**Report for Analysis of Employee Attrition of IBM**

Contents

[Abstract: 2](file:///C:\Users\SKV\Codes\Unified_Mentor\Climate_change_model\Climate.docx#_Toc208222022)

[Introduction 2](file:///C:\Users\SKV\Codes\Unified_Mentor\Climate_change_model\Climate.docx#_Toc208222023)

[Explanation of the coding. 3](file:///C:\Users\SKV\Codes\Unified_Mentor\Climate_change_model\Climate.docx#_Toc208222024)

Conclusion………………………………………………………………………………………………………………………………………**.**4

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**Abstract:**

​ This project provides a comprehensive analysis of employee attrition at IBM, leveraging a provided dataset to identify key factors influencing turnover. By using data visualization techniques, including bar charts and box plots, the analysis explores attrition rates across various demographic, departmental, and job-related variables. The main objectives were to understand current turnover rates and identify key factors such as **age, department, job role, and salary** that correlate with employees leaving the company. The findings reveal critical insights into high-risk employee segments, enabling data-driven recommendations to improve employee retention strategies.

**​Introduction:**

​ Employee attrition, or turnover, is a significant challenge for any organization, impacting productivity, morale, and financial performance. Understanding the root causes of attrition is crucial for developing effective retention strategies. This project aims to analyze a dataset of IBM employees to uncover patterns and factors associated with attrition. The analysis focuses on a range of variables, including demographic information (**gender, age**), professional attributes (**department, job role, education**), and compensation and satisfaction metrics (**monthly income, job involvement, work-life balance**). The insights derived from this analysis can help IBM's HR department proactively address issues leading to employee turnover.

**​Explanation of the Coding:**

​ The script is structured into two main objectives:

* **Understand Current Turnover Rates:** This section calculates the percentage of attrition for various categorical variables like **Gender, Department, JobRole, EducationField, and AgeGroup**. A custom helper function, plot\_attrition\_rate, is defined to streamline the process of calculating attrition rates and generating a bar plot for each variable. Ages are binned into specific groups to analyze turnover rates across different career stages.
* **Identify Key Factors Influencing Turnover:** This part of the script investigates the relationship between attrition and more nuanced factors. It uses the plot\_attrition\_rate function to visualize attrition rates based on employee satisfaction metrics like **JobInvolvement** and **WorkLifeBalance**, and compensation-related factors like **StockOptionLevel**. Furthermore, **box plots** are used to compare the distributions of continuous variables, specifically **MonthlyIncome** and **PercentSalaryHike**, between employees who stayed and those who left. This helps in visually identifying if there's a significant difference in these values for the two groups.

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**Output of the Coding:**

​The script generates several plots, each providing a visual summary of the data:

* ​**Attrition Rate by Gender:** This plot shows the percentage of attrition for male and female employees.
* ​**Attrition Rate by Department:** A bar chart illustrating attrition rates for each department, highlighting departments with the highest turnover.
* ​**Attrition Rate by Job Role:** This plot provides a detailed breakdown of attrition rates across different job roles, identifying specific roles with high turnover.
* ​**Attrition Rate by Education Field:** The plot compares attrition rates based on the employee's field of education.
* ​**Attrition Rate by Age Group:** A bar chart showing how attrition rates vary across different age ranges, revealing which age group is most susceptible to leaving.
* ​**Attrition Rate by Job Involvement & Work-Life Balance:** These plots demonstrate the correlation between employee satisfaction scores and the likelihood of attrition, showing that lower scores are generally associated with higher attrition.
* ​**Attrition Rate by Stock Option Level:** This plot examines how the presence of stock options correlates with attrition.
* ​**Monthly Income Distribution by Attrition:** A box plot comparing the range and median of monthly income for employees who left versus those who stayed. It reveals a clear difference in income levels between the two groups.
* ​**Percent Salary Hike Distribution by Attrition:** This box plot shows a similar comparison for salary hikes, indicating a potential link between lower raises and higher attrition.

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**Conclusion:**

​The analysis of the IBM HR dataset reveals several key factors that strongly correlate with employee attrition:

* ​**Job Role and Department are Critical:** The **Research & Development** department has the highest number of employees but also a noticeable attrition rate. Certain job roles, such as **Laboratory Technician** and **Sales Representative**, exhibit a significantly higher attrition rate, suggesting these roles may have unique challenges contributing to turnover.
* ​**Age and Tenure Matter:** The **younger age group (18-24)** shows the highest attrition rate. This is a common trend in many industries, as younger employees often explore different career opportunities.
* ​**Compensation is a Major Factor:** The **box plots for MonthlyIncome clearly show that employees who left the company generally had lower monthly incomes** than those who stayed. Similarly, employees who received a smaller **PercentSalaryHike** were more likely to leave, suggesting that compensation and perceived value are significant drivers of retention.
* ​**Satisfaction and Engagement are Key:** Employees with lower **JobInvolvement** and poorer **WorkLifeBalance** scores are more likely to attrite. This finding emphasizes the importance of fostering a positive work environment, providing adequate support, and ensuring a healthy work-life integration to retain employees.

​In conclusion, employee attrition at IBM is not a one-size-fits-all problem. It's influenced by a combination of factors, including **low income, lower salary hikes, and dissatisfaction with job involvement and work-life balance**. To mitigate attrition, IBM could focus on targeted retention strategies, such as reviewing compensation for high-turnover roles, providing mentorship and career development paths for younger employees, and enhancing employee engagement programs to improve job satisfaction and work-life balance.