HR Data: Predicting & Understanding Employee Attrition

Business Problem

Employee attrition presents a significant challenge for the organization, impacting operational continuity, employee morale, and financial performance. The company seeks to understand why employees are leaving, identify key predictors of attrition, and design data-driven strategies to reduce turnover—particularly among specific demographics such as younger employees, lower-income groups, certain job roles (e.g., Sales Reps, Lab Technicians), and those with lower job satisfaction or shorter tenures.

Core business problem-

 "How can the organization use data to identify at-risk employees and develop targeted, proactive strategies to reduce voluntary attrition, improve employee engagement, and retain top talent across all departments and roles?"
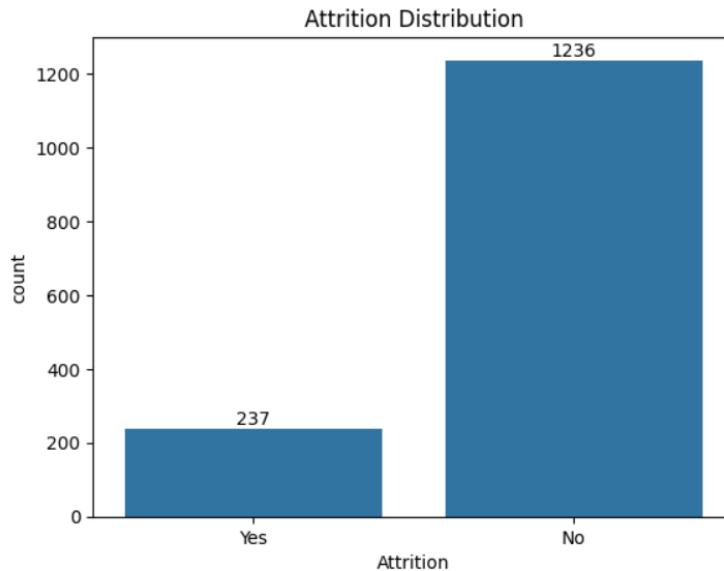
Dataset Description

- **Data Source:** Kaggle
- **Number of rows & columns:** 1480 rows & 38 columns
- **Data Types:** Object, Int64, Float64

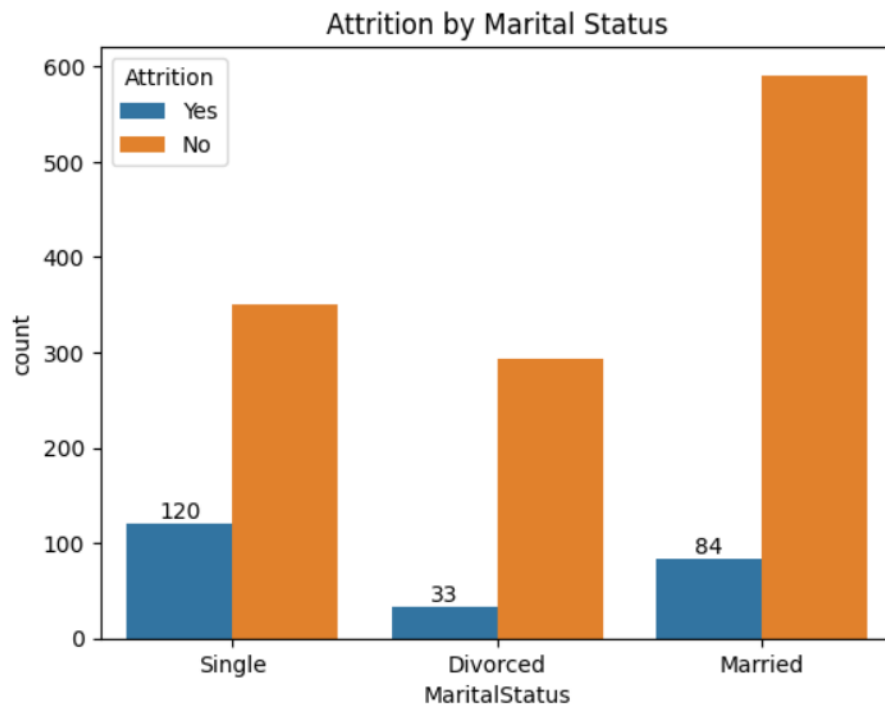## Data Cleaning

- **Missing Value:** Null
- **Duplicates:** 7

Exploratory Data Analysis with Python

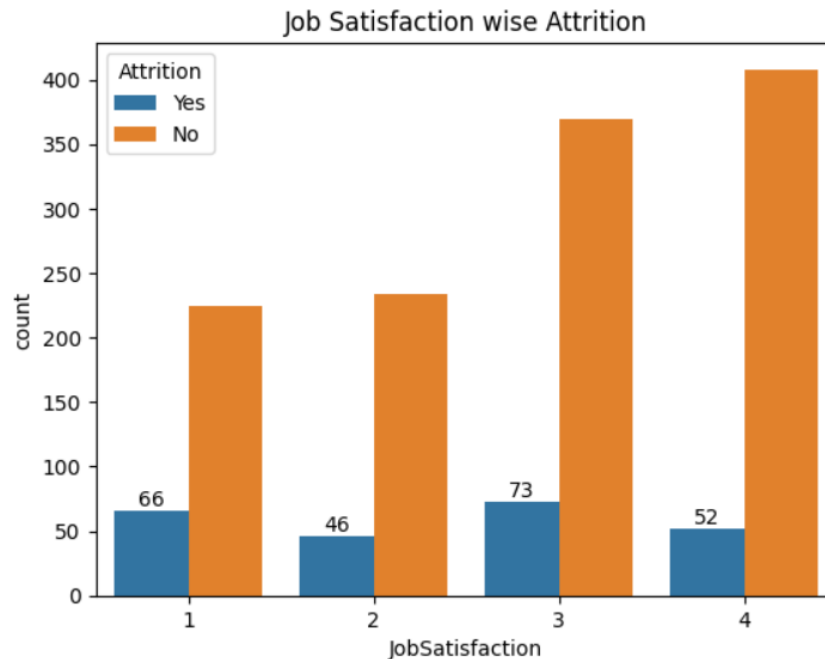**How many employees have left vs stayed?**

Out of 1473 employees, 237 has left the company.

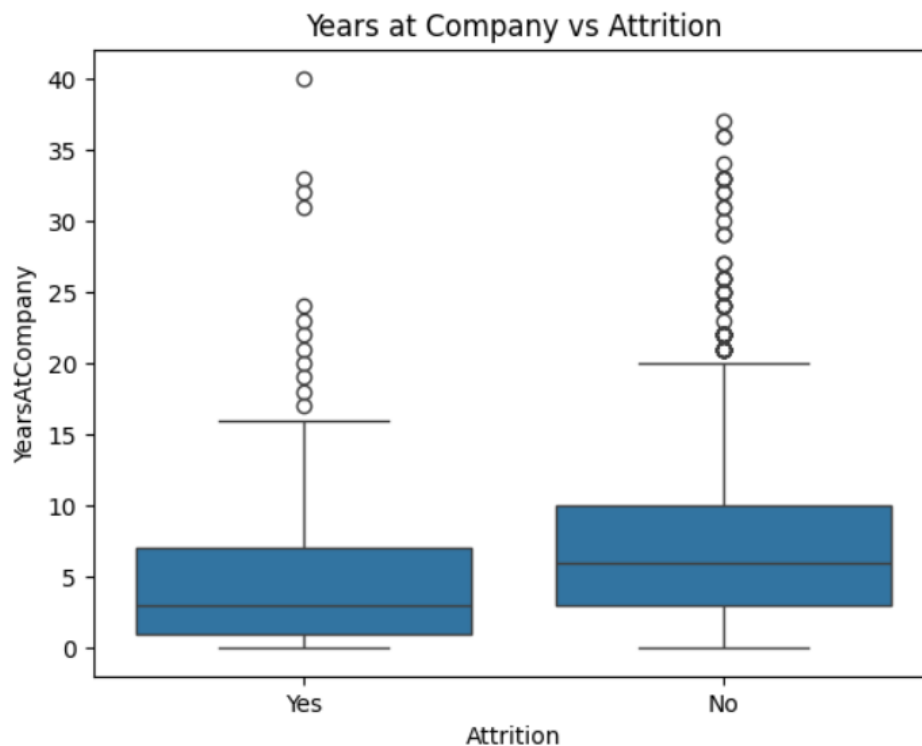- **Attrition by marital Status.**

Single employees have the highest number of attritions (120), even though they are not the largest group overall.

- **Attrition by Job Satisfaction:**
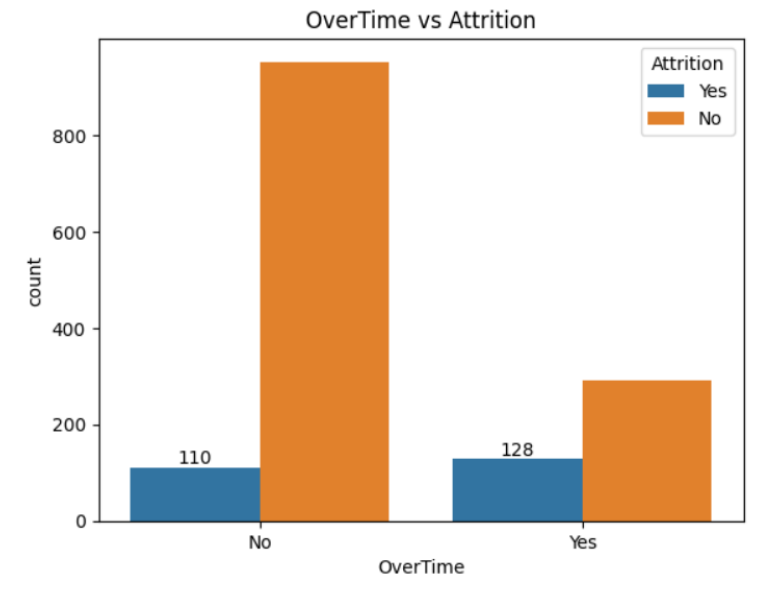

Job Satisfaction wise Attrition

Graph indicates that low job satisfaction is still a strong predictor of attrition. Highest attrition count (73) is at satisfaction level 3. 66 employees left, which is second highest in attrition count.

- **Attrition according to years of company.**
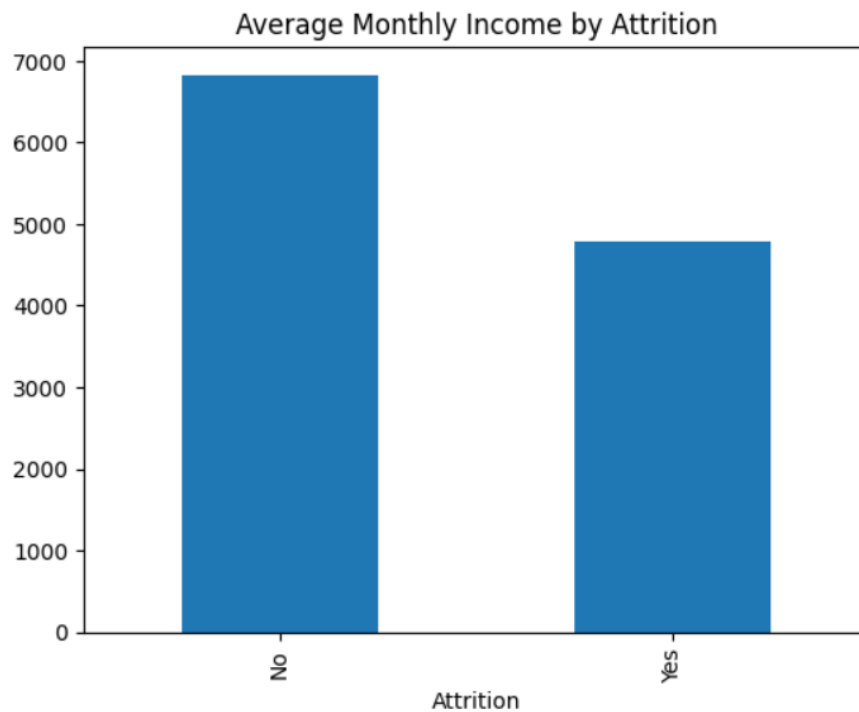

Years at Company vs Attrition

Employees who left ("Yes") had a lower median number of years at the company. Employees who stayed ("No") had a higher median tenure.
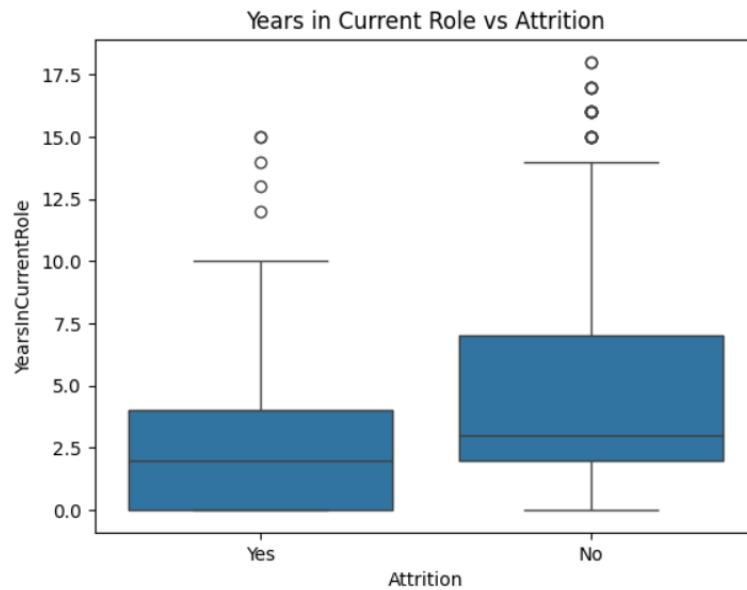
- **Impact of overtime on attrition.**

OverTime vs Attrition

Overtime strongly correlates with higher attrition.

- **Average income of leavers vs stayers.**
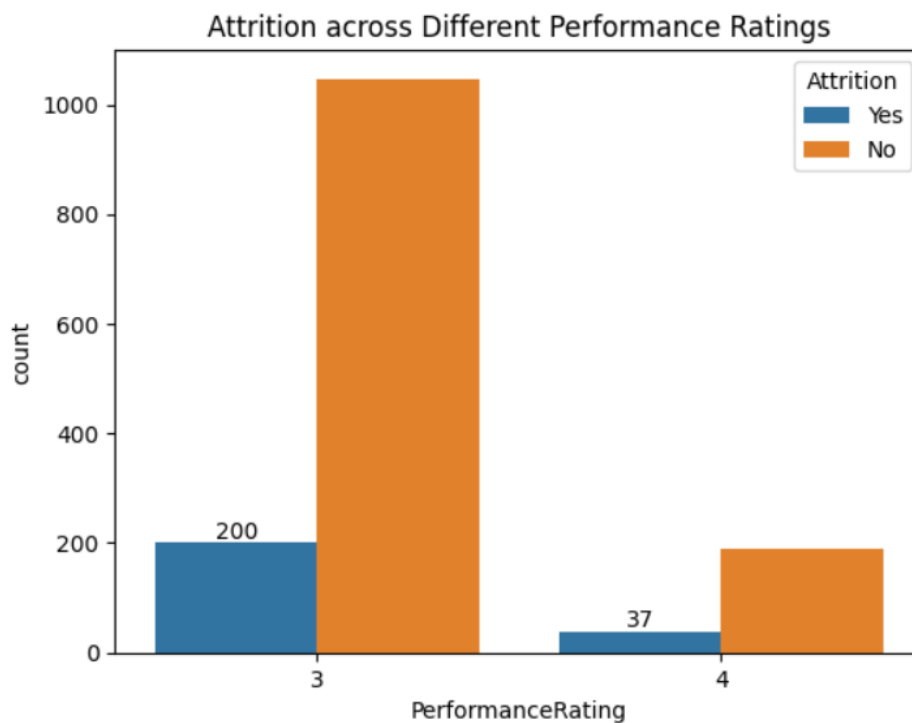

Average Monthly Income by Attrition

Employees who left the company had a lower average monthly income (~4800). Employees who stayed earned a higher average monthly income (~6800).

- **Years in current role vs attrition.**

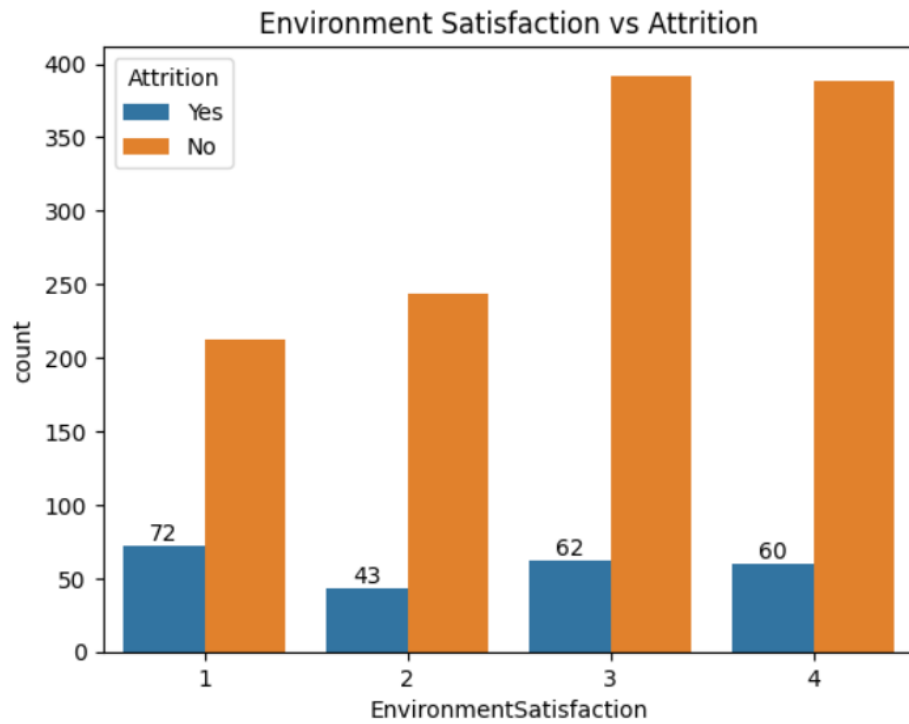Years in Current Role vs Attrition

Short Tenure in Role is Linked to Higher Attrition. Employees tend to leave early in their role, often within the first 2–3 years.

- **Performance ratings wise attrition.**

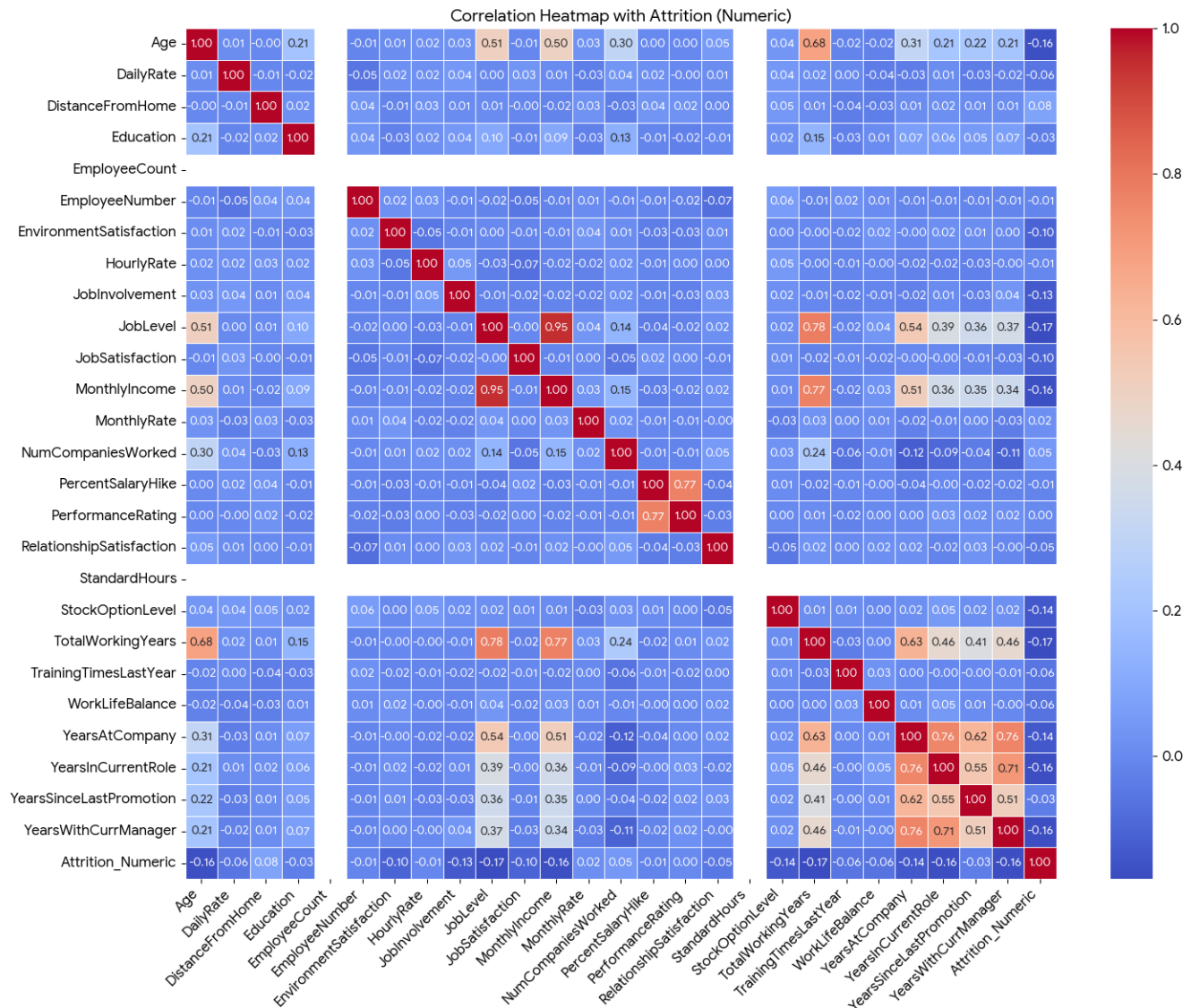
Attrition across Different Performance Ratings

Most attrition is coming from average performers.

- **Attrition according to environmental satisfaction.**

Low Environment Satisfaction is a red flag for attrition.

- **Heatmap of employee attrition & different numeric values.**

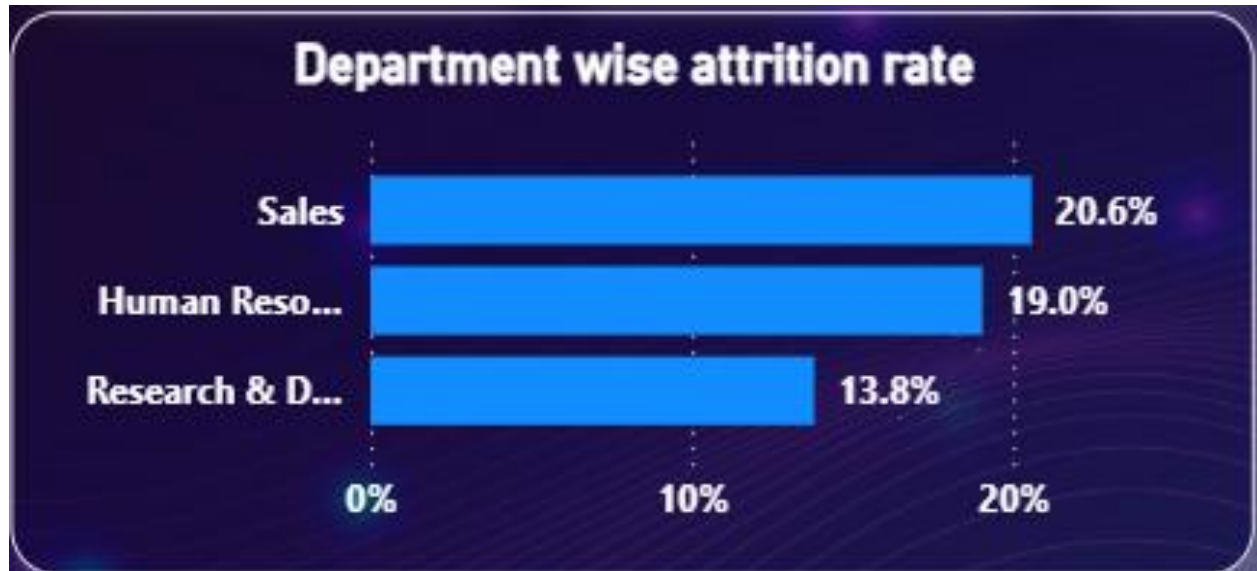Correlation Heatmap with Attrition (Numeric)

Based on the heatmap we generated, we can analyze the relationships between **Attrition_Numeric** and other numerical columns by looking at the Attrition_Numeric row or column in the matrix. The values in this row/column indicate the Pearson correlation coefficient, which ranges from -1 to +1.

- **Positive Correlation (closer to +1)**: Means that as the value of the other numerical column increases, the likelihood of attrition (being 'Yes', or 1) also tends to increase.
- **Negative Correlation (closer to -1)**: Means that as the value of the other numerical column increases, the likelihood of attrition tends to decrease.
- **Near Zero Correlation (closer to 0)**: Suggests a weak or no linear relationship between the two variables.

Microsoft Power Bi

- **Department wise attrition rate.**
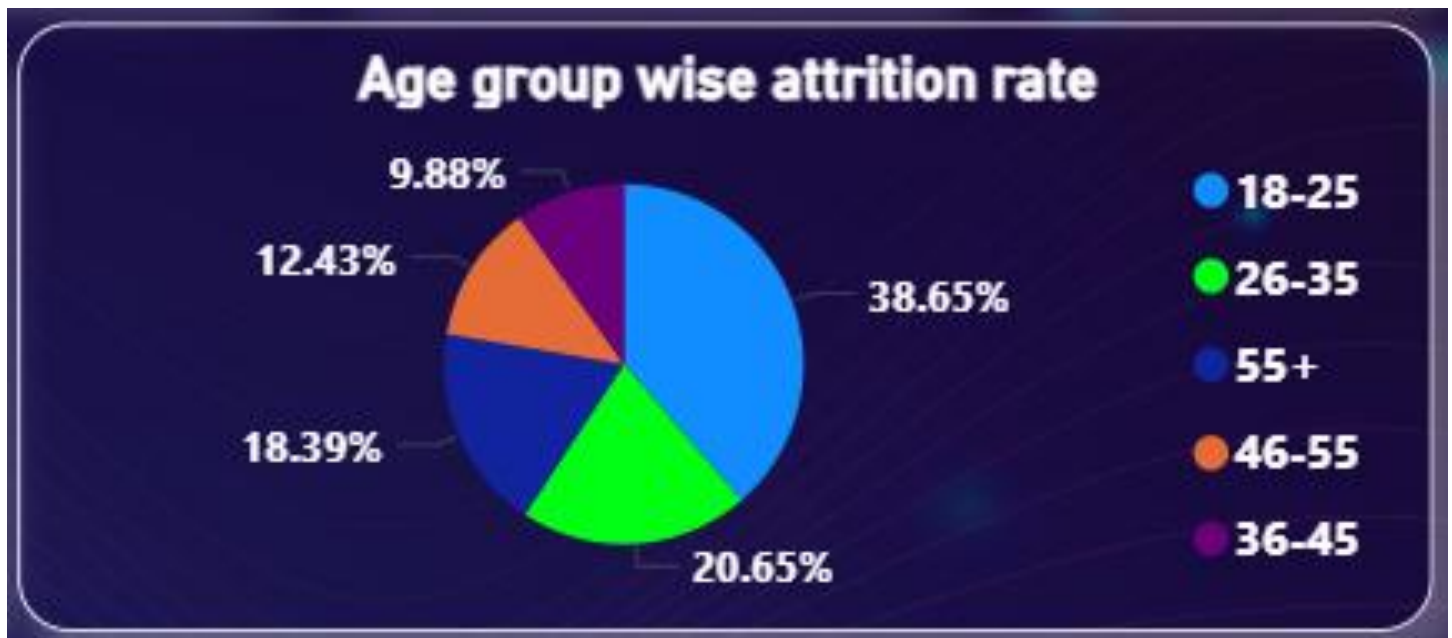

Sales Department & Human Resources Department has the highest(20.6%) and second-highest(19%) attrition rate.
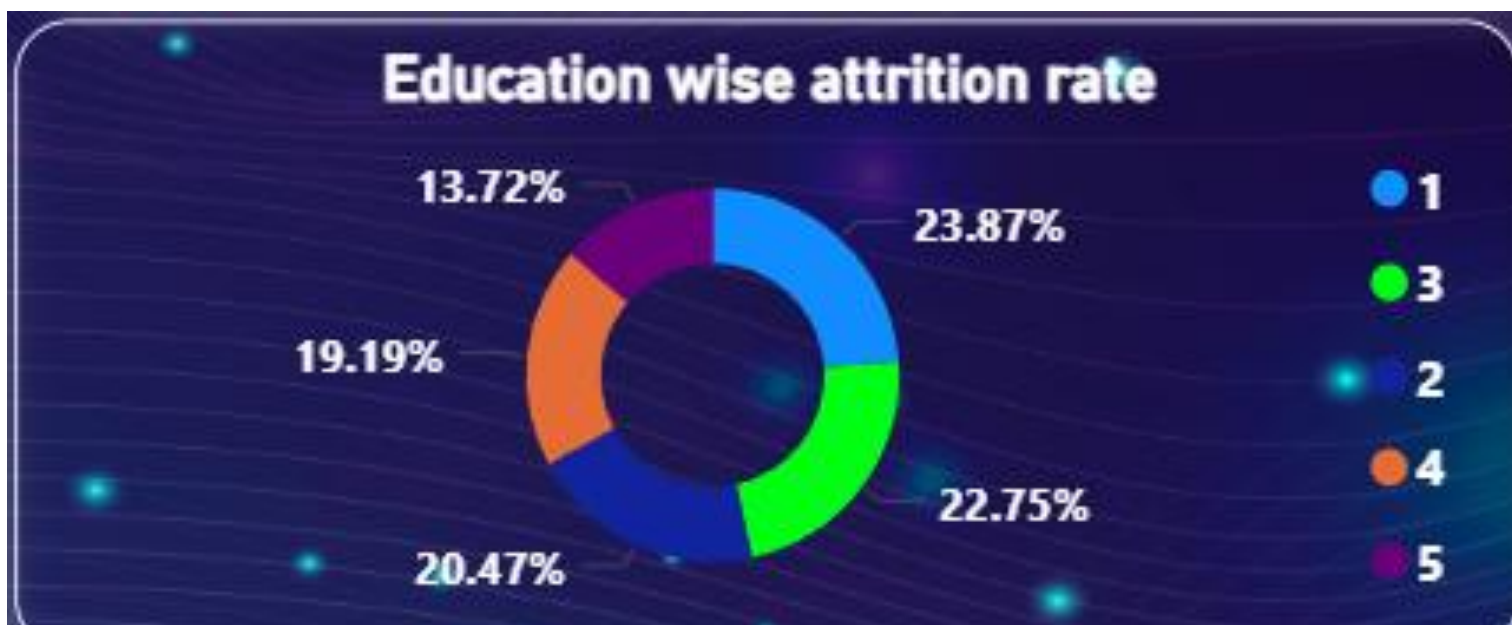
- **Jobrole wise attrition rate.**

Sales Representative (39.3%),Laboratory Technician (23.8%) and Human Resources (23.1%), these roles show high attrition rates, suggesting issues that may need addressing, such as job satisfaction, workload, or career advancement opportunities.

- **Age group wise attrition.**

Age group wise attrition rate

9.88%
12.43%
38.65%
18.39%
20.65%

- 18-25
- 26-35
- 55+
- 46-55
- 36-45
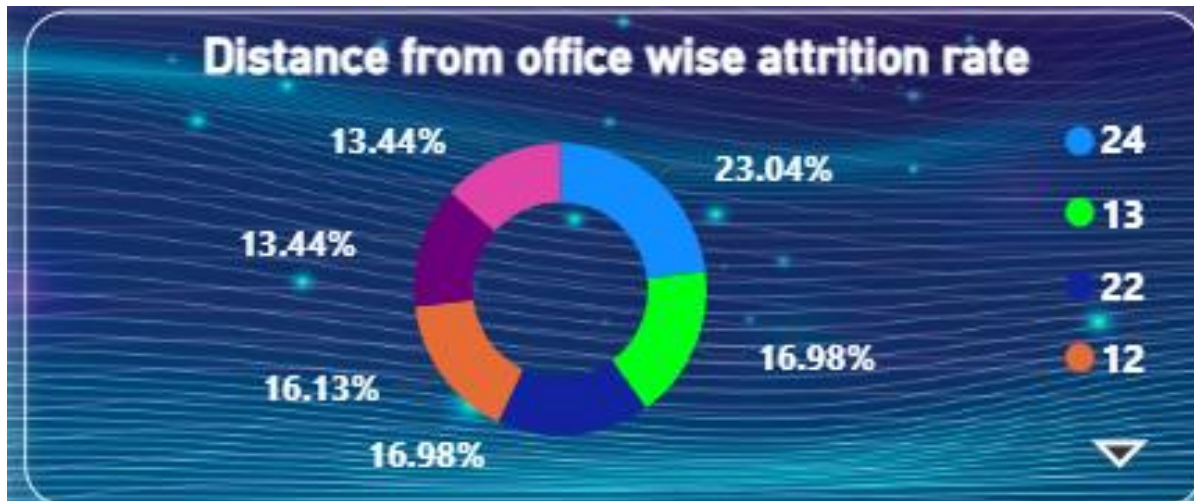
Age group of 18-25 & 26-35 shows significant attrition rates.

- **Education wise attrition rate.**

Education wise attrition rate

13.72%
23.87%
19.19%
22.75%
20.47%

- 1
- 3
- 2
- 4
- 5

Education level 1,2,3 has highest attrition rate.

- **Attrition rate due to distance from office.**

Employees, who live away from the office are tends to attrite more.

Business Recommendation

- **Target Young/Single Employees:** Design specific engagement programs and long-term incentives for younger, single employees to foster deeper workplace connection.
- **Address Low-Income Disparity:** Review and adjust compensation, as employees who left had a significantly lower average monthly income compared to those who stayed.
- **Mitigate Overtime Burden:** Implement policies to strictly manage and reduce frequent overtime, which is strongly linked to higher attrition and employee burnout.
- **Focus on Early Career Retention:** Prioritize early engagement and provide clear growth opportunities during an employee's first 1–3 years at the company and in their current role.
- **Support Average Performers:** Create mentorship programs and provide recognition or support to "average performers" (rating 3), as this group accounts for the majority of attrition.
- **Boost Low Job/Environment Satisfaction:** Invest in improving workplace conditions (environmental satisfaction) and re-engaging employees who report moderate satisfaction (level 3), as they are high-risk.
- **Develop Sales/HR Retention Plans:** Implement targeted retention and engagement strategies for the **Sales** and **Human Resources** departments, which have the highest attrition rates.

- **Invest in Low-Education Talent:** Offer tailored training, development, and career growth paths for employees with lower education levels (1, 2, and 3) to increase their perceived value.
- **Strengthen Manager Relationships:** Promote stable and consistent leadership to ensure employees build longer tenures with their current managers, which reduces turnover risk.
- **Re-evaluate At-Risk Roles:** Investigate and address issues like workload, satisfaction, or career advancement in high-attrition roles: **Sales Representatives**, **Laboratory Technicians**, and **Human Resources** roles.