Developing a long-term strategy to reduce turnover of high-performance employees

September 2020

Executive summary

The company has an overall 24% turnover rate which comprises majority of employees with a satisfaction level of less than 0.5

- However, a distinct group of highly satisfied employees (satisfaction level > 0.7) still chooses to leave

Employees are 4x less likely to turnover if they have received a promotion in the last 5 years and if they have a high salary

- The company only has a 0.5% yearly promotion rate, very small compared to the U.K.'s national average of 20%

There is a significant group of high-performing employees who chooses to leave, likely due to lack of career progression and compensation

- Most of the employees who choose to leave do not have a work-life balance, they are either working more than 250, or less than 150 hours a month

The ideal employees, having high performance and satisfaction scores, are one of the main groups of turnover, alongside with high-performing but dissatisfied employees

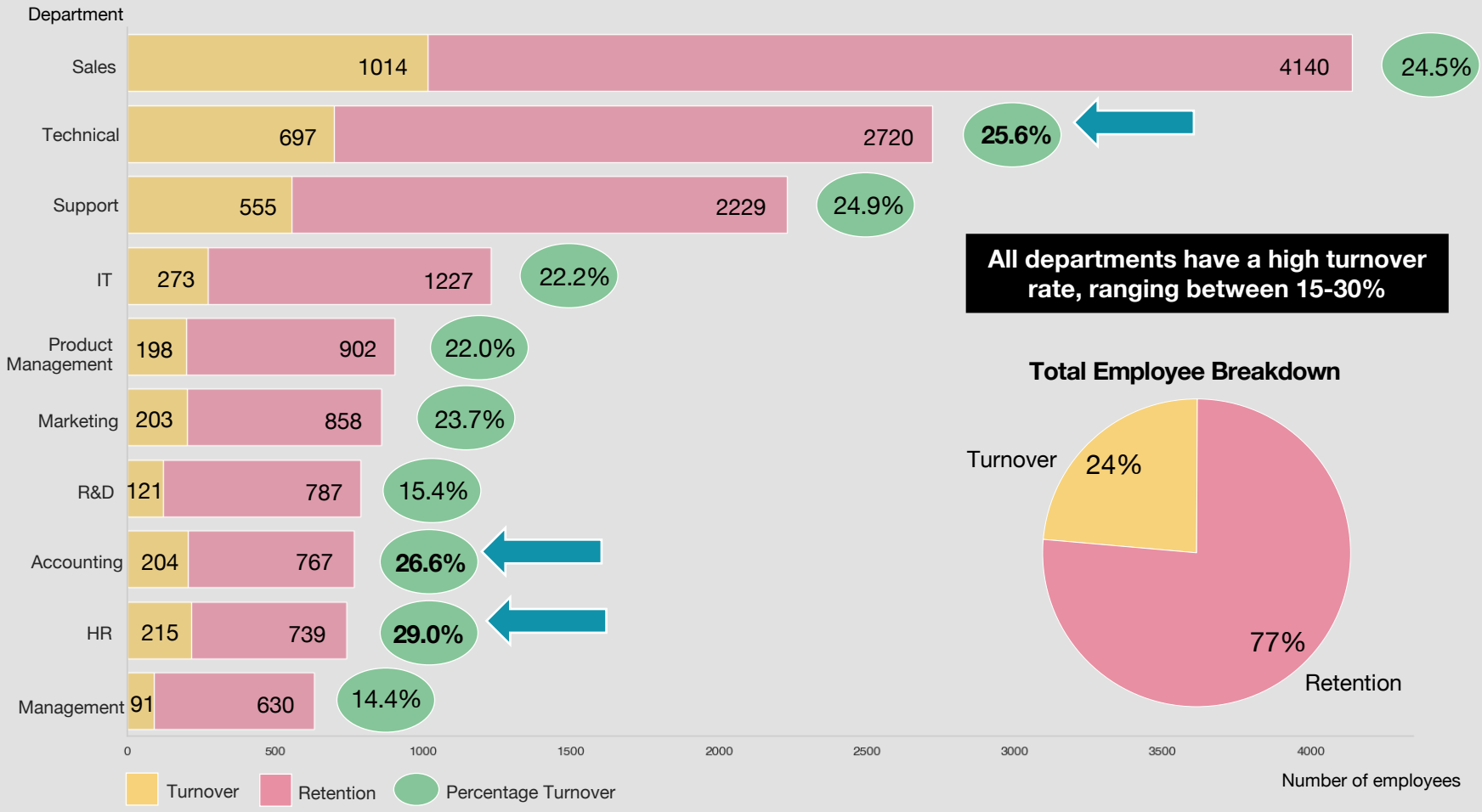
- A work-life balance and proper reward for the employees' efforts could go a long way in incentivising them to stay at the company

A predictive model with 99% accuracy has been developed and used to segment the current employee population into turnover risk brackets

- The model's feature importance information allows to prioritise which factors are most influential for employee turnover and can be used to inform action steps to prevent turnover according to the individual risk brackets

The company is dealing with a high employee turnover rate across all departments, signalling the need for some company-wide improvements

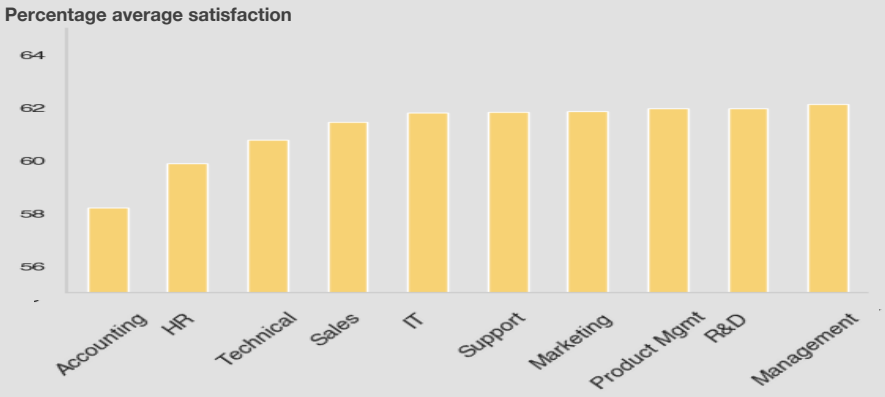
Turnover breakdown by department shows a turnover rate > 25% for Technical, Accounting and HR departments, Management being the lowest with < 15%

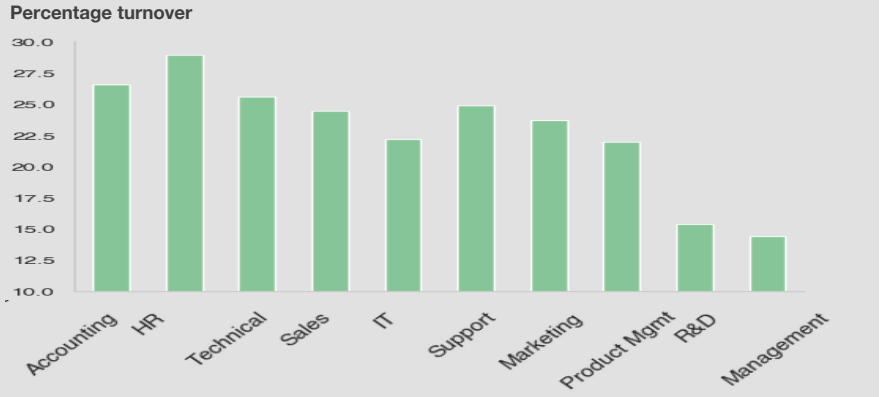


Source: Client dataset

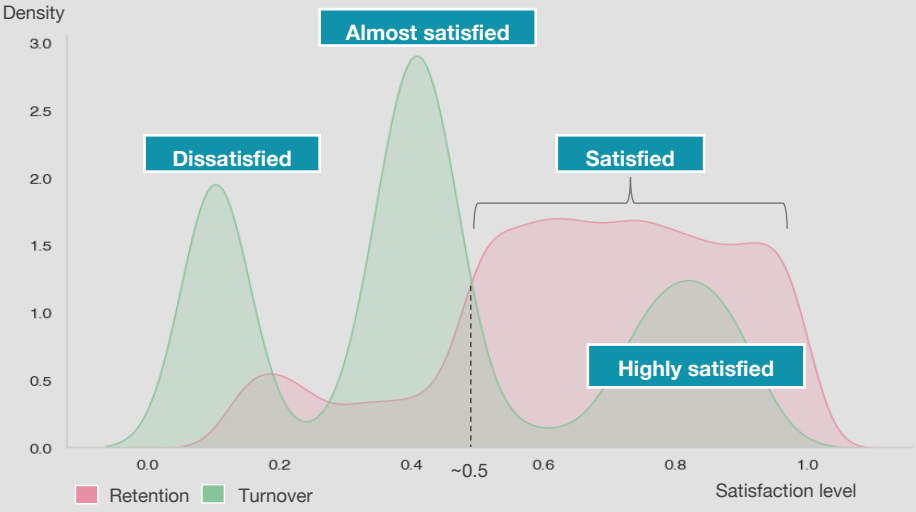
Satisfaction levels greater than 0.5 greatly reduce chances of turnover, however a group of highly satisfied employees still chooses to leave

Satisfaction level shows upward trend when turnover rate decreases, suggesting inverse correlation





Turnover satisfaction level follows a tri-modal distribution, highlighting three main groups



Key Insights

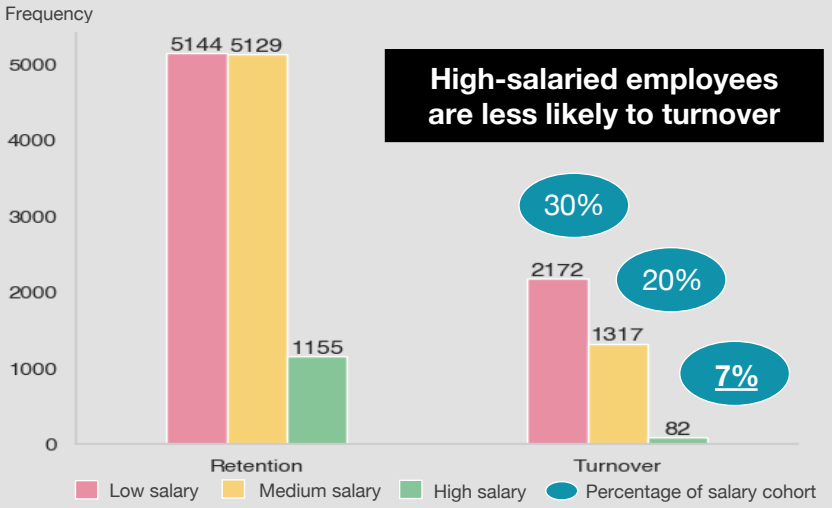
- Retention is much more likely provided employees reach a satisfaction level > 0.5
- However, there is a spike in turnover rate as satisfaction level approaches 0.8

- Turnover employees can be categorised into three main satisfaction groups:
  - **Dissatisfied**, satisfaction < 0.2
    Sub-optimal working conditions?
  - **Almost satisfied**, satisfaction < 0.5
    Sub-optimal reward schemes?
  - **Highly satisfied**, satisfaction > 0.7
    Can find better opportunities?

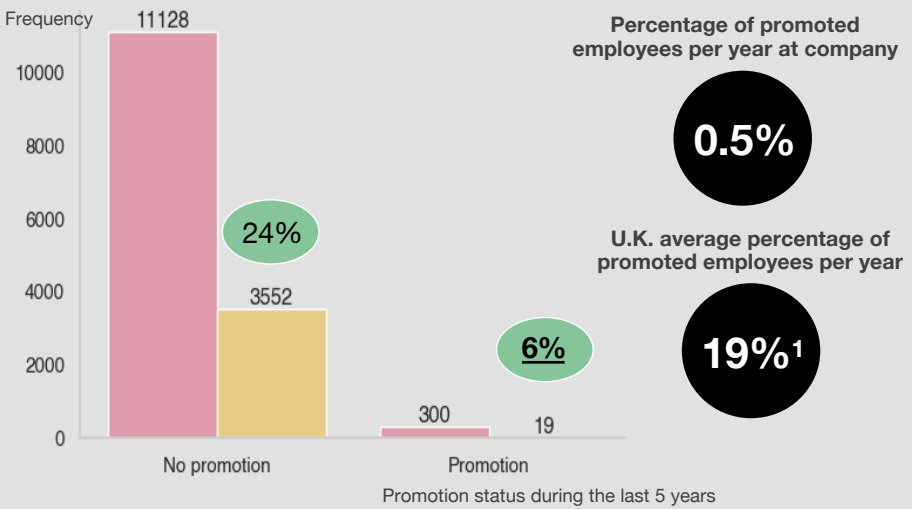
Source: Client dataset

There is a strong link between high salary, promotions and employee retainment, such bonuses might incentivise mid-career employees to stay

93% of high-salaried employees remain at the company compared to 70% of low-salaried employees



Only 2% of employees have received a promotion in the last 5 years, and those who did are 4x more likely to stay



Key Insights

- Employees who receive a high salary, a recent promotion or are 7+-year senior employees are less likely to turnover
- Every year only 0.5% of employees are promoted compared to national average of almost 20%
- Restructuring the **salary and promotions schemes to match national average** would likely be effective in **reducing turnover**

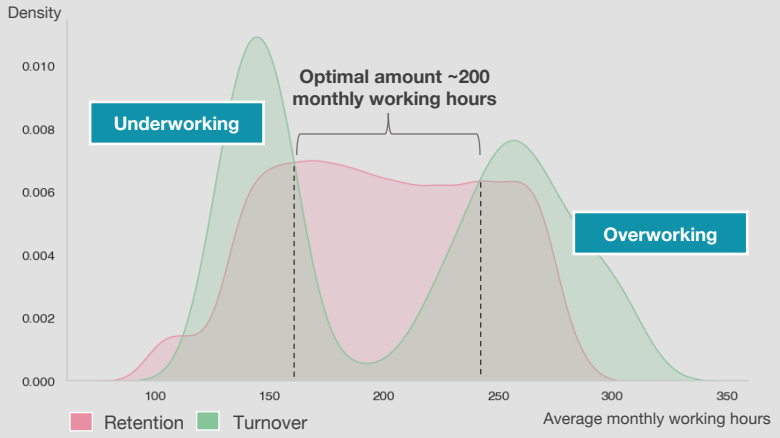
7+ year-long senior employees are staying at the company, perhaps due to a higher salary and recent promotions

[1]: According to ONS – LFS (2016-17)

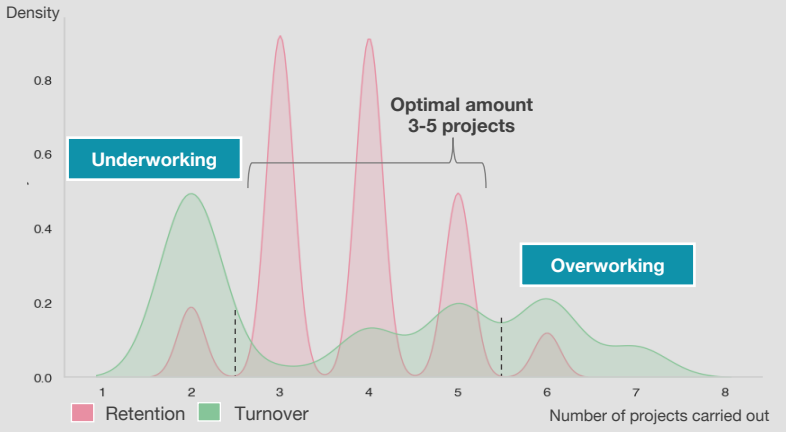
Source: Client dataset, Literature search

Employees' performance score and average working hours are highly correlated, but a work-life balance is important to avoid turnover

Turnover's monthly working hours follows a bi-modal distribution, highlighting underworking and overworking

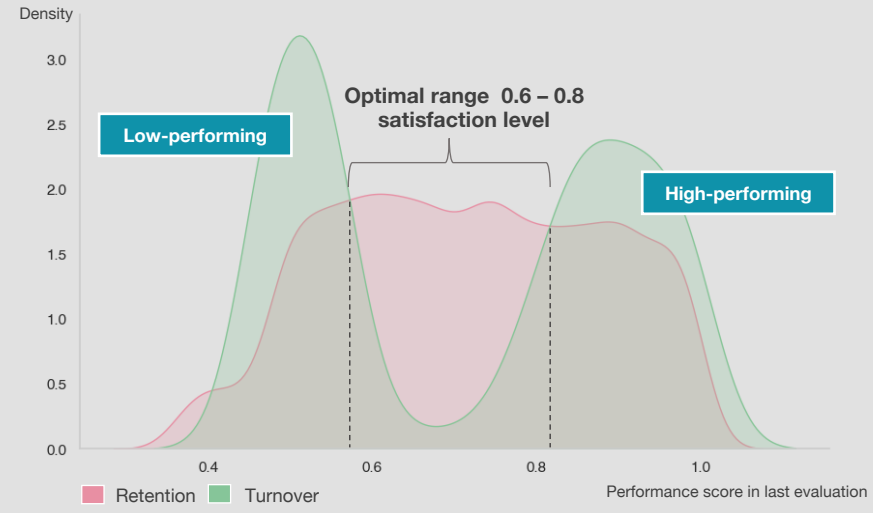


The number of projects carried out is highly correlated with the average monthly working hours



High turnover rate of high performing employees could be related to overworking

Turnover's performance score also follows a bi-modal distribution, highlighting low-performing and high-performing



Key Insights

- **Low-performing** (performance score < 0.6) and **high-performing** (performance score > 0.8) employees tend to leave the company
- **Underworked** (monthly hours < 150 & projects < 3) and **overworked** (monthly hours > 250 & projects > 5) employees tend to leave the company

Source: Client dataset

Turnover segmentation allows the company to gain insight on the common characteristics of employees who turnover

Turnover is segmented into three distinct groups by k-means clustering[2]

[2]: A method that aims to partition *n* observations into *k* clusters in which each observation belongs to the cluster with the nearest mean

1 High-performing and Dissatisfied Employee

Performance > 0.75 | Satisfaction < 0.2

- High performance is ideal but satisfaction for this group should be increased
- Very high performance is linked with overworking which is a cause for turnov
- **Action step: encourage a work-life balance**

2 Low-performing and Almost-satisfied Employee

Performance < 0.6 | Satisfaction ~ 0.4

- The low-performing employee group is not favourable for the company to retain
- **Action step: make sure the employees have a clear picture of what they will be working on before joining the company**

3 High-performing and Highly Satisfied Employee

Performance > 0.8 | Satisfaction > 0.7

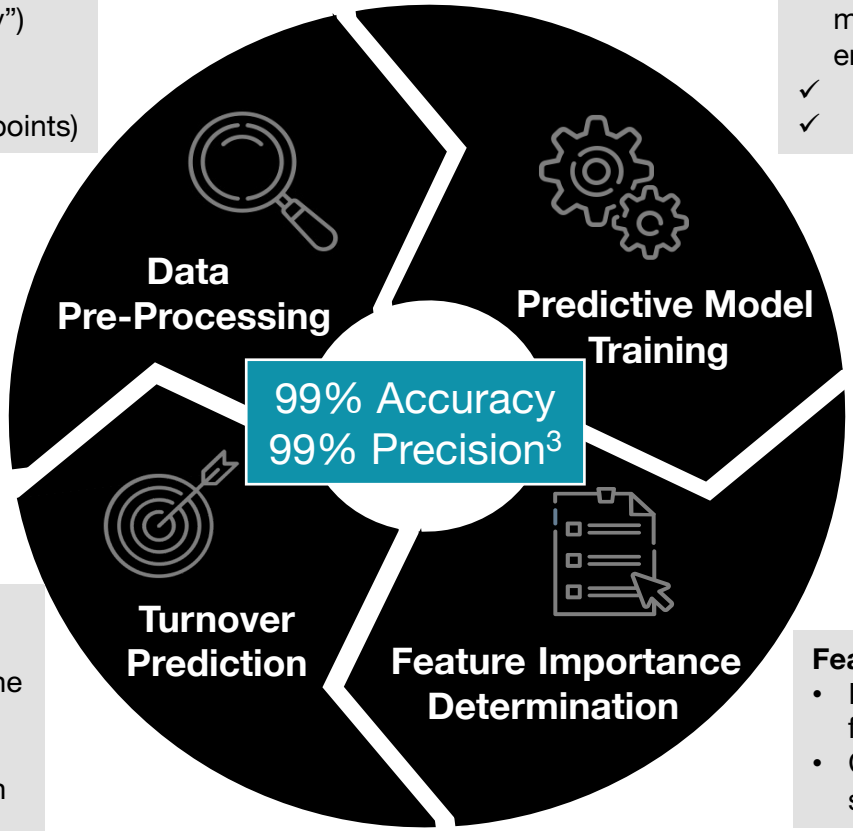
- High performance and high satisfaction are ideal
- However, these employees likely turnover to seek better compensation as the promotion rate for the company is very low compared to national average
- **Action step: promotion rate to match average**

Source: Client dataset, Literature search

A Machine Learning model that can predict how likely an employee is to leave has been created with 99% accuracy and precision

Data Pre-Processing
- ✓ Create dummy variables for categorical values (e.g. "salary")
- ✓ Address class imbalance by upsampling most sparse data (turnover data has fewer datapoints)

Predictive Model Training
- Use Machine Learning to create a model that can predict how likely an employee is to turnover
- ✓ Fit a random forest classifier model[4]
- ✓ Apply 5-fold cross-validation[5]



Turnover Prediction
- The final product is a Machine Learning model able to predict the likelihood of employee turnover
- Should be used in conjunction with a **preventative system** with unique measures for each employee

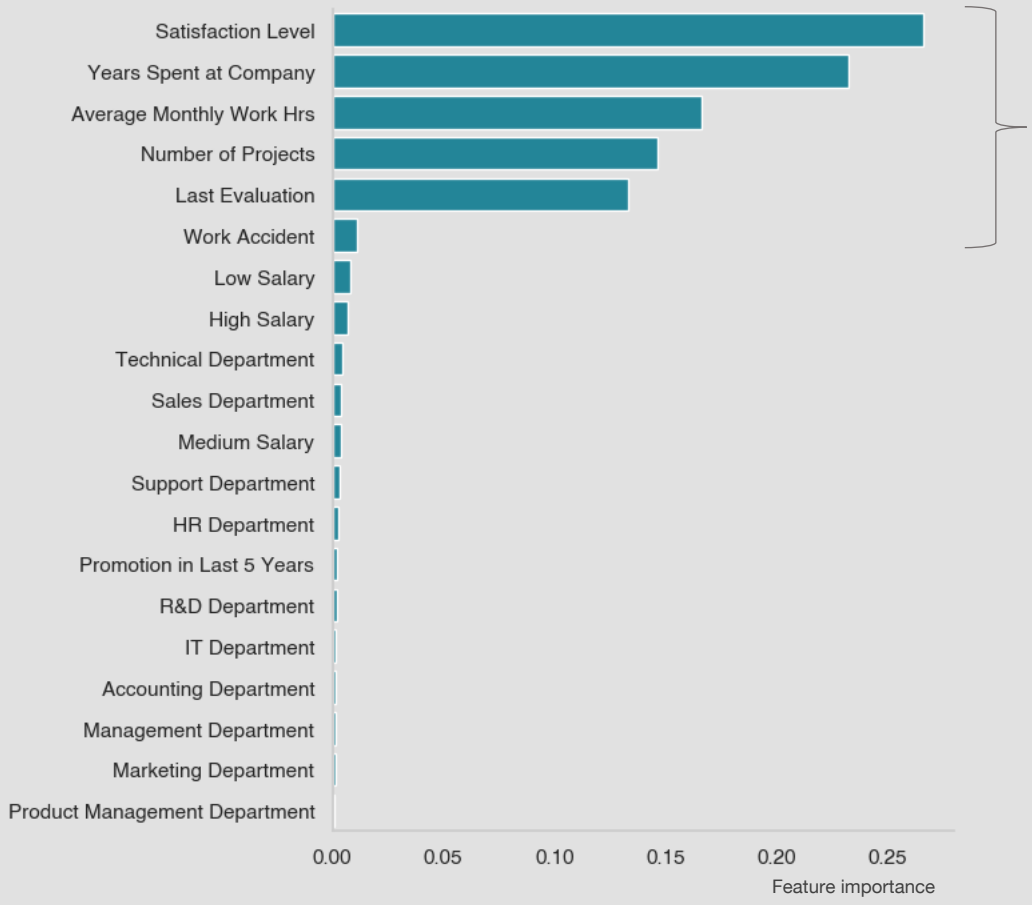
Feature Importance
- Indicates the relative importance of features when making a prediction
- Can be used to **prioritise** action steps in employee retention

[3]: As determined by AUC score. 97% precision was obtained for turnover data.
[4]: A Machine Learning algorithm that builds decision trees on different samples and takes their majority vote.
[5]: A resampling method that uses different portions of the data to test and train a model on different iterations.

Source: Literature search

Predictive model uses 5 main characteristics to predict employee turnover, which can be used to implement preventative steps

Feature Importance determination analysis shows how 5 factors can almost single-handedly predict employee turnover



Most influential factors for turnover

1. **Satisfaction level**
2. **Years spent at company**
3. **Average monthly work hours**
4. **Number of projects**
5. **Performance at last evaluation**

Key Insights

- The results generated from the model stress the significance of the analysis previously discussed
- These 5 factors should be kept in high consideration when planning **preventative action steps**
- The order of importance can be used to **prioritise** action steps once the need arises

A summary of the most influential features relating to turnover and some recommended action steps

Factors influencing turnover	Why are employees leaving right now?	What can we do about it?
1 **Satisfaction level**	• **Low satisfaction** group • **Almost satisfied** group • **Highly satisfied** group - Limited growth, poor management, being underpaid, lack of interest in the job	• Have frequent employee surveys • Encourage career progression within company • Implement learning programmes for managers and frequently assess their performance • Increase employee input in project preferences
2 **Years spent at company**	• Employees in their **3rd – 6th year** are more likely to leave, likely because of lack of career progression opportunities within company	• Improve the promotion scheme to match national average of ~20% yearly
3 **Average monthly work hours**	• **Underworking** employees <150 monthly working hours • **Overworking** employees <250 monthly working hours	• Encourage managers to enforce a work-life balance with ~ 200 hours of monthly work
4 **Number of projects**	• **Underworking** employees with > 3 projects • **Overworking** employees with < 3 projects	• Encourage employees with less project experience to take on projects • Encourage experienced employees to mentor and share expertise they gained
5 **Performance**	• **Low-performing** with < 0.6 performance score • **High-performing** with > 0.8 performance score	• Work on making staying at the company more attractive by implementing above suggestions • **Implement an incentive budget allocated to high-performing employees most likely to turnover**

Source: Literature search

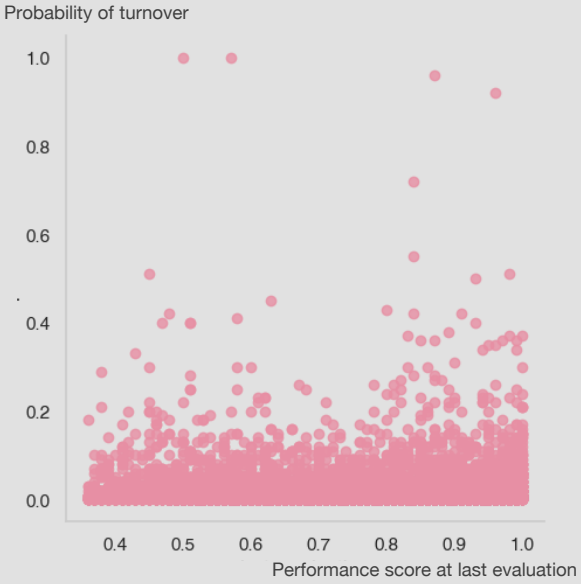
Using the predictive model to visualise the probability of the current employees to turnover and recommended action steps

Example employee data from the testing dataset[6]

Promotion (last 5 years)	Department	Salary	Satisfaction level	Performance (last evaluation)	Number of projects	Average monthly work	Time spent at company	Work accident
No	HR	Low	0.76	0.93	3	271 hours	5 years	No

Model prediction: 0.4 ~ 40% chance of turnover

Applying predictive model to retention data shows which of the highest performing employees are most likely to turnover



Turnover risk	Number of employees	Action steps
High risk (between 0.8 and 1)	**4**	Action to be taken on immediate basis Management to have a 1-to-1 conversation
Medium risk (between 0.5 and 0.8)	**4**	Action to be taken on medium-term basis HR to watch for progression into high risk
Low risk (between 0.2 and 0.5)	**79**	Action to be taken on long-term basis HR to track employee data for changes
Safe (less than 0.2)	**11314**	No action required

[3]: Data that has not been fed into the predictive model in the training stage.

Source: Literature search

The Analytics Diagnostic

Opportunity Evaluation

Predictive model

- This high-impact analytics solution allows real-time monitoring of possible turnover that can inform strategic decisions

Retaining high-performers

- Thanks to QuantSpark analysis the main turnover groups have been segmented and recommendations for action steps given

This presentation

Data Health Report

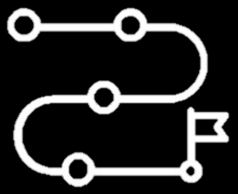
The data is in a good state

- No missing or misplaced values, consistent data

Some small improvements

- Grammatical errors in dataset feature names (“montly” vs “monthly”, “time_spend” vs “time_spent”)
- Feature names need to be descriptive (“sales” is not an optimal name to describe department variable, as it is one of the entries)

Small improvements



Analytics Roadmap

Improving the model

- Commissioning an improvement to the predictive model
  - Distinguish high-performing employees to avoid spending unnecessary resources

More specific turnover info

- The model could be further improved by distinguishing voluntary vs involuntary turnover and job type (”intern” vs “full-time”)

Can be expanded

Thank you

https://github.com/martina-torce