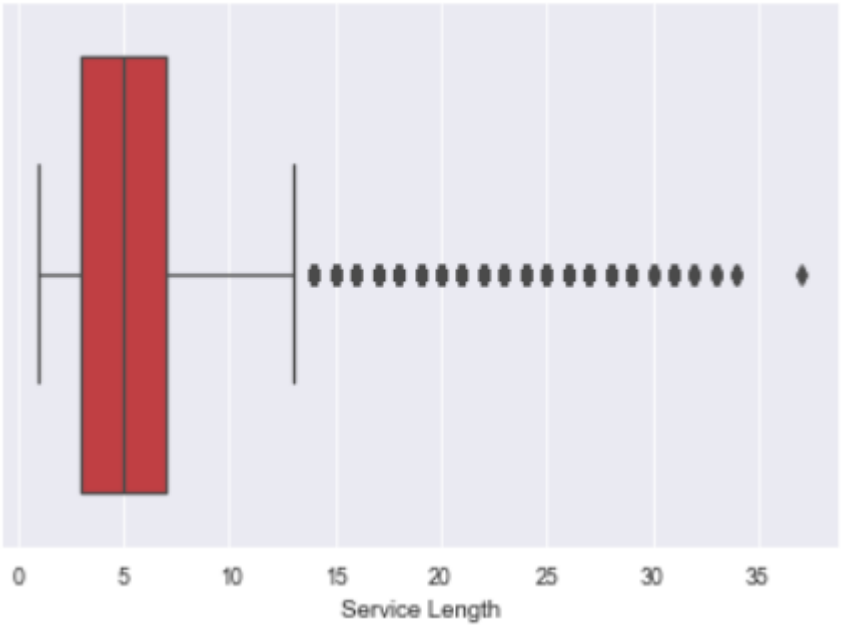

- Previous Year Rating Feature has (5) unique values from (1 - 5)
- Most of Employs has rate (3) with percentage (34%)
- Previous Year Rating has **(4124) missing value with percentage (7%)**

## Service Length in (Years) Feature Distribution

| | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| **Service Length** | 54808.0 | 5.865512 | 4.265094 | 1.0 | 3.0 | 5.0 | 7.0 | 37.0 |




### Boxplot To Show Outliers Point And Its Distribution




* Service Length with **skewness to the right**

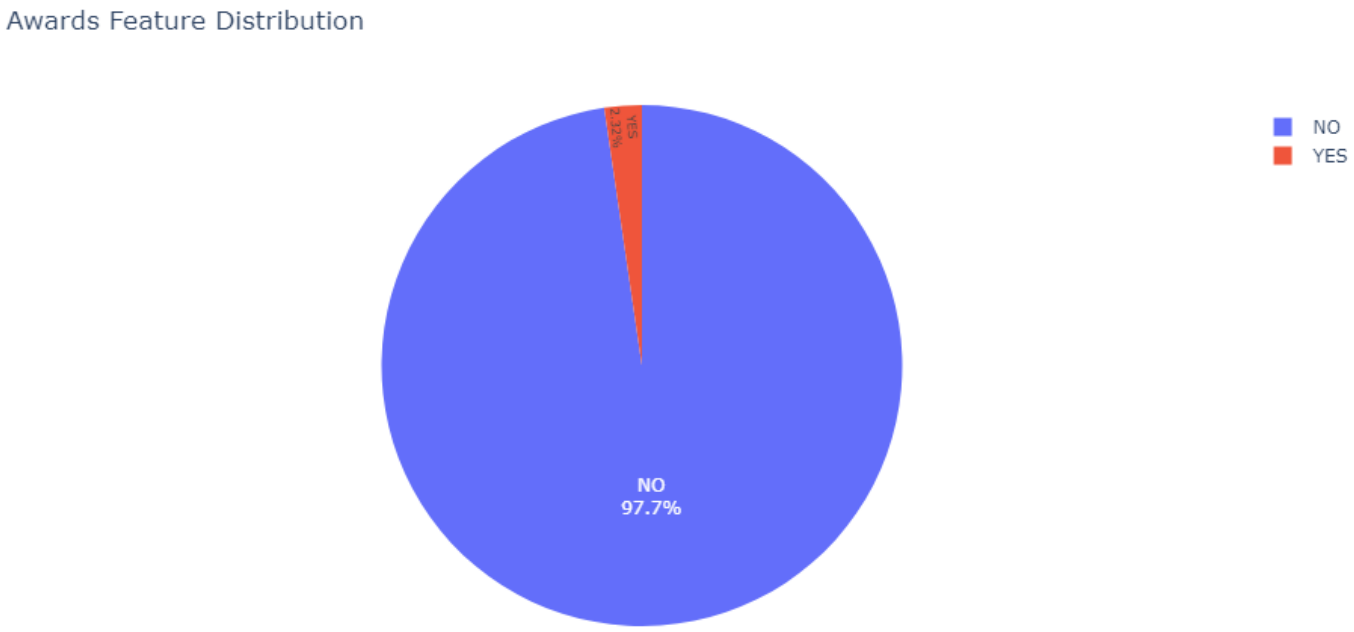
* There were no missing values

* There was **(3489) outlier points**

* Range from (1) to (37) with **mean = (5.865512)** and **median = (5.0)**

## Awards Feature Distribution

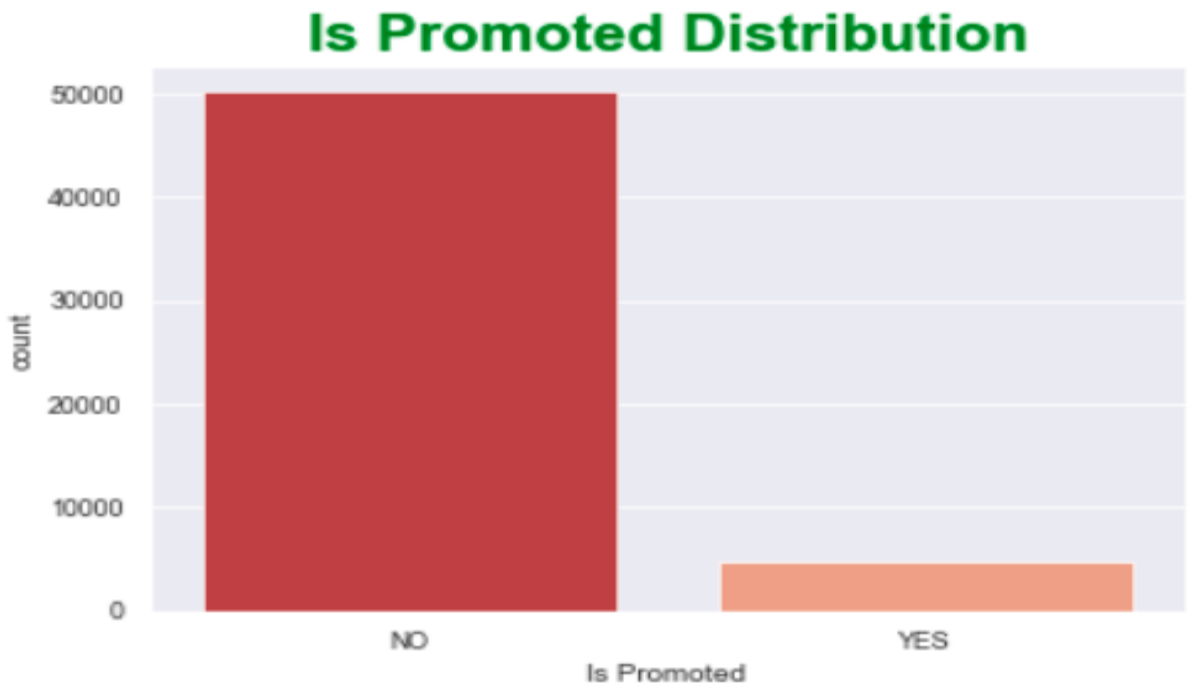
| | NO | YES |
|---|---|---|
| Awards | 53538 | 1270 |




- Awards Feature has (2) unique values [yes, no]
- Most of the employees **not** awarded with **percentage (97%)**
- There was **No Missing** values

**Is Promoted Feature Distribution**

| | NO | YES |
|---|---|---|
| Is Promoted | 50140 | 4668 |




- Is Promoted Feature having (2) unique values [yes, no]
- Most of the Employees **Not** Promoted with **percentage (91.5%)**
- **No missing values**
- **Unbalanced Class (Label)**

Based on this report we will deal with our feature in preprocessing phase