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Lower Employee Attrition and Improving Retention

Introduction:

      Positive employee retention and reducing attrition is crucial to a company establishing success in the long run. In this report, I will dive deep into the key factors/variables that play a role in lowering employee attrition and boosting employee retention rates. Furthermore, my points of analysis will stem from key statistical measures and outlier detection in different variables, correlation to examine relationship between variables and attrition, conducing feature importance report from a random forest classifier, and potential further points of interest that can explain an employee attrition decision.

Data Processing:

      All the analysis and visualizations will be conducted in Python using the libraries: Pandas, Matplotlib, Seaborn, Numpy, and Sklearn.

      The dataset contains data for 1,470 different employees and 21varaibles. ([This is a link to all of the data variables and definitions](#)) The dataset was efficient to work with because there were no missing data values for any of the variables. Also, all the variables were simple data types (integer, string/object, and boolean) to be altered for different statistical methods and analysis.

      The main alteration I made to the dataset was representing each of the categorical columns with numerical representations for ease of incorporation into different models. At the same time, I incorporated these values into additional variables/columns to have ease of incorporating numerical or string values for each of the categorical columns.

Analysis:

Categorical Columns:

      First, I conducted a chi-squared analysis on each of the categorical variables to detect potential statistical significance between each variable with the attrition decision. Furthermore, I generated a contingency table to detect outlying data values that drive employee's decisions.

The variables of interest: marital status, job role, and business travel.

Marital Status:

      Chi-Squared Test P-Value: 9.46e-11

      With a very low p-value, we can confidently affirm that there is a significant association between an employee's attrition decision and their marital status. Analysis of the data reveals that employees who are single exhibit the highest attrition rate at 34.29%, significantly surpassing that of married and divorced employees, who show much lower attrition rates at 14.26% and 11.22% respectively.

Attrition by Marital Status

Attrition	Divorced	Married	Single
False	294	589	350
True	33	84	120

This pattern suggests that single employees may face unique challenges or lack certain support that is more accessible to their married or divorced counterparts. To address this disparity, it is recommended that the company consider implementing targeted support mechanisms specifically designed for single employees. One potential initiative would be to increase social/networking opportunities to have single employees engage socially in a more relaxed setting. Another initiative could be flexible work arrangements to include flexible hours and remote work opportunities to relief stress and increase work-life balance for all categories of marital status.

Job Role:

Chi-Squared Test P-Value: 2.75e-15

With the lowest p-value of all categorial variables, we can dictate that job role has one of the most crucial impacts on an employee's attrition decision. Furthermore, the job roles that saw the highest attrition rates: sales representatives (66%), Laboratory Technician (31.47%), and Sales Executives (21.90%).

Looking at these three job roles, they all have a common theme—long hours and high stress. Both of those can cause employee burn out and the desire to find different companies that prioritize a healthy work-life balance for all roles. Coming from that, this distinction puts an emphasis on establishing concrete guidelines for the working hours and breaks times given to these positions.

Business Travel:

Chi-Squared Test P-Value: 5.61e-06

This p-value showcases a strong relationship between frequency of traveling for business and employee's attrition decision. Looking at the analysis there is an incremental increase in attrition when travel requirements also increase: Frequent (33.17%), Rarely (17.59%), and Never (8.70%).

Seeing this increase in employee attrition as travel frequency increases establishes the need to correctly accommodate and care for employees as they are traveling for work. Traveling for work requires being away from family, daily routines, and the comfort of home, which can contribute significantly to job stress and dissatisfaction. Given the clear link between increased travel frequency and higher attrition rates, it is imperative that the company implements supportive measures to improve the well-being of traveling employees.


Attrition by Business Travel

Numerical Columns:

Second, I generated a histogram for each numerical column aggregated by the employee's attrition decision to potentially identify alterations in employee's decision to leave or stay at the company. This can help detect areas of interest and prioritize focus on certain characteristics of jobs and employee satisfaction.

The variables of interest: age, years at company, and years in current role.
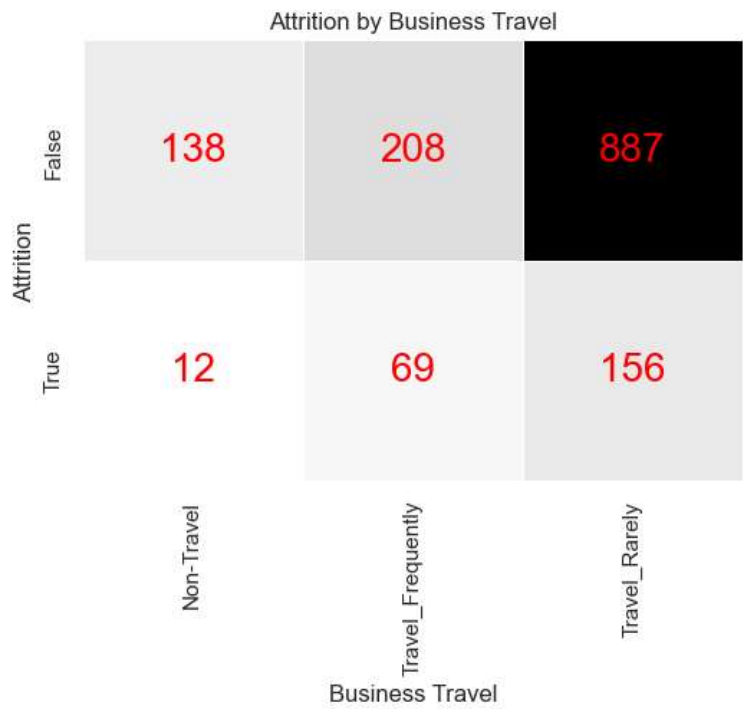
Age:
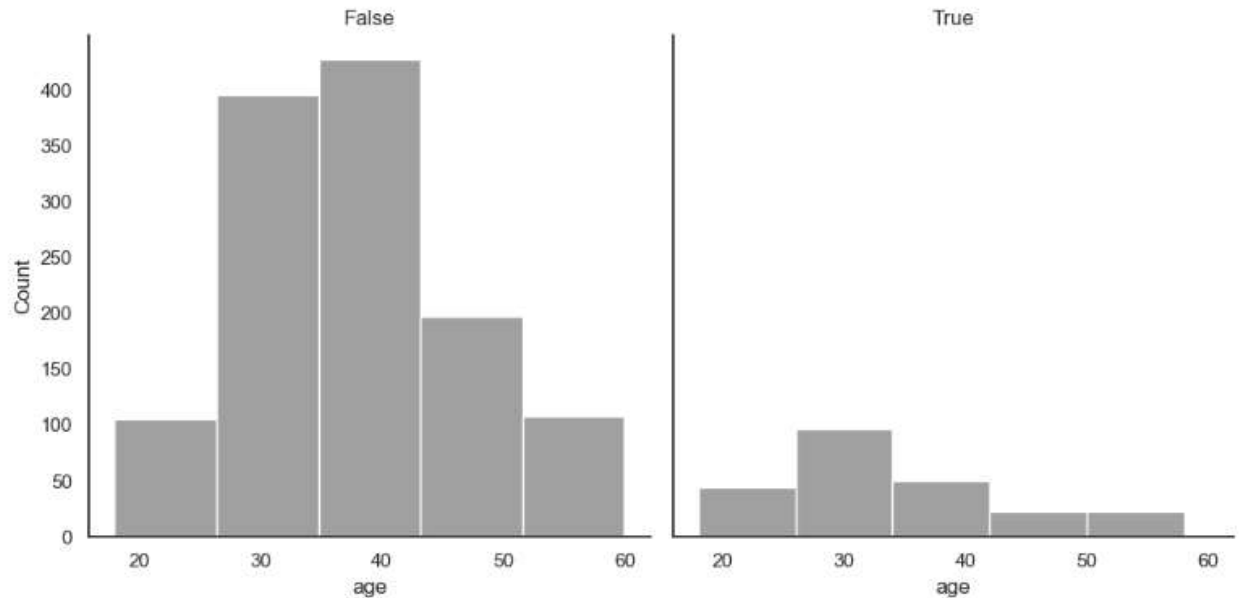
The histogram displaying attrition for employees aged 20-40 labeled as 'True/employees leaving the company' reveals a significantly higher attrition rate within this age group. This stark contrast to the trends observed in the histogram for 'False/staying at the company,' which shows that employees aged 40 and beyond tend to remain with the organization, suggests age-specific factors influencing employee retention.

Recognizing the challenges and opportunities associated with retaining younger employees is essential. Effective retention strategies not only reduce training and recruitment costs but also increase the likelihood of internal referrals, improve long-term employee engagement, and build a more experienced workforce. Some focuses to reduce the attrition rate in this range can include clear career progression within the company and offering experiences like certificate and outside courses to benefit growth/learning. This proposal will increase the potential for employees at a younger age to build a career at their current company.

Years at Company:
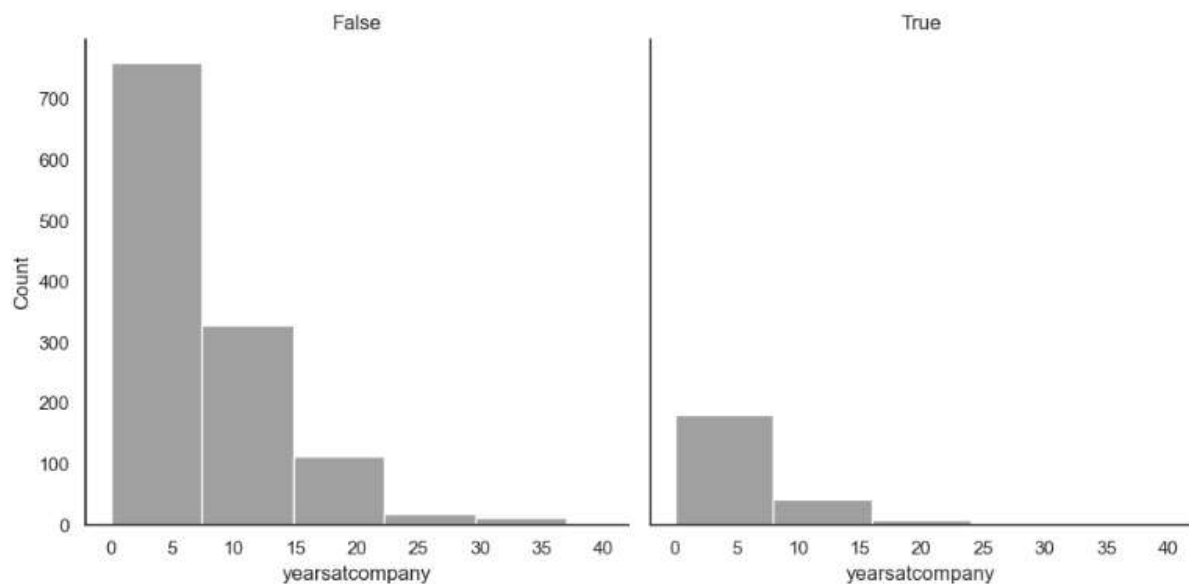
The histogram analyzing attrition by tenure reveals a compelling trend: newer employees exhibit higher attrition rates, while those with more years at the company show a decrease, indicating stronger retention as tenure increases. This pattern highlights the challenges of retaining employees early in their careers and underscores the importance of tenure in employee loyalty.

To address this, implementing structured career progression plans is crucial. By offering clear pathways, targeted training, mentorship, and clear career milestones, the company can enhance retention among newer hires. These initiatives should be communicated from the start, providing a blueprint for employees that emphasizes the company's commitment to their long-term growth and stability. This strategic approach not only reduces turnover but also builds a more committed and knowledgeable workforce.

Number of Companies Worked:
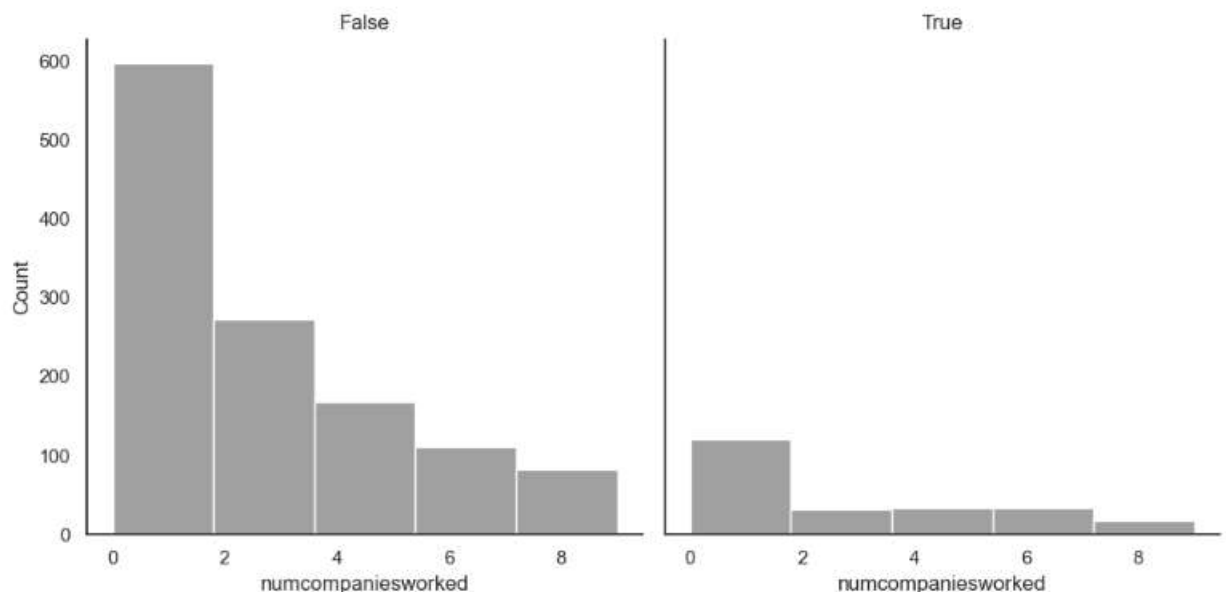
The analysis of attrition relative to the number of companies an employee has worked for shows a clear trend: individuals with experience at only 0-2 companies have the highest attrition rates, indicating that younger or newer employees are often still exploring their career options. Conversely, those who have worked at more companies tend to stay longer, suggesting they are making more deliberate choices about settling into a long-term workplace.

This pattern highlights the importance of instilling confidence in newer employees about their career prospects within the company. Effective strategies include robust onboarding programs that outline clear career paths and growth opportunities, complemented by mentorship and structured training. By clearly communicating the potential for long-term development and stability, companies can reduce early attrition and foster a committed workforce.

Correlation:

Correlation analysis is instrumental in identifying key factors influencing employee attrition. The data highlights a significant positive correlation with attrition among single employees and those in high-pressure roles like sales, suggesting these groups face unique challenges that may increase their turnover. Additionally, frequent job changes also correlate positively with attrition, indicating a tendency among some employees to seek opportunities outside the company.

In contrast, negative correlations with attrition are observed in factors like total working years, tenure in current roles, and monthly income, underscoring the importance of job stability and financial security in retaining employees. To enhance retention, especially among at-risk groups, targeted interventions such as tailored career development opportunities, robust support programs, and competitive compensation packages are recommended. These strategies aim to stabilize the workforce and reduce attrition by addressing the specific needs highlighted throughout the analysis.
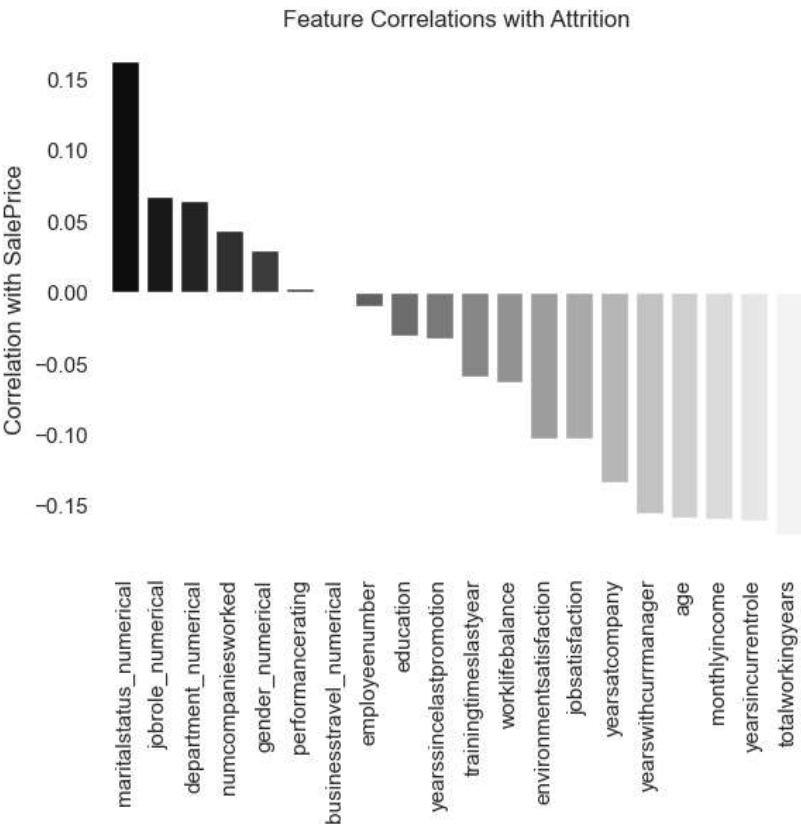
Feature Importance:

I employed a Random Forest classifier to identify key factors influencing employee attrition. This technique constructs multiple decision trees using random data subsets and feature sets to determine splits, with feature importance measured by each feature's ability to reduce uncertainty in predictions. The analysis highlights monthly income as the most impactful factor, affirming the critical role of competitive compensation in employee retention. Additional significant factors include age, total working years, and years at the compan', which align with previous findings that career stability and advancement are crucial for retention.
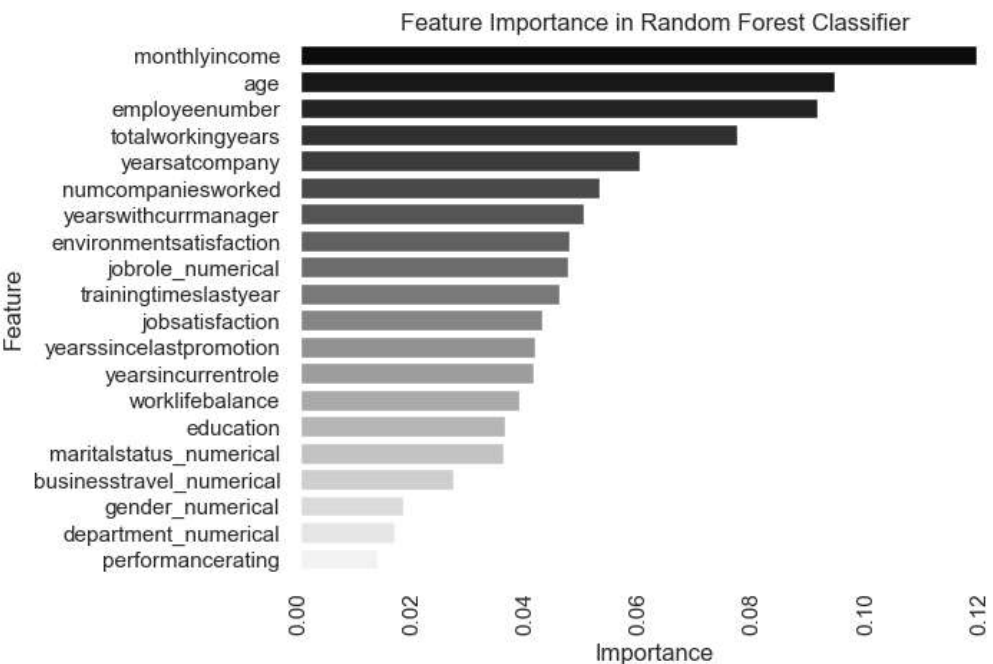
Conversely, variables such as performance ranking, department, and gender ranked lower in importance, suggesting that they have less influence on attrition rates. This insight enables the company to prioritize resources effectively, concentrating on enhancing compensation packages and career development opportunities rather than on areas with limited effect on turnover. By strategically targeting these crucial factors, the company can not only reduce employee turnover but also significantly improve overall job satisfaction.

Conclusion and Future Points of Reference:

It is evident that wanting to lower employee attrition rates requires a focus on the well-being and growth potential for employees. Offering a workspace where employees can enjoy work and outside hobbies/enjoyments, not have to worry about compensation, and be given a clear vision of their trajectory within the company is crucial to retaining them as employees.

Furthermore, some areas of interest I believe would help further the ability to reduce employee attrition even greater are categorizing employee tiers and increase of income over time. Having a value for the tier of employment each employee has would give good insights into attrition rates at different levels in the company. As seen throughout the analysis, years variables have a big impact on attrition, and the greater the years at the company often foster a lower attrition rate. So being able to see the difference in attrition between entry-level, senior-level, executive, and president level roles can give a grasp on the need for career progression internally and will give more context to the years since last promotion variable. Also, incrementing increase in income over time for each year an employee has been at the company will give great insight into attrition because monthly income variable arguably has the most importance into the attrition rate. So, seeing if there is a greater increase in some employees compared to others could directly showcase foundational lapses in attrition rates especially in the earlier years of someone's career at the company. This could bolster extra emphasis towards a change to more competitive compensation packages for employees.