



# **Machine Learning based Employee Attrition Prediction and Layoff Prediction System**

## **IEEE BASE PAPER TITLE:**

### **Analyzing Employee Retention Factors using Machine Learning**

## **IEEE BASE PAPER ABSTRACT:**

This research proposal aims to employ machine learning techniques to analyze employee retention factors in Software Companies, recognizing its crucial role in organizational success and the potential costs of high turnover rates. Through Watson Analytics' advanced analytics capabilities, the study seeks to identify key factors contributing to employee attrition and retention, culminating in the development of a predictive model using machine learning algorithms. The outcomes are expected to include actionable recommendations to improve retention strategies, insights into the relative importance of different factors, and the creation of a data-driven, proactive talent management approach for Software Companies. By empowering organizations to retain top talent and fostering a positive work environment, this research envisions a transformative impact on long-term success and performance.

## **OUR PROPOSED ABSTRACT:**

Employee attrition refers to the gradual reduction of a company's workforce due to employees leaving voluntarily, such as through resignation or retirement, without immediate replacement. It can impact organizational knowledge, morale, and productivity if not properly managed. Layoffs, on the other hand, are involuntary separations initiated by the employer, often due to economic downturns, restructuring, or cost-cutting measures. Both attrition and layoffs pose significant challenges to human resource management, necessitating proactive strategies to predict and mitigate their effects.

In this project we propose a new unique concept of integrating both Employee attrition and Employee layoff. The project titled "Machine Learning-based Employee Attrition Prediction and Layoff Prediction System" aims to leverage advanced machine learning techniques to accurately predict employee attrition and potential layoffs within organizations. Developed using Python for the backend and incorporating HTML, CSS, and JavaScript for the frontend, this system utilizes the Flask web framework to ensure seamless integration and deployment. The primary goal of this project is to provide organizations with valuable insights to preemptively address employee turnover and layoffs, thereby enhancing workforce management and strategic planning.

For predicting employee attrition, we employed two distinct machine learning models. The first model, the Random Forest Classifier, achieved a perfect training accuracy of 100% and an impressive testing accuracy of 98%. The second model, the Bagging Classifier, attained a training accuracy of 99% and a testing accuracy of 95%. The dataset used for this task consists of 1,470 records, encompassing a diverse range of 35 features. These features enable the models to capture various



aspects influencing employee attrition, providing a comprehensive prediction framework.

In addition to attrition prediction, the system also focuses on predicting employee layoffs using two different machine learning models. The Gradient Boosting Regressor model achieved a Training Set Mean Absolute Error (MAE) of 0.2197 and a Testing Set MAE of 1.5444. Similarly, the Random Forest Regressor model achieved a Training Set MAE of 0.5434 and a Testing Set MAE of 1.4992. The dataset utilized for layoff prediction comprises 3,612 records with 9 features. These features provide a robust foundation for understanding and predicting layoff trends across different organizational contexts.

Overall, the "Machine Learning-based Employee Attrition Prediction and Layoff Prediction System" serves as a powerful tool for organizations, enabling them to anticipate and mitigate potential workforce challenges. By integrating accurate predictive models and comprehensive datasets, this system aids in strategic decision-making, ultimately fostering better management of human resources and contributing to organizational stability and growth.

## **SYSTEM REQUIREMENTS:**

### **HARDWARE REQUIREMENTS:**

- System : Pentium i3 Processor.
- Hard Disk : 500 GB.
- Monitor : 15'' LED.
- Input Devices : Keyboard, Mouse.
- Ram : 8 GB.



## **SOFTWARE REQUIREMENTS:**

- Operating System : Windows 10 / 11.
- Coding Language : Python 3.12.0.
- Web Framework : Flask.
- Frontend : HTML, CSS, JavaScript.

## **REFERENCE:**

Moshiur Rahman; Md Rashedul Islam; Partho Bala; Abdus Sattar, “Analyzing Employee Retention Factors using Machine Learning”, IEEE CONFERENCE, 2024. DOI: 10.1109/ICAECT60202.2024.10469009