

HR Analytics Employee Attrition

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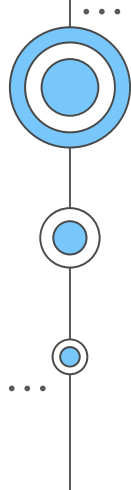
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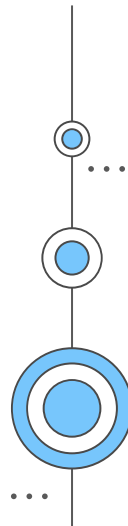
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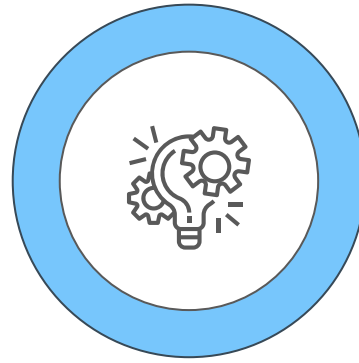




01

Introduction

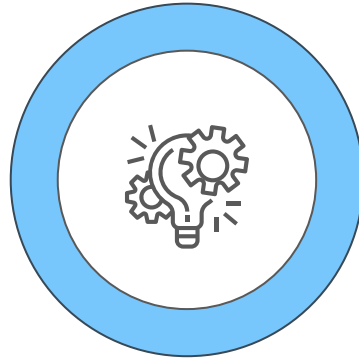




HR Analytics

HR Analytics helps us with interpreting organizational data. It helps to find people-related trends in the data and helps the HR Department taking appropriate steps to keep the organization running smoothly and profitably. Attrition in human resources refers to the gradual loss of employees over time and is one of the complex challenges that the people managers and the HR department have to deal with. In general, relatively high attrition is problematic for companies.

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Attrition

For every company it's important and challenging to keep the employees happy and satisfied. If an employee you have invested much time and money leaves the company, this would mean that you would have to spend even more time and money to hire somebody else.

In this case the goal is to predict if an employee will leave the company or not (employee attrition).



Data Set



I used a fictional dataset created by IBM data scientists (from kaggle) with the following information, separated in 5 groups.

1. Role of employee in the company

- a. Job role, Job level, Department, Years in current role, Years at company, Years with current manager, Years since last promotion, Business Travel

2. Employee related information

- a. Age, Gender, Marital Status, Distance from home, Educational field, Education, number of companies worked for, total working years

3. Satisfaction & Job Involvement

- a. Job Involvement, Performance Rating, Environment Satisfaction, Job Satisfaction, Relationship Satisfaction, Work Life Balance

4. Working Hours

- a. Standard Hours, Over Time

5. Salary & money related information

- a. Hourly Rate, Daily Rate, Monthly Rate, Stock Option Level, Percent Salary Hike, Training Times Last Year



Findings

Job Role



- Most of the employees worked as a Sales Executive (in total = 232)
- Most employees who left the company worked as a Laboratory Technician (in total = 49) followed by Sales Executives (in total = 39)
- In relation 43% of the Sales Representatives left the company, followed by 26% of the Laboratory Technicians



Job Level & Department



- Most employees who left the company had a Job Level of 1, so it seems that beginners are highly motivated to leave
- The risk of attrition is higher (27%) for employees with a job level of 1 .
- Further more we've found out that that employees with a higher job level (4 and 5) are not so willing to leave the company
- The sales (21%) and HR (16%) department have a higher attrition rate than R&D (15%)
- (In total) Most employees who left the company worked at the Research & Development Department

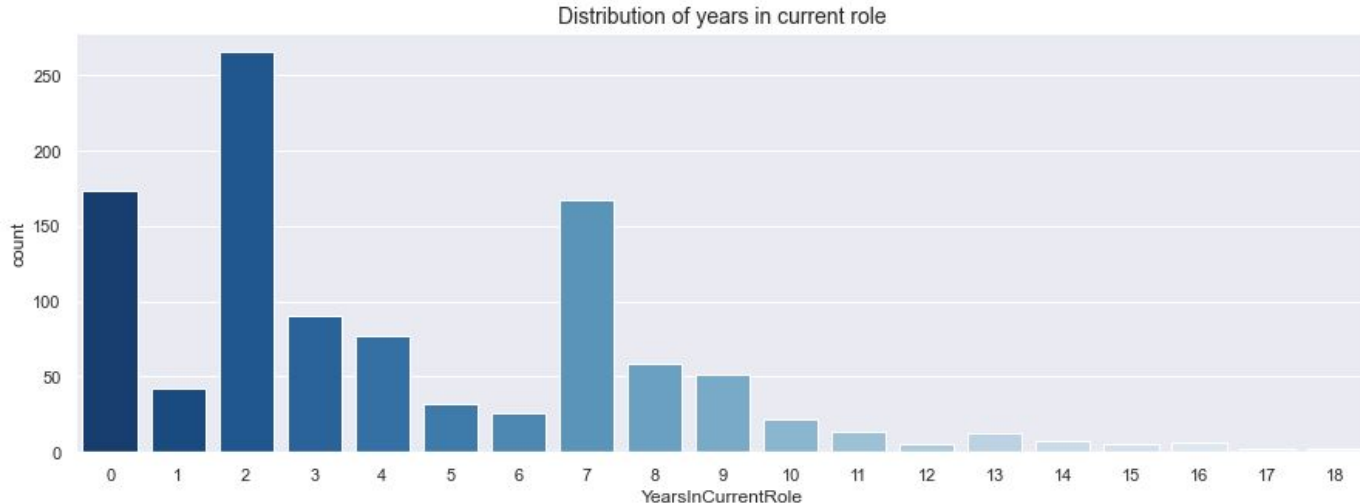
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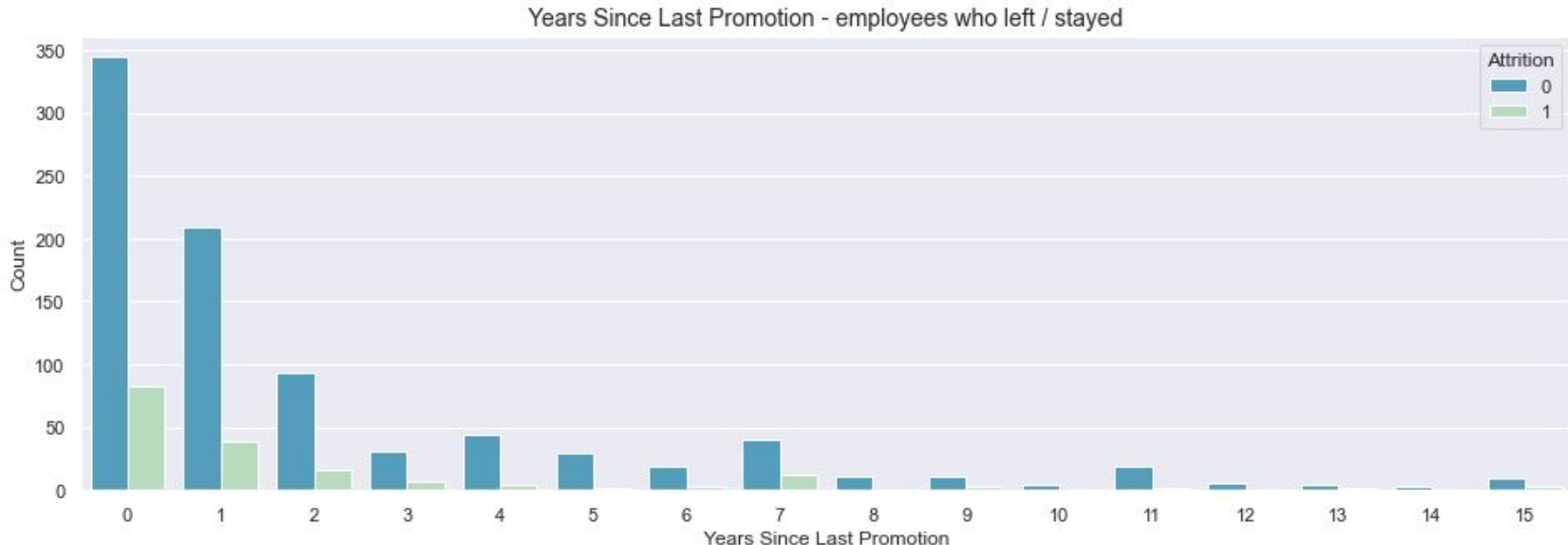
Years in current role & years at company

- In total most of the employees **stayed at the company for around 1-5 years** and employees with a low number (0-5 years) are most willing to **leave with a chance of 21%**
- Most employees are working in their current role for 2 years followed by 7 years
- Employees who are in their **current role for 15 years are very willing to leave** the company followed by **freshers (0 or 2 years)**
- Furthermore it seems that when an employee stays in a current role for a **very long time, they are not so willing** to leave the company.



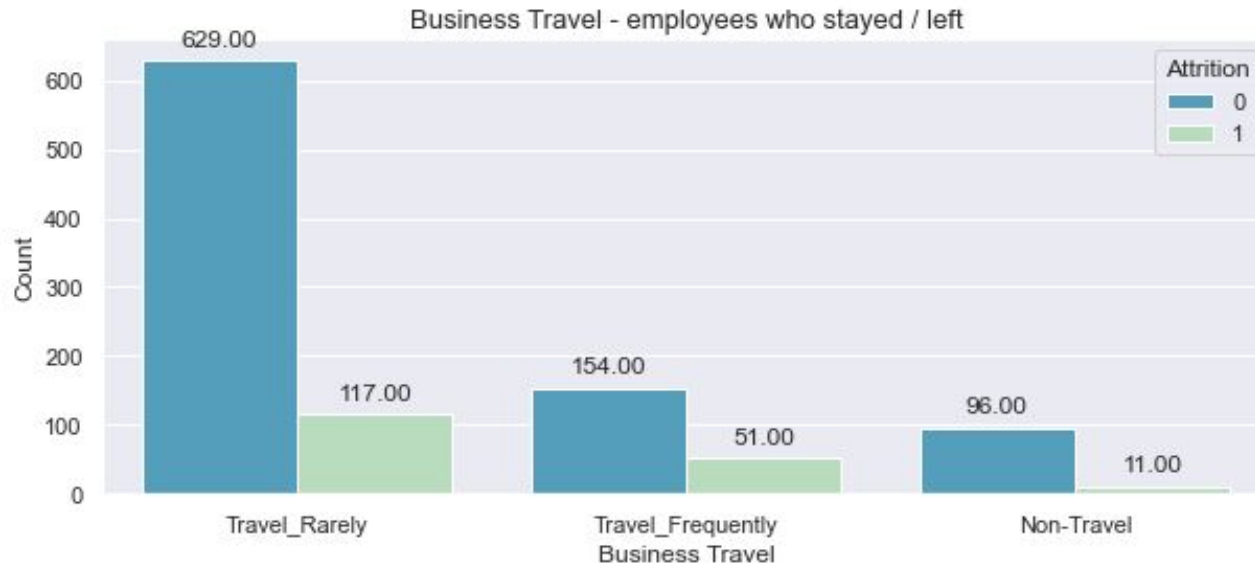
Years since last promotion

- Most employees (in total) who left the company had their **last promotion the last year (1 year)** ; unsure if the employee got a promotion and left the company a short time after or if the employee left the company in the first year, before they got a promotion.
- At a second point we can see that there is an higher value after 7 years.
- But employees who got their **last promotion 13 years** ago are most willing to leave (28%) followed by **7 years (25%)** and **15 years (23%)**.



Business Travel

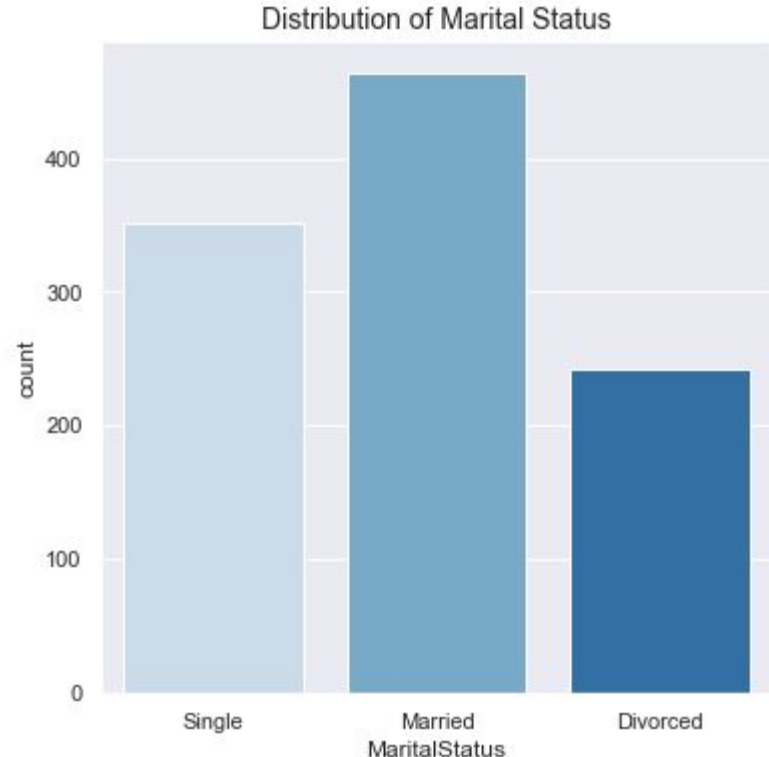
- Most of the employees (in total) who left, travelled from time to time (rarely)
- But I've found out that employees **who travelled more frequently** have a much higher attrition rate than others (25%).



Gender, Age and Marital Status



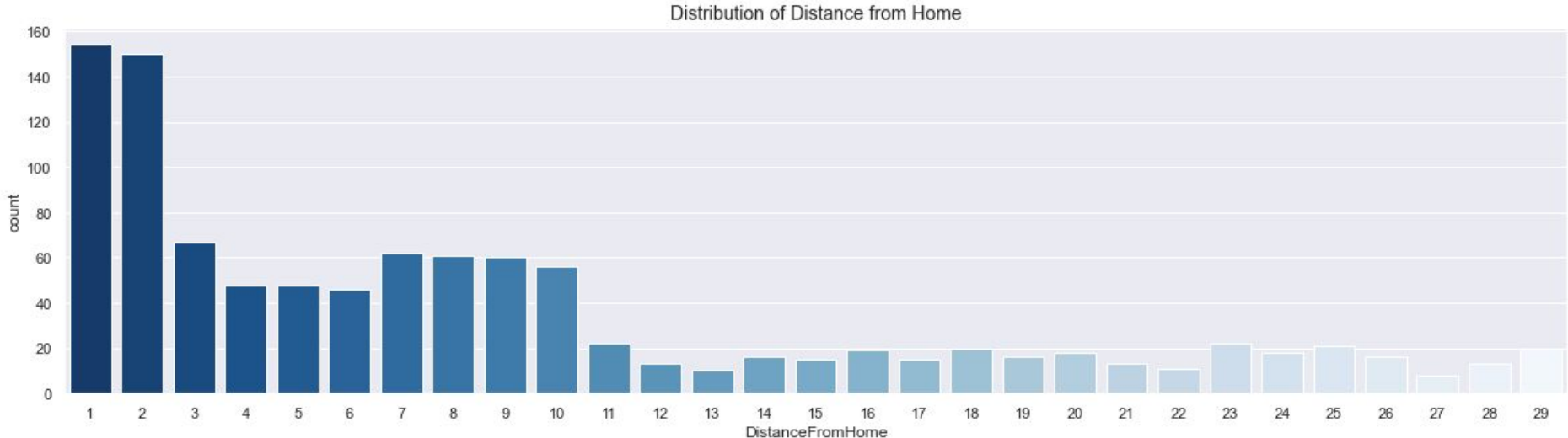
- In this set we had 41.4% female employees and 58.6% male employees
- **Males (17%) had a slightly higher attrition rate than woman (16%).**
- Most employees (in total) who left, were at the **mid agers (31 followed by 29)**
- The **average age** of females is **37.39** and for males is **36.81** and both distributions are similar.
- Most of the employees are married.
- People with Marital Status as **Single** have **much higher chance of attrition (27%)**, Married (13%) and Divorced (10%).



Distance from Home



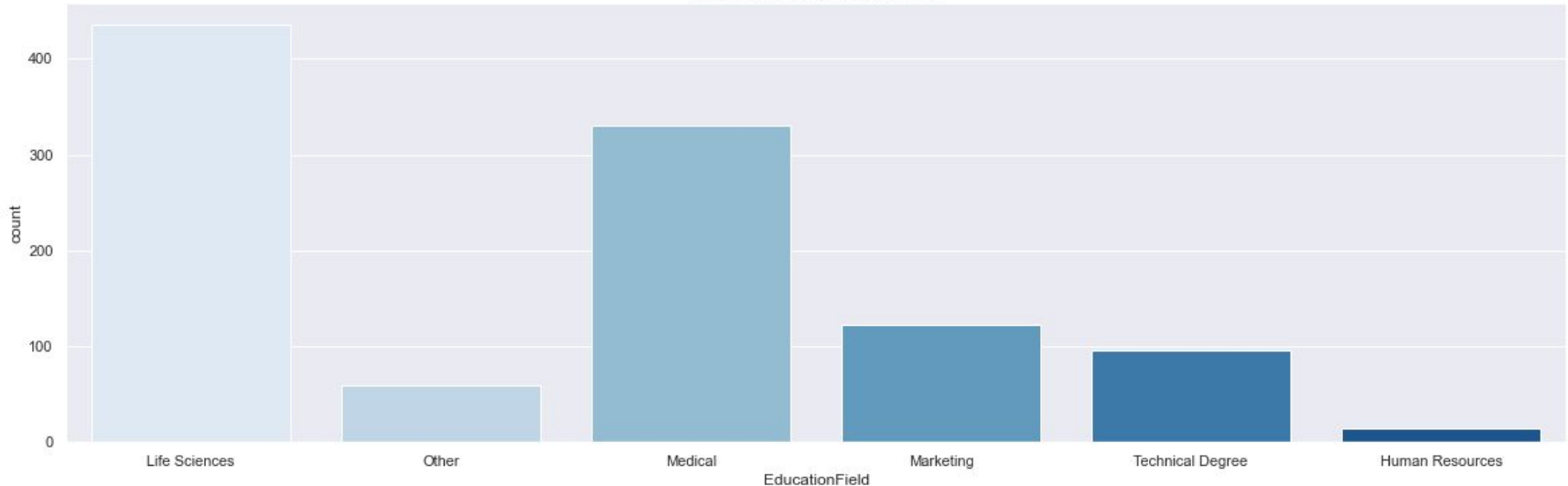
- It's seems that most of the employees do live close to the company
- 50% of the employees do have a distance of 7 (unfortunately we don't know if it's kilometers or miles)
- Furthermore I've found out that employees who have a **long way to work are more willing to leave a company** (e.g. Distance From Home 12 = 38%).



Educational field

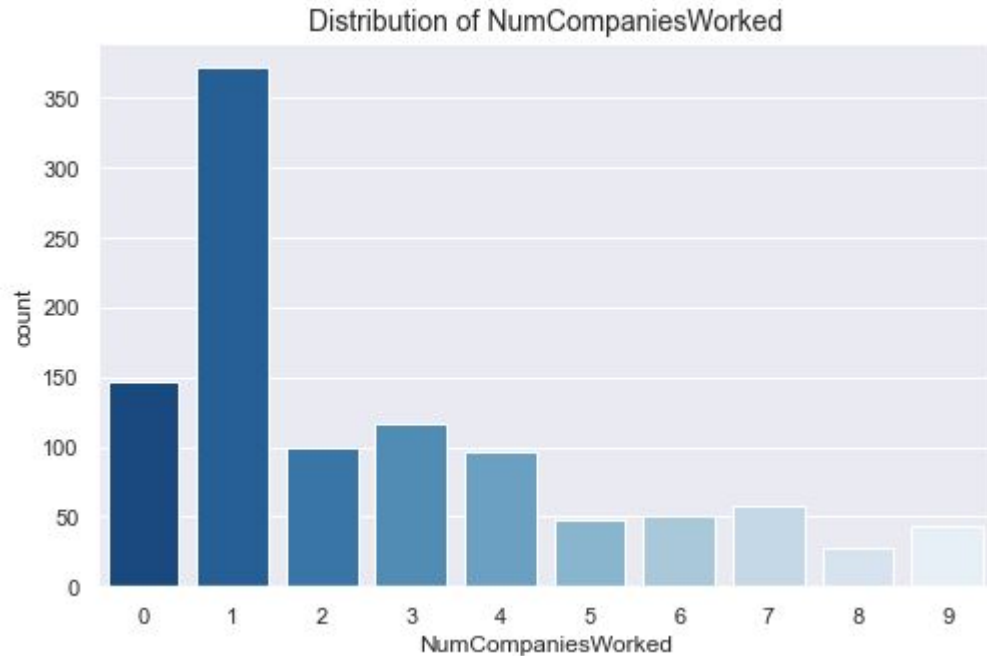
- Most of the employees (in total) have an educational background in life science or a medical background
- I've found out that employees with a **technical degree** are **very willing to leave (26%)** followed by Marketing (21%)
- Employees with the field HR are very willing to stay at the company

Distribution of Education Field



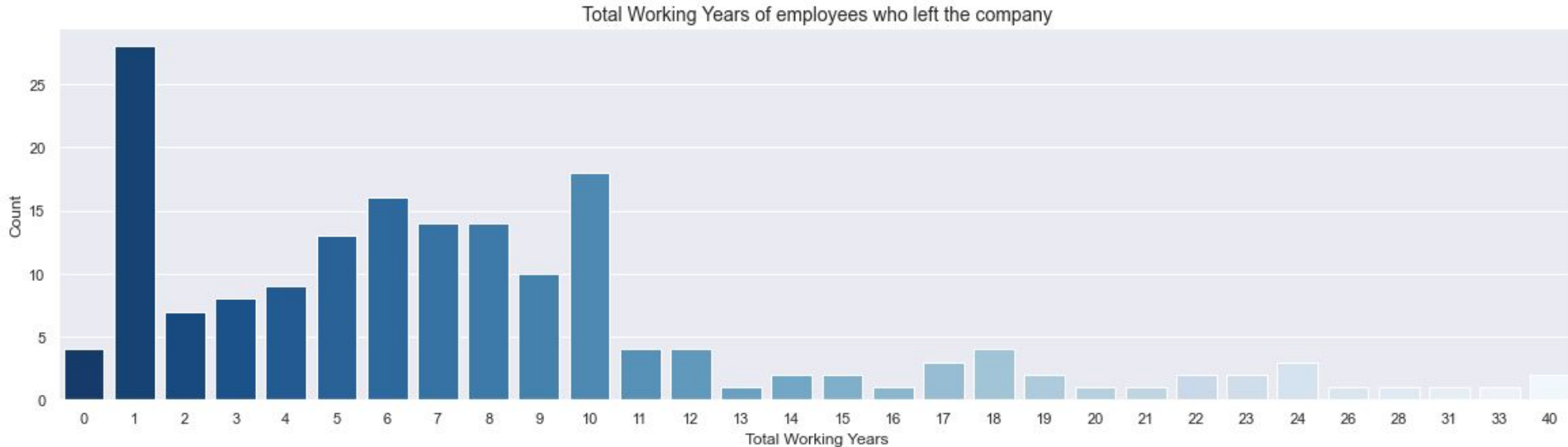
Number of companies worked for

- Most of the employees **worked just for 1 one company**
- The more companies an employee worked for, the more he/she is willing to leave.
- The **highest risk is for employees with 5 companies (27%)**



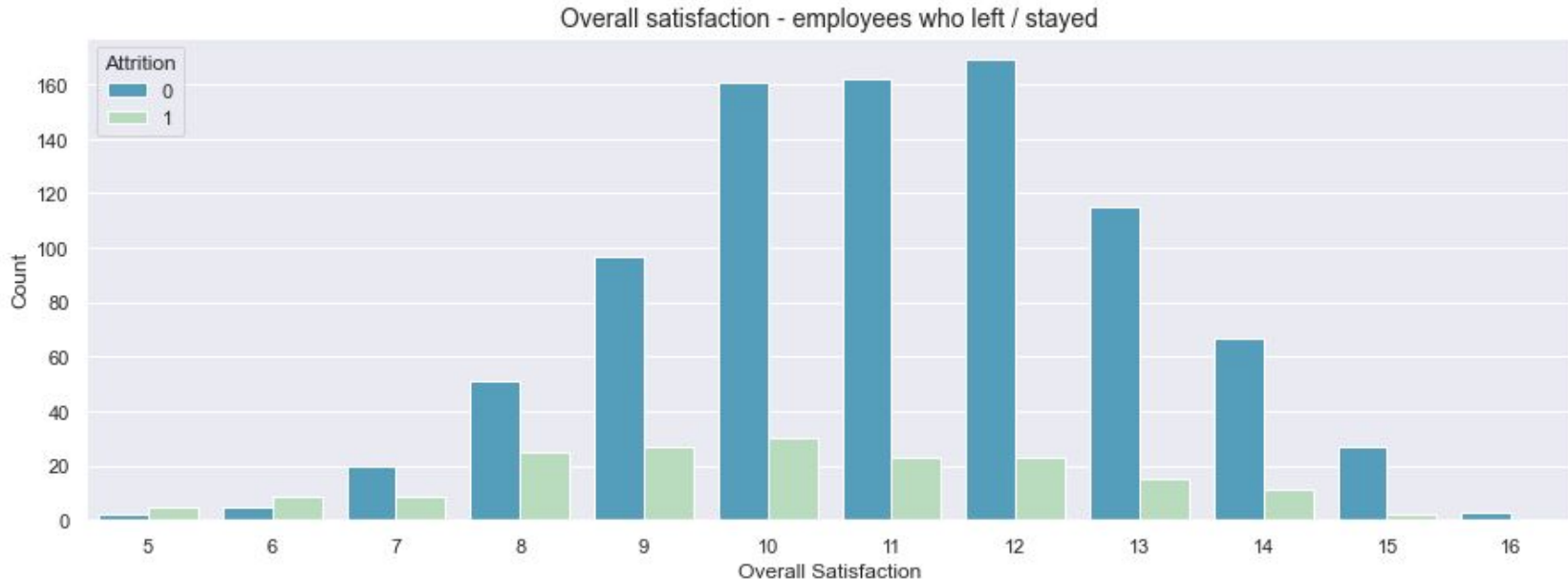
Total working years

- In total most of the employees who are **leaving only have 1 year of work experience followed by** them who worked since **10 years**.
- The highest risk is for employees with 40 years of experience (100%) but this might be in case of retirement. Followed by employees with **1 year (49%)** and **employees within their first year (44%)**.
- Also I've found out that employees with a **higher number** of years (eg. 25, 32, 36,) are **not willing** to leave (0%).
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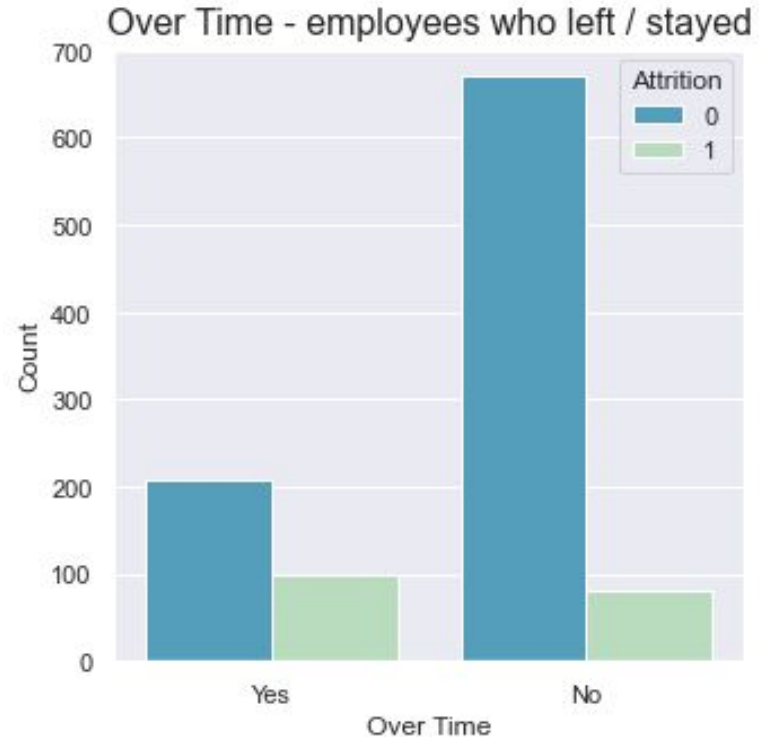
Overall satisfaction

- Most of the employees are satisfied (level of 10 - 12)
- I made a new feature called “overall satisfaction” out of the features Environment Satisfaction, Job Involvement, Job Satisfaction and Relationship Satisfaction
- Not very surprisingly, employees with a **low satisfaction of 5 or 6 are highly motivated to leave** the company (71% and 64%).



Standard Hours & Over Time

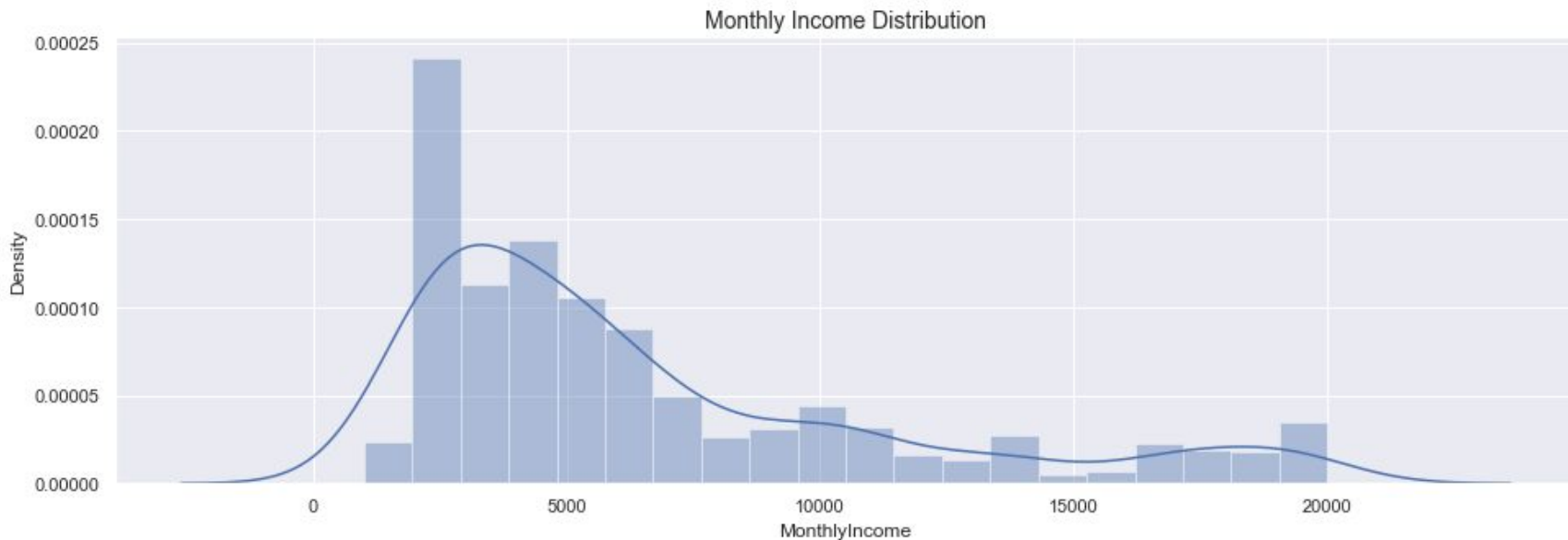
- In the data set we **only had employees who worked full time**
- Most of the employees (in total) **don't have any over times**
- But we can see that **employees with over time are more willing to leave** (31%) than employees without (11%)



Monthly Income



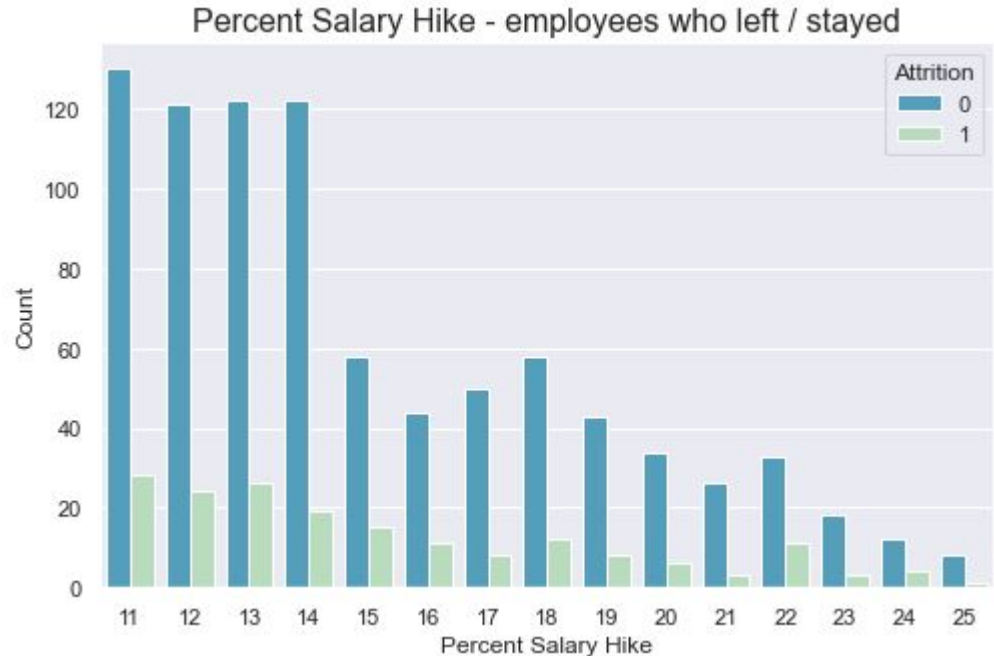
- In total most employees do have a monthly income bin around 2000 - 4000
- Employees having a **small monthly income bin (0 - 2000)** do have a **higher risk of leaving** the company (50%).
- Employees with a bin from 14000 up don't have any risk of leaving (0%)



Percent Salary Hike



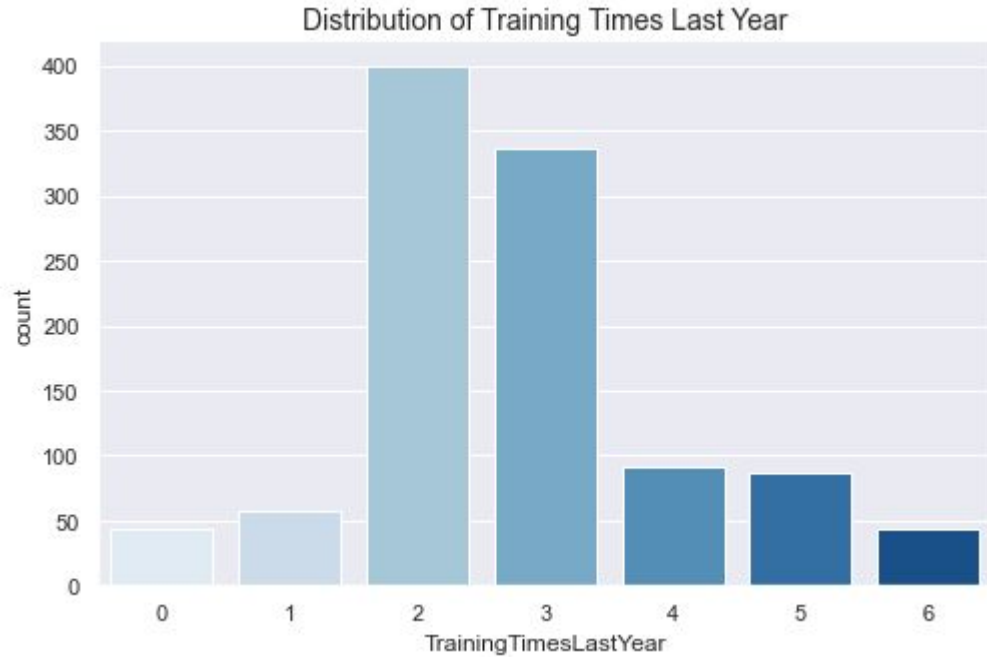
- Most employees got a salary hike of 11%
- I've found out that employees with a **higher value of salary hike are more willing to leave**
- For example **22% or 24% salary hike** lead to a risk of **attrition of 25%**



Training times last year



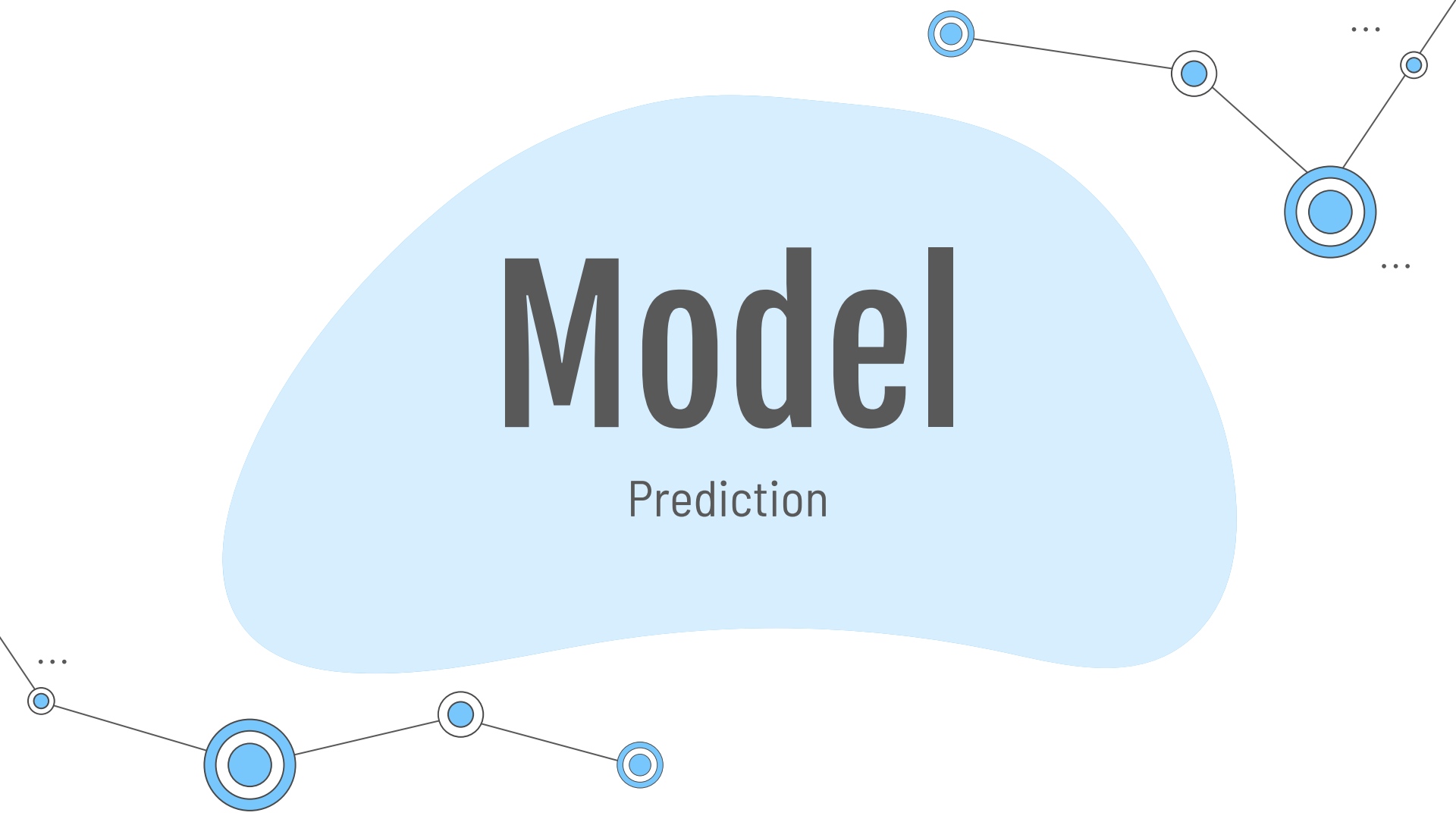
- As we can see most of the employees did have a training two or three times a year.
- When taking a closer look at the number of employees who left, I saw that employees with **zero trainings are most willing to leave (30%)** followed by employees with 4 trainings (21%).





Model

Prediction



Model Prediction



It is possible to go on with numerous other studies that could have been carried out on this data. But having gained some insight on the characteristics of this dataset and having performed a quiet well exploratory data analysis and simple feature engineering we are now ready to proceed onto building our models.

I performed the following classification models:

- Random Forest
- Logistic Regression
- K-Nearest Neighbours
- Decision Tree
- AdaBoost
- XGBoost

Model Prediction

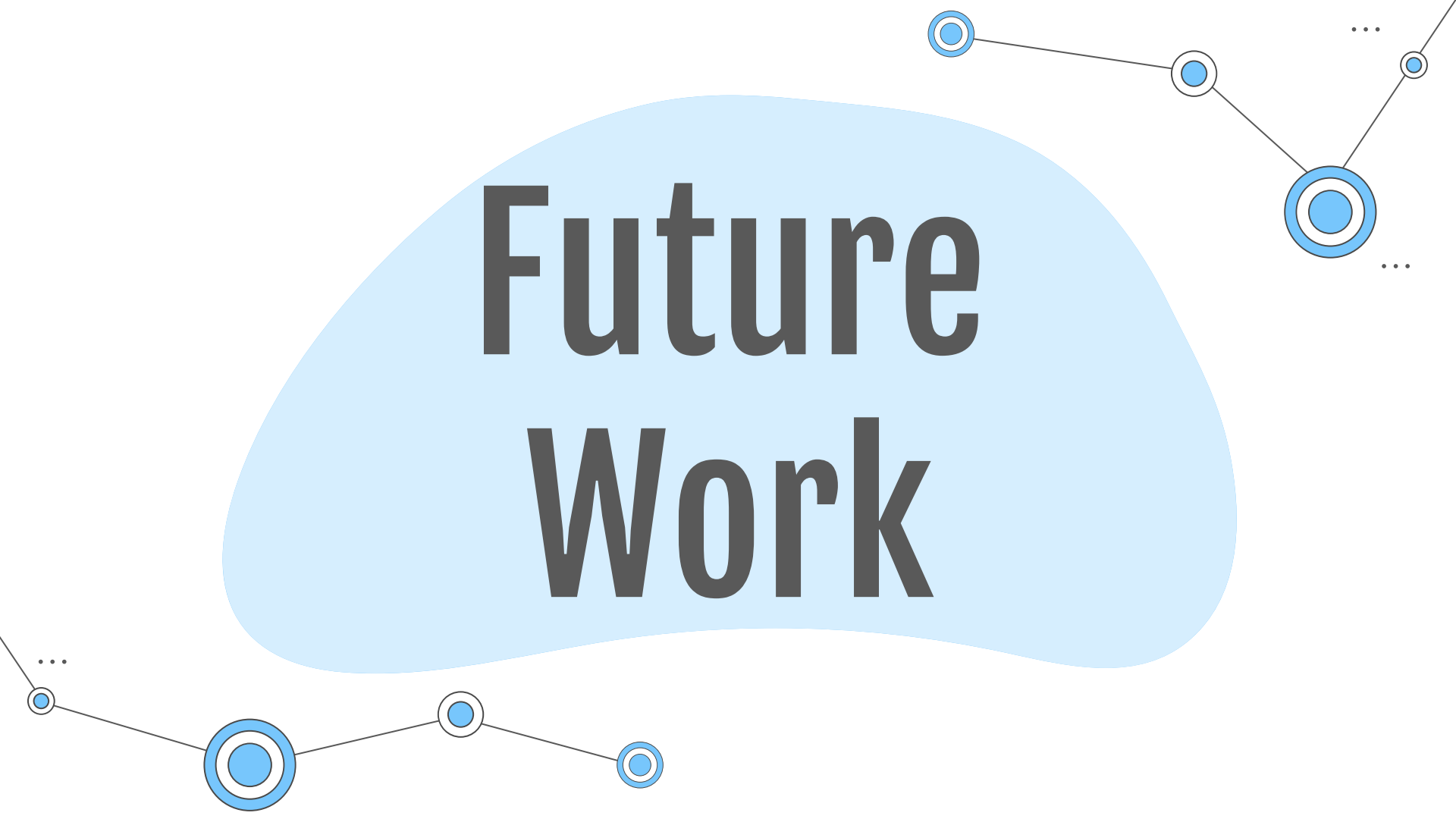


The final features (after performing feature selection) were:

- Years at Company
- Job involvement
- Years in current role
- Overall satisfaction
- Monthly Income
- Age
- MaritalStatus Single
- Stock Option Level
- OverTime_Yes

Depending on the model: With an **accuracy between 74% and 93 %** and a **precision between 72% and 88%** the model can predict if an employee will leave the company.

Future Work



Future Work



When I'll have time I would like to go on with the following things:

- Checking outliers and make boxplots
- Trying further models like SVM or neural networks
- Check further topics like modeling the business costs

Other interesting topics:

- What are the benefits of using talent acquisition analytics? Prediction of candidate / hiring success
- Office Space Question / How Can We Design a Better Office Typology?

Thanks!

Do you have any questions?

Contact me at linkedin

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