MES COLLEGE OF ENGINEERING-KUTTIPPURAM
DEPARTMENT OF COMPUTER APPLICATIONS
20MCA246 – MAIN PROJECT

## PRO FORMA FOR THE APPROVAL OF THE FINAL SEMESTER PROJECT

*(Note: All entries of the pro forma of approval should be filled up with appropriate and complete information. Incomplete Pro forma of approval in any respect will be rejected.)*

Project Proposal Number : _____
*(Filled by the Department)*

E-Mail : _____
Mobile No. : _____

Academic Year : _____
Year of Admission : _____
Admission Number : _____
Roll Number : _____
Register Number : _____

1. Name of the Student (in BLOCK LETTERS) : SHAMILA VA
2. Name of the Organization : _____
3. Address of the Organization : _____
   Telephone No. : _____ Company E-Mail : _____
4. Name of the External Guide : _____
   Mobile No. : _____ E-Mail : _____
5. Title of the Project : _____
6. Name of the Guide (Internal-Departmet) : _____

Date : Signature of the Student:

**Comments of The Project Guide**

Initial Submission :
Approval Status : Approved / Not Approved Dated Signature of Guide HOD
First Review :
Second Review :
Third Review :

**Comments of The Project Coordinator**

Initial Submission:
First Review : Second Review: Third Review:

Dated Signature of Project Coordinator:

ABSTRACT

# PREDICTING EMPLOYEE TURNOVER:A SYSTEMATIC MACHINE LEARNING APPROACH FOR RESORCE CONVERSATION AND WORKFORCE STABILITY

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## Introduction:

Employee turnover is a significant challenge for organizations, impacting workforce stability and increasing resource costs. Attrition arises due to diverse factors such as retirement, relocation, or career advancement. High turnover rates necessitate effective prediction methods to mitigate negative consequences and optimize workforce management. This project employs systematic machine learning techniques to forecast employee turnover, leveraging open-source datasets and models like Logistic Regression, Random Forest, and XGBoost. By identifying key attrition factors, the study aims to provide actionable insights for retaining talent and ensuring organizational stability.

## Objectives:

The primary objective of this study is to develop and evaluate machine learning models to accurately predict employee turnover. This involves:

1. **Comparative Analysis**: Utilizing and comparing various supervised machine learning algorithms such as Logistic Regression, Random Forest, XGBoost, and others to identify the most effective model for predicting attrition.
2. **Feature Identification**: Analyzing key factors influencing employee turnover to provide actionable insights for organizations.
3. **Optimization**: Assisting organizations in minimizing turnover-related costs by forecasting attrition risks and enabling proactive interventions.
4. **Resource Conservation**: Supporting HR teams in maintaining workforce stability and reducing the frequency of hiring and training processes.
   Let me know if you need further refinements!

## Motivation or Relevance:

1. **Resource Conservation**: Employee turnover leads to significant financial and operational losses due to recruitment, onboarding, and training processes. Predicting turnover can help organizations save resources by retaining key employees.
2. **Workforce Stability**: Maintaining a stable workforce is crucial for organizational growth and performance. Identifying employees at risk of leaving enables timely interventions to ensure stability.
3. **Data-Driven Decisions**: Leveraging machine learning models allows organizations to transition from reactive to proactive strategies, using data to make informed HR decisions.
4. **Talent Retention**: Understanding factors influencing employee attrition can help create better workplace policies, enhancing employee satisfaction and retention.
5. **Technological Advancement**: The integration of machine learning in HR processes showcases the potential of AI-driven solutions in solving complex business challenges.
6. **Global Relevance**: With increasing globalization and workforce mobility, organizations worldwide face turnover issues. Developing predictive models addresses a universally relevant concern.

## Problem Definition:

Employee turnover poses a significant challenge to organizations, leading to financial losses, decreased productivity, and disruptions in workforce stability. Attrition occurs due to various factors such as career advancement opportunities, job dissatisfaction, and external economic conditions.

Traditional methods of addressing turnover are often reactive, relying on post-event analysis and lacking the ability to foresee and mitigate potential risks. This inability to predict employee turnover in advance creates challenges for HR departments in retaining talent, optimizing resource allocation, and ensuring organizational efficiency.
The problem lies in developing a systematic and reliable approach that utilizes machine learning models to accurately predict employee turnover, identify key influencing factors, and provide actionable insights for reducing attrition rates. This approach must balance predictive accuracy with practical applicability to support data-driven decision-making in human resource management.

Basic functionalities:

1. **Data Collection**: Gathering relevant employee data, including demographics, performance, satisfaction levels, and organizational factors, from reliable sources like HR databases or open datasets.
2. **Data Preprocessing**: Cleaning and preparing the dataset by handling missing values, encoding categorical data, and normalizing numerical features to make it suitable for machine learning models.
3. **Feature Analysis**: Identifying the key factors influencing employee turnover, such as job role, salary, work environment, and promotions.
4. **Model Selection**: Employing supervised machine learning algorithms such as Logistic Regression, Random Forest, XGBoost, or Support Vector Machines (SVM) to build predictive models.
5. **Training and Testing**: Splitting the dataset into training and testing subsets to train the model and evaluate its performance using metrics like accuracy, precision, recall, and F1-score.
6. **Prediction**: Using the trained model to predict whether an employee is likely to stay or leave the organization based on their profile and organizational factors.
7. **Actionable Insights**: Providing HR teams with insights into high-risk employees and key turnover factors to develop proactive retention strategies.
   This system allows organizations to make data-driven decisions, improve workforce stability, and reduce the costs associated with employee turnover.

Tools / Platform, Hardware and Software Requirements:

Operating System :Windows 10/11
Programming Language: Python
Frameworks: Machine learning
Database: MySQL
Version Control: Git or GitHub for collaborative development and code management.