

Project Initialization and Planning Phase

Date	20 March 2024
Team ID	Advait Mahesh Shinde
Project Title	Human Resource Management: Predicting Employee Promotions Using Machine Learning
Maximum Marks	3 Marks

Project Proposal (Proposed Solution) template

Employee promotions play a vital role in career development and organizational growth. However, traditional promotion methods often involve subjective judgments, leading to potential biases and inefficiencies. This project aims to develop a machine learning model to predict employee promotions, ensuring a more objective, fair, and data-driven process.

Project Overview	
Objective	To create and implement a machine learning model that accurately predicts employee promotions, enhancing the fairness, transparency, and efficiency of the promotion process within the organization.
Scope	<ol style="list-style-type: none"> 1. Define the boundaries and extent of the project 2. Collect and preprocess historical employee data 3. Develop and validate machine learning models 4. Integrate the chosen model into the HR management system 5. Create tools for HR managers to utilize the predictions 6. Provide training and documentation for the new system
Problem Statement	
Description	The current employee promotion process relies heavily on subjective assessments, leading to potential biases and inefficiencies. This can result in unfair promotions, reduced employee morale, and higher turnover rates.
Impact	<ol style="list-style-type: none"> 1. Increase the fairness and transparency of the promotion process. 2. Enhance employee satisfaction and trust in the promotion system. 3. Improve retention rates by recognizing and promoting deserving employees. 4. Optimize the use of HR resources by streamlining the promotion decision-making process.

Proposed Solution	
Approach	<ol style="list-style-type: none"> 1. Data Collection: Gather historical employee data, including demographics, work experience, performance evaluations, education, and past promotions. 2. Data Preprocessing: Clean and preprocess the data to handle missing values, outliers, and categorical variables. Normalize and standardize data as needed. 3. Feature Selection: Identify key features influencing promotion decisions using techniques like correlation analysis and feature importance from tree-based models. 4. Model Development: Train multiple machine learning models (e.g., logistic regression, decision trees, random forests, gradient boosting, neural networks). Fine-tune hyperparameters using grid search or random search. Evaluate models using metrics like accuracy, precision, recall, F1 score, and ROC-AUC. 5. Model Evaluation: Validate the model using cross-validation and test sets to ensure generalizability and robustness. 6. Implementation: Deploy the model using a cloud-based service or integrate it into the existing HR system. Develop dashboards and visualization tools to display predictions and insights for HR managers.
Key Features	<ol style="list-style-type: none"> 1. Predictive Accuracy: High accuracy in predicting employee promotions. 2. Transparency: Clear and interpretable model predictions to explain promotion decisions. 3. Integration: Seamless integration with existing HR systems. 4. Visualization: User-friendly dashboards for HR managers to view predictions and insights. 5. Continuous Improvement: Regular updates and retraining of the model to maintain accuracy and relevance.

Resource Requirements

Resource Type	Description	Specification/Allocation
Hardware		
Computing Resources	CPU/GPU specifications, number of cores	2 x NVIDIA V100 GPUs
Memory	RAM specifications	32 GB RAM
Storage	Disk space for data, models, and logs	1 TB SSD or 512 SSD
Software		
Frameworks	Python frameworks	Flask, Django
Libraries	Additional libraries	TensorFlow, scikit-learn, numpy, pandas, flask, seaborn, matplotlib
Development Environment	IDE, version control	Jupyter Notebook, Git, Vscode
Data		
Data	Source, size, format	emp_promotion.csv dataset from Kaggle (54808 columns, 14 rows)