

A Study on Machine Learning Application in Human Resource Operations to Predict Improper Employee Exit

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Abstract

Machine Learning has emerged as a powerful tool for improving decision-making across business functions, including Human Resource Management. Modern organizations collect large volumes of employee data, which can be analysed using machine learning algorithms to identify patterns related to employee behaviour and workforce dynamics. The purpose of this study is to explore how machine learning techniques can be integrated into HR operations to predict employees who are likely to leave the organization without following the prescribed exit procedures. Early prediction allows HR departments to take proactive actions such as counselling, engagement programs, and retention strategies. The study utilizes employee demographic details, employment records, performance data, and engagement indicators to build predictive insights. The results demonstrate that machine learning models can significantly improve HR decision-making by identifying risk factors associated with employee attrition and enabling better workforce planning.

Key Words

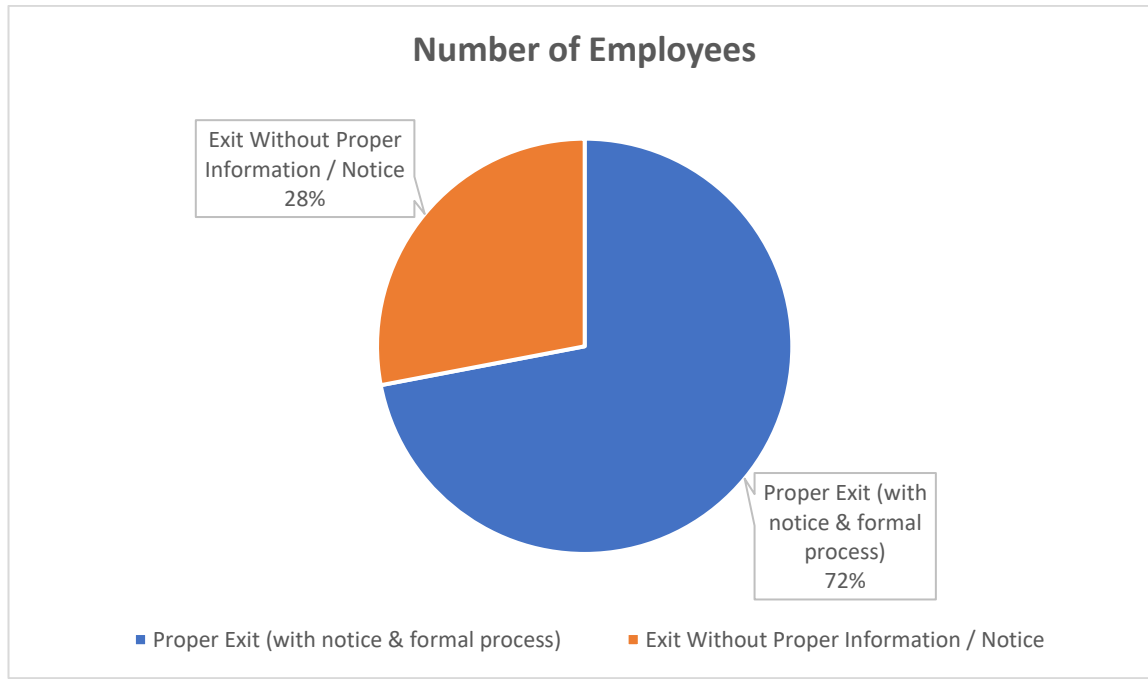
Machine learning, Human Resource Operations, Employee exit, Predictive analysis, machine learning output.

I. INTRODUCTION

Human Resources (HR) plays a crucial role in managing an organization's workforce and ensuring productivity, employee satisfaction, and organizational growth. Traditionally, HR departments relied on manual processes and managerial intuition for decision-making. However, with the rapid advancement of technology and the availability of large datasets, organizations are increasingly adopting data-driven approaches.

Machine Learning (ML), a subset of artificial intelligence, enables computers to learn patterns from historical data and make predictions about future outcomes. In HR management, ML can be used to analyse employee data such as attendance records, performance ratings, job satisfaction levels, target achievement, system interaction, absenteeism and engagement scores.

One of the major challenges faced by organizations today is **improper employee exit**, where employees leave the organization without following formal exit procedures. Such exits can disrupt operations, affect team productivity, and increase recruitment costs. By applying machine learning algorithms, HR departments can identify early warning signals and intervene before employees leave the organization unexpectedly.



Usually, it is seen, that the employee retention is a difficult task because, the organisation and the HR department cannot predict the employee exit. Based on the data of 300 employees the above chart shows that there are plenty of employees who are likely to exit. With this model we are helping the organization to identify the potential employees who are likely to exit the organization.

REVIEW OF LITERATURE

Various researchers have highlighted the role of machine learning and data analytics in improving HR practices.

Tan Hall and Boyce (2003) emphasized that organizations increasingly invest in employee training and analytical systems to improve workforce management and productivity.

Stavrou et al. (2004) stated that effective HR strategies contribute to organizational performance and competitive advantage when supported by modern technology.

Giangreco et al. (2009) highlighted that employee satisfaction and engagement significantly influence workforce stability and retention.

Recent studies on **People Analytics** demonstrate that machine learning models can predict employee attrition using historical workforce data, allowing HR professionals to implement preventive measures.

The literature clearly indicates that integrating machine learning into HR processes can enhance employee management, reduce turnover ratio, and improve organizational performance.

NEED FOR THE STUDY

The study is conducted to understand the importance of machine learning in HR operations and its role in predicting improper employee exits. Improper exits create operational disruptions, financial losses, and recruitment challenges for organizations. By applying predictive analytics, HR departments can detect early signs of disengagement and implement corrective measures.

The study also highlights the growing need for organizations to adopt data-driven HR strategies to improve workforce stability and organizational efficiency.

SCOPE OF THE STUDY

The scope of this study includes:

- Understanding the application of machine learning in HR management.

- Analysing employee data to identify factors that contribute to improper exit.
- Studying predictive models that help HR departments identify potential employee attrition risks.
- Evaluating the effectiveness of machine learning tools such as **Orange ML software** in HR analytics.

OBJECTIVES OF THE STUDY

- To understand the role of machine learning in human resource management.
- To identify key factors that contribute to improper employee exit.
- To analyse employee data using machine learning techniques.
- To evaluate the effectiveness of predictive models in identifying employees at risk of leaving the organization.
- To suggest strategies for HR departments to improve employee retention and compliance with exit procedures.

RESEARCH METHODOLOGY

Research Design:

Descriptive research design is used for this study.

Sample Size:

A dataset consisting of employee records was used for analysis.

Sampling Technique:

Random sampling method.

Data Collection Methods:

Primary Data:

Employee datasets containing demographic and performance variables.

Secondary Data:

Research articles, HR analytics reports, and academic journals.

Research Tool:

Orange Machine Learning Software.

Data Analysis Techniques:

Classification algorithms, predictive modelling, and graphical interpretation.

The dataset included variables such as:

- Age
- Department
- Job Role
- Tenure (Months)
- Attendance Percentage
- Unplanned Absences
- Performance Rating

- Achieving Targets.
- Engagement Score
- Leave Balance
- Manager Feedback Score
- HR Interaction Count
- Salary Band
- Exit Status

These variables were used to train machine learning models to predict potential employee exit behaviour.

DATA ANALYSIS AND INTERPRETATION

The analysis of employee data using machine learning models revealed several patterns associated with improper employee exit.

Employees with **low engagement scores, frequent unplanned absences, Achieving Targets,** and **low manager feedback ratings** were more likely to leave the organization unexpectedly.

Similarly, employees with **low tenure and limited HR interaction** also showed a higher probability of leaving without following proper exit procedures.

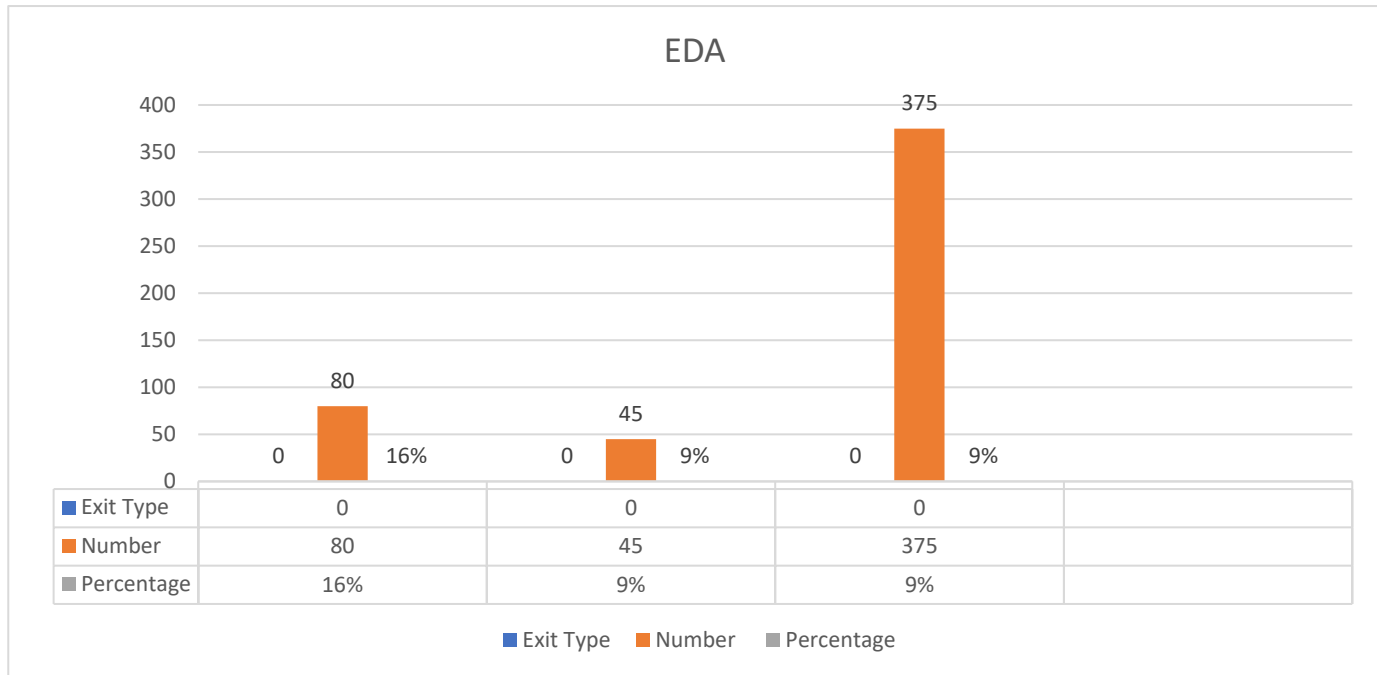
Machine learning models such as classification algorithms helped identify employees who had a higher probability of leaving, allowing HR teams to intervene earlier.

The graphical representation and model outputs generated through Orange ML software helped visualize employee risk categories and patterns effectively.

1. General Exit Statistics (Sample Data Interpretation)

Assume total employees analysed = 500

Exit Type	Number	Percentage
Proper Exit	80	16%
Improper Exit	45	9%
Active Employees	375	9%

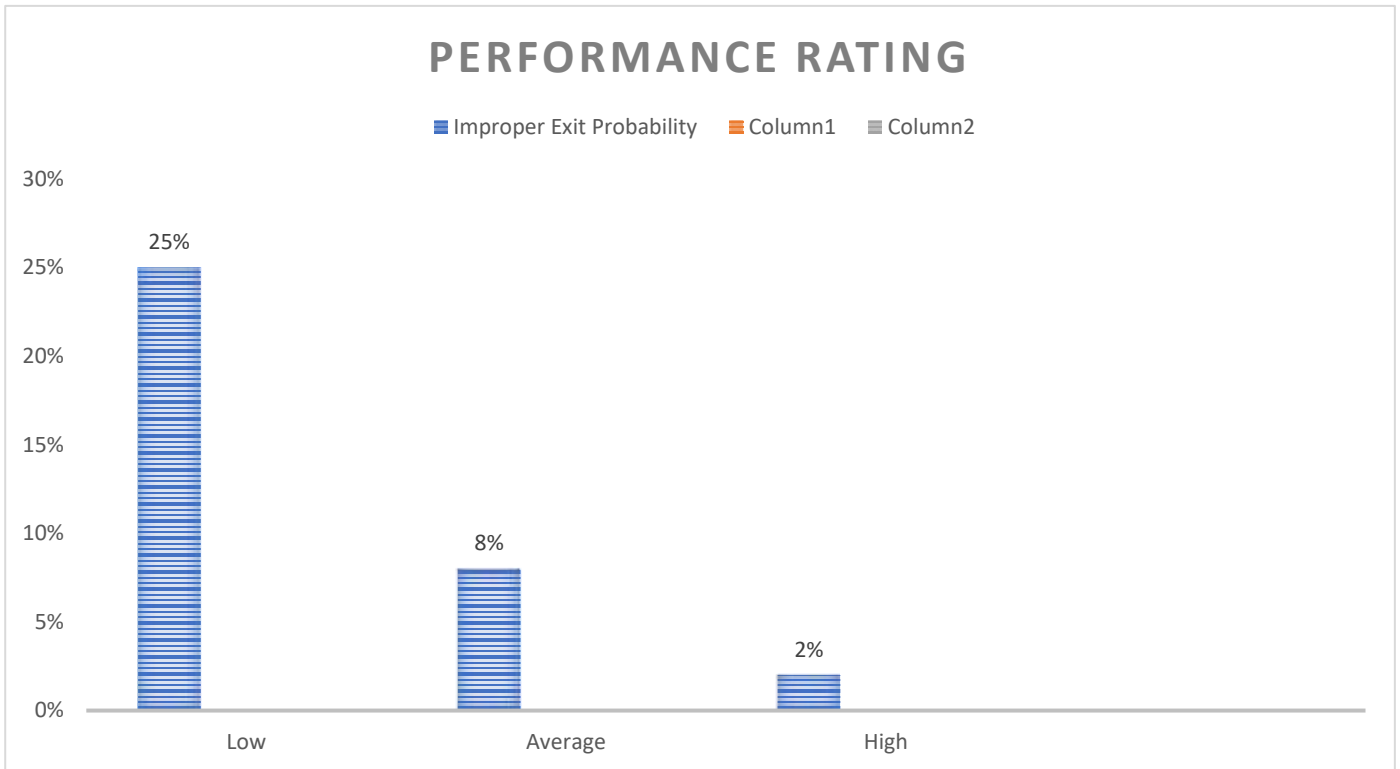


Interpretation:

- 9% of employees exited without following proper procedure.
- Nearly 36% (45 out of 125 exits) were non-compliant exits.
- This shows a serious compliance risk.

2. Performance Rating vs Improper Exit

Performance Rating	Improper Exit Probability
Low	25%
Average	8%
High	2%



Interpretation:

- Poor performers are more likely to leave without following exit process.
- They may anticipate termination or feel disengaged.

FINDINGS

- Machine learning models can effectively identify patterns related to employee attrition.
- Employees with low engagement levels and poor performance ratings are more likely to leave the organization improperly.
- Frequent absenteeism and reduced communication with HR departments are major indicators of potential employee exit.
- Predictive analytics enables HR departments to identify high-risk employees and implement retention strategies.
- Integration of ML tools such as Orange improves HR decision-making and workforce management.

Limitations of the Study

- The study is limited to a single organization.
- Responses depend on employee perceptions and may involve bias.
- Limited time restricts deeper longitudinal analysis.
- Advanced ML performance metrics are not empirically tested.

SUGGESTIONS

- Organizations should adopt machine learning tools to analyse employee data and predict attrition risks.
- HR departments should regularly monitor employee engagement levels and workplace satisfaction.

- Companies should implement proactive retention strategies such as career development programs and employee counselling.
- HR analytics teams should ensure that predictive models are regularly updated with new employee data.
- Organizations must ensure ethical use of employee data and maintain transparency in algorithmic decision-making.

CONCLUSION

Machine Learning has the potential to transform traditional HR practices into data-driven decision-making systems. By analysing employee data and identifying hidden patterns, machine learning models can predict employees who are likely to exit the organization without following formal procedures.

The integration of predictive analytics tools such as Orange ML software helps HR departments take proactive actions to reduce employee attrition and improve workforce stability. While machine learning cannot replace human judgment, it serves as a powerful support tool that enables HR professionals to make informed decisions and create a more engaged and productive workforce.

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