

California State Polytechnic University, Pomona

Business Intelligence
CIS 3252
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Business Intelligence Solution Development using Data Analytics

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Sample Project Format: Enhancing Customer Retention for an E-Commerce Platform

RangeIndex: 1480 entries, 0 to 1479

Data columns (total 38 columns):

#	Column	Non-Null Count	Dtype
0	EmpID	- object	
2	AgeGroup	- object	
4	BusinessTravel	- object	
6	Department	- object	
8	Education	- int64	
10	EmployeeCount	- int64	
12	EnvironmentSatisfaction	- int64	
14	HourlyRate	- int64	
16	JobLevel	- int64	
18	JobSatisfaction	- int64	
20	MonthlyIncome	- int64	
22	MonthlyRate	- int64	
24	Over18	- object	
26	PercentSalaryHike	- int64	
28	RelationshipSatisfaction	- int64	
30	StockOptionLevel	- int64	
32	TrainingTimesLastYear	- int64	
34	YearsAtCompany	- int64	
36	YearsSinceLastPromotion	- int64	
1	Age	- int64	
3	Attrition	- object	
5	DailyRate	- int64	
7	DistanceFromHome	- int64	
9	EducationField	- object	
11	EmployeeNumber	- int64	
13	Gender	- object	
15	JobInvolvement	- int64	
17	JobRole	- object	
19	MaritalStatus	- object	
21	SalarySlab	- object	
23	NumCompaniesWorked	- int64	
25	OverTime	- object	
27	PerformanceRating	- int64	
29	StandardHours	- int64	
31	TotalWorkingYears	- int64	
33	WorkLifeBalance	- int64	
35	YearsInCurrentRole	- int64	
37	YearsWithCurrManager	- float64	

1. Executive Summary: HR Analytics for Attrition Management

The project focuses on leveraging data-driven insights to understand the factors contributing to attrition within a corporate setup. By employing data preprocessing, descriptive analytics, and data visualization techniques, we aim to unravel patterns and trends associated with employee turnover.

2. Introduction

Managing Human Resources effectively is crucial for an organization's success. This analytics project explores the issue of attrition, which is a challenging issue for managers and HR personnel. This Project aims to interpret organizational data, reveal people-related trends, and empower the HR Department. This finding will be an important step in maintaining organizational stability and profitability.

One of the most important challenges that the HR departments are facing is employee attrition. Attrition can have a significant impact on the organization, as it can lead to loss of productivity, increased training costs, and a decline in job satisfaction.

3. Methodology: Fix DataFrame for HR Analytics

Data Collection:

The project uses data from Kaggle called HR Analytics, containing data related to employee information performance metrics and historical attrition records.

Data Inspection and Cleaning:

Python, and essential libraries such as Pandas, were primarily used for data manipulation and cleaning. The cleaning procedures were implemented to ensure the integrity and accuracy of the data.

Data Analysis:

Descriptive analytics techniques were applied to unravel key insights from the dataset. The data analysis involved statistical measures, summary statistics, and visualizations to gain a better understanding of the distribution of employee attributes, performance metrics, and their correlation.

Data Visualization:

Python's Matplotlib and Seaborn libraries were great sources for creating visual representations of the analyzed data. Visualizations, such as bar charts, pie charts, and correlation metrics, were generated to highlight trends, patterns, and relationships within the dataset. These visuals helped to interpret the findings.

4. Data Preprocessing and Descriptive Analytics

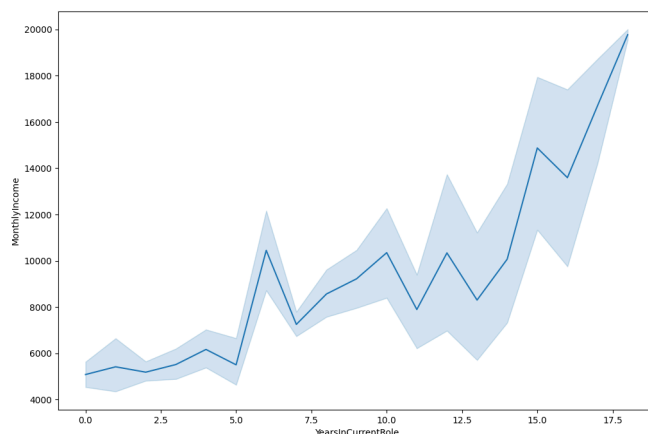
The raw data contained 1480 rows of employees and 38 columns. Since every employee had a unique employee ID there were no duplicates and all employees answered all questions in the 38 columns, therefore, there was no need to remove duplicates or handle missing values. We found that the distribution between men and women is Male: 889 and Female: 591, or 60,1% and 39.1%. The average environmental satisfaction is 2.72 / 4, and job satisfaction is 2.73 / 4 which isn't far from each other. We also found that the average monthly income is 6504.99. Finally, the attrition rate is No: 1242 vs. Yes: 238, or 83.9% and 16.1%.

5. Data Visualization

Four types of visualizations were created:

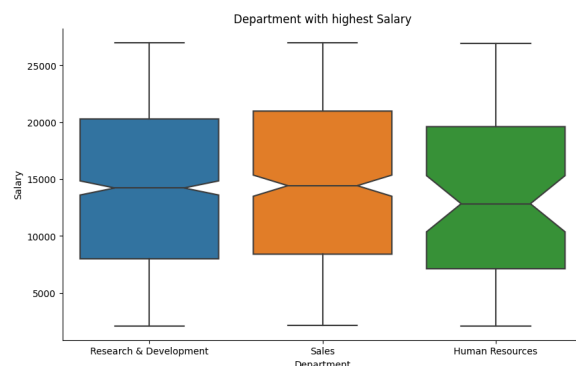
- Histograms to show employees' age distribution and Satisfaction rate
- Line graphs to illustrate monthly pay over time.
- Bar charts to represent the job role relationship between male and female.
- Boxplot to display pay relationship with department and age group.

6. Findings and Insights

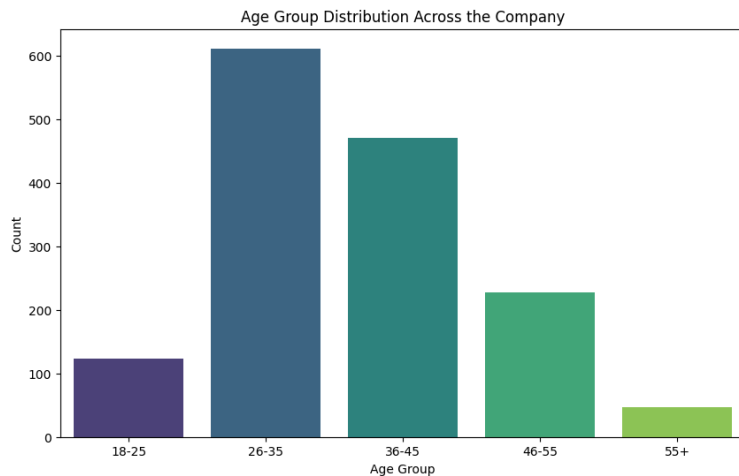


The line graph reveals a clear correlation between employee tenure and monthly income. As employees stay longer in the company, their monthly income increases consistently, demonstrating a rewarding trajectory of financial compensation. This relationship highlights how extended loyalty and service are recognized and rewarded with higher income levels.

In the box plot, the Sales Department has the highest average pay of \$14,494 among the departments. However, the Research & Development Department has a pay containing an outlier with the highest pay observed across the entire company of \$26,999. Although the Research & Development Department has the highest outlier pay, it also contains the lowest



pay in the company at \$2094. The inconsistency of pay distribution within the organization is highlighted by both departmental averages and the presence of an outlier.



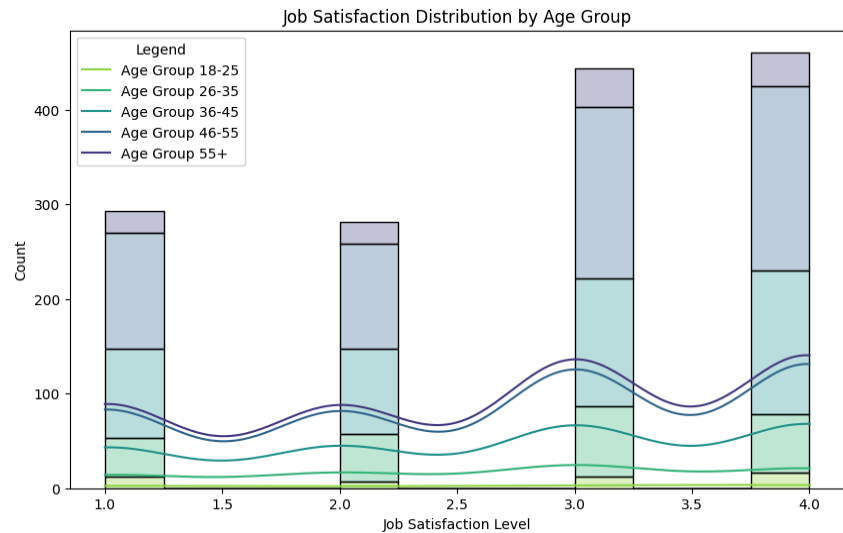
With the bar chart, we were able to find the number of employees per age group;

Age Group	Count
18-25	123
26-35	611
36-45	471
46-55	228
55+	47

It is important to know what is the majority of age group across the company before knowing how satisfied the employees are to derive a better conclusion.

Age Group	Job satisfaction score
18-25	2.731707
26-35	2.733224
36-45	2.732484
46-55	2.692982
55+	2.680851

With the histogram, we were able to find that people are in general satisfied to be in this company. However, it seems like the people in the age group between 46-55 and 55 + seem to be less happy although they have roles in the company that are higher than the other age group. This could be due to higher stress level that comes with more responsibility.



7. Recommendations

To reduce attrition, it is recommended that the company:

Attrition Mitigation Strategies:

- Implement targeted retention programs, especially for employees in the age group 46-55 +, as they rated the lowest satisfaction score indicating potential reason why people are leaving.
- Conduct exit interviews for employees leaving the company to gather insights into specific reasons for attrition and identify areas for improvement.

Professional Development Opportunities:

- Design and promote professional development programs tailored to the specific needs and expectations of employees in the age group 18-25 since they have the lowest job level. This could include mentorship programs, skill-building workshops, or career advancement initiatives.

Company-Wide Communication:

- Strengthen internal communication channels to keep employees informed about organizational changes, development opportunities, and company achievements. Improved communication can foster a sense of belonging and engagement.

Diversity and Inclusion Initiatives:

- Promote diversity and inclusion within the company to create an inclusive work environment. This may involve targeted initiatives to address potential disparities in opportunities or experiences across different demographic groups.

Continuous Monitoring and Adaptation:

- Establish regular data monitoring processes to track employee satisfaction, identify trends, and adapt strategies accordingly. Continuous assessment will enable the company to stay responsive to changing workforce dynamics.

8. Conclusion

The project findings revealed that several factors can contribute to employee turnover, including:

- **Job dissatisfaction** can be due to Unfair pay or benefits, poor working conditions, and lack of opportunities for advancement.
- **Lack of career development:** Employees who feel that they are not being given opportunities to develop their careers are more likely to leave their organization.

The project findings also revealed that there are several things that organizations can do to reduce employee turnover, including:

- **Ensuring fair pay and benefits:** Employees who are satisfied with their pay and benefits are likely to stay in their organization.
- **Providing opportunities for career development:** Employees who are given opportunities to develop their careers are more likely to stay with their organization.

Organizations can reduce turnover rates and improve bottom lines by identifying and addressing these factors that contribute to employee turnover.

9. References

- <https://www.kaggle.com/code/pankajsharma127/hr-analytics>