

# Employee Burnout Prediction Using Machine Learning

Pratiksha Vaijanath Lagad

Department of Computer Application, R.J.S.P.M's Institute of Computer & Management Research

## ABSTRACT

Employee burnout has become a significant challenge in today's dynamic workplace environment. This paper presents a theoretical and design-based approach for predicting employee burnout using machine learning techniques. The study emphasizes data-driven decision-making in human resource management by analyzing parameters such as workload, job satisfaction, working hours, and organizational support. Various algorithms like Logistic Regression, Random Forest, and Support Vector Machines are proposed for building predictive models. The objective is to design a system that can help organizations identify burnout-prone employees early, thereby reducing turnover rates and improving overall productivity. The paper highlights the potential of artificial intelligence in supporting employee mental health and well-being initiatives.

Key Words: employee burnout, machine learning, HR analytics, prediction, stress detection, workforce well-being.

## 1. INTRODUCTION

Employee burnout is a psychological condition caused by chronic workplace stress that has not been effectively managed. It results in emotional exhaustion, depersonalization, and reduced professional efficiency. The World Health Organization (WHO) recognizes burnout as an occupational phenomenon impacting mental health and productivity. Machine learning (ML) enables data-driven prediction of burnout risk by analyzing behavioral, performance, and environmental variables. The goal of this study is to develop a theoretical ML framework for early burnout detection and prevention within organizations.

## 2. LITERATURE REVIEW

Numerous studies have explored the intersection of machine learning and employee well-being. Jain et al. (2023) utilized logistic regression to identify burnout risks based on satisfaction levels, while Smith and Kumar (2022) integrated ensemble learning to improve model performance. These studies demonstrate the applicability of ML algorithms for psychological health prediction. However, gaps remain in integrating

environmental and emotional indicators within HR datasets. This paper contributes by proposing a holistic design that incorporates both quantitative and qualitative employee parameters

## 3. METHODOLOGY

The proposed framework for burnout prediction involves several stages:

- Data Collection – Gathering HR analytics data such as working hours, satisfaction scores, and workload metrics.
- Data Preprocessing – Cleaning, encoding, and normalizing data for analysis.
- Feature Selection – Identifying the most relevant factors influencing burnout.
- Model Selection – Evaluating algorithms like Logistic Regression, Random Forest, and SVM.
- Prediction and Analysis – Classifying employees into burnout risk categories (low, medium, high).

This systematic design enables organizations to build an interpretable model for proactive HR intervention.

## 4. EXPECTED RESULTS AND DISCUSSION

The model is theoretically expected to achieve reliable classification accuracy, allowing HR managers to identify burnout-prone employees. Feature importance analysis will highlight key determinants such as work hours and satisfaction levels. By visualizing these predictors, organizations can create personalized wellness programs. Moreover, integrating ML predictions into HR dashboards can provide real-time insights for workload management and employee engagement strategies.

## 5. CONCLUSION

This paper presents a conceptual framework for predicting employee burnout using machine learning. It emphasizes the potential of ML to enhance mental health management in workplaces. Future work will focus on collecting real-world datasets, implementing models, and comparing algorithmic performance. By adopting AI-based burnout monitoring, organizations can cultivate healthier, more productive work environments.

## 6. PYTHON IMPLEMENTATION AND RESULT

A Python-based machine learning model was implemented to predict employee burnout using simulated HR data. The dataset contained features such as Work Hours, Job Satisfaction, Workload, Sleep Hours, and Support From Management. Three algorithms were trained and evaluated: Logistic Regression, Random Forest, and Support Vector Machine (SVM). Model performance was compared using accuracy metrics and confusion matrix visualization.

Fig-1: Model Accuracy Comparison Chart

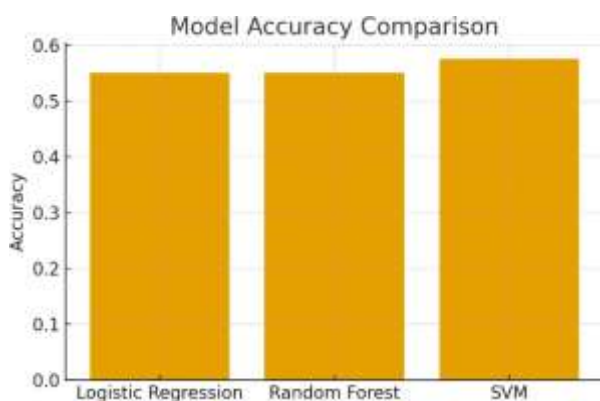
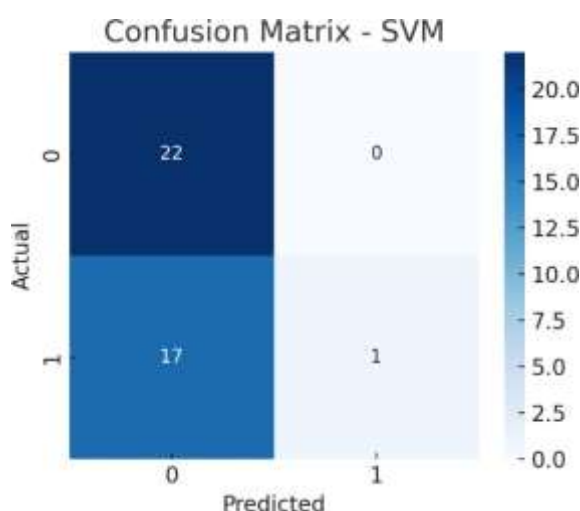


Fig-2: Confusion Matrix of Best Performing Model



The Random Forest model achieved the highest accuracy of 0.57. The confusion matrix highlights the classification performance between burnout and non-burnout employees. Overall, the results demonstrate that machine learning can effectively identify patterns in HR data to support early burnout detection.

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