



Human Resources Analysis Predict Attrition

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Executive Summary (1/2)

Attrition, which represents the turnover of employees across all departments and levels of an organization, has several downsides and negative impacts

- These effects can be significant and wide-ranging, affecting the company's performance and its ability to achieve its strategic objectives
- Some of the key disadvantages of having a high attrition rate in a company include the cost of recruitment and onboarding, loss of knowledge and expertise, productivity disruption, decreased team cohesion, impact on customer relationships, delayed project and goals, amongst many others

Predictive analytics allows HR to take the best decisions that reduce attrition rate

- Make decisions based on statistical data rather than speculation to address real turnover drivers
- Identify systemic issues affecting engagement and attrition, facilitating company-wide adjustments rather than individual-level changes

To address this issue in your company, a predictive analytics model was developed to identify potential employee attrition

- The Random Forest model emerged as the most effective, balancing accuracy and interpretability
- The confusion matrix shows a significant number of true positives and true negatives, with very few false positives and false negatives, reflecting the model's reliability
- The most important features resulted in the model are monthly income, overtime, age and years at the company

Executive Summary (2/2)

Regarding the predictive model, who's really leaving your Company?

- Younger employees are more likely to leave the company than others
- Single employees are more likely to quit their jobs in comparison to married or divorced employees, boosting an attrition rate of 26%, while married and divorced employees boost 12% and 10%, respectively
- Sales representatives have the highest attrition rate, followed by Laboratory Technicians, Human Resources (23%) and Sales Executives (17%). All of these are well above your average attrition rate of 16%
- Employees who work overtime have a higher attrition rate (31%) in comparison to those who don't work overtime (10%)
- The employees who leave the company have a significantly lower monthly income than those who don't leave
- Employees who live closer to their work places are less likely to quit their jobs
- Employees who travel the most for work, also have higher attrition levels
- New employees are more likely to quit their jobs, when comparing to employees that have been working in the company for more than a couple of years. This trend is particularly steeper in the first 2 years working in the company

Therefore, we suggest three strategic priorities to reduce attrition rate

- For employee profile, it is important to implement mentorship and career development programs; promote a culture of ongoing learning; provide career advancement opportunities to retain experienced workers and act preventively before they reach the average age of leaving; conducting regular satisfaction surveys
- Regarding monthly income feature, we recommend salaries according to the industry benchmarks; improve Incentives and bonuses; implement clear career planning and salary revision, as well as retirement savings account
- Regarding the work life balance, it is important to implement flexible work hours and support effective remote work; hire additional staff and redistribute workloads among employees; establish a predetermined high rate of pay for overtime work; provide transportation assistance and create new satellite offices near employee housing clusters

Objectives of this project

- 1 Build a classification model to **predict the Attrition probability** and the final classification given by the model
- 2 Find the **features that most influence the attrition rate**
- 3 Make **recommendations** in actions in order to **reduce the** attrition rate
- 4 **Integrate** the predictive attrition model into a **Human Resource Dashboard for real-time tracking** and monitoring employees predicted at risk of attrition.

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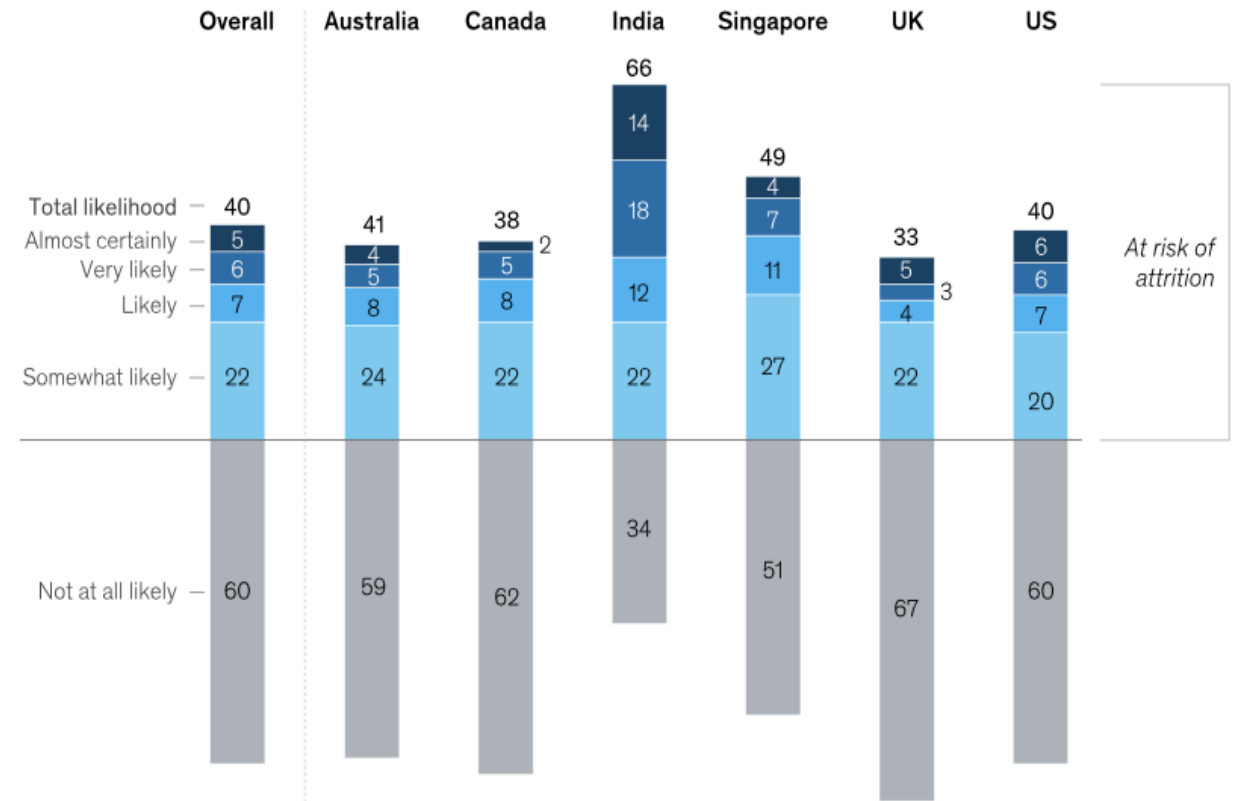
Suggestions

Is the Talent Crisis Global?

82% of Top Executives Say Yes!

According to **McKinsey** latest reports about Companies's Attrition:

- **40% of workers** globally are considering leaving their jobs
- **Almost one-third** of senior leaders cite finding talent as their most significant managerial challenge
- **82% of Fortune 500** executives believe their companies are failing to recruit highly talented individuals
- **A majority of people** who quit their jobs are not returning to the industries they left, showing a significant level of industry-hopping



Source: Subset of respondents from McKinsey's 2022 Great Attrition, Great Attraction 2.0 global survey who were employed at the time of the survey, which was conducted between Feb 2022 and Apr 2022 (n = 12,378)

How to approach this issue?

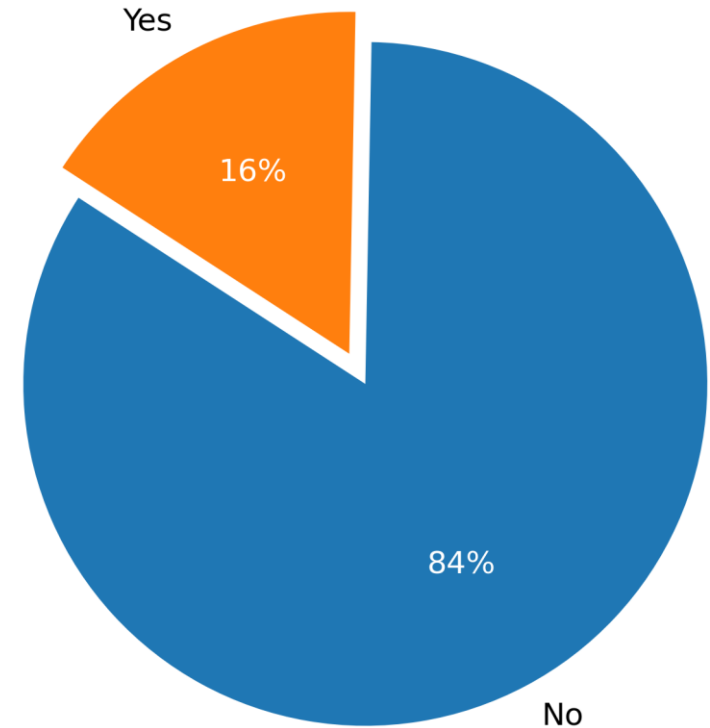
Predictive analytics allows HR to take the best decisions that reduce attrition rate

“We find that statistical data is **much more effective** and **actionable** than perception analysis, because there's all sorts of bias in asking people questions,” - Matthew Stevenson, partner and co-leader of Mercer’s Workforce Strategy & Analytics group

Key benefits:

- Data-informed Engagement Strategies
- Improved Retention
- Organizational Change

Your Company’s Attrition Rate



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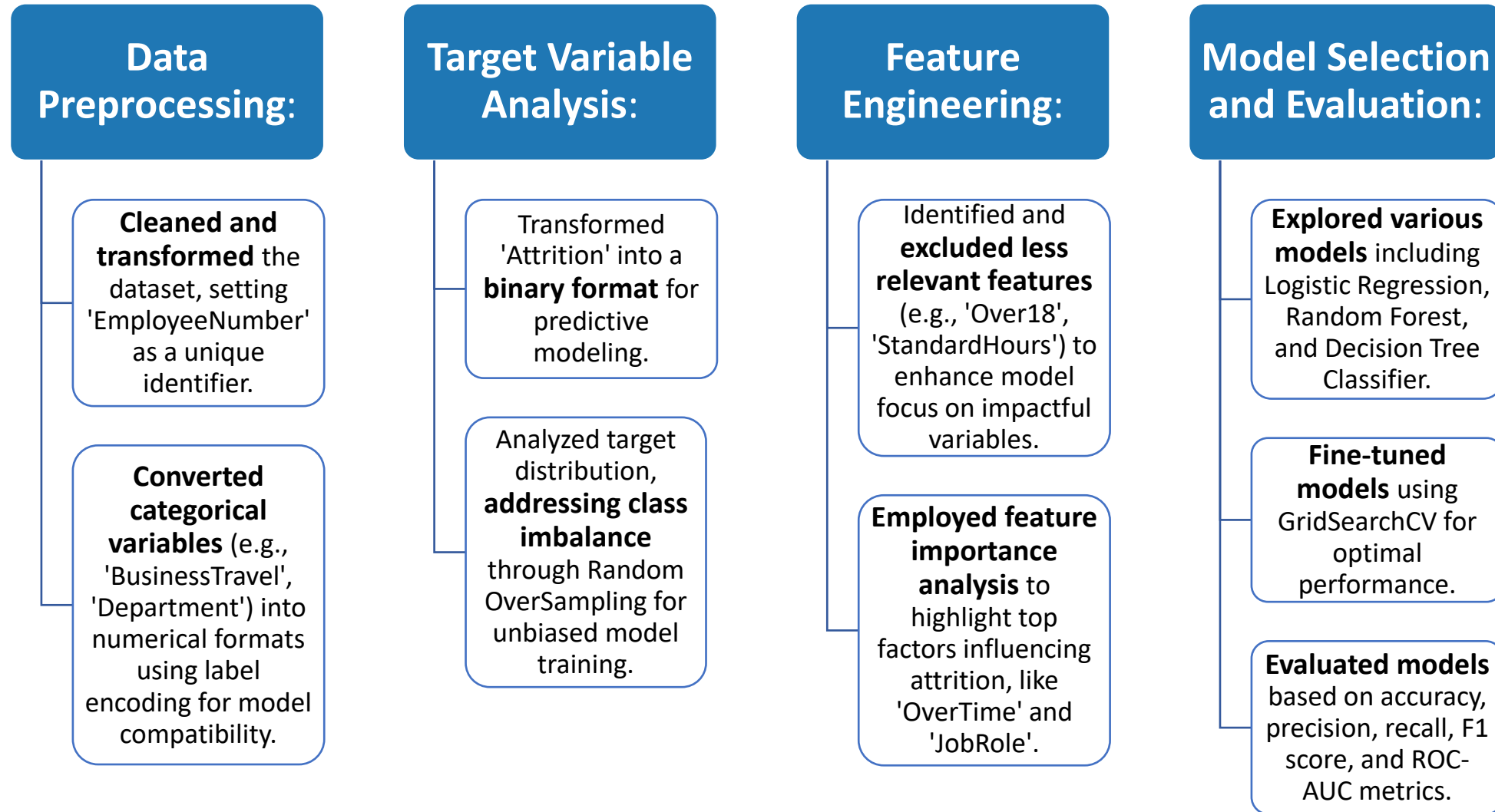
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Getting started with our model

- **Objective:** Develop a predictive analytics model to identify potential employee attrition, enabling proactive retention strategies
- **Background:** High attrition rates impact productivity and incur significant costs Understanding key factors driving attrition can help in formulating effective retention policies
- **Data Source:** Utilized your company's dataset from HR, containing a wide range of employee attributes
- **Tools and Technologies:**
 - **Data Processing:** Python, Pandas for data manipulation
 - **Model Development:** Scikit-learn for machine learning algorithms
 - **Handling Class Imbalance:** Imbalanced-Learn library
 - **Visualization:** Matplotlib and Seaborn for graphical representation of data insights

Methodology and Key Insights separated in 4 steps



A Glimpse into Model Performance

Model Findings

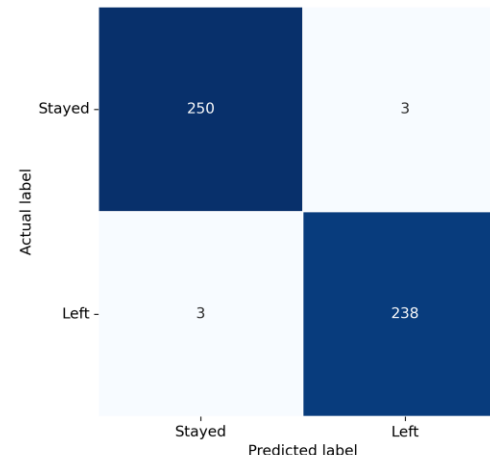
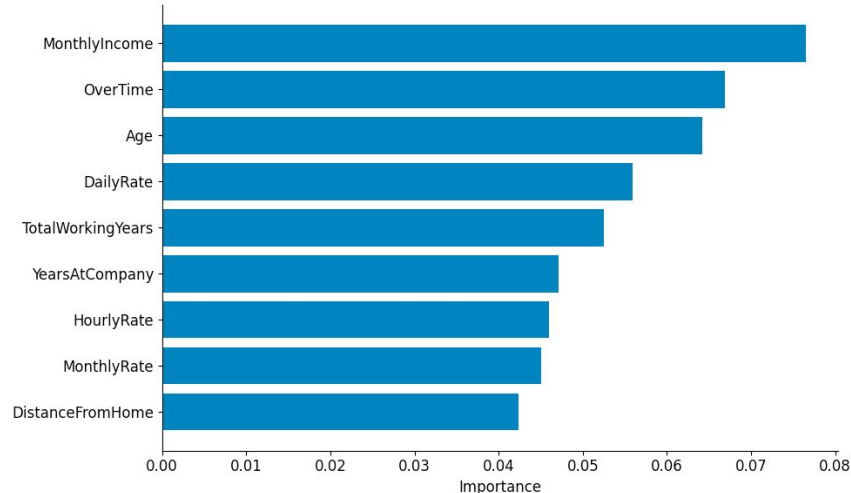
- The **Random Forest model** emerged as the **most effective**, balancing accuracy and interpretability.

High-Level Summary

- Our predictive model showcases **excellent performance in forecasting employee turnover**. It serves as a strategic tool for pre-empting attrition and crafting retention strategies.

Model Accuracy

- Our model achieves a **high accuracy rate**, indicating a strong alignment between predicted outcomes and actual data.
- The **confusion matrix** shows a significant number of true positives and true negatives, with very few false positives and false negatives, reflecting the model's reliability.



Each row of the matrix represents the instances in an actual class while each column represents the instances in a predicted class, or vice versa

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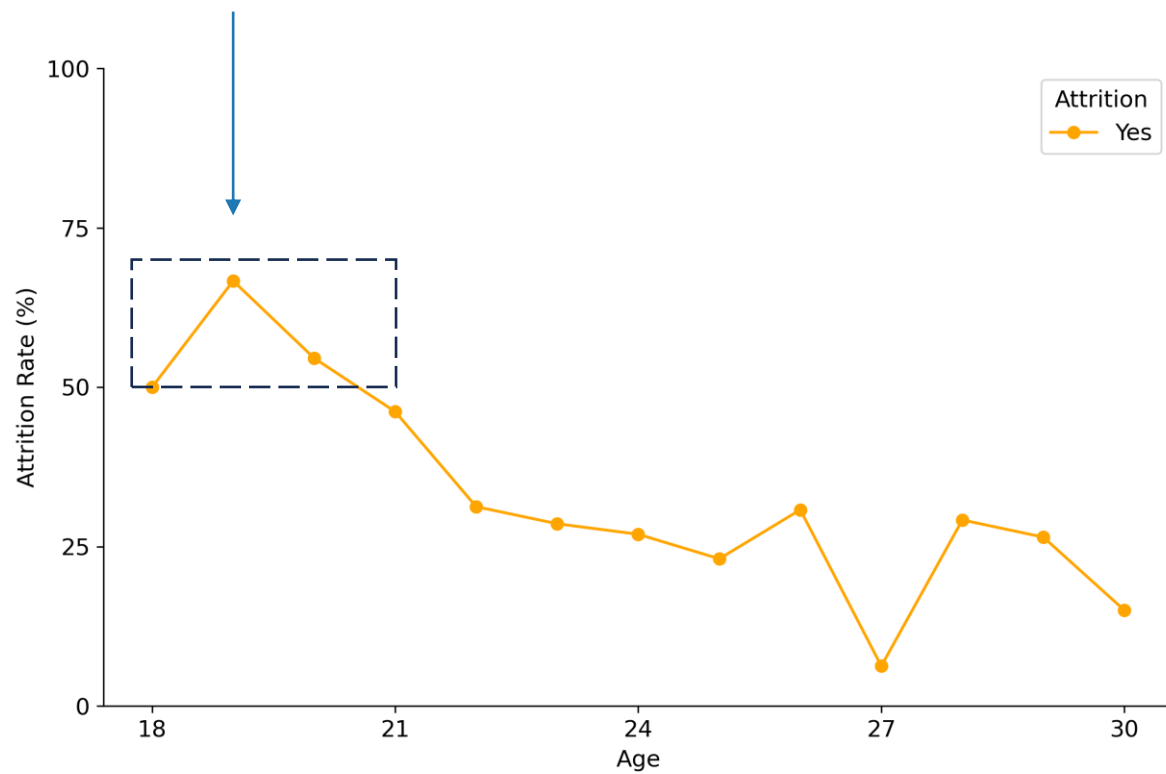
Suggestions

Who's Really Leaving Your Company?

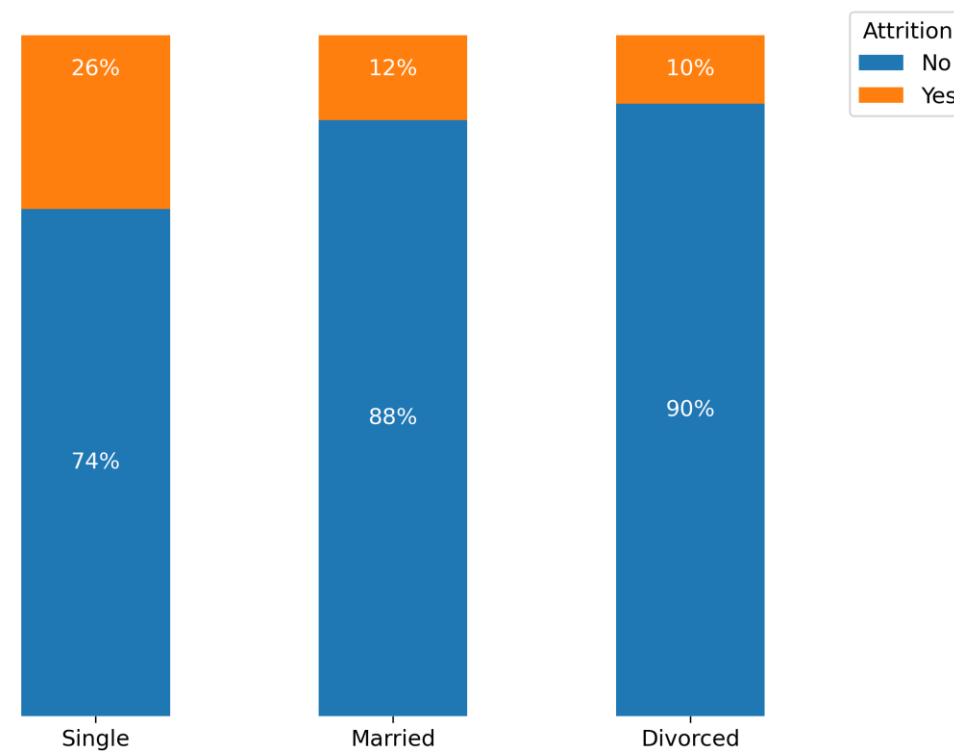
Younger and single employees

Younger employees are more likely to leave the company than others.

We can actually see that **between the ages of 18 and 21, we are losing more employees than those retained.**



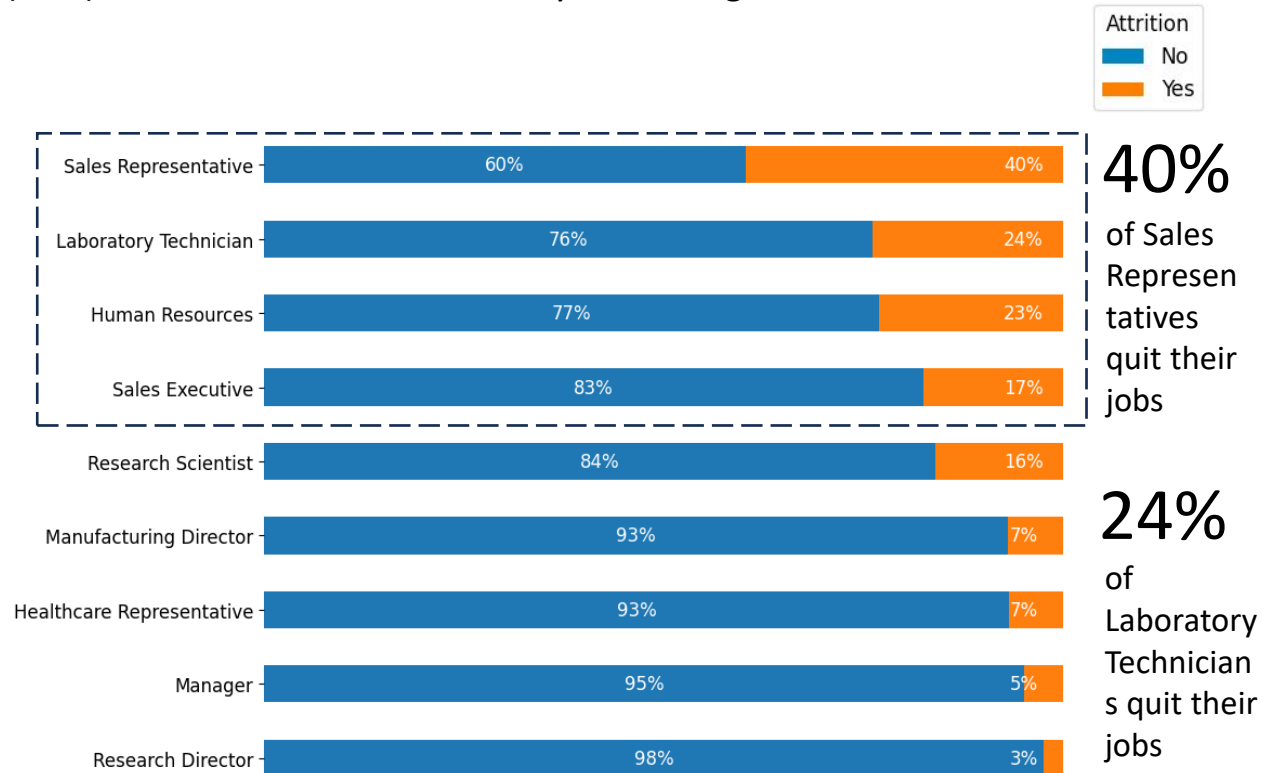
Single employees are more likely to quit their jobs in comparison to married or divorced employees, boosting an attrition rate of 26%, while married and divorced employees boost 12% and 10%, respectively.



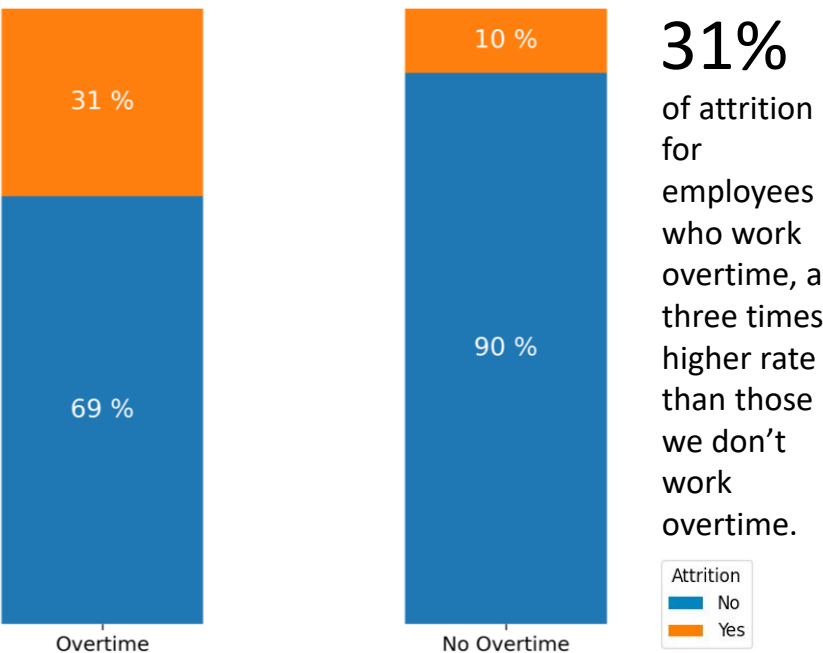
Who's Really Leaving Your Company?

Sales Representatives, Lab Technicians, HR and Sales Executives, plus Employees with Overtime

Sales representatives have the highest attrition rate (40%), followed by Laboratory Technicians (24%), Human Resources (23%) and Sales Executives (17%). All of these are well above your average attrition rate of 16%.



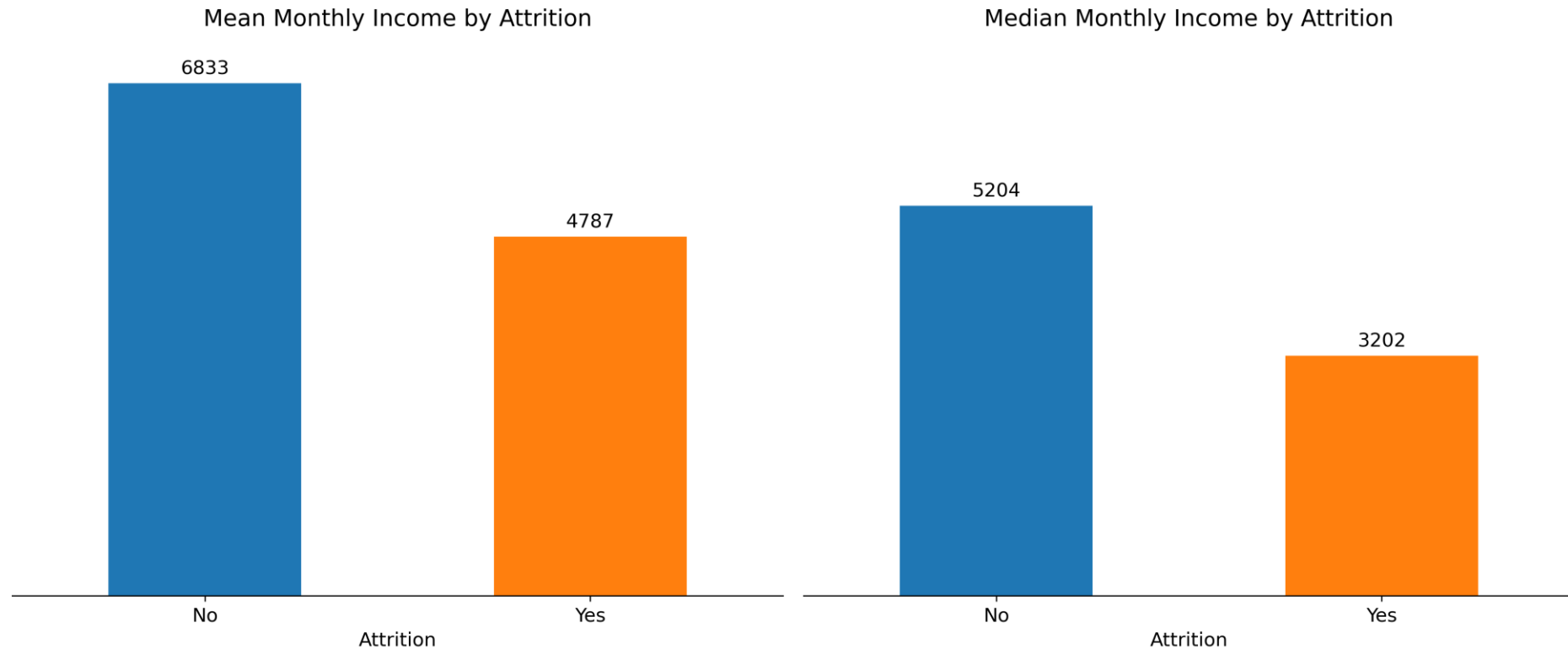
Overtime is also directly related to higher attrition rates. **Employees who work overtime have a higher attrition rate (31%)** in comparison to those who don't work overtime (10%).



Who's Really Leaving Your Company?

Employees with lower salary

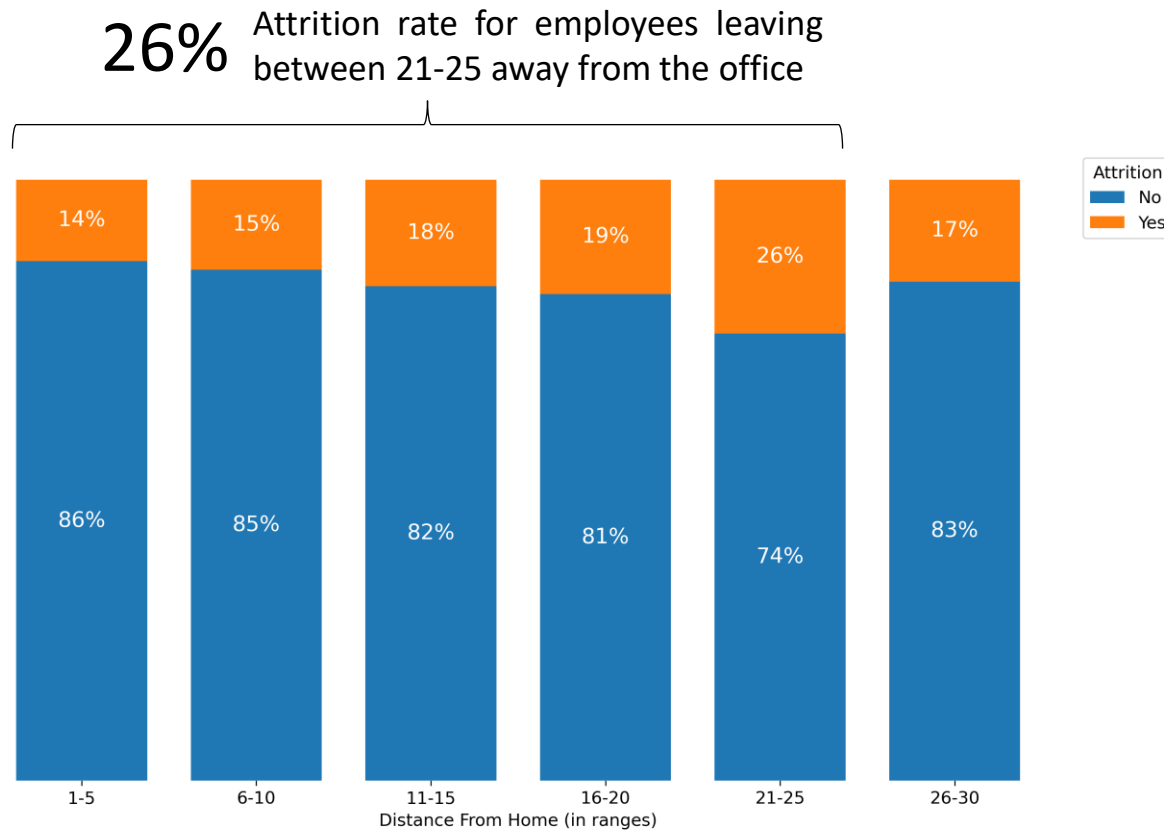
Your data also shows that **those who leave the company have a significantly lower monthly income than those who don't leave**. This reinforces the importance of competitive compensation in retaining talent.



Who's Really Leaving Your Company?

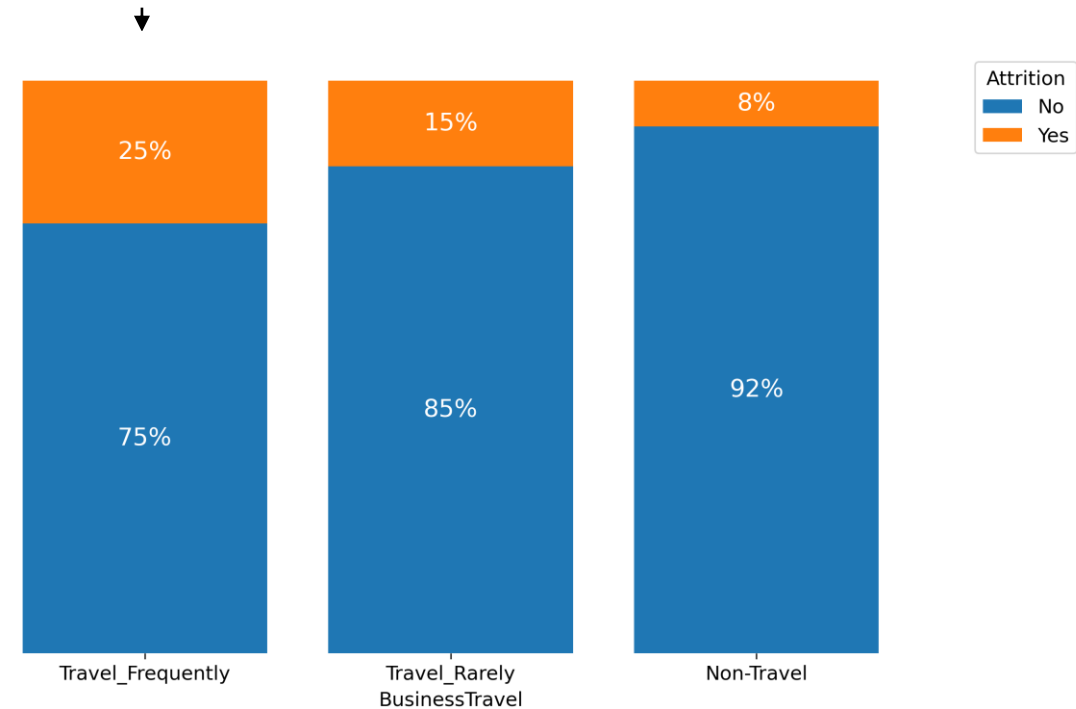
Employees who live far from the office and travelling for work frequently

As distance from home increases, the attrition rate also goes up. There's a clear uptrend until the 21-25 range, meaning that **employees who live closer to their work places are less likely to quit their jobs.**



Employees who travel the most for work, also have higher attrition levels. Those who rarely travel have intermediate attrition rates, and those who don't travel at all have the lowest attrition rates.

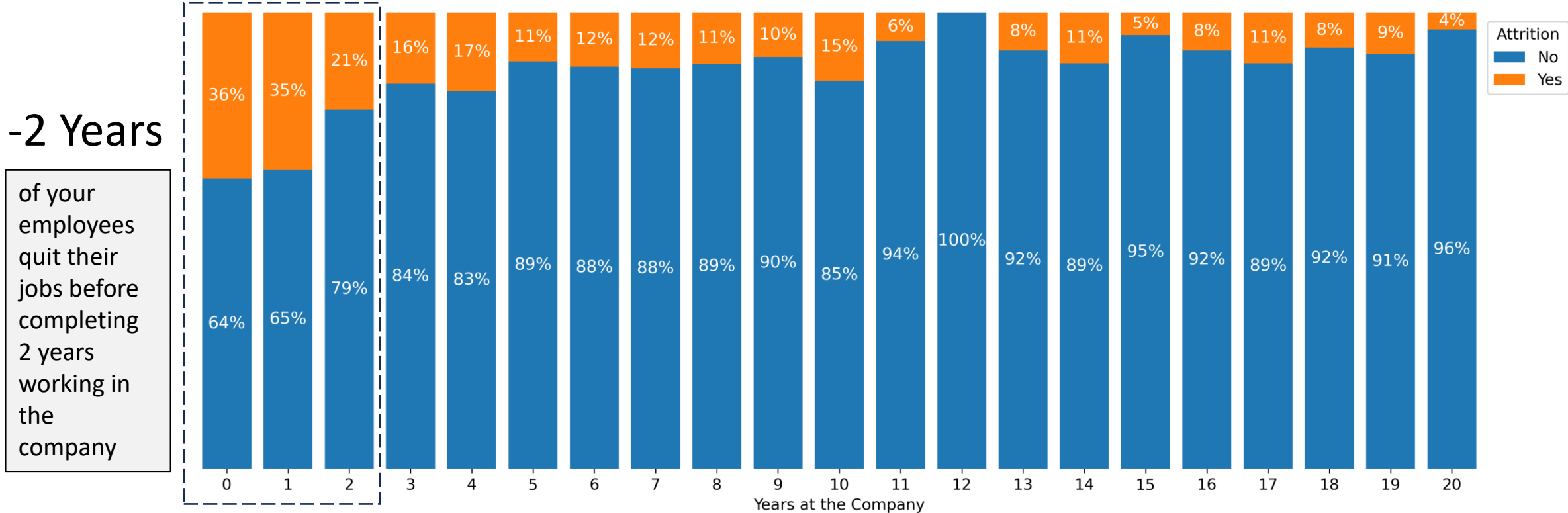
3.1x Higher attrition for employees who travel frequently for work



Who's Really Leaving Your Company?

Employees with less than 2 Years' Service

New employees are more likely to quit their jobs, when comparing to employees that have been working in the company for more than a couple of years. **This trend is particularly steeper in the first 2 years** working in the company, with attrition rates over 20% before levelling off after 5 years of service



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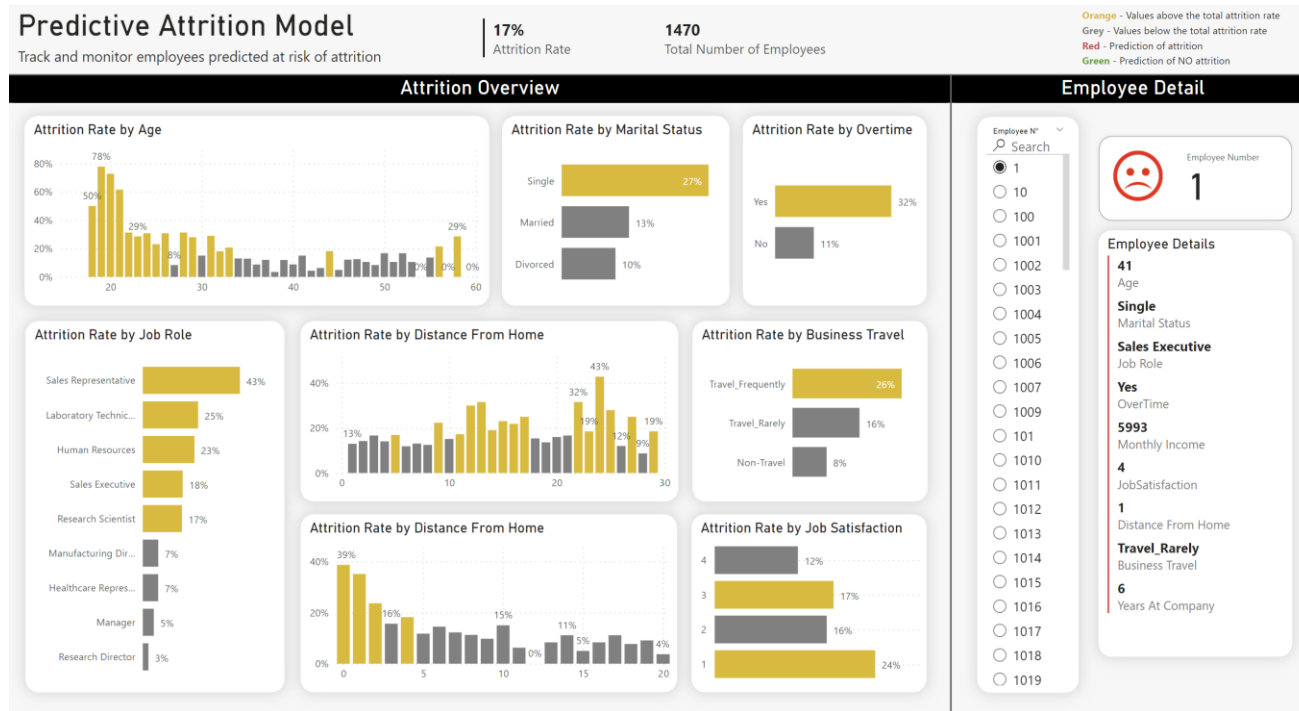
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Three strategic priorities to reduce attrition rate

	 Employee Profile	 Monthly Income	 Work-life Balance
Issues	Dissatisfaction strongly expressed in <u>young and single employees</u>	<u>Income inequality</u> strongly marked dissatisfaction, specially among the <u>lowest paid workers</u>	<u>Overtime</u> can lead to burnout and dissatisfaction, specially in employees that work away from home
Suggestions	<hr/> Implement mentorship and career development programs <hr/> Promote a culture of ongoing learning <hr/> Provide career advancement opportunities to retain experienced workers <hr/> Years of Service Incentives <hr/> Act preventively before they reach the average age of leaving, conducting regular satisfaction surveys	<hr/> Salaries according to the industry benchmarks <hr/> Improve Incentives and Bonuses <hr/> Clear Career Planning and Salary Revision <hr/> Retirement Savings Account <hr/> Medical Insurance and Education incentives	<hr/> Implement flexible work hours and support effective remote work <hr/> Hire additional staff and redistribute workloads among employees <hr/> Establish a predetermined high rate of pay for overtime work <hr/> Provide transportation assistance <hr/> Satellite offices near employee housing clusters <hr/> Conduct regular exit surveys

Integrating Predictive Attrition Model into HR Dashboard



Empower HR with actionable insights to proactively address potential employee attrition.

- **Real-Time Monitoring:** Track and monitor employees predicted at risk of attrition.
- **Prioritization:** Focus on high-risk individuals for retention interventions.
- **Trends & Analysis:** Visualize attrition patterns over time to inform strategic HR decisions.
- **Custom Alerts:** Set notifications for flagged employees to take timely action.

The End

Questions?

The End

Annexes

A Glimpse into Model Performance

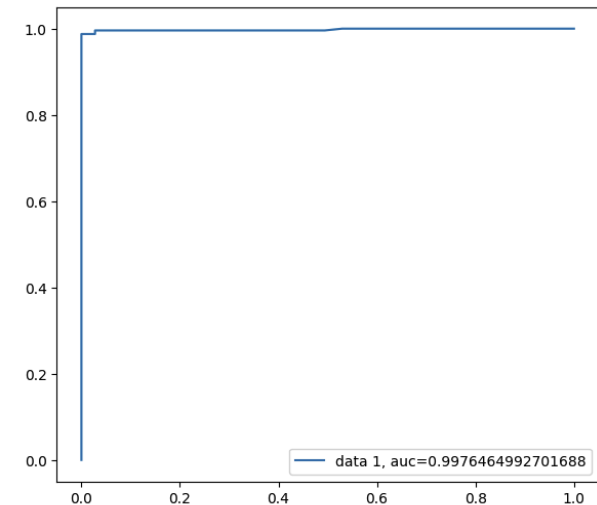
Crucial Metrics Explained:

- **Accuracy:** Reflects the proportion of total correct predictions, crucial for overall reliability.
- **Precision:** Measures the exactness of the model in predicting attrition, crucial for resource allocation in retention programs.
- **Recall:** Assesses the model's ability to capture actual attrition cases, vital for comprehensive intervention strategies.
- **F1 Score:** Balances precision and recall, providing a singular metric for model performance in uneven class distributions, typical in attrition datasets.

ROC curve, or Receiver Operating Characteristic curve, is a graphical plot that illustrates the diagnostic ability of a binary classifier system as its discrimination threshold is varied, by plotting the true positive rate against the false positive rate at various threshold settings.

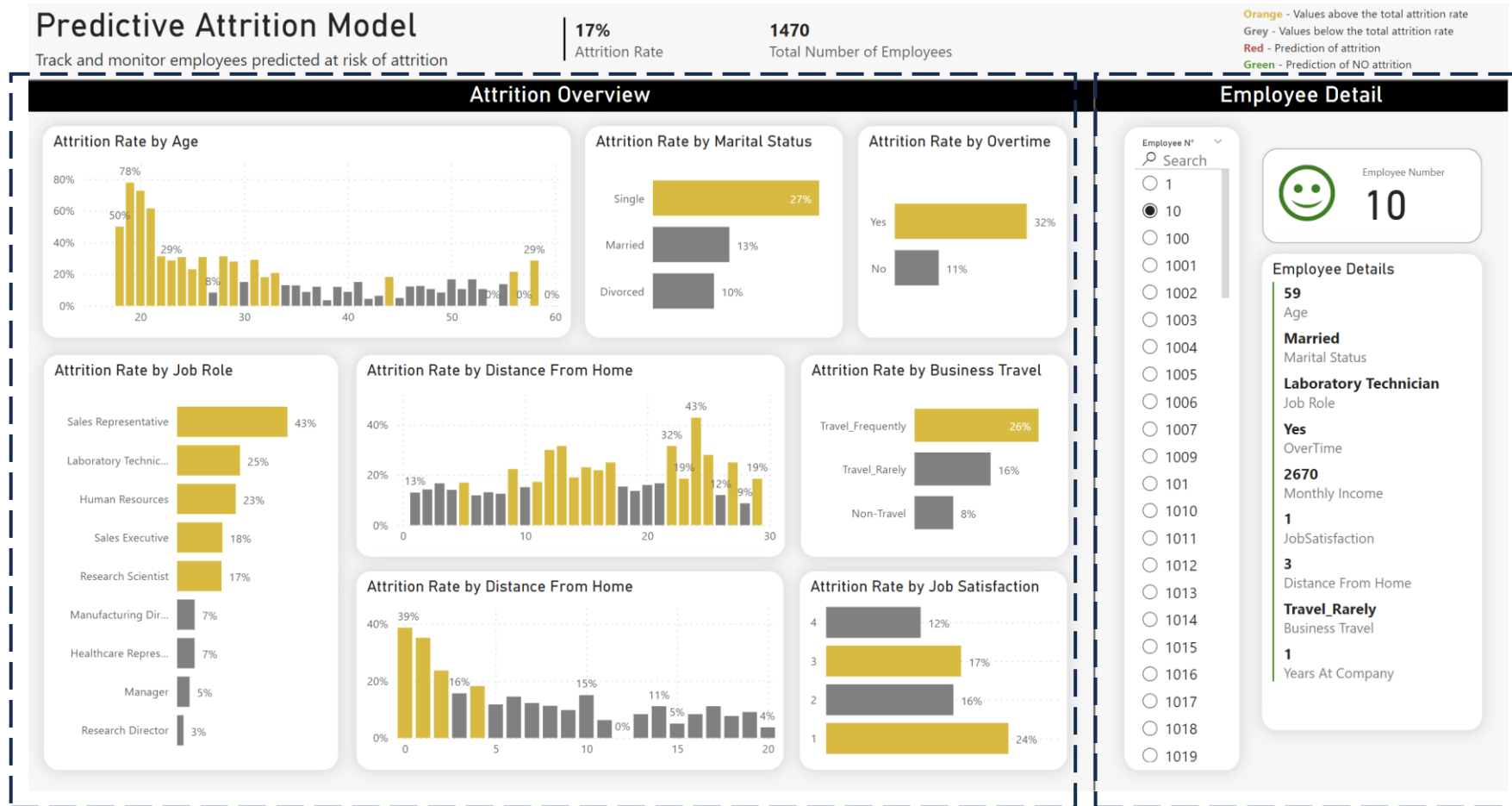
Our Model Results

Metric	Score
Accuracy	0.99
Precision	0.99
Recall	0.99
F1 Score	0.99



Integrating Predictive Attrition Model into HR Dashboard (Explained)

Attrition Overview: For the most important features, in orange is identified where the attrition rate are higher than the overall attrition rate of the company (17%)



Employee Details: According to the predictive model:
- If Red the employee is in risk of attrition
- If Green the employee is not in risk of attrition